HARMONY TSHEPONG PV SOLAR FACILITY, FREE STATE PROVINCE

DEA Reference: 14/12/16/3/3/1/1444

ENVIRONMENTAL MANAGEMENT PROGRAMME

Revision 1

April 2021

Prepared for
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PROJECT DETAILS

DEA Reference	:	14/12/16/3/3/1/1444
Title	:	Environmental Management Programme: Revision 1 - Proposed Harmony Tshepong PV Solar Facility, Free State Province
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DEFINITIONS AND TERMINOLOGY

Accelerated soil erosion: Soil erosion induced by human activities and ultimately leading to irreversible degradation of the ecosystem and loss of
ecosystem functionality

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

Archaeological material: Remains resulting from human activities which are in a state of disuse and are in or on land and which are older than 100 years,

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

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

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

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

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

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

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

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

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

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

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

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

Hazardous Waste: Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment (National Environmental Management : Waste Act, 2008)

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

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

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

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

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

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

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In

terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

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

Waste:

(a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to this Act; or

(b) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the Gazette, but any waste or portion of waste, referred to in paragraphs (a) and (b), ceases to be a waste:

  (i) once an application for its re-use, recycling or recovery has been approved or, after such approval, once it is, or has been re-used, recycled or recovered;

  (ii) where approval is not required, once a waste is, or has been re-used, recycled or recovered;

  (iii) where the Minister has, in terms of section 74, exempted any waste or a portion of waste generated by a particular process from the definition of waste; or

  (iv) where the Minister has, in the prescribed manner, excluded any waste stream or a portion of a waste stream from the definition of waste.

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CHAPTER 1: PROJECT DETAILS

Tshepong Photovoltaic (Pty) Ltd, an Independent Power Producer (IPP), is proposing the establishment of a commercial solar energy facility (using photovoltaic technology) of up to 10 MW in capacity. The facility is proposed on the Farm Free State Geduld 448 under the jurisdiction of the Matjhabeng Local Municipality and the Lejweleputswa District Municipality, Odendaalsrus, Free State Province (refer to Figure 1.1). The proposed project will be referred to as the **Harmony Tshepong PV Solar Facility**.

The purpose of the facility will be to provide up to 10MW of power to the Tshepong Mining Shaft of the Harmony Gold Mining Company for operational purposes. The aim of the proposed project is to reduce the Harmony Gold Mining Company's dependency on Eskom to supply energy whilst simultaneously decreasing their carbon footprint.

In order to evacuate the generated power into the Harmony Gold Mining Company's Tshepong shaft, a grid connection needs to be established. An overhead power line will be the connection between the mini substation on the PV Solar Facility and the main substation which will be used as the connection point to the shaft. The main substation associated with this grid connection will be the existing Anglo Geduld Substation.

The facility development footprint, which is proposed to be approximately 19.6ha in extent, will include the following infrastructure:

- Photovoltaic (PV) panels of up to 5m in height (fixed-tilt/static or tracking technology) with a generating capacity of up to 10MW.
- Mounting structures to be either rammed steel piles or piles with pre-manufactured concrete footings to support the PV panels.
- Cabling between the project components, to be lain in trenches ~ 1- 2m deep.
- Power inverters between the PV arrays.
- Transformers with a step-up of up to 33kV.
- A mini-substation.
- An over-head power line of up to 33kV voltage for the distribution of the generated power which will be connected to the Anglo Geduld substation.
- A main external access road that leads to the development site and minor internal roads (5 meters in width) between the PV arrays.
- Office, workshop area for maintenance and storage.
- Lighting and fencing will be available in and around the facility for security and visibility purposes.
- During construction (temporary infrastructure) such as laydown areas will also be required.

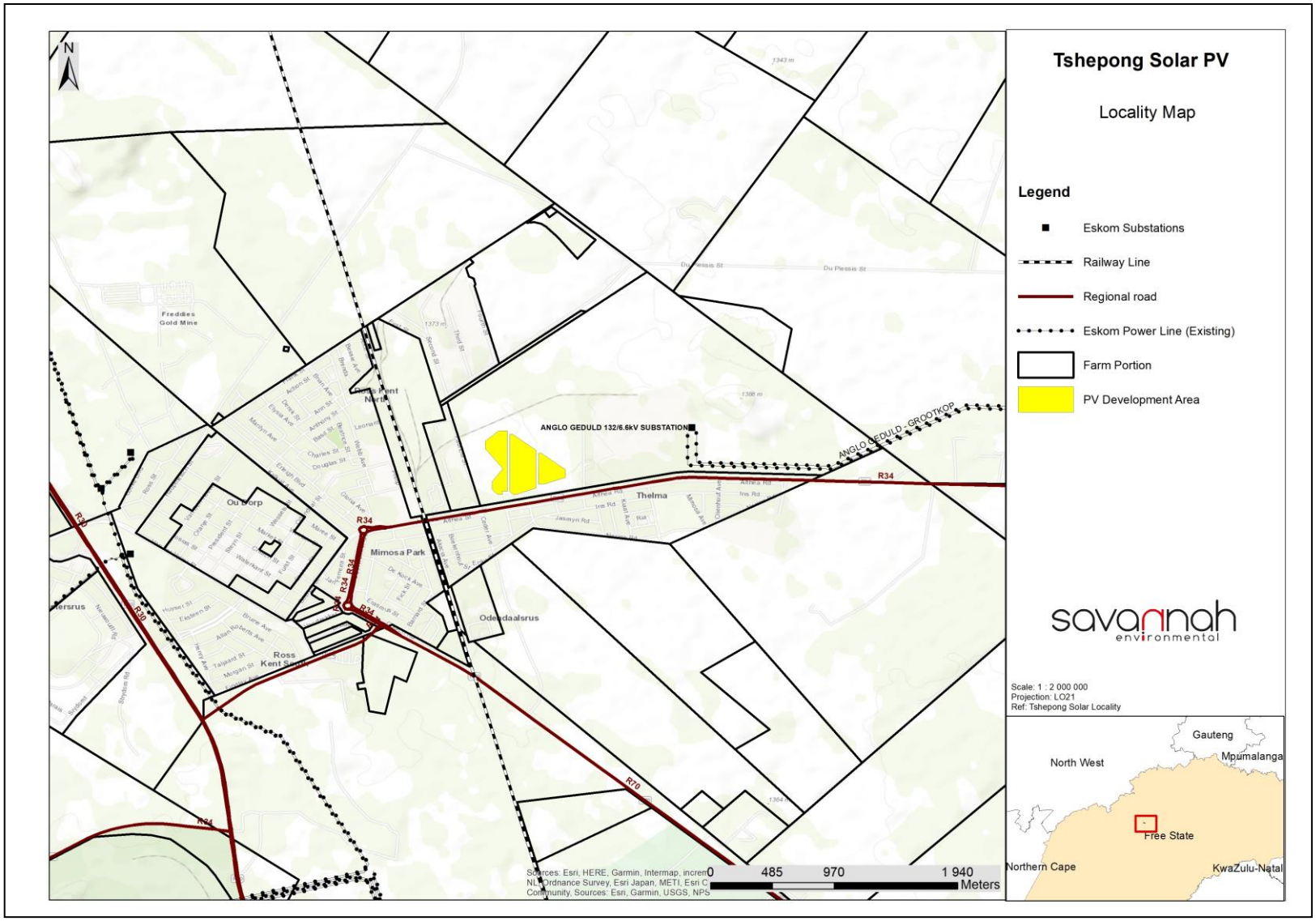

Figure 1.1: Locality map showing the location for the proposed Harmony Tshepong PV Solar Facility, Free State Province

1.1. Activities and Components associated with the Construction Operation and Decommissioning Solar Energy Facility

Table 1.1: Activities associated with the construction of a PV facility

Main Activity/Project Component	Components of Activity	Details
	Construction	
Undertake site preparation	» Clearance of vegetation at the infrastructure footprints. » Where required, some levelling of the land may occur.	» These activities will require the stripping of topsoil, which will need to be appropriately stockpiled for use in rehabilitation. » Topsoil stockpiles must be placed in an area where it will not be disturbed by construction activities.
The creation of a main site access road and internal maintenance tracks	» Construct ~5 m wide gravel roads to and within the site.	» The proposed internal access roads will be comprised of gravel tracks or compacted rock-fill.
Fencing of the project site, which may also serve as a fire-break	» The construction of fences around the site.	» Fencing will be placed around the site for security and maintenance purposes.
Construction of PV panels (fixed-tilt/static or tracking technology)	» Mounting structures will either be pile driven, screwed or pre-cast concrete footings » PV panels are transported in containers. » The assembling of the project structures will take place on site.	» Mounting structures will not involve the utilization of concrete, but would be pile driven, screwed or pre-cast concrete footings. » The steel mounting structures, manufactured in South Africa, are custom made for the site. They are to be assembled on site.
Construction of a short power line as part of the grid connection and on site cabling	» An ~ 1.5km long powerline (up to 33kV) is required to connect the PV solar facility to the gird. » The grid connection point will be through the Anglo Geduld Substation.	» The electricity generated at the site will run through the power line to the substation, which will feed the generated electricity into the Harmony Tshepong Mining Shaft.
Construction of a mini-substation	» The PV panels will be connected to the on-site mini-substation via underground cabling (where practical). » Excavation of trenches for underground cables.	» The installation of underground cables will require the excavation of trenches of approximately 1–2 meters deep within which they can then be laid. » The construction of a mini-substation on the proposed site

Main Activity/Project Component	Components of Activity	Details
Temporary construction camps	» Certain laydown areas will be established for the storing of machinery and any other equipment during the construction phase.	» The areas must be placed outside of, and not in close proximity to any sensitive areas.
Transport of components and equipment to site	» Trucks will be used to transport all components to site, including: * The normal civil engineering construction equipment for the civil works (e.g. trucks, graders, compaction equipment, cement mixers, etc.).	» The equipment will be transported to the site using appropriate National and Provincial routes, and the dedicated access/haul road to the site itself.
Undertake site rehabilitation at the conclusion of construction	» Remove all construction equipment from the site. » Rehabilitation of temporarily disturbed areas where practical and reasonable.	» On full commissioning of the facility (or a portion thereof), any access points to the site which are not required during the operation phase will be closed and prepared for rehabilitation.
Operation		
Operation	» PV panels. » Associated infrastructure.	» The operational phase is proposed to run for a period of at least 20 years. » During this time, full time security, maintenance, supervision, and monitoring will be required on site. » The PV facility will be operational during daylight hours only but not under circumstances of mechanical breakdown, or maintenance activities. » No energy storage mechanisms (i.e. batteries) which would allow for continued generation at night or on cloudy days are proposed. » An estimated 10 m^3 litres of water per annum would be required for the cleaning of panels 2-3 times per annum. This water will be obtained from the mine.
Maintenance & Security	» Maintenance during the life cycle of the facility would include emergency repairs, routine panel maintenance, routine maintenance of medium voltage equipment and maintenance of the site.	» 24 hour on-site security, 2m – 5m high perimeter fencing, and 2-6 security guards.

Main Activity/Project Component	Components of Activity	Details
Decommissioning		
Disassembling of panels	» The panels will be disassembled and removed.	» The components of the plant will be disassembled and removed. Thereafter they will be reused and recycled (where possible) or disposed of in accordance with regulatory requirements.

1.2. Findings of the Basic Assessment Process

Through the environmental assessment of impacts associated with the Harmony Tshepong PV Solar Facility, both potentially positive and negative impacts have been identified. The most significant environmental impacts associated with the proposed project include:

» The overall impact on **ecology** as a result of the construction and operation of the proposed facility is likely to be of **low to medium significance**. The site for the proposed Harmony Tshepong PV Solar Facility is not considered highly sensitive from an ecological perspective (refer Figure 1.2). The proposed development areas have been transformed in the past through anthropogenic activities and overgrazing and although there are some relatively more sensitive habitats in the vicinity, these are of limited extent and are outside of the development footprint of the current development layout. There is a small seasonal depression wetland at the western end of the proposed Harmony Tshepong PV solar energy facility. Due to the highly localized situation of the depression wetland along with the highly degraded state, the wetland does not contribute significantly to the overall ecological functionality of the area. The wetland is however considered as a 'no-go' area for development. Overall, the study site is relatively poor in species diversity. During the Ecological Impact Assessment, a total of 56 species were noted of which 7 species were weeds and alien invasives. No rare, endangered or endemic species were found with only one species, *Schizocarpus nervosus*, noted that is listed in the Free State Nature Conservation Ordinance (Act 8 of 1969) as a Protected Plant (Schedule 1). Of the 7 different weeds and alien invasive species, *Eucalyptus camldulensis* species is listed as a Category 2 Weed and *Opuntia lindheimeri* as a Category 1 according to CARA (1983). A slope seepage wetland is present outside the study area to the east (may be impacted by proposed route of the power line). This slope seepage wetland, which can be considered as being extremely fragmented and disturbed, is located to the east of the proposed development area. This wetland is considered as a 'no-go' area for development. This wetland forms part of a wetland cluster and is classified as a NFEPA wetland. As a result of the current ecological state of the proposed project site, and the chance of recovery to its natural state being very low, the construction of the proposed PV Solar Facility will not have a significant impact on the area.

» The impacts to heritage resources as a result of the construction and operation of the proposed development are considered to be **low significance**. No heritage resources were recorded during the Archaeological Impact Assessment. Due to the subsurface nature of archaeological material and graves, the possibility of the occurrence of unmarked or informal graves and subsurface finds cannot be excluded. If during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find.

Based on the findings of the studies undertaken, in terms of environmental constraints and opportunities identified through the Environmental Basic Assessment process, no environmental fatal flaws were identified to be associated with the establishment of the proposed Harmony PV Solar facility and associated infrastructure. Sensitive areas within which construction should not occur were however identified. These are detailed in Figure 1.2. The layout for the proposed Harmony Tshepong PV Solar Facility (Figure 1.2) is designed as to avoid the small depression wetland located to the west of the site and is located far away from the R34, which reduces the visibility of the facility.

1.3. Findings of the final walk-through surveys (2021)

The draft EMPr, dated September 2015, submitted as part of the final Basic Assessment Report requires that prior to finalisation and approval of the EMPr, the programme be updated to include site-specific information and specifications following the final walk-through survey of the development footprint by ecological and heritage specialists. A summary of the findings of the final walk-through surveys is provided below:

» The Fauna and Flora pre-construction walk-through undertaken in March 2021 identified four protected plant species within the proposed development, and none within the grid connection corridor. No red data species (Red List of South African plants version 2017.1) were recorded within the "walked" area. Only one conservation important faunal species was noted, namely the Yellow Mongoose. Five category 1b listed alien invasive species were recorded within the "walked" area. Identification of protected species within the "walked" area implies that a permit for the removal and relocation of all protected plants and animals that will be affected will be required from the national and provincial environmental authorities (the Department of Forestry, Fisheries and the Environment, and the Free State Department: Economic, Small Business Development, Tourism and Environmental Affairs) (all four protected plant species are protected under the Free State Nature Conservation Ordinance 8 of 1986 and one of the four plants is also protected under the National Forests Act 84 of 1998) , as well as written permission from the landowner.

» The 2015 Archaeological Impact Assessment conducted by Heritage Contracts and Archaeological Consulting recorded no sites of heritage significance, and the heritage walk-through survey undertaken in 2020 confirmed the absence of surface indicators of heritage resources. Due to the apparent absence of significant heritage resources in the study area, the impact of the proposed project on heritage resources is considered to be of **low significance** and it is recommended that the proposed project commence on the condition that a chance find procedure be implemented as part of the EMPr.

1.4. Layout Update

In accordance with Condition 14 of the EA dated 08 December 2015 (DEA Reference: 14/12/16/3/3/1/1444), Tshepong Photovoltaic (Pty) Ltd has updated the layout of the solar energy facility. Figure 1.2 includes the environmental sensitivity and layout map for the solar energy facility, submitted as part of the final Basic Assessment Report in 2015. Figure 1.3 provides the final layout of the Tshepong PV facility. Figure 1.4. includes an environmental sensitivity and layout map of the final layout of the solar energy facility.

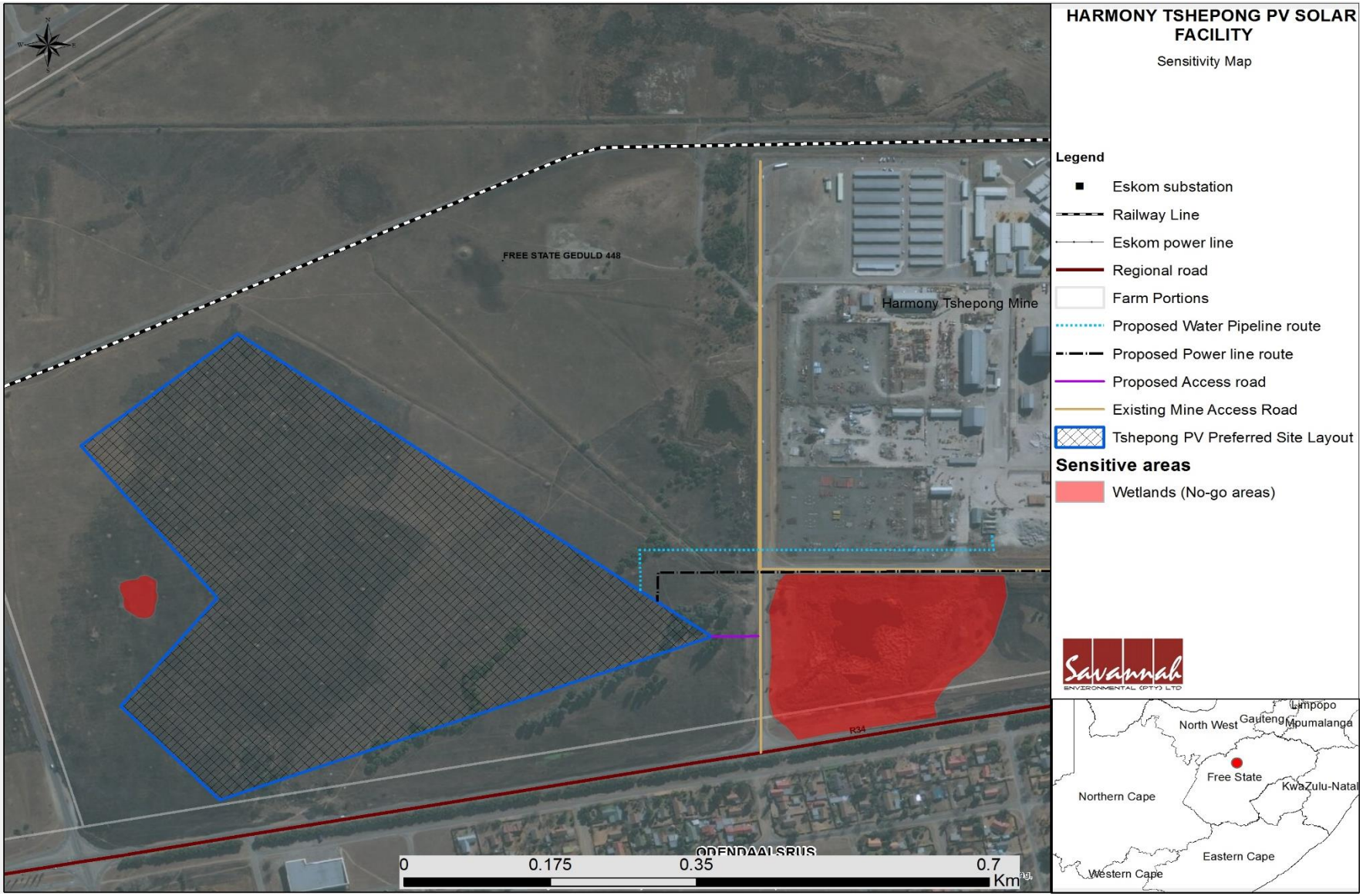

Figure1.2: Sensitivity map of the layout for the proposed Harmony Tshepong PV Solar Facility (2015)

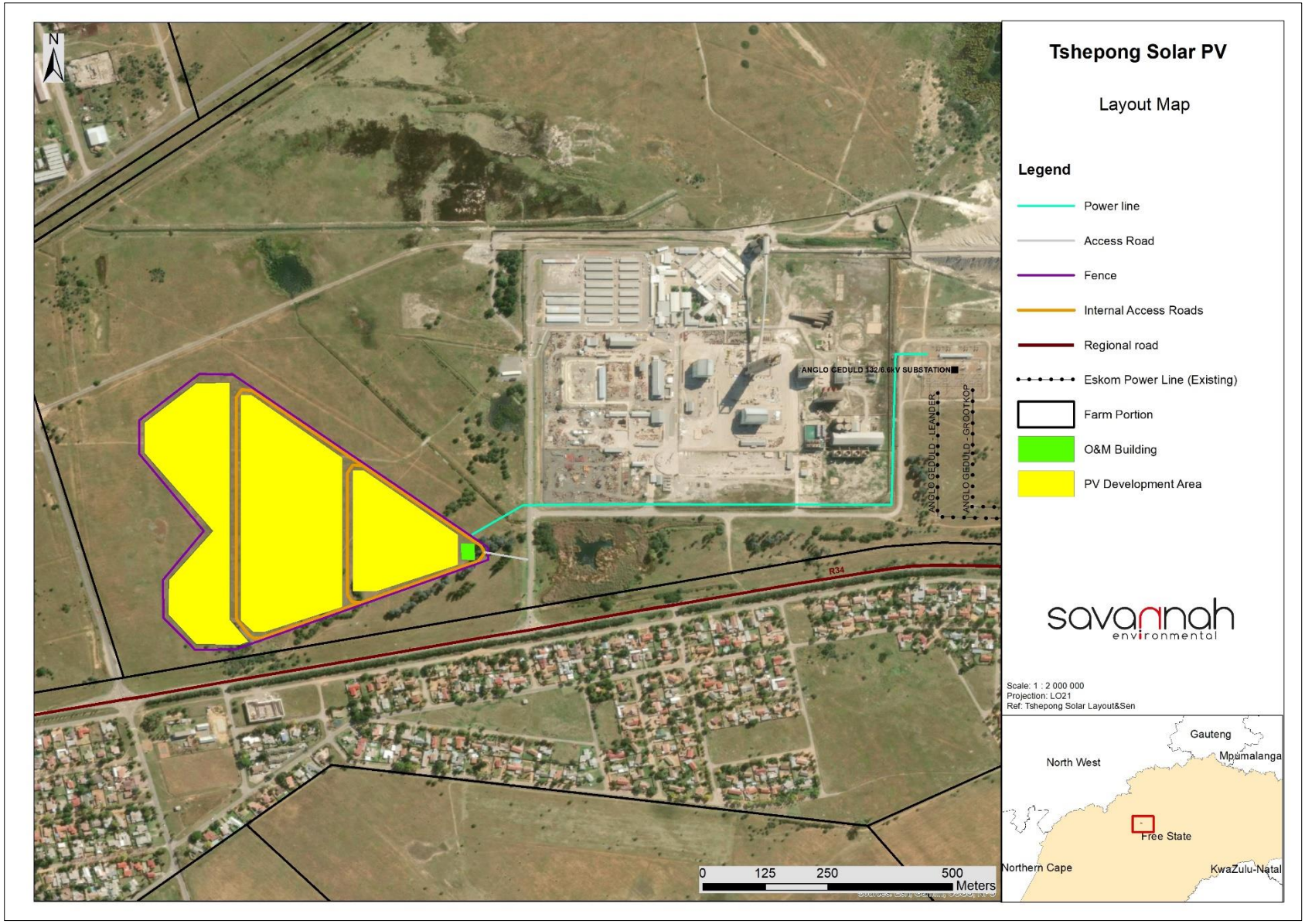

Figure 1.3: Final facility site layout map (2021)

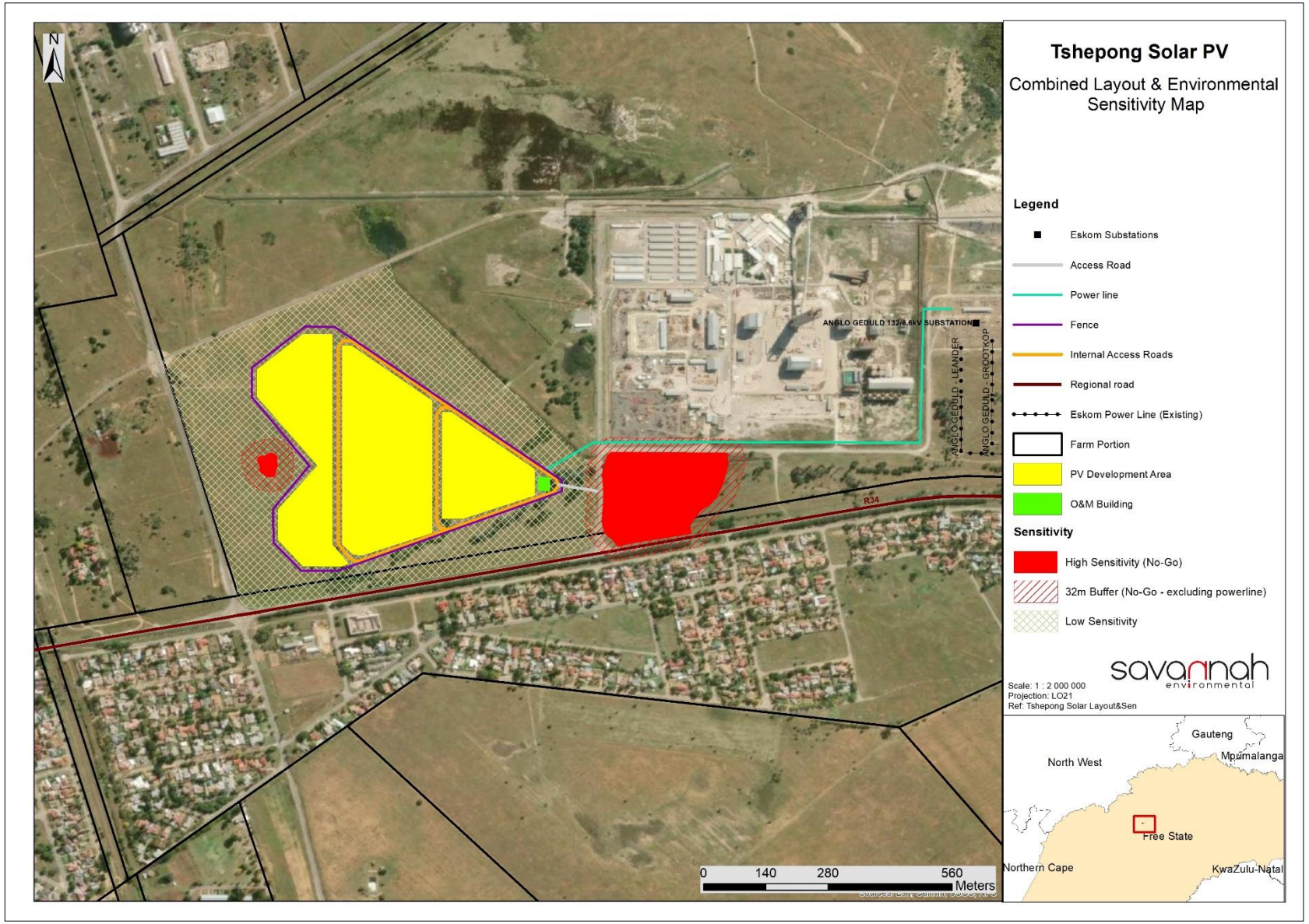

Figure 1.4: Final site layout map overlain on the environmental sensitivity map as updated in accordance with Condition 14 of the EA (2021)

1.5. Benefits of the Proposed Project

Internationally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of resources.

The construction of the proposed project will include direct and indirect benefits at the local and regional scale. The generation of electricity from a renewable resource will have a widespread benefit due to the minimisation of the need to use non-renewable resources for this purpose and the avoidance of associated environmental impacts. The proposed PV solar facility will not only secure the supply of power to the Harmony Tshepong Mining Shaft, but also indirectly add capacity to the electricity grid (due to the reduced reliance of Harmony Tshepong Mine on this supply). Improved power supply will result in benefits to society at a national scale. As the proposed site falls within an area within the mine boundary which has been degraded and transformed from its natural state. The placement of the PV facility in this area will reduce impacts on ecological systems, and will provide a beneficial alternative land use to mining as the construction and operation of a PV solar facility will have lower impacts on the environment than mining.

The positive implications of establishing a solar energy facility on the demarcated site within the Free State include:

» The potential to harness and utilise good solar energy resources would be realised.
» Promotion of clean, renewable energy in South Africa.
» Positive impacts on the tourism economy of the area.
» Creation of local employment and business opportunities for the area.

The proposed development represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole. The proposed project will not consume energy, but will instead provide a new source of clean, renewable electricity. This generation of renewable power will aid in reducing the dependency on other power generation fuels and enhancing the reliability of the regional energy supply.

CHAPTER 2: PURPOSE AND OBJECTIVES OF THE EMPR

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

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

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

This EMPr has been prepared in accordance with Appendix 4 of the EIA Regulations, published on the 8th of December 2014 (as amended) , and has been and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project. The EMPr has been developed as a set of environmental specifications (i.e. principles of environmental management), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools).

This EMPr has the following objectives:

- Outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction and rehabilitation, operation, and decommissioning phases of the project in order to manage and minimise the extent of potential environmental impacts associated with the facility.
- Ensure that all the phases of the project do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
- Identify entities responsible for the implementation of the measures and outline functions and responsibilities.
- Propose mechanisms and frequency for monitoring compliance, and preventing long-term or permanent environmental degradation.
- Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the Basic Assessment process.

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

Tshepong Photovoltaic (Pty) Ltd must ensure that the implementation of the project complies with the requirements of all environmental authorisations, permits, and obligations emanating from relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMPr and through its integration into the contract documentation. Since this EMPr is part of the Basic Assessment process for the proposed Harmony Tshepong PV Solar Facility, it is important that this document be read in conjunction with the Final Basic Assessment Report compiled for this project (Savannah Environmental, September 2015). This will contextualise the EMPr and enable a thorough understanding of its role and purpose in the integrated environmental management process. Should there be a conflict of interpretation between this EMPr and the environmental authorisation dated 08 December 2015 (DEA Reference: 14/12/16/3/3/1/1444), the stipulations in the environmental authorisation shall prevail over that of the EMPr, unless otherwise agreed by the competent authority in writing. Similarly, any provisions in legislation overrule any provisions or interpretations within this EMPr.

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

2.1. EMPr Update

This EMPr update has been undertaken in accordance with the requirements of Conditions 16 and 17 of the EA dated 08 December 2015 (DEA Reference: 14/12/16/3/3/1/1444). The EMPr Plans (Appendix A – H) included in the EMPr should be adhered to as they form part of this EMPr. Table 2.1 below indicates how the conditions in the EA have been addressed in this revised EMPr:

Table 2.1: EA Conditions which required the EMPr amendment

EA Condition Reference	Section of EMPr where Condition has been addressed
17. The EMPr amendment must include the following:	
17.1 All recommendations and mitigation measures recorded in the EIA r and specialist studies attached as part of the EIAr.	All recommendations and mitigation measures of the EIAr and specialist studies have been included in Chapters 5, 6, 7, 8 and 9 of the EMPr. Where amendments and/or additions have been made, these have been underlined for ease of reference.
17.2 The requirements and conditions of this environmental authorisation.	The relevant requirements and conditions of the authorisation have been integrated into this EMPr. Where amendments and/or additions have been made, these have been underlined for ease of reference.
17.3. An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.	An alien invasive management plan has been included as Appendix B of the EMPr. The plan includes mitigation measures to be implemented to reduce the invasion of alien plant species within the project footprint and the surrounding area.

EA Condition Reference	Section of EMPr where Condition has been addressed
17.4 A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site in consultation with the ECO to be implemented prior to commencement of the construction phase.	The project has not reached the construction phase as yet; however, a walk-through survey of the proposed development footprint was undertaken by an ecological specialist on 6 March 2021. The plant rescue and protection plan has been appended to the EMPr as Appendix E.
17.5 A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery of natural habitats.	A re-vegetation and habitat rehabilitation plan has been included in the EMPr as Appendix F.
17.6 A stormwater and wash water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated stormwater or increased soil erosion. The plan must include the construction of design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of stormwater run-off.	A generic stormwater and wash water management plan has been developed for the proposed facility and has been included in the EMPr as Appendix G.
17.7 An erosion management plan for monitoring and rehabilitating erosion events associated with the facility. Erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.	An erosion management plan has been included as Appendix C of the EMPr.
17.8 An effective monitoring system to detect any leakage or spillage of any hazardous substances during their transportation, handling, use, or storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or stormwater systems.	Refer to Objective 12 under the Construction EMPr.
17.9 Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.	Measures to protect hydrological features, and other environmental sensitive areas from construction impacts have been included under Objective 1 (planning and design phase), Objectives 1,2 3 and 7 (construction phase), and Objectives 1 and 2 (operational phase).
17.10 A fire management plan to be implemented during the construction and operation of the facility.	A fire management plan has been included in the EMPr as Appendix H.
17.11 An environmental sensitivity map indicating environmentally sensitive areas and features identified during the EIA process.	An environmental sensitivity map of the solar energy facility indicating environmentally sensitive areas and features identified during the EIA process have been included as Figure 1.2.
17.12 The final site layout map.	The final site layout has been included as Figure 1.3

EA Condition Reference	Section of EMPr where Condition has been addressed
17.13 The final site layout map superimposed (overlain) on the environmental sensitivity map. This map must reflect the approved location of the PV as stated in the EIAr and this environmental authorisation.	A final site layout map superimposed on the environmental sensitivity map has been included as Figure 1.4 in the EMPr.

CHAPTER 3: STRUCTURE OF THIS EMPR

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

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

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

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

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

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

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

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

» Planned activities change (i.e. in terms of the components and/or layout of the facility);
» Modification to or addition to environmental objectives and targets;

» Relevant legal or other requirements are changed or introduced; and
» Significant progress has been made on achieving an objective or target such that it should be re-examined to determine if it is still relevant, should be modified, etc.

3.1. Project Team

This EMPr was compiled by:

	Name	Company
EMPr Compilers:	Lisa Opperman EAP Karen Jodas Mmakoena Mmola Jo-Anne Thomas	Savannah Environmental (2015) Savannah Environmental (2015) Savannah Environmental (2021) Savannah Environmental (2021)
Specialists:	Gerhard Botha Jaco van der Walt Marion Bamford	Enviro-Niche Consulting (Ecology) (2015) Nkurenkuru Ecology and Biodiversity (Ecology) (2021) Heritage Contracts and Archaeological Consulting (Heritage) (2015 and 2020) Evolutionary Studies Institute (Palaeontology) (2015)

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

CHAPTER 4: KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT

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

- National Environmental Management Act (Act No 107 of 1998).
- EIA Regulations, published under the NEMA (GNR R983, GNR 984 and GNR 985 in Government Gazette 38282 of 4 December 2014).
- Guidelines published in terms of the NEMA Basic Assessment Regulations, in particular:
  - Public Participation in the Basic Assessment Process (DEA, 2010).
  - Integrated Environmental Management Information Series (published by DEA).
- International guidelines, including the Equator Principles.

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

Table 4.1: Relevant legislative and permitting requirements applicable to the establishment of the proposed Harmony Tshepong PV Solar Facility

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Legislation			
National Environmental Management Act (Act No 107 of 1998)	The EIA Regulations have been promulgated in terms of Chapter 5 of the Act. Listed activities which may not commence without an environmental authorisation are identified within these Regulations. In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation. In terms of GNR 983 of December 2014, a Basic Assessment process is required to be undertaken for the proposed project	Department of Environmental Affairs – competent authority Free State Department of Economic Development, Tourism and Environmental Affairs (FS DEDTEA) – commenting authority	A Basic Assessment Report was submitted to the DEA (now DFFE) in support of the application for authorisation. An EA was issued for the project on 08 December 2015 (DEA Reference: 14/12/16/3/3/1/1444), and subsequently amended on 13 January 2021 (DEA Reference: 14/12/16/3/3/1/1444/AM1).
National Environmental Management Act (Act No 107 of 1998)	In terms of the Duty of Care Provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, stopped or minimised. In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.	Department of Environmental Affairs	While no permitting requirements arise from this section of the Act, this will be applicable during construction and operation in order to ensure minimisation of impacts on the environment.
National Environmental Management Act (No 107 of 1998) (NEMA)	Section 30 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA") pertains to the control of incidents. In the event of a significant spill or leak of hazardous	DFFE	Section 30 of NEMA contains reporting obligations. It prescribes that, after gaining knowledge of the occurrence of an incident, the responsible person or

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	substances (e.g. petrol. Diesel, etc.) used during the proposed activities, such as an incident(s) must be reported to the relevant authorities, including this directorate, in accordance with section 30 of the NEMA	Free State Department of Economic Development, Tourism and Environmental Affairs	his/her employer must report it through the most effective means reasonably available to the competent authority.
Environment Conservation Act (Act No 73 of 1989)	National Noise Control Regulations (GN R154 dated 10 January 1992)	Department of Environmental Affairs Free State Department of Economic Development, Tourism and Environmental Affairs Local Authorities	Noise impacts are expected to be associated with the construction phase of the project and are not likely to present a significant intrusion to the local community. Therefore is no requirement for a noise permit in terms of the legislation.
National Water Act (Act No 36 of 1998)	Water uses under S21 of the Act must be licensed unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation.	Department of Water and Sanitation	A water use license (WUL) is required to be obtained if water resources are impacted on. No water resources will be impacted directly by the proposed layout of the facility. Based on the final layout, the infrastructure of the PV facility will not infringe on the two wetlands identified on site, and as such, a water use license will not be required. This is further supported by the Department of Water and Sanitation (DWS) Risk Assessment undertaken for the project.
National Water Act (Act No 36 of 1998)	In terms of S19, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing, or recurring.	Department of Water and Sanitation	This section of the Act will apply with respect to the potential impact on the seasonal depression wetland, primarily during the construction phase (i.e. pollution from construction vehicles).
Minerals and Petroleum Resources Development Act (Act No 28 of 2002)	A mining permit or mining right may be required where a mineral in question is to be mined (e.g.	Department of Mineral Resources	As no borrow pits are expected to be required for the construction of the

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	materials from a borrow pit) in accordance with the provisions of the Act. Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act. S53 Department of Mineral Resources: Approval from the Department of Mineral Resources (DMR) may be required to use land surface contrary to the objects of the Act in terms of section 53 of the Mineral and Petroleum Resources Development Act, (Act No 28 of 2002): In terms of the Act approval from the Minister of Mineral Resources is required to ensure that proposed activities do not sterilise a mineral resources that might occur on site		facility, no mining permit or right is required to be obtained. A Section 53 application process is in progress.
National Environmental Management: Air Quality Act (Act No 39 of 2004)	S18, S19, and S20 of the Act allow certain areas to be declared and managed as "priority areas." Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards.	Department of Environmental Affairs	No permitting or licensing requirements arise from this legislation. The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act.
National Heritage Resources Act (Act No 25 of 1999)	S38 states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including: » The construction of a road, power line, pipeline, canal or other similar linear development or barrier exceeding 300 m in length; and	South African Heritage Resources Agency (SAHRA) Free State Heritage Resources	A Heritage Impact Assessment has been undertaken as part of the Basic Assessment Process to identify heritage sites (refer to **Appendix D2** of the Basic Assessment Report). No heritage resources were discovered through the Heritage Impact Assessment. This was confirmed during the heritage walk through of the final layout in 2020. It

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» Any development or other activity which will change the character of a site exceeding 5 000 m^2 in extent. Stand alone HIAs are not required where an EIA Process is carried out as long as the EIA contains an adequate HIA component that fulfils the provisions of S38. In such cases only those components not addressed by the EIA should be covered by the heritage component.		should however be noted that if during the construction phase any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find. A Palaeontological Impact Assessment has been undertaken as part of the Basic Assessment Process to identify possible impact of the development on the palaeontology of the site (refer to **Appendix D3** of the Basic Assessment Report). The proposed PV Solar Energy Facility will not impact on any palaeontological material. If any fossil discoveries are made during the construction, then it is strongly recommended that a professional palaeontologist be called to assess the importance and rescue them if necessary (with the relevant SAHRA permit).
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	In terms of S57, the Minister of Environmental Affairs has published a list of critically endangered, endangered, vulnerable, and protected species in GNR 151 in Government Gazette 29657 of 23 February 2007 and the regulations associated therewith in GNR 152 in GG29657 of 23 February 2007, which came into effect on 1 2007.	Department of Environmental Affairs	As the applicant will not carry out any restricted activity, as is defined in S1 of the Act, no permit is required to be obtained in this regard. Specialist flora and fauna studies have been undertaken as part of the Basic Assessment process. As such, the

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	In terms of GNR 152 of 23 February 2007: Regulations relating to listed threatened and protected species, the relevant specialists must be employed during the EIA Phase of the project to incorporate the legal provisions as well as the regulations associated with listed threatened and protected species (GNR 152) into specialist reports in order to identify permitting requirements at an early stage of the EIA Phase. The Act provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GoN 1002), 9 December 2011).		potential occurrence of critically endangered, endangered, vulnerable, and protected species, as well as critically endangered (CR), endangered (EN), vulnerable (VU) or protected ecosystems and the potential for them to be affected has been considered (refer to the Ecological Impact Assessment contained in **Appendix D1** of the Basic Assessment Report). A fauna and flora pre-construction walk-through of the final layout was undertaken in March 2021. No species protected under this Act were identified.
Conservation of Agricultural Resources Act (Act No 43 of 1983)	Regulation 15 of GNR1048 provides for the declaration of weeds and invader plants, and these are set out in Table 3 of GNR1048. Weeds are described as Category 1 plants, while invader plants are described as Category 2 and Category 3 plants. These regulations provide that Category 1, 2 and 3 plants must not occur on land and that	Department of Agriculture	This Act will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	such plants must be controlled by the methods set out in Regulation 15E.		management plan must be implemented. Based on the final site layout, the project will not require the draining of vleis, marshes or water spongers, and therefore, permission to carry this activity from the agricultural authority is not required.
National Forests Act (Act No. 84 of 1998)	» In terms of S5(1) no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license granted by the Minister to an (applicant and subject to such period and conditions as may be stipulated". » GN 155 provides a list of protected tree species.	National Department of Forestry	A fauna and flora pre-construction walk-through of the final layout was undertaken, and four protected species were noted within the proposed development footprint. Only one of these protected plant species, namely *Acacia (Vachellia) erioloba*, is protected under the National Forest Act, 1998 (Act 84 of 1998). As per the recommendation made by the ecologist in the fauna and flora pre-construction walk-through report, should this protected plant species be affected by the development, a permit will be required for its removal and relocation.
National Veld and Forest Fire Act (Act 101 of 1998)	In terms of S21 the landowner would be obliged to burn firebreaks to ensure that should a veldfire occur on the property, that it does not spread to adjoining land. In terms of S12 the landowner must ensure that the firebreak is wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material.	Department of Water and Sanitation	While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction and operational phase of the project.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	In terms of S17, the landowner must have such equipment, protective clothing, and trained personnel for extinguishing fires.		
Hazardous Substances Act (Act No 15 of 1973)	This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. • Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance • Group IV: any electronic product; and • Group V: any radioactive material. The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.	Department of Health	It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license is required to be obtained from the Department of Health.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	The Minister may by notice in the *Gazette* publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. The Minister may amend the list by – » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. In terms of the Regulations published in terms of this Act (GN 921), A Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities. Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in » any other way rendered unlit for the safe storage of waste. » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise; and	National Department of Water and Environmental Affairs Provincial Department of Environmental Affairs (general waste)	As no waste disposal site is to be associated with the proposed project, no permit is required in this regard. Waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of the Act (refer to **Appendix D** for Waste Management Plan).

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» Pollution of the environment and harm to health are prevented.		
National Road Traffic Act (Act No 93 of 1996)	» The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. » Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. » The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.	» South African National Roads Agency Limited (national roads) » Provincial Department of Transport	» An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. » Transport vehicles exceeding the dimensional limitations (length) of 22m. » Depending on the trailer configuration and height when loaded, some of the substation components may not meet specified dimensional limitations (height and width).
Provincial Legislation			
The Nature Conservation Ordinance 8 of 1969 and amendments	Lists plant and animal species as protected	Free State Department of Economic Development, Tourism and Environmental Affairs	A fauna and flora pre-construction walk-through of the final layout was undertaken, and four protected species were noted within the proposed development footprint, all of which are

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			protected under the Free State Nature Conservation Ordinance, 1969 (Act 8 of 1969), namely *Helichrysum caespititium, Helichrysum rugulosum, Schizocarpus nervosus, Acacia (Vachellia) erioloba.* Should individuals of these plants be impacted directly by the proposed facility, a permit from the provincial conservation authority for the removal/relocation thereof will need to be applied for.

CHAPTER 5: MANAGEMENT PROGRAMME - PLANNING AND DESIGN

Overall Goal – to undertake the planning and design phase in a way that:

- Ensures that the design of the facility responds to the identified environmental constraints and opportunities.
- Ensures that adequate regard has been taken of any landowner and community concerns and that these are appropriately addressed through design and planning (where appropriate).
- Ensures that the best environmental options are selected for the linear components, including the access roads and power line alignments.
- Enables the solar energy facility construction activities to be undertaken without significant disruption to other land uses and activities in the area.

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

5.1 Objectives

OBJECTIVE 1: Ensure the selection of the best environmental option and ensure that all environmental sensitivities and possible impacts are fully accounted for

Opportunities to mitigate the negative impacts of PV developments largely arise during the planning and design stages. The correct choice of footprint location and layout is paramount, thus ecosystem components such as biodiversity and ecosystem function should be given full consideration during the design phase, as determined by the Environmental Impact Assessments. The exact design of PV arrays (panel size, height, spacing, and nature of panels tracking or fixed) can be equally important. The timing of pre-commencement, construction, maintenance and decommissioning activities also provides opportunities to reduce negative impacts on biodiversity.

Sensitive areas have been identified on the proposed project site (determined through an Ecological Impact Assessment). Two wetlands were identified during the Ecological Impact Assessment which have been classified as no-go areas (areas to be avoided) in regards to activities and development taking place. A small seasonal depression wetland occurs to the west of the proposed project site. A seepage wetland occurs outside of the proposed project site to the east and is situated along the route for the proposed power line. Due to a history of heavy communal over-grazing as well as the occurrence of anthropogenic activities in the proposed project site and adjacent areas these wetlands have been degraded and transformed to a point where natural recovery is no longer possible. Even though the nature of the wetlands are not ideal and do not contribute significantly to the ecological functioning of the site, as a result of degradation and transformation, they still need to be protected. This is governed by the fact that the Free State Province has a " no wetland loss policy" which prevents the loss and further degradation of any wetlands.

Project Component/s	» PV Array. » Grid connection and associated servitudes. » Access roads. » Workshop, guardhouses, substation and other related infrastructure.

	» Temporary construction camps. » Protective fencing around development. » Potential topsoil stockpiles.
Potential Impact	» Placement of infrastructure that degrades the environment unnecessarily, particularly with respect to habitat destruction, loss of indigenous flora, damage to depression wetland, establishment and persistence of alien invasive plants, and erosion.
Activities/Risk Sources	» Positioning of solar components and internal access routes. » Positioning of workshop, guardhouses, substation and other related infrastructure. » Alignment of power line and servitudes. » Alignment of access roads to development. » Positioning of temporary sites.
Mitigation: Target/Objective	» To ensure selection of best environmental option for positioning of proposed infrastructure. » Environmental sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	Responsibility	Timeframe
The holder of the authorisation must appoint an experienced Environmental Control Officer (ECO) for the construction phase of the development that will have the responsibility to ensure that the mitigation/rehabilitation measures and recommendations referred to in this environmental authorisation are implemented and to ensure compliance with the provisions of the approved EMPr. » The ECO must be appointed before commencement of any authorised activities. » Once appointed, the name and contact details of the ECO must be submitted to the Director: Compliance Monitoring of the Department. » The ECO must keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO. » The ECO must remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site is ready for rehabilitation.	Tshepong Photovoltaic (Pty) Ltd	Pre-construction
Contractor to sign and undertake to comply with Environmental Specifications.	Contractor	Pre-construction
Authorisation of the activity is subject to the conditions contained in the environmental authorisation, which form part of the environmental authorisation and are binding on the holder of the authorisation.	Tshepong Photovoltaic (Pty) Ltd Contractor	Duration of project
The holder of the authorisation is responsible for ensuring compliance with the conditions contained in the environmental authorisation. This includes any person acting on the holder's behalf, including but not limited to, an agent, servant, contractor, sub-contractor, employee, consultant or person rendering a service to the holder of the authorisation.	Tshepong Photovoltaic (Pty) Ltd	Duration of project

Mitigation: Action/Control	Responsibility	Timeframe
The recommendations of the EAP in the BAR dated September 2015 and the specialist studies attached must be adhered to. In the event of any conflicting mitigation measures and conditions of the Environmental Authorisation, the specific condition of the Environmental Authorisation will take preference.	Tshepong Photovoltaic (Pty) Ltd Contractor	Duration of project
Design of the facility and power line must ensure the avoidance of the identified wetlands.	Tshepong Photovoltaic (Pty) Ltd Design Engineer	Design phase
A 32 m buffer must be placed around the wetland as indicated on Figure 1.5.	Tshepong Photovoltaic (Pty) Ltd Design Engineer	Design phase
Underground cabling and internal access roads must be aligned as much as possible along existing infrastructure to limit damage to vegetation and watercourses.	Tshepong Photovoltaic (Pty) Ltd Design Engineer	Design phase
Include depression wetland into PV facility fenced area.	Tshepong Photovoltaic (Pty) Ltd Design Engineer	Design phase
Undertake pre-construction walk-through footprint investigations for protected flora. The final footprint investigation (walkthrough) is aimed to fully inform the developer, responsible conservation authority (that will issue the relevant permits and authorisations), contractors, EO and ECO about: » Protected species that will be affected by the development. ∗ Location of protected plant species within the footprint area – either individually mapped or approximate areas of occurrence (alternatively, for linear structures, between which structures or other markers). ∗ Identification of the affected species by providing a representative photo record that enables ECOs and contractors to identify such plants. ∗ Location and nature of any nesting sites or active burrows of vertebrate species (birds, amphibians, reptiles and mammals), mapped by GPS, that will have to be inspected and cleared/relocated prior to construction by the contractor or duly appointed person(s).	Tshepong Photovoltaic (Pty) Ltd, to be carried out by appropriate specialists	Design review phase
A pre-construction survey of the final development footprint must be conducted to ascertain the identity and exact number of individuals of protected species affected by the proposed development. Prior to commencement of construction, a rescue and rehabilitation operation for these species which could survive translocation must be conducted.	Tshepong Photovoltaic (Pty) Ltd, Specialist and Contractor	Pre-construction
Appropriately demarcate all footprint areas prior to construction, and then have a suitably qualified contractor	Tshepong Photovoltaic (Pty) Ltd, Contractor, specialist and ECO	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
locate and remove/relocate all protected species, supervised and possibly assisted by the project ECO.		
The above pre-construction footprint investigations will be used together with results from the ecological specialist report to draft a comprehensive alien invasive species eradication and management plan (as outlined in **Appendix B**).	Tshepong Photovoltaic (Pty) Ltd, to be carried out by a specialist	Design review phase
Permits will be required to remove or relocate *Schizocarphus (Scilla) nervosus, Helichrysum caespititium, Helichrysum rugulosum,* and *Acacia (Vachellia) erioloba.*	Tshepong Photovoltaic (Pty) Ltd	Pre-construction
Before the clearing of the site, the appropriate permits must be obtained from the Department of Agriculture, Forestry and Fisheries (DAFF) for the removal of plants listed in the National Forest Act and from the relevant provincial department for the destruction of species protected in terms of the specific provincial legislation. Copies of the permit must be kept by the ECO.	Tshepong Photovoltaic (Pty) Ltd ECO	Pre-construction Construction
All footprint areas must be appropriately demarcated prior to construction, and a suitably qualified contractor must be appointed to locate and remove/relocate all protected species, supervised and possibly assisted by the project ECO.	Tshepong Photovoltaic (Pty) Ltd, Contractor and ECO	Pre-construction
No construction activities can commence without having obtained the necessary permits for threatened or protected species (ToPS) listed and provincially protected species within the study area.	Tshepong Photovoltaic (Pty) Ltd	Pre-construction
An Invasive Alien Plant Management Plan should be compiled by a suitably qualified specialist, addressing the monitoring and eradication of such listed alien invasive plants during the construction and operational phase.	Tshepong Photovoltaic (Pty) Ltd, to be carried out by a specialist	Pre-construction
Use design-level mitigation measures recommended in respect of habitat and ecosystem intactness and prevention of species loss as detailed within the Basic Assessment Report: » This includes positioning components of the development as close as possible together and in close proximity to other existing or planned developments in the area. » Strictly adhere to existing tracks/roads where ever possible to gain access to the site. » Sites for storing, mixing, and handling topsoil stockpiles (if necessary) or any introduced materials, including all machinery or processing implements, must be placed in an ecologically least sensitive area and at least 100 m from any type of wetland.	Tshepong Photovoltaic (Pty) Ltd	Construction Phase
Access roads and machinery turning points must be planned to minimise the impacted area, avoid the initiation of accelerated soil erosion and prevent unnecessary compaction and disturbance of topsoil.	Tshepong Photovoltaic (Pty) Ltd	Design phase
Compile a comprehensive storm water management and erosion (as outlined in **Appendix C and Appendix G**) control	Tshepong Photovoltaic (Pty) Ltd and the relevant specialist	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
plan for the footprint area as part of the final design of the project.		
Kerbs and stormwater channels must be designed in such a way that they can allow small animals and reptiles to move freely.	Design Engineer	Pre-construction
Internal roads must be located to minimize stream crossings. All structures crossing streams must be located and constructed so that they do not decrease channel stability or increase water velocity.	Design Engineer	Pre-construction
Permissible biodiversity: » Depending on the final PV array and mechanism developed and taking all potential impacts, fire risks and maintenance requirements into consideration, it has to be decided upon and made clear: ∗ Maintenance of this vegetation – mowing, small livestock grazing, etc.	Tshepong Photovoltaic (Pty) Ltd, in consultation with the relevant specialist	Pre-construction
Compile a comprehensive vegetation rehabilitation management plan.	Tshepong Photovoltaic (Pty) Ltd and the relevant specialist	Pre-construction
The terms of this EMPr and the Environmental Authorisation must be included in all tender documentation and Contractor's contracts.	Tshepong Photovoltaic (Pty) Ltd and EPC	Tender process
Compile a detailed invasive plant management (as outlined in **Appendix B**) and monitoring programme as guideline for the entire construction, operational and decommissioning phase: » This plan must contain WfW-accepted species- specific eradication methods. » It must also provide for a continuous monitoring programme to detect new infestations.	Specialist	Pre-construction
Ensure that proper planning is undertaken regarding the placement of lighting structures and that light fixtures only illuminate areas inside the substation sites..	Tshepong Photovoltaic (Pty) Ltd / lighting engineer and EPC	Planning and design
The siting of the construction equipment camp/s must take cognisance of any sensitive areas identified by the Basic Assessment studies (i.e. the wetland areas). The location of this construction equipment camp/s shall be approved by the project ECO.	Contractor and EPC	Pre-construction
Source general construction material and goods locally where available to limit transportation over long distances.	Tshepong Photovoltaic (Pty) Ltd and Contractor and EPC	Pre-construction
Should abnormal load have to be transported by road to the site, a permit must be obtained from the relevant Provincial Government.	Contractor (or appointed transportation contractor) and EPC	Pre-construction
A designated access to the proposed site must be created to ensure safe entry and exit.	Contractor and EPC	Pre-construction
Appropriate road management strategies must be implemented on external and internal roads with all employees	Contractor (or appointed	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
and contractors required to abide by standard road and safety procedures.	transportation contractor) and EPC	
Join local Fire Protection Agency (if established).	Tshepong Photovoltaic (Pty) Ltd	Pre-construction
A rehabilitation plan that specifies the rehabilitation process should be compiled and should be approved by the ECO.	Contractor, Tshepong Photovoltaic (Pty) Ltd and ECO and EPC	Pre-construction

Performance Indicator	» Grid connection and road alignments meet environmental objectives. » Solar components and all associated temporary and permanent infrastructure and access road alignments meet environmental objectives. » Ecosystem fragmentation is kept to a minimum. » Ecosystem functionality is retained and any degradation prevented. » Wetland areas are avoided. » Designs and the final site layout map respond to the mitigation measures and recommendations in the BA Report and walk-through reports and the conditions of the EA. » All species of conservation concern identified or removed prior to vegetation clearance.
Monitoring	Ensure that the design implemented meets the objectives and mitigation measures in the BA Report through review of the design by the Project Manager, EPC, Contractor, and the ECO prior to the commencement of activity.

OBJECTIVE 2: Minimise storm water runoff (guideline for storm water management plan)

Management of storm water will be required during the construction phase of the facility. A detailed storm water management plan is required to be compiled as part of the final design to ensure compliance with applicable regulations and to prevent off-site migration of contaminated storm water or increased soil erosion. The section below provides a guideline for the management of storm water on site and will need to be supplemented with the relevant method statements during the construction phase of the facility.

Project Component/s	» Storm water management components. » Any hard engineered surfaces (i.e. access roads).
Potential Impact	» Poor storm water management and alteration of the hydrological regime (i.e. drainage lines).
Activities/Risk Sources	» Construction of the facility (i.e. placement of hard engineered surfaces).
Mitigation: Target/Objective	» Appropriate management of storm water to minimise impacts on the environment.

Mitigation: Action/Control	Responsibility	Timeframe
A Method Statement for the management of storm water which also considers the recommendations below is to be submitted to the ECO prior to commencement of construction activities.	Tshepong Photovoltaic (Pty) Ltd and EPC	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
Reduce the potential increase in surface flow velocities and the resultant impact on the localised drainage system as a result of increased sedimentation through the implementation of appropriate erosion management measures (as outlined in **Appendix C**).	Tshepong Photovoltaic (Pty) Ltd and EPC	Planning and design
Roads must be designed so that changes to surface water runoff are avoided and erosion is not initiated.	Design Engineer	Planning and design
Appropriately plan hard-engineered bank erosion protection structures.	Tshepong Photovoltaic (Pty) Ltd and EPC	Planning and design
Ensure suitable handling of storm water within the site (i.e. separate clean and dirty water streams around the plant and install stilling basins to capture large volumes of run-off, trapping sediments and reduce flow velocities) through appropriate design of the facility.	Tshepong Photovoltaic (Pty) Ltd and EPC	Design phase
Design measures for storm water management must allow for surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows.	Tshepong Photovoltaic (Pty) Ltd and EPC	Planning and design
Design measures to prevent the concentration or flow of surface water or storm water down cut or fill slopes or roads and ensure measures to prevent erosion are in place prior to construction.	Tshepong Photovoltaic (Pty) Ltd and EPC	Planning and design
Where access roads cross natural drainage lines or wetlands, culverts (or other appropriate measures) must be designed to allow free flow.	Tshepong Photovoltaic (Pty) Ltd and EPC	Planning and design

Performance Indicator	» Appropriate storm water management measures included within the facility design. » Sound water quality and quantity management during construction and operation.
Monitoring	» Monitoring of implementation during construction and operation.

OBJECTIVE 3: To ensure effective communication mechanisms

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

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

Mitigation: Action/control	Responsibility	Timeframe
Compile and implement a grievance mechanism procedure for the public (as outlined in **Appendix A**) to be implemented during both the construction and operational phases of the facility. This procedure should include details of the contact person who will be receiving issues raised by interested and affected parties, and the process that will be followed to address issues.	Tshepong Photovoltaic (Pty) Ltd and EPC	Pre-construction (construction procedure) Pre-operation (operation procedure)
Develop and implement a grievance mechanism for the construction, operational and closure phases of the project for all employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law.	Tshepong Photovoltaic (Pty) Ltd / Contractor and EPC	Pre-construction (construction procedure) Pre-operation (operation procedure)
Draft and implement a Code of conduct for construction workers.	Contractor and sub-contractor/s and EPC	Pre-construction
The adjacent landowners to develop a Code of Conduct for construction workers.	Tshepong Photovoltaic (Pty) Ltd / Contractor and EPC	Pre-construction
Inform all workers of the conditions contained in the Code of Conduct.	Contractor and EPC	Pre-construction
The contractor's plans, procedures and schedules should be communicated with affected parties prior to the commencement of construction activities on site.	Tshepong Photovoltaic (Pty) Ltd / Contractor and EPC	Pre-construction
Develop and implement an emergency preparedness plan during the construction phase.	Contractor and EPC	Pre-construction
Liaison with landowners/farm managers must be done prior to construction in order to provide sufficient time for them to plan agricultural activities.	Tshepong Photovoltaic (Pty) Ltd	Pre-construction

Performance Indicator	» Effective communication procedures in place.
Monitoring	» An incident reporting system should be used to record non-conformances to the EMPr. » A public complaints register must be developed and maintained.

CHAPTER 6: MANAGEMENT PROGRAMME - CONSTRUCTION

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

- Ensures that construction activities are appropriately managed in respect of environmental aspects and impacts.
- Enables construction activities to be undertaken without significant disruption to other land uses and activities in the area, in particular concerning noise impacts, traffic and road use, and effects on local residents.
- Minimises the impact on any remaining indigenous natural vegetation and habitats of ecological value (i.e. wetlands
- Minimises impacts on fauna using the site.
- Minimises the impact on heritage sites should they be uncovered.

6.1 Institutional Arrangements: Roles and Responsibilities for the Construction Phase

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

OBJECTIVE 1: Establish clear reporting, communication, and responsibilities in relation to overall implementation of the EMPr

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Manager; Site Manager; Safety, Health and Environment Representative; Environmental Control Officer (ECO) and Contractor for the construction phase of this project are as detailed below.

Project Manager will:

- Ensure all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these.
- Ensure that Tshepong Photovoltaic (Pty) Ltd and its Contractor(s) are made aware of all stipulations within the EMPr.
- Ensure that the EMPr is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes.
- Be fully conversed with the Basic Assessment for the project, the EMPr, the conditions of the Environmental Authorisation dated 08 December 2015, and all relevant environmental legislation.

Site Manager (Tshepong Photovoltaic (Pty) Ltd on-site Representative) will:

- Be fully knowledgeable with the contents of the Basic Assessment.
- Be fully knowledgeable with the contents and conditions of the Environmental Authorisation (once issued).
- Be fully knowledgeable with the contents of the EMPr.
- Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.
- Have overall responsibility of the EMPr and its implementation.
- Conduct audits to ensure compliance to the EMPr.
- Ensure there is communication with the Project Manager, the ECO, and relevant discipline engineers on matters concerning the environment.
- Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site.
- Confine activities to the demarcated construction site.

An independent **Environmental Control Officer** (ECO) must be appointed by Tshepong Photovoltaic (Pty) Ltd prior to the commencement of any authorised activities. The ECO will be responsible for monitoring, reviewing and verifying compliance by the Contractor with the environmental specifications of the EMPr and the conditions of the Environmental Authorisation. Accordingly, the ECO will:

- Be fully knowledgeable with the contents with the Basic Assessment report.
- Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation (once issued).
- Be fully knowledgeable with the contents with the EMPr.
- Be fully knowledgeable with the contents with all relevant environmental legislation, and ensure compliance with them.
- Ensure that the contents of this document are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.
- Ensure that the compliance of the EMPr is monitored through regular and comprehensive inspection of the site and surrounding areas.
- Ensure that if the EMPr conditions or specifications are not followed then appropriate measures are undertaken to address this.
- Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
- Ensure that activities on site comply with all relevant environmental legislation.
- Ensure that appropriate measures are undertaken to address any non-compliances recorded.
- Ensure that a removal is ordered of any person(s) and/or equipment responsible for any contravention of the specifications of the EMPr.
- Ensure that the compilation of progress reports for submission to the Project Manager, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit.
- Ensure that there is communication with the Site Manager regarding the monitoring of the site.
- Ensure that any non-compliance or remedial measures that need to be applied are reported.
- Independently report to DEA (now the Department of Forestry, Fisheries and the Environment (DFFE)) in terms of compliance with the specifications of the EMPr and conditions of the Environmental Authorisation dated 08 December 2015).

» Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.

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

Engineering Procurement Contractor (EPC)/Contractors and Service Providers: The EPC is the main overarching contractor appointed for the construction of renewable energy projects. The role of the EPC is to appoint other contractors and manage the construction. It is important that contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The contractor's obligations in this regard include the following:

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

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

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

successful implementation of the EMPr (i.e. ensure their staff are appropriately trained as to the environmental obligations).

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

The Contractor's SHE Representative should:

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

6.2 Objectives for Construction

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

OBJECTIVE 1: Minimise loss of indigenous biodiversity, vegetation, faunal habitat and degradation of water resources

Project Component/s	» Construction phase activities associated with the establishment of the PV facility and associated infrastructure. » PV Array. » Grid connection and associated servitudes. » Access roads. » Workshop, guardhouses, substation and other related infrastructure. » Temporary construction camps. » Protective fencing around development. » Potential topsoil stockpiles.
Potential Impact	» Increased cost of rehabilitation. » Loss of natural vegetation. » Loss of faunal habitat. » The footprint of the solar energy facility and associated infrastructure will result in a loss of land that will impact on grazing activities on the site. » Degradation of water resources.
Activities/Risk Sources	» Construction related loss and damage to remaining natural and semi-natural vegetation, and water resources.

	» The footprint occupied by the solar energy facility and associated infrastructure.
Mitigation: Target/Objective	» Rescue, maintenance and subsequent replanting of at least all bulbous protected plant species within the specific land portion. » ECO must monitor indicators listed above to ensure that they have been met for the construction phase. » To minimise loss of natural vegetation an faunal habitat. » To minimise the loss of land taken up by the PV facility and associated infrastructure and to enable farming activities to continue where possible, specifically grazing. » To minimise degradation of water resources.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Ecological footprint investigation of the localities of protected species should be documented, and permits must be applied for, for removal or relocation.	Ecologist	Prior to commencement of activity
All cable trenches, excavations, etc., through sensitive areas should be excavated carefully in order to minimise damage to surrounding areas and biodiversity: » The trenches must be checked regularly basis for the presence of trapped animals. » Any animals found must be removed in a safe manner, unharmed, and placed in an area where the animal will be comfortable. » If the ECO or contractor is unable to assist in the movement of a fauna species, ensure a member of the conservation authorities assists with the translocation. » All mammal, large reptiles and avifauna species found injured during construction will be taken to a suitably qualified veterinarian or rehabilitation centre to either be put down in a humane manner or cared for until it can be released again.	Contractor / EO / ECO	Duration of construction
Identify and demarcate construction areas for general construction work and restrict construction activity to these areas. Prevent unnecessary destructive activity within construction areas (prevent over-excavations and double handling).	Contractor	Before and during construction
New access roads and other servitudes to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement, and compaction of soil.	Contractor	Before and during construction
Identify and demarcate construction areas, servitudes, and access for general construction work.	Contractor, Tshepong Photovoltaic (Pty) Ltd and EPC	Construction
Restrict construction activities to the footprint of the PV facility and the associated infrastructure.	Contractor, Tshepong Photovoltaic (Pty) Ltd and EPC	Construction
Contractors and construction workers must be clearly informed of the no-go areas.	EO	Construction
Workers must be made aware of the importance of not polluting rivers or wetlands and the significance of not undertaking activities	EO	Construction

Mitigation: Action/Control	Responsibility	Timeframe
that could result in such pollution, and this awareness must be promoted throughout the construction phase.		
The footprint of the development must be limited to the areas required for actual construction works and operational activities.	Contractor, Tshepong Photovoltaic (Pty) Ltd and EPC	Construction Operation
Vegetation clearing must be limited to the required footprint. Mitigation measures must be implemented to reduce the risk of erosion and the invasion of alien species.	Contractor	Construction
Wetlands, rivers and river riparian areas must be treated as "no-go" areas and appropriately demarcated as such. No vehicles, machinery, personnel, construction material, fuel, oil, bitumen or waste must be allowed into these areas without the express permission of and supervision by the ECO, except for rehabilitation work in these areas.	Contractor EO	Pre-construction Construction
Areas outside of the footprint, including sensitive areas and buffer areas, must be clearly demarcated (using fencing and appropriate signage) before construction commences and must be regarded as no-go areas.	Contractor	Pre-construction
Construction activities must be restricted to demarcated areas to restrict the impact on sensitive environmental features.	Contractor	Construction
It is recommended that the three *Acacia erioloba* trees recorded within the development area should not be disturbed or destroyed, unless a permit has been obtained for their removal.	Contractor and ECO	Construction
For protected species, the Nature Conservation Ordinance 8 of 1969, Chapter 2, Section 1 and 2 (as amended) states: » The species specified in Schedules 1 and 6 of this Act are declared provincial protected species. » In addition to the restricted activities listed in the Biodiversity Act and except in terms of a permit issued by the MEC, no person may in relation to a specimen of any provincial protected species: * hunt, catch, capture or kill any living specimen of a listed provincial protected species by any means, method or device whatsoever, including searching, pursuing, driving, lying in wait, luring, alluring, discharging a missile or injuring with intent to hunt, catch, capture or kill any such specimen; * gather, collect or pluck any such specimen; * pick parts of, or cut, chop off, uproot, damage or destroy any such specimen; * import into the province any such specimen; * export from the province, including re-exporting from the province, any such specimen; * have in possession or exercising physical control over any such specimen; * grow, breed or in any other way propagate any such specimen, or cause it to multiply; * convey, move or otherwise translocate any such specimen; and	Contractor and ECO	Construction

Mitigation: Action/Control	Responsibility	Timeframe
* sell or otherwise trade in, buy, receive, give, donate or accept as a gift, or in any way acquire or dispose of any such specimen.		
Disturbed areas must be rehabilitated as soon as possible after construction and local indigenous plants must be used to enhance the conservation of existing natural vegetation on site.	Contractors and EPC	Construction
All construction vehicles must remain on properly demarcated roads. No construction vehicles should be allowed to drive over the vegetation except where no cleared roads are available. In such cases a single track should be used and multiple paths should not be formed. Where temporary access roads are created, they should be rehabilitated as outlined in the rehabilitation plan after completion of construction.	Contractors and EPC	Construction
Implement an alien plant monitoring programme and remove alien species as soon as possible utilising appropriate measures.	Contractors and EPC	Construction
No discharge of effluents or polluted water must be allowed into rivers or wetlands.	Contractors and EPC	Construction
No activities will be allowed to encroach into a water resource without a water use license being in place from the Department of Water and Sanitation.	ECO, Contractors and EPC	Construction

Performance Indicator	» Removal/relocation of species of conservation concern » No damage or injury to fauna » Re-establishment of rescued species » No activities or loss of vegetation outside of designated development area. » Site is clear of alien plant species
Monitoring	» It may be possible that geophytic species may emerge during construction that were not accounted for in the original S&R plan – once observed the ECO should consult the botanists on the identification and possible S&R for those plant species

OBJECTIVE 2: Minimising the Impact on fauna

Project component/s	» Construction phase activities associated with the establishment of the PV facility and associated infrastructure. » PV Array. » Grid connection and associated servitudes. » Access roads. » Workshop, guardhouses, substation and other related infrastructure. » Temporary construction camps. » Protective fencing around development. » Potential topsoil stockpiles.
Potential Impact	» Construction activities can result in mortalities or damage to local fauna as a result of vehicles and machinery operating in the area.
Activity/risk source	» During construction, local fauna may be killed, injured or damaged. » Human activities occurring within a close proximity to natural habitat can also lead to increased pressure on natural resources through illegal

	hunting/poaching/trapping of wildlife for various uses such as food/medicinal purposes.
Mitigation: Target/Objective	» Onsite control measures to be provided that aim to minimise the risk of incurring direct impacts to fauna.

Mitigation: Action/Control	Responsibility	Timeframe
All construction vehicles should adhere to a low speed limit on site to avoid collisions with susceptible species such as snakes and tortoises.	Contractor	Construction
Excavations must be inspected regularly to rescue trapped animals.	Contractor EO/ ECO	Construction
Any fauna directly threatened by the construction activities should be allowed to passively vacate the site or be removed to a safe location by a suitably qualified person.	Specialist	Construction
The collection, hunting, or harvesting of any plants or animals at the site is strictly forbidden, except as authorised by the relevant authorities.	Tshepong Photovoltaic (Pty) Ltd Contractor	Construction Operation
Electric fencing should not have any strands within 30cm off the ground, which should be sufficient to allow smaller mammals, reptiles and tortoises through (tortoises retreat into their shells when electrocuted and eventually succumb from repeated shocks), but still remain effective as a security barrier.	Contractor	Construction
All new powerlines must be marked with bird flight diverters along their entire length. To create a net benefit, where possible, the new lines must run parallel to existing marked lines so as to reduce the collision risk posed by the older lines.	Contractor	Construction
The poles should be fitted with bird perches on top of the poles to draw birds, away from the potentially risky insulators.	Contractor	Construction
All pylons to be constructed should make use of "bird friendly" structures as per Eskom standard guidelines.	Contractor	Construction

Performance Indicator	» Records indicate that all staff have undergone environmental induction training. » A copy of the EMPr is located at the site at all times. » The extent of the construction zone has been restricted to the development footprint. » No fauna has been unnecessarily harmed by construction activities or construction workers.
Monitoring and Reporting	» Regular site visits and compliance audits to be undertaken by the ECO and EO. » An incident reporting system must be implemented by the ECO to record any non-issues of non-compliance with the requirements of the EMPr and identify corrective actions to be actioned to address incidents and ensure compliance is achieved.

	» Records of environmental inductions and staff attendance to be maintained by the EO.

OBJECTIVE 3: Minimise impacts related to inappropriate site establishment

The movement of workers on site and layout of the construction camp needs to be well managed in order to reduce the environmental impacts.

Project Component/s	» Area infrastructure (i.e. PV panels, and substation). » Linear infrastructure (i.e. power line, and access roads).
Potential Impact	» Hazards to landowners and public. » Damage to indigenous natural vegetation, due largely to ignorance of where such areas are located. » Loss of threatened plant species.
Activities/Risk Sources	» Open excavations (foundations and cable trenches). » Movement of construction vehicles in the area and on-site.
Mitigation: Target/Objective	» To secure the site against unauthorised entry. » To protect members of the public/landowners/residents. » No loss of or damage to sensitive vegetation in areas outside the immediate development footprint.

Mitigation: Action/Control	Responsibility	Timeframe
Secure site, working areas and excavations in an appropriate manner, as agreed with the ECO.	Contractor and EPC	Site establishment, and duration of construction
Where necessary to control access, fence, and secure area (especially relevant to no-go areas).	Contractor and EPC	Site establishment, and duration of construction
Contractors and construction workers must be adequately informed of any no-go areas identified on the site and in the surrounding areas.	Tshepong Photovoltaic (Pty) Ltd and EPC	Construction
Fence and secure contractor's equipment camp.	Contractor and EPC	Site establishment
The construction camp used to house equipment should be located in a disturbed area and must be screened off as far as practical during the entire construction phase.	Contractor and EPC	Erection: during site establishment Maintenance: for duration of Contract
Establish appropriately bunded areas for storage of hazardous materials (i.e. fuel to be required during construction).	Contractor and EPC	Site establishment
All unattended open excavations shall be adequately demarcated and/or fenced.	Contractor and EPC	Site establishment, and duration of construction
The contractor must provide sanitation facilities within the construction area so that workers do not pollute the surrounding environment. These facilities must be removed from the site when	Contractor and EPC	Site establishment, and duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
the construction phase is completed as well as associated waste be disposed of at a registered waste disposal site.		
Ablution or sanitation facilities should not be located within 100 m from a 1:100 year flood line including wetlands.	Contractor and EPC	Site establishment, and duration of construction
No spoil material, including stripped topsoil, must be temporarily or permanently stockpiled within 30m of freshwater ecosystems identified to be or low or moderate conservation importance and 50m of freshwater ecosystems identified to be of high conservation importance.	Contractor and EPC	Site establishment, and duration of construction
Supply adequate waste collection bins at site where construction is being undertaken. Separate bins should be provided for general and hazardous waste. As far as possible, provision should be made for separation of waste for recycling.	Contractor and EPC	Site establishment, and duration of construction
The Contractor must take all reasonable measures to ensure the safety of the public in the surrounding area. Where the public could be exposed to danger by any of the works or site activities, the contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English, Afrikaans and any other relevant local languages, all to the approval of the Site Manager.	Contractor and EPC	Site establishment, and duration of construction
Where access roads cross natural drainage lines or wetlands, culverts (or other appropriate measures) must be designed to allow free flow. Regular maintenance must be carried out.	Contractor	Construction phase and monitored throughout
No temporary site camps will be allowed outside the footprint of the development area as the establishment of such structures might trigger a listed activity as defined in the Environmental Impact Assessment Regulations.	Tshepong Photovoltaic (Pty) Ltd and EPC	Site establishment, and duration of construction

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

OBJECTIVE 4: Appropriate management of the construction site and construction workers and avoid the potential impact of the activities during construction on the safety of local communities

The construction phase of the PV facility is expected to extend over a period of 4-6 months and create employment opportunities of between 50-100. Ideally, low skilled and semi-skilled positions will be filled by locals living in and around the study area (from towns such as Odendaalsrus). This will however be

dependent on the skills availability in the area. Workers not living in the area, including those required for skilled positions will be transported to site on a daily basis and will not be housed on site. However, a security team will be required on site.

An inflow of workers could, as a worst case scenario and irrespective of the size of the workforce, pose some security risks. Criminals could also use the opportunity due to "outsiders" being in the area to undertake their criminal activities.

Project Component/s	» Area and linear infrastructure. » Construction and establishment activities associated with the establishment of the PV facility, including infrastructure, etc.
Potential Impact	» Damage to indigenous natural vegetation and sensitive areas. » Damage to and/or loss of topsoil (i.e. pollution, compaction etc.). » Impacts on the surrounding environment due to inadequate sanitation and waste removal facilities. » Pollution/contamination of the environment. » Impact on safety of landowners, tenants and communities (increased crime etc.) and potential loss due to stock theft by construction workers.
Activities/Risk Sources	» Vegetation clearing and levelling of equipment storage area/s. » Access to and from the equipment storage area/s. » Ablution facilities. » Contractors not aware of the requirements of the EMP, leading to unnecessary impacts on the surrounding environment. » The presence of construction workers on the site can pose a potential safety risk to local landowners, tenants and communities and may result in theft. The activities of construction workers may also result in damage to farm infrastructure.
Mitigation: Target/Objective	» Limit equipment storage within demarcated designated areas. » Ensure adequate sanitation facilities and waste management practices. » Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment. » To avoid and or minimise the potential impact on local communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	Contractor and EPC	Site establishment, and during construction
Rehabilitate all disturbed areas at the construction equipment camp as soon as construction is complete within an area.	Contractor and EPC	Duration of Contract
Ensure waste removal facilities are maintained and emptied on a regular basis.	Contractor and EPC	Site establishment, and duration of construction
Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm. This can be achieved through the provision of	Contractor and EPC	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
appropriate environmental awareness training to all personnel. Records of all training undertaken must be kept.		
Cooking and eating of meals must take place in a designated area. No fires are allowed on site. No firewood or kindling may be gathered from the site or surrounds.	Contractor and sub-contractor/s and EPC	Duration of contract
No unsupervised open fires for cooking or heating must be allowed on site.	Contractor and sub-contractor/s and EPC	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area. Particular attention needs to be paid to food waste.	Contractor and sub-contractor/s and EPC	Duration of contract
No one may disturb flora or fauna outside of the demarcated construction area/s.	Contractor and sub-contractor/s and EPC	Duration of contract
Firefighting equipment and training must be provided before the construction phase commences.	Contractor and sub-contractor/s and EPC	Duration of contract
Contractors must ensure that all workers are informed at the outset of the construction phase of the conditions contained in the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.	Contractor and sub-contractor/s and EPC	Construction
On completion of the construction phase, all construction workers must leave the site within one week of their contract ending.	Contractor and sub-contractor/s and EPC	Construction
The contractor must train safety representatives, managers and workers in workplace safety. The construction process must be compliant with all safety and health measures prescribed by the relevant act.	Contractor and sub-contractor/s, HSE	Construction

Performance Indicator	» The construction camps have avoided sensitive areas. » Ablution and waste removal facilities are in a good working order and do not pollute the environment due to mismanagement. » All areas are rehabilitated promptly after construction in an area is complete. » Excess vegetation clearing and levelling is not reported. » No complaints regarding contractor behaviour or habits. » Appropriate training of all staff is undertaken prior to them commencing work on the construction site. » Code of Conduct drafted before commencement of construction phase. » Code of Conduct developed and approved prior to commencement of construction phase. » All construction workers made aware of Code of Conduct within first week of being employed. » Compensation claims settled within an appropriate timeframe of claim being verified.
Monitoring	» Regular audits of the construction camps and areas of construction on site by the ECO. » Proof of disposal of sewage at an appropriate wastewater treatment works.

	» An incident reporting system should be used to record non-conformances to the EMPr. » Observation and supervision of Contractor practices throughout construction phase by the ECO. » Complaints must be investigated and, if appropriate, acted upon. » Tshepong Photovoltaic (Pty) Ltd and/or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE 5: Minimise impacts related to traffic management and transportation of equipment and materials to site (Traffic Management and Transportation Plan)

The construction phase of the project will be the most significant in terms of generating traffic impacts; resulting from the transport of equipment (including turbine components) and materials and construction crews to the site and the return of the vehicles after delivery of materials. Potential impacts associated with transportation and access relate to works within the site boundary and external works outside the site boundary.

The components for the proposed facility will be transported to site by road. The identified site is accessible via the R34, Leading into the town of Odendaalsrus from the east.

The section below provides a guideline for the Traffic Management and Transportation Plan on site and will need to be supplemented with the relevant final transport plan devised by the EPC partner during the final design phase of the facility.

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

Mitigation: Action/Control	Responsibility	Timeframe
Source general construction material and goods locally where available to limit transportation over long distances.	Tshepong Photovoltaic (Pty) Ltd and Contractor and EPC	Construction
Appropriate dust suppression techniques must be implemented to minimise dust from gravel roads.	Tshepong Photovoltaic (Pty) Ltd and EPC	Construction
Construction vehicles and those transporting materials and goods should be inspected by the contractor or a sub-contractor to ensure that these are in good working order and not overloaded.	Contractor and EPC	Construction
Strict vehicle safety standards should be implemented and monitored.	Contractor and EPC	Construction
No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the contractor.	Contractor and EPC	Duration of contract
Any traffic delays because of construction traffic must be co-ordinated with the appropriate authorities.	Contractor and EPC	Duration of contract
The movement of all vehicles within the site must be on designated roadways.	Contractor and EPC	Duration of contract
Signage must be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards and regularly maintained).	Contractor and EPC	Duration of contract
Signs must be placed along construction roads to identify speed limits, travel restrictions, and other traffic control information. To minimize impacts on local commuters, consideration should be given to limiting construction vehicles travelling on public roadways during the morning and later afternoon commute time.	Contractor and EPC	Duration of contract
Construction vehicles carrying materials to the site should avoid using roads through densely populated built-up areas so as not to disturb retail and commercial operations.	Contractor and EPC	Duration of contract
Appropriate maintenance of all vehicles of the contractor must be ensured.	Contractor and EPC	Duration of contract
All vehicles of the contractor travelling on public roads must adhere to the specified speed limits and all drivers must be in possession of an appropriate valid driver's license.	Contractor and EPC	Duration of contract
Keep hard road surfaces as narrow as possible.	Contractor and EPC	Duration of contract
Signs must be placed along construction roads to identify speed limits, travel restrictions and other standard traffic control information.	Contractor and EPC	Duration of contract

Performance Indicator	» Vehicles keeping to the speed limits. » Vehicles are in good working order and safety standards are implemented. » Local residents and road users are aware of vehicle movements and schedules. » No construction traffic related accidents are experienced. » Local road conditions and road surfaces are up to standard.

	» Complaints of residents are not received (e.g. concerning the speeding of heavy vehicles).
Monitoring	» Developer and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE 6: To avoid and or minimise the potential impacts of safety, noise and dust and damage to roads caused by construction vehicles during the construction phase

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

Project Component/s	» Construction and establishment activities associated with the establishment of the PV facility, including infrastructure etc.
Potential Impact	» Heavy vehicles can generate noise and dust impacts. Movement of heavy vehicles can also damage roads.
Activities/Risk Sources	» The movement of heavy vehicles and their activities on the site can result in noise and dust impacts and damage roads.
Mitigation: Target/Objective	» To avoid and or minimise the potential noise and dust impacts associated with heavy vehicles, and minimise damage to roads.

Mitigation: Action/Control	Responsibility	Timeframe
Implement appropriate dust suppression measures on site and ensure that vehicles used to transport building materials are fitted with tarpaulins or covers.	Contractors and EPC	Duration of Construction
Ensure that all vehicles are road-worthy; drivers are qualified and are made aware of the potential noise, dust and safety issues.	Contractors and EPC	Duration of Construction
Ensure that drivers adhere to speed limits.	Contractors and EPC	Duration of Construction
Ensure that damage to roads attributable to construction activities is repaired before completion of construction phase.	Contractors and EPC	Duration of Construction
Dust abatement techniques must be used before and during surface clearing, excavation, or blasting activities.	Contractors and EPC	Duration of Construction
Appropriate dust suppression techniques must be implemented on all exposed surfaces during periods of high wind. Such measures may include wet suppression, chemical stabilisation, the use of a wind fence, covering surfaces with straw chippings and re-vegetation of open area or other suitable measures.	Contractors and EPC	Duration of Construction

Performance Indicator	» Dust suppression measures implemented for all areas that require such measures during the construction phase. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed.

	» Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.
Monitoring	» Tshepong Photovoltaic (Pty) Ltd and/or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE 7: Minimising the impact on heritage sites

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

The impacts to heritage resources by the proposed development are considered to be low. No heritage resources were discovered on the proposed project site during the 2015 assessment, and the walk-down survey undertaken in 2020. However some recommendations are made to protect the site from accidental damage during the construction phase of the project and are discussed below.

The palaeontology of the site has also been assessed to determine what the impact of the proposed PV solar facility may be. The results showed that since the area has poor quality coal deposits which are well below the surface, and the proposed PV solar facility will be on the ground surface, with foundations of a few meters depth only, the project will not impact on any paleontological material.

Project Component/s	» Solar Array. » Roads. » Powerlines. » Construction equipment camps.
Potential Impact	» Destruction of archaeological sites.
Activity/Risk Source	» Solar array foundations, power lines and roads.
Mitigation: Target/Objective	» Minimise impacts on heritage sites.

Mitigation: Action/control	Responsibility	Timeframe
Should any archaeological sites, artefacts, palaeontological fossils or graves be exposed during construction work, work in the immediate vicinity of the find must be stopped. The South African Heritage Resources Agency (SAHRA) must be informed and the services of an accredited heritage professional must be obtained for an assessment of the heritage resources. No work may be resumed in the area without permission from SAHRA and the ECO.	Contractor, EO, ECO and EPC	Duration of construction
If during the pre-construction phase, construction or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractor and subcontractors, or service	Contractor, EO, ECO and EPC	Duration of construction

Mitigation: Action/control	Responsibility	Timeframe
provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervision to the senior on-site manager.		
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 required.	Tshepong (Pty) Ltd, to be carried out by appointed specialist	Construction
It is the responsibility of the senior on-site manger to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area.	Contractor Senior on-site manger	Duration of construction
The senior on-site manager will inform the EO of the chance find and its immediate impact on operations. The EO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA.	Senior on-site manger and EO	Duration of construction

Performance Indicator	» No destruction of archaeological sites or graves.
Monitoring	» Monitoring during construction to ensure that if heritage resources are discovered, operations are halted and an archaeologist is contacted for further study/investigation.

OBJECTIVE 8: Minimisation of disturbance to and loss of topsoil and erosion management

Compacted and/or denuded and disturbed soils are usually prone to surface capping – even more so if the soils are dispersive or have a fine texture due to higher clay or loam contents. Such capped soils are prone to ever increasing erosion, creating a dysfunctional landscape and ecosystem that rapidly loses soil, nutrients and seeds from the ecosystem.

An erosion and stormwater management method statement must be compiled by the contractor, to the satisfaction of the ECO, for implementation during construction.

Topsoil conservation is an integral part of rehabilitation efforts and helps to maintain the productive capability and ecological functionality of rangelands. Removal of topsoil should be done where:

» Areas will be excavated.
» Areas will be severely compacted.
» Areas will be buried with excavated material.
» Areas will be permanently covered with altered surfaces.

Topsoil must at all times be treated as a valuable natural resource, and may thus not be discarded or degraded.

Project Component/s	» PV Array supports and trenching. » Grid connection and associated servitudes. » Access roads. » Workshop, guardhouses, substation and other related infrastructure.

	» Potential topsoil stockpiles.
Potential Impact	» Loss of topsoil and natural resources and biological activity within the topsoil. » Loss of natural regeneration potential of soils. » Loss of agricultural potential of soils.
Activities/Risk Sources	» Site preparation and earthworks. » Excavation of foundations and trenches. » Construction of site access road. » PV array construction activities. » Stockpiling of topsoil, subsoil and spoil material. » Concentrated discharge of water from construction activity and new infrastructure. » Construction equipment and vehicle movement on site. » Cabling activities. » Power line construction activities.
Mitigation: Target/Objective	» To retain full biological activity and functionality of topsoil. » To retain desirable natural vegetation, where possible. » To minimise footprints of disturbance of vegetation/habitats. » Remove and store all topsoil on areas that are to be excavated, and use this topsoil in subsequent rehabilitation of disturbed areas. » Minimise spoil material. » To minimise erosion of soil from site during construction. » Minimal loss of vegetation cover due to construction related activities. » No increased in runoff into wetlands as a result of road construction. » To minimise damage to rock, soil, animals and vegetation by construction activities.

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary clearing.	Contractor in consultation with Specialist	Pre-construction
Construction activities must be restricted to demarcated areas so that impact on topsoil is restricted.	Contractor	Construction
Immediately after clearing of vegetation, the soil surface must be inspected for signs of erosion and stabilised as soon as possible. After completion of construction, such erosion stabilisation should preferably be with a cover of vegetation. A dense initial grass or other perennial cover will be desirable.	Contractor in consultation with Specialist	Construction
The first vegetation layer must be developed further until a desirable end state, as determined during the design phase and taking the original vegetation description as guideline, is established.	Contractor in consultation with Specialist	Construction
Control depth of excavations and stability of cut faces/sidewalls.	Contractor	Construction
Compile a comprehensive storm water management method statement, as part of the final design of the project and implement during construction.	Tshepong Photovoltaic (Pty) Ltd and Contractor	Construction
Salvaging of topsoil:	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
» Topsoil must always be salvaged and stored separately from subsoil and lower-lying parent rock or other spoil material: ∗ Topsoil stripping removes up to 30 cm or less of the upper soils. » Prior to salvaging topsoil the depth, quality and characteristics of topsoil should be known for every management area: ∗ This will give an indication of total volumes of topsoil that need to be stored to enable the proper planning and placement of topsoil storage. ∗ Different types of topsoil – rocky soils and sands must be stored separately. » Topsoil should be removed (and stored) under dry conditions to avoid excessive compaction whenever topsoil will have to be stored for longer than one year.		
Storing topsoil: » Viability of stored topsoil depends on moisture, temperature, oxygen, nutrients and time stored. » Rapid decomposition of organic material in warm, moist topsoils rapidly decreases microbial activity necessary for nutrient cycling, and reduces the amount of beneficial micro-organisms in the soil. » Stockpile location if not adjacent to a linear development: ∗ At least 50 m from any natural wetlands. ∗ Ideally a disturbed but weed-free area. » Topsoil is typically stored in berms with a width of 150 – 200 cm, and a maximum height of 100 cm, preferably lower: ∗ Place berms along contours or perpendicular to the prevailing wind direction » Topsoil handling should be reduced to stripping, piling (once), and re-application. Between the piling and reapplication, stored topsoils should not undergo any further handling except control of erosion and (alien) invasive vegetation » Where topsoil can be reapplied within six months to one year after excavation, it will be useful to store the topsoil as close as possible to the area of excavation and re-application, e.g. next to cabling trenches: ∗ In such case, use one side of the linear development for machinery and access only. ∗ Place topsoil on the other/far side of this development, followed by the subsoil (also on geotextile). ∗ If there will be a need for long-term storage of topsoil in specified stockpiles, this must be indicated in the design phase already and accompanied by a detailed topsoil stockpile management plan. » In cases where topsoil has to be stored longer than 6 months or during the rainy season, soils should be kept as dry as possible and protected from erosion and degradation by: ∗ Preventing puddling on or between heaps of topsoil. ∗ Covering topsoil berms. ∗ Preventing all forms of contamination or pollution.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
* Preventing any form of compaction. * Monitoring establishment of all invasive vegetation and removing such if it appears. * Keeping slopes of topsoil at a maximal 2:1 ratio. * Monitoring and mitigating erosion where it appears. * Where topsoil needs to be stored in excess of one year, it is recommended to either cover the topsoil or allow an indigenous grass cover to grow on it – if this does not happen spontaneously, seeding should be considered.		
General Erosion control measure: » Ensure that heavy machinery does not compact areas that are not meant to be compacted as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area.	Contractor	Construction
Anti-erosion measures such as silt fences or other appropriate measures must be installed in disturbed areas, as required.	Contractor	Construction
Foundations and trenches must be backfilled with originally excavated materials as much as possible. Excess excavation materials must be disposed of only in approved areas or, if suitable, stockpiled for use in rehablitation activities.	Contractor	Construction
Borrow materials must be obtained only from authorized and permitted sites. Permits must be kept on site by the ECO.	Tshepong Photovoltaic (Pty) Ltd, Contractor, and ECO	Construction
An appropriately designed and effective stormwater management system must be implemented.	Tshepong Photovoltaic (Pty) Ltd and ECO	Construction Operation
Topsoil and subsoil must be stockpiled separately and replaced according to the correct profile i.e. topsoil replaced last. Stockpile should not be situated such that they obstruct natural water pathways and drainage channels.	Contractor	Construction
Topsoil stockpiles must not exceed 2m in height. Stockpiles older than 6 months must be enriched before they can be used to ensure the effectiveness of the topsoil.	Contractor	Construction

Performance Indicator	» Vegetation clearing is undertaken at suitable times to limit exposure of bare soils to heavy rainfall. » Vegetation clearing is scheduled and undertaken immediately prior to construction commencing in an area to limit exposure of bare soils. » Minimal disturbance outside of designated work areas. » Topsoil appropriately stored, managed, and stored.
Monitoring	» Monitoring of appropriate methods of vegetation clearing and soil management activities by ECO throughout construction phase. » An incident reporting system must be used to record non- conformances to the EMPr. » Regular monitoring of topsoil after construction by developer until such topsoil can be regarded as fully rehabilitated, stable and no longer prone to accelerated erosion.

	» After every rainfall event, the contractor must check the site for erosion damage and rehabilitate this damage immediately.

OBJECTIVE 9: Manage and reduce the impact of invasive vegetation

Within the project area invasive species – indigenous and alien – occur, which all have a potential of reproducing to such an extent that the ecosystem within and beyond the project area could be impaired. Additional alien species grow along major transport routes to the area and thus could be potentially spread there as well.

Alien invasive plant species confirmed on site that need to be eradicated as much as possible:

Listed alien invasives that must be eradicated by law:

» *Eucalyptus camaldulensis* and *Opuntia lindheimeri*

Weeds and potentially invasive species confirmed on site that need to be monitored and managed:

» *Asparagus laricinus, Melia azedarach, Pseudognaphalium luteo-album, Solanum incanum* and *Gomphocarpus fruticosus, Ailanthus altissima, Nicotiana glauca, Opuntia humifusa,* and *Cylindropuntia imbricata.*

Project component/s	» Permanent and temporary infrastructure. » Access roads.
Potential Impact	» Impacts on natural vegetation. » Impacts on soil. » Impact on faunal habitats. » Degradation and loss of agricultural potential.
Activity/risk source	» Transport of construction materials to site. » Movement of construction machinery and personnel. » Site preparation and earthworks causing disturbance to indigenous vegetation. » Construction of site access road. » Stockpiling of topsoil, subsoil and spoil material. » Routine maintenance work – especially vehicle movement.
Mitigation: Target/Objective	» To significantly reduce the presence of weeds and eradicate alien invasive species. » To avoid the introduction of additional alien invasive plants to the project control area. » To avoid further distribution and thickening of existing alien plants on the project area. » To complement existing alien plant eradication programs in gradually causing a significant reduction of alien plant species throughout the project control area.

Mitigation: Action/control	Responsibility	Timeframe
Avoid creating conditions in which invasive plants may become established:	Contractor	Construction phase

Mitigation: Action/control	Responsibility	Timeframe
» Keep disturbance of indigenous vegetation to a minimum. » Rehabilitate disturbed areas as quickly as possible. » Shred all non-seeding material from cleared invasive shrubs and other vegetation and use as mulch as part of the rehabilitation and revegetation plan. » Where possible, destroy seeding material of weeds and invasives by piling burning (in designated areas or suitable containers). » Do not import soil from areas with alien plants.		
» Eradicate all invasive plants that occur within the development's temporary and permanent footprint areas. » Ensure that material from invasive plants that can regenerate – seeds, suckers, plant parts are adequately destroyed and not further distributed.	Contractor	Construction phase
Immediately control any alien plants that become newly established using registered control measures	Contractor	Construction phase
Cleared alien vegetation must not be dumped on adjacent intact vegetation during clearing, but must be temporarily stored in a demarcated area.	Contractor	Construction phase

Performance Indicator	» Visible reduction of number and cover of alien invasive plants within the project area. » Improvement of vegetation cover from current dominance of invasive shrubs to dominance of perennial grasses and dwarf shrubs. » No establishment of additional alien invasive species.
Monitoring	» Ongoing monitoring of area by ECO during construction. » Ongoing monitoring of area by EO during operation. » Audit every two to three years by a suitably qualified botanist to assess the status of infestation and success of eradication measures. » If new infestations are noted, these must be recorded. A comprehensive eradication programme with the assistance of the WFW (Working for Water) Programme is advisable.

OBJECTIVE 10: The mitigation and possible negation of the additional visual impacts associated with the construction of the solar energy facility

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

Project Component/s	» Construction site, various buildings, a generator, a substation, a power line, a fence and internal access roads.
Potential Impact	» Potential scarring and erosion due to the unnecessary removal of vegetation. » Visual impact of general construction activities and associated impacts.
Activity/Risk Source	» Potential impact on sensitive receptors within the foreground and middle ground.
Mitigation: Target/Objective	» Minimal visual intrusion by construction activities and general acceptance and compliance with Environmental Specifications.

Mitigation: Action/Control	Responsibility	Timeframe
Keep disturbed areas to a minimum.	Contractor	Throughout construction
Identify suitable areas within the construction site for fuel storage, temporary workshops, eating areas, ablution facilities and washing areas.	Contractor	Throughout construction
Institute a solid waste management programme to minimise waste generated on the construction site, and recycle where possible.	Contractor	Throughout construction
Reduce and control dust through the use of approved dust suspension techniques as and when required.	Contractor	Throughout construction
Construction to occur only during daytime. Should the ECO authorize night work, low flux and frequency lighting shall be used.	Contractor	Throughout construction
Institute a rigorous planting regime in collaboration with the appointed botanical specialist.	Contractor	Construction
Adopt responsible construction practices aimed at containing the construction activities to specifically demarcated areas thereby limiting the removal of natural vegetation to the minimum.	Contractors and EPC	Construction
Limit access to the construction site to existing access roads.	Contractors and EPC	Construction
Rehabilitate all disturbed areas to acceptable visual standards as soon as possible after construction is complete in an area.	Contractors and EPC	Construction
The holder of the authorisation must reduce visual impacts during construction by minimising areas of surface disturbance, controlling erosion, using dust suppression techniques and restoring exposed soil as closely as possible to their original contour and vegetation.	Contractor	Construction
Lighting for both the construction period and through the operation of the facility must be LED, preferably yellow. All perimeter and security lighting must be attached to motion detectors, unless permanent lighting is required for safety or security reasons, and should be dark-sky friendly.	Contractor	Construction

Performance Indicator	» Vegetation cover that remains intact with no erosion. » Construction site is confined to the demarcated areas identified on a Development Plan. No transgression of the Environmental Specifications visible

	and natural processes occurring freely outside boundaries of the construction site.
Monitoring	» Monitoring to be undertaken by an appointed Environmental Control Officer who will enforce compliance with the Environmental Specifications. » Monitoring of vegetation clearing during the construction phase.

OBJECTIVE 11: Appropriate handling and management of waste

The main wastes expected to be generated by the construction of the solar energy facility will include general construction waste, hazardous waste (i.e. fuel), and liquid waste (including grey water and sewage). The volumes of waste expected to be generated will not trigger the requirement for a waste management license. Wastes must however be managed effectively in order to ensure minimal impacts on the environment. A Waste Management Plan is included as **Appendix D** of this EMPr.

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

Mitigation: Action/Control	Responsibility	Timeframe
Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.	Contractor and EPC	Duration of contract
An integrated waste management approach must be implemented that is based on waste minimisation and must incorporate reduction, recycling and re-use options where appropriate. Where solid waste is disposed of, such disposal shall only occur at a landfill licensed in terms of section 20(b) of the National Environmental Management Waste Act, 2008 (Act 59 of 2008).	Contractor and EPC	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor and EPC	Duration of contract
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse,	Contractor and EPC	Duration of contract

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

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

OBJECTIVE 12: Appropriate handling and storage of chemicals and hazardous substances

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

Project Component/s	» Storage and handling of chemicals and hazardous substances.
Potential Impact	» Release of contaminated water from contact with spilled chemicals. » Generation of contaminated wastes from used chemical containers.
Activity/Risk Source	» Vehicles associated with site preparation and earthworks. » Construction activities of area and linear infrastructure. » Hydrocarbon use and storage.
Mitigation: Target/Objective	» To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons. » To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons. » Vehicles and equipment must be serviced regularly and maintained in a good running condition. Vehicles must be fitted with spill skills. Storage of contaminants must be limited to low quantities and done under strict industry standards. There must be strict control over the safe usage of vehicles and equipment to minimise vehicle accidents and damage to vehicles by rocks and boulders which may cause spillages. Contingency plans must be in place to deal with spillages. The solar arrays should only be cleaned with water and soaps and detergents should not be allowed.

Mitigation: Action/Control	Responsibility	Timeframe
Develop and implement an emergency preparedness plan during the construction phase.	Contractor and EPC	Duration of Contract
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Contractor and EPC	Duration of contract
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of a polluting substance is identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures.	Contractor and EPC	Duration of contract
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents.	Contractor and EPC	Duration of contract
Spilled cement must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor and EPC	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor and EPC	Duration of contract
Routine servicing and maintenance of vehicles must not take place on-site (except for emergencies). If repair of vehicles must take place, an appropriate drip tray must be used to contain any fuel or oils.	Contractor and EPC	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
All stored fuels to be maintained within a bund and on a sealed surface. The bunded area must be provided with a tap-off system through which spillages and leakages that might occur will be removed without any spillage outside the bunded area.	Contractor and EPC	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	Contractor and EPC	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	Contractor and EPC	Duration of contract
Oily water from bunds at the substations must be removed from site by licensed contractors.	Contractor and EPC	Duration of contract
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with Material Safety Data Sheets (MSDS) files.	Contractor and EPC	Duration of contract
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled with.	Contractor and EPC	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations	Contractor and EPC	Duration of contract
The sediment control and water quality structures used on-site must be monitored and maintained in an operational state at all times.	Contractor and EPC	Duration of contract
Upon the completion of construction, the area must be cleared of potentially polluting materials.	Contractor and EPC	Completion of construction
Implement an effective monitoring system to detect any leakage or spillage of any hazardous substances during their transportation, handling, use or storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or stormwater systems.	Contractor and EPC	Duration of contract

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

OBJECTIVE 13: To avoid and or minimise the potential risk of increased veld fires during the construction phase

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

Project Component/s	» Construction and establishment activities associated with the establishment of the PV facility, including infrastructure etc.
Potential Impact	» Veld fires can pose a personal safety risk to the communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences.
Activities/Risk Sources	» The presence of construction workers and their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	» To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
Ensure that open fires on the site for cooking or heating are not allowed except in designated areas.	Contractors	Duration of construction
Provide adequate firefighting equipment onsite.	Contractors	Duration of construction
Provide fire-fighting training to selected construction staff.	Contractors	Duration of construction
Compensate farmers / community members at full market related replacement cost for any losses, such as livestock, damage to infrastructure etc. associated with fires proven to be associated with the construction activities.	Contractors	Duration of construction

Performance Indicator	» Designated areas for fires identified on site at the outset of the construction phase. » Firefighting equipment and training provided before the construction phase commences. » Compensation claims settled within 1 month of claim.
Monitoring	» Tshepong Photovoltaic (Pty) Ltd and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

6.3 Detailing Method Statements

OBJECTIVE 14: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk

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

specified requirements will be achieved through the submission of written Method Statements to the Site Manager and ECO.

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

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

Very specific areas to be addressed in method statements before, during and post construction include:

- Site Establishment plan (which explains all activities from induction training to offloading, construction sequence for site establishment and the different amenities and to be established etc. Including a site camp plan indicating all of these).
- Preparation of the site (i.e. clearing vegetation, compacting soils and removing existing infrastructure and waste).
- Soil management/stockpiling and erosion control.
- Excavations and backfilling procedure and processes.
- Stipulate norms and standards for water supply and usage (i.e.: comply strictly to licence and legislation requirements and restrictions as applicable).
- Stipulate the storm water management procedures recommended in the storm water management plan.
- Ablution facilities (placement, maintenance, management and servicing).
- Solid Waste Management:
    - Description of the waste storage facilities (on site and accumulative).
    - Placement of waste stored (on site and accumulative).
    - Management and collection of waste process.
    - Recycle, re-use and removal process and procedure.
- Liquid waste management:
    - The design, establish, maintain and operate suitable procedures for pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into rivers, streams or existing drainage systems.
    - Stipulate grey water (i.e. water from basins, showers, baths, kitchen sinks etc.) that needs to be disposed of, link into an existing facilities where possible. Where no facilities are available,

grey water runoff must be controlled to ensure there is no seepage into wetlands or natural watercourses.

- Dust and noise pollution:
  - Describe necessary measures to ensure that noise from construction activities is maintained within lawfully acceptable levels (construction activities generating output levels of 85 dB(A) near human settlement, are to be confined to working hours (06h00 - 18h00) Mondays to Fridays).
  - Procedure to control dust at all times on the site, access roads, borrow pits and spoil sites (dust control shall be sufficient so as not to have significant impacts in terms of the biophysical and social environments). These impacts include visual pollution, decreased safety due to reduced visibility, negative effects on human health and the ecology due to dust particle accumulation.
- Hazardous substance storage (ensure compliance with all national, regional and local legislation with regard to the storage of oils, fuels, lubricants, solvents, wood treatments, bitumen, cement, pesticides and any other harmful and hazardous substances and materials. South African National Standards apply).
  - List of all potentially hazardous substances to be used.
  - Appropriate handling, storage and disposal procedures.
  - Prevention plan of accidental contamination of soil at storage and handling areas.
  - All storage areas, (i.e.: for harmful substances appropriately bunded with a suitable collection point for accidental spills must be implemented and drip trays underneath dispensing mechanisms including leaking engines/machinery).
- Fire prevention and management measures on site.
- Fauna and flora protection process on and off site (i.e.: removal to reintroduction or replanting, if necessary).
- Rehabilitation and re-vegetation process.
- Traffic management.
- Incident and accident reporting protocol.
- General administration (and stipulating that all documentation and licences must be on site at all times).
- Designate access road and the protocol on while roads are in use.
- Requirements of gate control protocols.

Where relevant, these Method Statements must be prepared and submitted to Tshepong Photovoltaic (Pty) Ltd, Construction Manager/Project Manager and/or the ECO. The Contractor may not commence the activity covered by the Method Statement until it has been approved by the Construction Manager (or may be delegated to the ECO) /Project Manager, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract. Failure to submit a method statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved.

The ECO should monitor the construction activities to ensure that these are undertaken in accordance with the approved Method Statement.

6.4 Awareness and Competence: Construction Phase of the Solar Energy Facility

OBJECTIVE 15: To ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm

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

The Contractor's obligations in this regard include the following:

- Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- Ensuring that a copy of the EMPr is readily available on-site, and that all site staff are aware of the location and have access to the document.
- Employees will be familiar with the requirements of the EMPr and the environmental specifications as they apply to the construction of the facility.
- Employees must undergo training for the operation and maintenance activities associated with a PV plant and have a basic knowledge of the potential environmental impacts that could occur and how they can be minimised and mitigated.
- Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course.
- The course should be sufficient to provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- Awareness of any other environmental matters, which are deemed necessary by the ECO.
- Ensuring that employee information posters, outlining the environmental "do's" and "don'ts" (as per the environmental awareness training course) are erected at prominent locations throughout the site.
- Ensure that construction workers have received basic training in environmental management, including the storage and handling of hazardous substances, minimisation of disturbance to sensitive areas, management of waste, and prevention of water pollution.
- Records must be kept of those that have completed the relevant training.
- Training should be done either in a written or verbal format but must be appropriate for the receiving audience.
- Refresher sessions must be held to ensure the contractor staff are aware of their environmental obligations as practically possible.

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

6.4.1 Environmental Awareness Training

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

6.4.2 Induction Training

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

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

6.4.3 Toolbox Talks

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

6.5 Monitoring Programme: Construction Phase

OBJECTIVE 16: To monitor the performance of the control strategies employed against environmental objectives and standards

A monitoring programme must be in place not only to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are, or could result in significant environmental impacts for which corrective action is required. Monitoring during construction must be on-going for the duration of this phase. . The Project Manager will ensure that the monitoring is conducted and reported.

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

- Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications.
- Ensure adequate and appropriate interventions to address non-compliance.
- Ensure adequate and appropriate interventions to address environmental degradation.
- Provide a mechanism for the lodging and resolution of public complaints.

- Ensure appropriate and adequate record keeping related to environmental compliance.
- Determine the effectiveness of the environmental specifications and recommend the requisite changes and updates based on audit outcomes, in order to enhance the efficacy of environmental management on site.
- Aid communication and feedback to authorities and stakeholders.

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

6.5.1 Non-Conformance Reports

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

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

6.5.2 Monitoring Reports

A monitoring report will be compiled by the ECO on a monthly basis and must be submitted to the DEA (now the DFFE) for their records. This report should include details of the activities undertaken in the reporting period, any non-conformances or incidents recorded, corrective action required, and details of those non-conformances or incidents which have been closed out.

6.5.3 Final Audit Report

An ECO close-out environmental audit report must be submitted to DEA (now the DFFE) upon completion of the construction and rehabilitation activities. This report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions and the requirements of the EMPr.

CHAPTER 7: MANAGEMENT PROGRAMME: REHABILITATION

Overall Goal: Undertake the rehabilitation measures in a way that ensures rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed.

7.1. Objectives

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

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

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

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

Mitigation: Action/Control	Responsibility	Timeframe
All temporary facilities, equipment, and waste materials must be removed from site.	Contractor and EPC	Following execution of the works
All temporary fencing and danger tape must be removed once the construction phase has been completed.	Contractor and EPC	Following completion of construction activities in an area
The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these should be cleaned up.	Contractor and EPC	Following completion of construction activities in an area
All hardened surfaces within the construction camp area should be ripped, all imported materials removed, and the area shall be top soiled and re-vegetated.	Contractor and EPC	Following completion of construction activities in an area
Temporary roads must be closed and access across these blocked. Compacted surfaces of temporary roads must be ripped to facilitate their rehabilitation.	Contractor and EPC	Following completion of construction activities in an area

Mitigation: Action/Control	Responsibility	Timeframe
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	Contractor and EPC	Following completion of construction activities in an area
Disturbed areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-use of native/indigenous plant species removed from disturbance areas in the rehabilitation phase to be determined by a botanist as applicable.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
No exotic plants may be used for rehabilitation purposes; only indigenous plants of the area may be utilised.	Contractor	Following completion of construction activities in an area
Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	Tshepong Photovoltaic (Pty) Ltd in consultation with rehabilitation specialist	Post-rehabilitation
Erosion control measures should be used in sensitive areas such as steep slopes, hills, and drainage lines as necessary.	Tshepong Photovoltaic (Pty) Ltd in consultation with rehabilitation specialist	Post-rehabilitation
On-going invasive and alien plant monitoring and removal must be undertaken on all areas of natural vegetation on an annual basis.	Tshepong Photovoltaic (Pty) Ltd in consultation with rehabilitation specialist	Post-rehabilitation

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

OBJECTIVE 2: Rehabilitation and minimisation of disturbance to and loss of topsoil and ecosystem functionality

Project component/s	» PV Array supports and trenching. » Grid connection and associated servitudes. » Access roads. » Workshop, guardhouses, substation and other related infrastructure.

	» Potential topsoil stockpiles and/or borrow pits.
Potential Impact	» Within the footprint, a change of plant species composition with lower productivity and agricultural potential can be expected due to removal, disturbance and continued long-term shading of vegetation. » A largely reduced vegetation cover will render the ecosystem more prone to erosion and irreversible degradation. » Disturbance of indigenous vegetation creates opportunities for the establishment of invasive vegetation or creation of surfaces that do not support the permanent (re-) establishment of vegetation. » Loss of natural regeneration potential of soils. » Loss of agricultural potential of soils.
Activity/risk source	» Site preparation and earthworks. » Excavation of foundations and trenches. » Construction of site access road. » Power line construction activities. » PV array construction activities. Stockpiling of topsoil, subsoil and spoil material. » Premature abandonment of adaptive management in regards to rehabilitation.
Mitigation: Target/Objective	» Recreate a non-invasive, acceptable vegetation cover that will facilitate the establishment of desirable and/or indigenous species. » Prevent accelerated erosion and ecosystem degradation.

Mitigation: Action/control	**Responsibility**	**Timeframe**
Rehabilitation of surface		
Prior to the application of topsoil: » Subsoil shall be shaped and trimmed to blend in with the surrounding landscape or used for erosion mitigation measures. » Ground surface or shaped subsoil shall be ripped or scarified with a mechanical ripper or by hand to a depth of 15 – 20 cm » Compacted soil shall be ripped to a depth greater than 25 cm and the trimmed by hand to prevent re-compacting the soil » Any foreign objects, concrete remnants, steel remnants or other objects introduced to the site during the construction process shall be cleared before ripping, or shaping and trimming of any landscapes to be rehabilitated takes place	Contractor	Rehabilitation
Application of topsoil: » Topsoil shall be spread evenly over the ripped or trimmed surface, if possible not deeper than the topsoil originally removed. » The final prepared surface shall not be smooth but furrowed to follow the natural contours of the land. » The final prepared surface shall be free of any pollution or any kind of contamination. » Care shall be taken to prevent the compaction of topsoil.	Contractor, ECO to control	During and after construction

Mitigation: Action/control	Responsibility	Timeframe
Soil stabilisation: » Mulch, if available from shredded vegetation, shall be applied by hand to achieve a layer of uniform thickness. » Mulch shall be rotated into the upper 10 cm layer of soil: * this operation shall not be attempted if the wind strength is such as to remove the mulch before it can be incorporated into the topsoil. » Measures shall be taken to protect all areas susceptible to erosion by installing temporary and permanent drainage work as soon as possible: * where natural water flow-paths can be identified, subsurface drains or suitable surface drains and chutes need to be installed. » Runnels or erosion channels developing shall be back-filled and restored to a proper condition: * such measures shall be effected immediately before erosion develops at a large scale. » Where erosion cannot be remedied with available mulch or rocks, geojute or other geotextiles shall be used to curtail erosion.	Contractor, ECO to control	Construction phase Operational phase, followed up until desired end state is reached
Topsoil from all excavations and construction activities must be salvaged and reapplied during rehabilitation.	Contractor, ECO to control	Rehabilitation
Revegetation		
» In line with specifications regarding permissible biodiversity and the rehabilitation plan, a minimum percentage cover of vegetation must be established and permanently maintained post construction.	Developer and horticultural contractor	After construction, throughout operational phase
» All areas of disturbed soil must be rehabilitated using only indigenous grass and shrubs. Rehabilitation activities shall be undertaken according to the rehabilitation plan included in this final EMPr.	Contractor, ECO to control	After construction
» Revegetation of the final prepared area is expected to occur spontaneously to some degree where topsoil could be re-applied within 6 months. » Revegetation will be done according to an approved planting/landscaping plan according to the desirable end states and permissible vegetation.	Contractor, ECO to control	Construction phase Operational phase, followed up until desired end state is reached
Re-seeding: » Revegetation can be increased where necessary by hand- seeding indigenous species: * Previously collected and stored seeds shall be sown evenly over the designated areas, and be covered by means of rakes or other hand tools.	Contractor, ECO to control	Construction phase Operational phase, followed up until desired end state is reached

Mitigation: Action/control	Responsibility	Timeframe
* Commercially available seed of grass species naturally occurring on site can be used as alternative. » Re-seeding shall occur at the recommended time to take advantage of the growing season. » In the absence of sufficient follow-up rains after seeds started germinating, irrigation of the new vegetation cover until it is established shall become necessary to avoid loss of this vegetative cover and the associated seedbank.		
Planting of species: » The composition of the final acceptable vegetation will be based on the vegetation descriptions of the original ecological EIA investigation, and will include rescued plant material. » Geophytic plants shall be planted in groups or as features in selected areas. » During transplanting care shall be taken to limit or prevent damage to roots. » Plants should be watered immediately after transplanting to help bind soil particles to the roots (or soil-ball around rooted plants) and so facilitate the new growth and functioning of roots.	Contractor, ECO to control	Construction phase Operational phase, followed up until desired end state is reached
Traffic on revegetated areas: » Designated tracks shall be created for pedestrian of vehicle traffic where necessary. » Disturbance of vegetation and topsoil must be kept to a practical minimum, no unauthorised off road driving will be allowed. » All livestock shall be excluded from newly revegetated areas, until vegetation is well established.	Contractor, ECO to control	Construction phase Operational phase
Establishment: » The establishment and new growth of revegetated and replanted species shall be closely monitored. * Where necessary, reseeding or replanting will have to be done if no acceptable plant cover has been created.	Contractor, ECO to control	Construction phase Operational phase, followed up until desired end state is reached
Monitoring and follow-up treatments		
Monitor success of rehabilitation and revegetation and take remedial actions as needed according to the respective plan: » Erosion shall be monitored at all times and measures taken as soon as detected. » Where necessary, reseeding or replanting will have to be done if no acceptable plant cover has been created.	ECO during construction, suitable designated person / contractor after that	Construction phase Operational phase
Weeding: » It can be anticipated that invasive species and weeds will germinate on rehabilitated soils:	Contractor	Construction phase Operational phase

Mitigation: Action/control	Responsibility	Timeframe
* These need to be hand-pulled before they are fully established and/or reaching a mature stage where they can regenerate. * Where invasive shrubs re-grow, they will have to be eradicated according to the Working for Water specifications.		

Performance Indicator	» No activity in identified no-go areas. » Natural configuration of habitats as part of ecosystems or cultivated land is retained or recreated, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist. » The structural integrity and diversity of natural plant communities is recreated or maintained. » Indigenous biodiversity continually improves according to the pre-determined desirable end state: * This end state, if healthy, will be dynamic and able to recover by itself after occasional natural disturbances without returning to a degraded state. » Ecosystem function of natural landscapes and their associated vegetation is improved or maintained. » Progressive return of disturbed and rehabilitated areas to the desired end state.
Monitoring	» An incident reporting system must record non-conformances to the EMPr. » Quarterly inspections and monitoring of the site by the ECO or personnel designated to the rehabilitation process until 80% of the desired plant species have become established: * These inspections should be according to the monitoring protocol set out in the rehabilitation plan. » Thereafter annual inspections according to the minimal monitoring protocol.

CHAPTER 8: MANAGEMENT PROGRAMME - OPERATION

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

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

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

8.1. Objectives

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

OBJECTIVE 1: Limit the ecological footprint of the facility and ensure avoidance of environmentally sensitive features

Indirect impacts on vegetation, fauna and water resources could result from operational activities, maintenance activities and the movement of people and vehicles on site and in the surrounding area. In order to ensure the long-term environmental integrity of the site following construction, maintenance of the areas rehabilitated post-construction must be undertaken until these areas have successfully re-established. In addition, it must be ensured that the operational activities avoid all environmentally sensitive features identified (refer to Figure 1.5).

Project component/s	» Presence and operation of the facility.
Potential Impact	» Impact on the surrounding landscape due to alien plant invasion. erosion or poor management with the facility. » Degradation of the environment, particularly with respect to habitat destruction, loss of indigenous flora, and damage to depression wetland.
Activity/Risk Source	» Alien plants within the facility. » Erosion from within the facility. » Human presence. » Maintenance and operational activities which may lead to negative impacts such as pollution, herbicide drift etc.
Mitigation: Target/Objective	» Low ecological footprint of the facility during operation. » Environmental sensitivities are avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	Responsibility	Timeframe
Access to the site should be controlled, to the actual facility as well as the surrounding farmland.	Operator	Operation
Vegetation control should be by manual clearing.	Operator t	Operation
Bi-annual monitoring for alien plant species - with follow up clearing.	Operator	Operation
Quarterly site inspection for erosion problems – with follow up remedial action where problems are identified.	Operator	Operation
All declared aliens must be identified and managed in accordance with the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 19830. There should be an alien species monitoring and eradication programme to prevent encroachment of these problem plants for the duration of the operation. This should aim to address alien plant problems within the whole site, not just the development footprint.	Operator	Operation
A rehabilitation strategy, with follow-up for at least two years after the end of the construction phase must be implemented.	Operator	Operation
Regular monitoring for erosion must take place to ensure that no erosion problems are occurring at the site as a result of the roads and other infrastructure. All erosion problems observed should be rectified as soon as possible as outlined in the erosion management plan within the EMPr.	Operator	Operation
Any vegetation clearing that needs to take place as part of maintenance activities must be done in an environmentally friendly manner, including avoiding the use of herbicides and using manual clearing methods wherever possible.	Operator	Operation
No activities will be allowed to encroach into a water resource without a water use license being in place from the Department of Water and Sanitation.	Operator	Throughout operation
Road borders must be regularly maintained to ensure that vegetation remains short and that they therefore serve as an effective firebreak.	Operator	Operation

Performance Indicator	» No alien species within the site. » No erosion problems within the site or from access roads. » Maintenance of a ground cover of perennial grasses and ferns that resist erosion. » No activities encroaching into water resources.
Monitoring	» Records of alien species presence and clearing actions » Records of erosion problems and mitigation actions taken with photographs » Management log detailing the management actions taken to maintain and control the vegetation within the facility. » The Environmental Manager must conduct regular monitoring to oversee that no activities encroach into water resources.

OBJECTIVE 2: Minimise impacts on fauna

Project component/s	» Presence of operational staff/ employees regularly accessing the site of the solar energy facility.
Potential Impact	» Pressures from humans on fauna during site operation.
Activity/risk source	» Wherever there are human activities occurring within a close proximity to natural habitat, this can lead to increased pressure on natural resources through illegal hunting/ poaching/ trapping of fauna by staff/ workers accessing the solar energy facility.
Mitigation: Target/Objective	» Onsite control measures to be provided that aim to minimise the risk of incurring direct impacts to fauna.

Mitigation: Action/control	Responsibility	Timeframe
The collection, hunting, or harvesting of any plants or animals at the site is strictly forbidden,	Operator	Duration of the operation period
If soaps are required during the washing of panels during maintenance, then biodegradable soaps must be used to avoid soil contamination and poisoning of small animals.	Operator	Duration of the operation period
During operation, any electrocution and collision events that occur at the substation or along the powerline route should be recorded, including the species affected and the date. If repeated collisions occur within the same area, then further mitigation and avoidance measures may need to be implemented.	Operator	Duration of the operation period

Performance Indicator	» Records indicate that all staff have undergone environmental induction training. » A copy of the EMPr is located at the site at all times. » Fines have been issued for any major infringements to the conditions of the EMPr. » No fauna has been unnecessarily harmed by operational activities or the operator.
Monitoring and Reporting	» Records of environmental education and staff attendance to be maintained.

OBJECTIVE 3: The mitigation and possible negation of the potential visual impact of lighting at the solar energy facility

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

Project Component/s	» Solar energy facility lighting fixtures. » Photovoltaic 'string' of panels including ancillary infrastructure. such as a maintenance workshop, storage building and offices.

Potential Impact	» The potential night time visual impact of lighting fixtures on observers in proximity to the site. » Potential visual intrusion in the area and damage to the natural environment.
Activity/Risk Source	» The effects of glare and light trespass on motorists and observers. » Potential impact on sensitive receptors within the *foreground*.
Mitigation: Target/Objective	» The containment of light emitted in order to eliminate the risk of additional night time visual impacts. » Minimal usage of security and other lighting. » A facility that fits in with the landscape, that is well maintained and managed.

Mitigation: Action/Control	Responsibility	Timeframe
Undertake regular maintenance of light fixtures.	Operator	Operation
Maintain the general appearance of the facility in an aesthetically pleasing way (i.e. the PV panels, buildings and associated infrastructure, roads and natural environment).	Operator	Operation
Monitor land surface below PV arrays to prevent loss of vegetation and first signs of desertification.	Operator	Operation
Maintain access roads to prevent scouring and erosion, especially after rains.	Operator	Operation
Lighting for both the construction period and through the operation of the facility must be LED, preferably yellow. All perimeter and security lighting must be attached to motion detectors, unless permanent lighting is required for safety or security reasons, and should be dark-sky friendly.	Operator	Operation

Performance Indicator	» The effective containment of the light on the site and no complaints from affected parties.
Monitoring	» The monitoring of the condition and functioning of the light fixtures during the operational phase of the project. » Management to be undertaken by operator.

OBJECTIVE 4: Prevention and early mitigation of all erosion and loss of topsoil and ecosystem integrity (Erosion Management)

Compacted and/or denuded and disturbed soils are usually prone to surface capping – even more so if the soils are dispersive or have a fine texture due to higher clay or loam contents. Such capped soils are prone to ever increasing erosion, creating a dysfunctional landscape and ecosystem that rapidly loses soil, nutrients and seeds from the ecosystem.

Naturally occurring grassland vegetation that historically covered the entire proposed development area not only protects the soil surface from direct raindrop impact, but high portion of biomass in the upper 20 – 50 cm of the soil significantly increases rapid infiltration of rainwater, whilst also binding soil particles and thus preventing erosion. A highly disturbed or reduced vegetation layer will thus naturally be accompanied by higher runoff levels and accelerated erosion, especially during extreme weather events.

The measures below indicate the minimum mitigation that will be required for erosion and stormwater control. An erosion and stormwater plan must be developed prior to operation.

Project component/s	» PV Array. » Grid connection and associated servitudes. » Access roads. » Workshop, guardhouses, substation and other related infrastructure. » Potential topsoil stockpiles and/or borrow pits.
Potential Impact	» Loss of topsoil and natural resources and biological activity within the topsoil. » Loss of natural regeneration potential of soils. » Loss of agricultural potential of soils.
Activity/risk source	» Rainfall and wind erosion of disturbed areas. » Excavation, stockpiling and compaction of soil. » Storm water run-off from sealed, altered or bare surfaces. » Roadside drainage ditches. » Premature abandonment of follow-up monitoring.
Mitigation: Target/Objective	» To minimise deposition of soil into drainage lines. » To minimise damage to vegetation by erosion or deposition. » No accelerated overland flow related surface erosion as a result of a loss of vegetation cover. » No reduction in the surface area of natural wetland areas as a result of the establishment of infrastructure. » No increase in runoff into drainage lines as a result of construction of project related infrastructure.

Mitigation: Action/control	**Responsibility**	**Timeframe**
Monitoring of rehabilitated disturbance areas after construction as per the rehabilitation plan.	Contractor	Operational phase
General Erosion control measures: » Runoff control and attenuation can be achieved by using any or a combination of sand bags, logs, silt fences, storm water channels and catch-pits, shade nets, geo-fabrics, seeding or mulching as needed on and around cleared and disturbed areas: * Ensure that all exposed soil surfaces are protected by vegetation or a covering to avoid the surface being eroded by wind or water. » Storm water and any runoff generated by hard impervious surfaces should be discharged into retention swales or areas with rock rip-rap. These areas should be grassed with indigenous vegetation. These energy dissipation structures should be placed in a manner that flows and managed prior to being discharged back into the natural water courses, thus not only preventing erosion, but also supporting the maintenance of natural base flows within these systems, i.e. hydrological regime (water quantity and quality) is maintained.	Contractor/ Operator	Operational phase

Mitigation: Action/control	Responsibility	Timeframe
» Mitigate against siltation and sedimentation of wetlands using the above mentioned structures and ensure that no structures cause erosion.		
Compile a comprehensive storm water management method statement, as part of the final design of the project and implement during operation.	Contractor, Operator	Operational phase
Where access roads cross natural drainage lines or wetlands, culverts (or other appropriate measures) must be designed to allow free flow. Regular maintenance must be carried out.	Contractor	Operational phase, monitored throughout
All vehicles on site must be appropriate to access the site. No off-road driving is permitted.	Operator	Operational phase

Performance Indicator	» Minimal level of soil erosion around site. » Minimal level of increased siltation in wetlands. » Minimal level of soil degradation. »
Monitoring	» Monthly/quarterly inspections of the site by Operator's EO. » Monthly/quarterly inspections of sediment control devices by Operator's EO. » Monthly/quarterly inspections of surroundings, including drainage lines by Operator's EO. » Immediate reporting of ineffective sediment control systems. » An incident reporting system must record non-conformances according to the EMPr.

OBJECTIVE 5: Minimise dust and air emissions

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

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

Mitigation: Action/Control	Responsibility	Timeframe
Roads must be maintained to a manner that will ensure that nuisance to the community from dust is not visibly excessive.	Operator	Operation
Appropriate dust suppression must be applied to the roads as required to minimise/control airborne dust.	Operator	Operation
Speed of vehicles must be restricted on site, as defined by the Environmental Manager.	Operator	Operation
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Operator	Operation

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

OBJECTIVE 6: Ensure the implementation of an appropriate fire management plan during the operation phase

The increased presence of people on the site could increase the risk of veld fires, particularly in the dry season (i.e. if the construction phase takes place within the dry season).

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

Mitigation: Action/Control	Responsibility	Timeframe
Join the local Fire Protection Agency (if established).	Tshepong Photovoltaic (Pty) Ltd and EPC	Operation
Provide adequate firefighting equipment on site.	Tshepong Photovoltaic (Pty) Ltd and EPC	Operation

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

Performance Indicator	» Firefighting equipment and training provided before the operational phase commences. » Appropriate fire breaks in place and maintained.
Monitoring	» Tshepong Photovoltaic (Pty) Ltd must monitor indicators listed above to ensure that they have been met.

OBJECTIVE 7: Appropriate handling and management of waste including handling hazardous/dangerous substances

The operation of the facility will involve the storage of chemicals and hazardous substances, as well as the generation of limited waste products. The main wastes expected to be generated by the operation activities include general solid waste, and liquid waste. A Waste Management Plan is included as **Appendix D** of this EMPr.

Project Component/s	» Substation. » Operation and maintenance staff. » Workshop.
Potential Impact	» Inefficient use of resources resulting in excessive waste generation. » Litter or contamination of the site or water through poor waste management practices. » Contamination of water or soil because of poor materials management.
Activity/Risk Source	» Transformers and switchgear for the substations. » Ancillary buildings.
Mitigation: Target/Objective	» Comply with waste management legislation. » Minimise production of waste. » Ensure appropriate waste disposal. » Avoid environmental harm from waste disposal. » Ensure appropriate storage of chemicals and hazardous substances.

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

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

OBJECTIVE 8: Minimise storm water runoff (guideline for storm water management plan)

Management of storm water will be required the operational phase of the facility. A detailed storm water management plan is required to be compiled as part of the final design to ensure compliance with applicable regulations and to prevent off-site migration of contaminated storm water or increased soil erosion. The section below provides a guideline for the management of storm water on site and will need to be supplemented with the relevant method statements during the operation phase of the facility.

Project Component/s	» Storm water management components. » Any hard engineered surfaces (i.e. access roads).
Potential Impact	» Poor storm water management and alteration of the hydrological regime (i.e. drainage lines).
Activities/Risk Sources	» Construction of the facility (i.e. placement of hard engineered surfaces).
Mitigation: Target/Objective	» Appropriate management of storm water to minimise impacts on the environment.

Mitigation: Action/Control	Responsibility	Timeframe
A Method Statement for the management of storm water which also considers the recommendations below is to be submitted to the ECO prior to commencement of construction activities.	Contractor	pre-construction
Reduce the potential increase in surface flow velocities and the resultant impact on the localised drainage system as a result of increased sedimentation through the implementation of appropriate erosion management measures (as outlined in **Appendix C**).	Operator	Operation
Appropriately plan hard-engineered bank erosion protection structures.	Operator	Operation
Ensure suitable handling of storm water within the site (i.e. separate clean and dirty water streams around the plant and install stilling basins to capture large volumes of run-off, trapping sediments and reduce flow velocities) through appropriate design of the facility.	Operator	Operation
Design measures for storm water management need to allow for surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows.	Operator	Operation

Performance Indicator	» Appropriate storm water management measures included within the facility design. » Sound water quality and quantity management during construction and operation.
Monitoring	» Devise a suitable surface water quality monitoring plan for implementation during construction and operation.

CHAPTER 9: MANAGEMENT PROGRAMME - DECOMMISSIONING

The solar infrastructure which will be utilised for the proposed solar energy facility is expected to have a lifespan of at least 20 years (i.e. with maintenance). Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility would comprise the disassembly and replacement of the solar infrastructure with more appropriate technology/infrastructure available at that time.

The relevant mitigation measures contained under the construction and rehabilitation sections of this EMPr should be applied during decommissioning and therefore is not repeated in this section. It must be noted that decommissioning activities will need to be undertaken in accordance with the legislation applicable at that time, which may require this section of the EMPr to be revisited and amended.

Should the activity ever cease or become redundant, the applicant shall undertake the required actions as prescribed by legislation at the time and comply with all relevant legal requirements administered by any relevant and competent authority at that time.

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

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

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

9.1. Objectives

In decommissioning the facility, Tshepong Photovoltaic (Pty) Ltd must ensure that:

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

- All rehabilitated areas are monitored for erosion.
- Components of the facility are removed from the site and disposed of appropriately.
- Retrenchments should comply with South African Labour legislation of the day.

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