DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

FOR THE PROPOSED DEVELOPMENT OF A 200 MEGAWATT PELLA SOLAR PV PROJECT LOCATED ON REMAINDER PORTION 5 OF FARM TOELANIE 185 JP IN MADIKWE, WITHIN THE MOSES KOTANE LOCAL MUNICIPALITY, UNDER THE JURISDICTION OF THE BOJANALA PLATINUM DISTRICT MUNICIPALITY, NORTH WEST PROVINCE.

Prepared For:

Toelane Solar (Pty) Ltd

Stonehouse, Ground Floor, 94 Sovereign Drive,

Route 21 Corporate Park, Irene,

Pretoria 0046

Prepared By:

QEMS Management and Business Solutions cc

7 Munnik Avenue, Sterpark, Polokwane,

0699

08 October 2026

DOCUMENT SYNOPSIS

Document Synopsis

Item	Description
Proposed development and location	The Proposed Development of A 200 Megawatt Pella Solar PV Project Located on Remainder Portion 5 of Farm Toelanie 185 JP in Madikwe, within the Moses Kotane Local Municipality, under the Jurisdiction of the Bojanala Platinum District Municipality, North West Province.
Coordinates	25°19'46.41" S, 26°30'24.87"E
Municipality	Moses Kotane Local Municipality
Predominant land use of surrounding area	Grazing
Applicant	Toelane Solar (Pty) Ltd
Prepared for:	**Toelane Solar (Pty) Ltd** Stonehouse, Ground Floor, 94 Sovereign Drive, Route 21 Corporate Park, Irene, Pretoria 0046
Prepared by:	**QEMS Management and Business Solutions cc** 7 Munnik Avenue Sterpark Polokwane 0699
Date of Report	08 October 2026
Draft Document	**Author:** **Dr. Patric Sithole**
Date: 08 October 2026	**Signature:**

ACKNOWLEDGEMENTS

The author acknowledges Toelane Solar (Pty) Ltd for their assistance with project information and project scope as well as responding technical queries related to the project.

TERMS AND DEFINITIONS

AUDIT: Regular inspection and verification of Construction activities for implementation of the approved EMP.

CONTRACTOR: Construction companies are appointed on behalf of the client to undertake the Construction activities, as well as their subcontractors and suppliers.

DWS: Department of Water and Sanitation

DEVELOPMENT SITE: Boundary and extent of development works and infrastructure.

EMERGENCY SITUATION: An incident, which potentially has the ability to significantly impact on the environment, and which, could cause irreparable damage to sensitive environmental features. Typical situations entail amongst others the: -

- Spill of petroleum products and lubricants into the aquatic system;
- Potential damage, erosion and slumping of unstable river embankments or drainage channels;
- Potential event of impeding the continuous flow of water to downstream water user's dependent on the flow.

EMPR: Environnemental Management Programme Report. The EMPR for the project sets out general instructions that will be included in a contract document for the Construction phase of the project. The EMPR will ensure the Construction activities are conducted and managed in an environmentally sound and responsible manner.

EMP: Environmental Management Plan.

ENVIRONMENT: The environment means the surroundings within which humans exist and that could be made up of water, air, soil, sand, plants and animals.

ENVIRONMENTAL ASPECT: An environmental aspect is any component of a contractor's Construction activity that is likely to interact with and on the environment.

EAP: Environmental Assessment Practitioner.

ENVIRONMENTAL IMPACT: An impact or environmental impact is the change to the environment, whether desirable or undesirable, that will result from the effect of a Construction activity. An impact may be the direct or indirect consequence of a Construction activity.

ENVIRONMENTAL CONTROL OFFICER: A qualified person nominated by the appointed contractor and/or client who will ensure the day-to-day implementation of the EMP by contractors during Construction and operation of the project.

ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)*:* A detailed plan of action prepared to ensure that recommendations for enhancing or ensuring positive environmental impacts and limiting or preventing negative environmental impacts are implemented during the life-cycle of the project. This EMPr focuses on the construction phase, operation (maintenance) phase and decommissioning phase of the proposed project.

GENERAL WASTE: Domestic waste, commercial waste, non-hazardous industrial waste and builders' rubble e.g. paper, plastics, food, tins, wood, etc.

GROUNDWATER: All subsurface water in rocks and soil pore spaces and in the fractures of rock formations, and it moves under the influence of gravitation.

HERITAGE RESOURCES: This means any place or object of cultural significance, including all human-made phenomena and intangible products that are the result of the human mind. Natural, technological, or industrial features may also be part of heritage resources, as places that have made an outstanding contribution to the cultures, traditions and lifestyles of the people or groups of people of South Africa

HERITAGE: That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act, 1999 (Act No. 25 of 1999).

IEM: Integrated Environmental Management.

IMPACT: A description of the potential effect or consequence of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.

MITIGATION: Are measures designed to prevent, reduce or remedy adverse impacts.

NEMA: National Environmental Management Act.

NEMAQA: National Environmental Management Air Quality Act.

NEMWA: National Environmental Management Waste Act.

PALAEONTOLOGY: Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

POLLUTION*:* The National Environmental Management Act, 1998 (Act No. 107 of 1998) defined pollution to mean any change in the environment caused by – substances; radioactive or other waves; or noise, odours, dust or heat emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.

- Potential damage, erosion and slumping of unstable river embankments or drainage channels.
- Potential event of impeding the continuous flow of water to downstream water user's dependent on the flow.

PROJECT/SITE MANAGER: A person who represents the client and is responsible for enforcing the technical and contractual requirements of the project.

SITE INSPECTION: Is an Environmental Inspection/regular check in to ensure compliance with the EMP. To ensure safety standards and working conditions are met. The findings of this inspection must be recorded on the Site Environmental Control Report.

SOLAR PLANT: is any facility that converts sunlight directly, like photovoltaics, or indirectly, like solar thermal plants, into electricity.

SAHRA: South African Heritage Resource Agency

SOLID WASTE: All solid waste, including Construction debris, chemical waste, excess cement/concrete, wrapping material, timber, tins and cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).

- Spill of petroleum products and lubricants into the aquatic system;
- that is identified as a waste by the relevant Minister by notice in the Gazette, and includes waste generated by the mining, medical or other sector, but—
- that is surplus, unwanted, rejected, discarded, abandoned or disposed of;
- that must be treated or disposed of; or

The Site Environmental Control Report must be submitted to the Project Manager on regular times. In case of non-compliance, the Project Manager and the contractor must be notified immediately.

TOPSOIL: The layer of soil covering the earth which provides a sustainable environment for the germination of seeds, allows water penetration, and is a source of micro-organisms and plant nutrients.

WASTE: Waste means any substance, whether or not that substance can be reduced, re-used, recycled and recovered

- that is surplus, unwanted, rejected, discarded, abandoned or disposed of;
- which the generator has no further use of for the purposes of production;
- that must be treated or disposed of; or
- that is identified as a waste by the relevant Minister by notice in the Gazette, and includes waste generated by the mining, medical or other sector, but—
- a by-product is not considered waste; and
- any portion of waste, once re-used, recycled and recovered, ceases to be waste.

WASTE DISPOSAL FACILITY: Waste disposal facility means any site or premise used for the accumulation of waste with the purpose of disposing of that waste at that site or on that premises.

WATER POLLUTION*:* The National Water Act, 1998 (Act No. 36 of 1998 defined water pollution to be the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it – less fit for any beneficial purpose for which it may reasonably be expected to be used; or harmful or potentially harmful to the welfare, health or safety of human beings; to any aquatic or non-aquatic organisms; to the resource quality; or to property.

ENVIRONMENTAL ASSESSMENT PRACTITIONER

Quality Environmental Management and Business Solutions cc (QEMS) is an independent environmental consultancy appointed by Toelane Solar (Pty) Ltd to undertake the required Environmental Management Services for the proposed development of a 200 Megawatts Pella Solar PV Project located on remainder portion 5 on Farm Toelane 185 JP in Madikwe, within the Moses Kotane Local Municipality, under the jurisdiction of the Bojanala Platinum District Municipality, North West Province. Refer to the table below for the EAP's details.

Environmental Assessment Practitioner:	QEMS Management and Business Solutions cc
Contact Person:	Dr. Patrick Sithole Registered EAP (EAPASA) Registered Pr.Sci.Nat. (SACNASP) Registered Pest Control Operator (PCO) Registered Process Controller-IV (DWS) 
Address:	7 Munnik Avenue, Sterpark, Polokwane, 0699, South Africa
Telephone	+ 27 61 535 3141/+27 76 859 8796
E-mail/ Website	sitholetp@qems.co.za/ www.qems.co.za
Expertise	A Registered natural scientific professional (SACNASP – Environmental and Chemical scientist), Registered Environmental Assessment Practitioner (EAPASA), social and sustainability expert with 21 years of experience, Patrick Sithole specialises in Strategic Environmental, Social and Sustainable Development projects, Climate Change and Health, Environmental Management issues and Construction Supervision of all infrastructural projects. Dr Sithole is also involved in vegetation clearance and pest control projects along infrastructural projects e.g. roads, railway lines, power lines, golf courses and buildings like complexes, houses, malls, etc. Patrick has very strong business development mindset that has seen him winning and working on projects across Africa and in

	Europe. His key experience includes the following areas; Environmental (Natural Resource) Management; Environmental Compliance; Social Facilitation and Consultation; Compensation of Land Claims; Climate Change; Climate (Change) and Human Health; Air Quality Management; Renewable Energy; Waste Management; Land Rehabilitation; Water Quality/Demand Management; Strategic Environmental Assessment; Waste Water (sewer) Treatment; Project Management; ISO 9001 and ISO14001; Vegetation Control Bush Clearance (Invasive plants)

Contents

1. INTRODUCTION AND BACKGROUND 1

1.1 PROJECT AREA DESCRIPTION 2

1.2 PROPERTY DESCRIPTION 3

1.3 ENVIRONMENTAL REQUIREMENTS 3

1.4 PURPOSE OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME 4

1.5 STRUCTURE OF THE EMPR 6

1.6 EMPR as a Live Document 7

1.7 ENVIRONMENTAL CODE OF CONDUCT 9

2 IMPACT ASSESSMENT METHODOLOGY 10

2.1. IMPACT ASSESSMENT METHODOLOGY 10

3 ASSESSMENT OF POTENTIAL IMPACTS 16

4 MANAGEMENT AND MONITORING PROCEDURE 26

4.1. ORGANIZATIONAL STRUCTURE AND RESPONSIBILITY 26

4.2. ENVIRONMENTAL AWARENESS TRAINING 28

4.2.1. TOPICS COVERED BY THE ENVIRONMENTAL AWARENESS PROGRAMME SHOULD INCLUDE: 29

4.2.2 EMERGENCY PREPARATION AND RESPONSE PLANS 29

5. LEGISLATION AND GUIDELINES 31

6. CONSTRUCTION ACTIVITIES 36

7. PRE-CONSTRUCTION PHASE 37

8. CONSTRUCTION PHASE 42

9. OPERATIONAL PHASE 71

9.1. GENERAL OPERATIONS OF THE SOLAR PLANT 79

10. DECOMMISSIONING PHASE 82

11. IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT PROGRAMME 82

11.1. ENVIRONMENTAL AUDITS AND MONITORING **83**

11.2. RECORD KEEPING **83**

11.3. EMPR UPDATES **84**

12. SUMMARY OF RECOMMENDATIONS AND CONCLUSION 84

LIST OF TABLES

Table 1: Farm properties of the proposed project area 3

Table 2: Coordinates of the study area 3

Table 3: Structure of the EMPr 6

Table 4: Potential Magnitude/Intensity/Severity Rating 11

Table 5: Potential Extent 12

Table 6: Potential Duration 12

Table 7: Probability 13

Table 8: Guide to assessing risk/impact significance as a result of consequence and probability 14

Table 9: Impact significance on Air pollution 16

Table 10: Impact significance on Terrestrial Fauna and Flora 17

Table 11: Impact significance on Aquatic Ecosystems (Groundwater) 19

Table 12: Impact significance on Waste Management 20

Table 13: Impact significance on Landscape and Visual Aspects 22

Table 14: Impact Significant on Noise Pollution 23

Table 15:Impact significant on Traffic and Road Network 24

Table 16: Impact significant on Heritage Aspects 25

Table 17: Emergency contacts details 30

Table 18: Impact and Mitigation Measures in Construction Phase 43

Table 19: Impact and Mitigation Measures in Operational Phase 71

LIST OF FIGURES

Figure 1: Locality Map 2

Figure 2: Deming Cycle 7

1. INTRODUCTION AND BACKGROUND

Quality Environmental Management and Business Solutions cc (QEMS) has been appointed as the Independent Environmental Assessment Practitioner (EAP) by Toelane Solar (Pty) Ltd to undertake the environmental services for the proposed development of a 200 Megawatts Pella Solar PV Project located on remainder portion 5 on Farm Toelane 185 JP in Madikwe, within the Moses Kotane Local Municipality under jurisdiction of the Bojanala Platinum District Municipality, North West Province.

The proposed Pella Solar PV project will be situated on approximately 321ha piece of land. The project entails the construction of Solar plant of 200 Megawatts, Battery Energy Storage System of 120MW, grid connection and boasting a capacity of 160 Megawatts (MW) (AC), to the Eskom distribution grid. This connection will be facilitated through a 132 kilovolt (kV) Overhead transmission line leading to a 3x40MVA Ngwedi substation, Internal roads, auxiliary buildings and boreholes.

This document was prepared on the basis of a Norms and Standards registration in line with the Norm for Exclusion of the development and expansion of solar photovoltaic facilities (GNR NO. 4558) in areas of Low or Medium environmental sensitivity, supported by the following specialist studies:

- Agricultural Impact Assessment
- Terrestrial Biodiversity Impact Assessment
- Plant impact Assessment
- Animal Impact Assessment
- Aquatic Impact Assessment
- Heritage and Cultural Impact Assessment

QEMS scope of work includes the development of an EMPr which outlines the environmental management guideline measures as outlined in Appendix 4 of the EIA Regulations (GNR 326) as amended on the 07 April 2017 that will be undertaken to avoid and minimise impacts on the environment throughout all phases of the proposed development.

1.1 PROJECT AREA DESCRIPTION

The proposed project is located on farm Toelane 185 JP in Madikwe within Moses Kotane Local Municipality of Bojanala Platinum District Municipality of Northwest Province. The central coordinates of the proposed project area are 25°19'46.41" S, 26°30'24.87"E. The area is situated approximately 1.58km South-East of Madikwe (Figure 1).

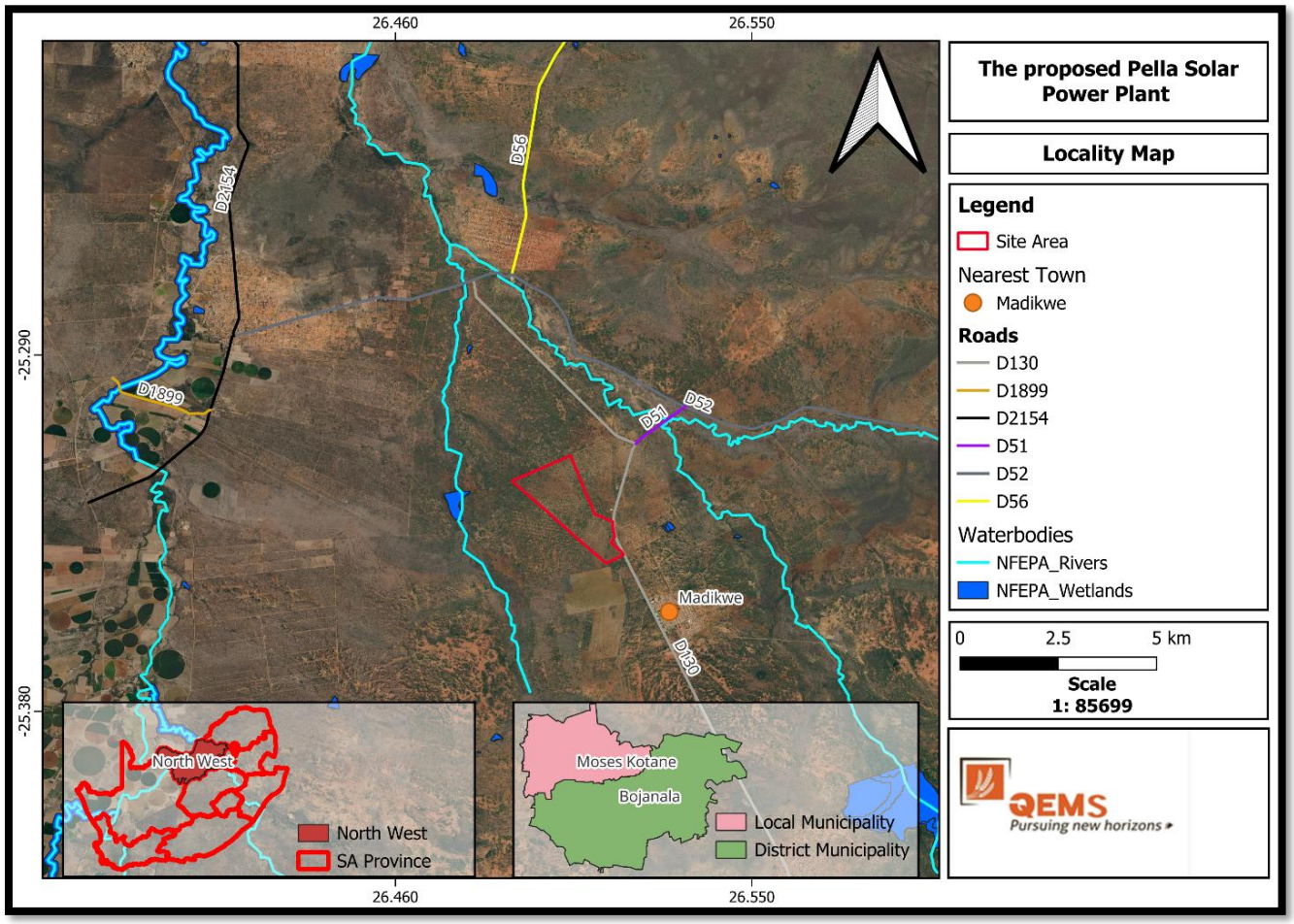


Figure 1: Locality Map

1.2 PROPERTY DESCRIPTION

The properties that will be affected by the proposed project are reflected in table 1 and 2 below.

Table 1: *Farm properties of the proposed project area*

Farm Name	Surveyor-General Cadastral Code No.
Toelane 185 JP	T0JP00000000018500005

Table 2: *Coordinates of the study area*

FEATURE	LATITUDE (S)	LONGITUDE (E)
Corner 1	25°19'18.45"S	26°29'22.00"E
Corner 2	25°20'33.30"S	26°30'47.72"E
Corner 3	25°20'25.64"S	26°31'3.48"E
Corner 4	25°20'22.98"S	26°31'1.71"E
Corner 5	25°20'14.20"S	26°30'52.01"E
Corner 6	25°20'9.20"S	26°30'55.53"E
Corner 7	25°20'2.77"S	26°30'53.97"E
Corner 8	25°19'55.35"S	26°30'53.52"E
Corner 9	25°19'48.64"S	26°30'37.22"E
Corner 10	25°18'55.54"S	26°30'15.06"E

1.3 ENVIRONMENTAL REQUIREMENTS

In terms of (Government Gazette number No 4558 dated 27 March 2024), the norm for the Exclusion of the Development and Expansion of Solar Photovoltaic Facilities in Areas of Low or Medium Environmental Sensitivity in terms of Section 24(10) of the Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and exclude, in terms of Sections 24(2)(d) of the NEMA activities identified in terms of solar photovoltaic facilities, including any associated activity or infrastructure, from the requirement to obtain an environmental authorization, based on compliance with the Norm.

The activities which are the subject of the exclusion relate to the development of a facility for the generation of electricity from solar photovoltaic technology, where such development or expansion triggers activity 1 or Activity 36 of listing notice 1 or Activity 1 of listing notice 2 and

any associated activity identified in listing 1,2 or 3 necessary for the realization of such facilities. The proposed development triggers activities:

- Activity 3.1.2 (GNR 4558 27 March 2024): of Norm for the Exclusion of the Development and Expansion of Solar Photovoltaic Facilities in Areas of Low or Medium Environmental Sensitivity in terms of section 24(10) of the National Environmental Management Act (Act No.107 of 1998).

The National Water Act (Act No. 36 of 1998)

The developer intends to refurbish the existing boreholes a formal water use license application (WULA) will be lodged to the Department of Water and Sanitation in terms of Section 21 of the National Water Act (Act No 36 of 1998). The WULA Procedure is regulated under the 'Procedural Requirements for Water Use License Applications and Appeals (GNR 267, 24 March 2017) published in terms of the NWA.

- Section 21 (a): Taking water from a water resource.

1.4 PURPOSE OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME

The EMPr forms part of the contractual obligations to which all contractors/employees involved in construction and operational phase of a project must be committed. It also forms an integral part of the contract document, as it outlines the environmental methodology and duties required for construction and operation for the authorised activity. It serves as a guideline and baseline information document for describing how negative impacts will be managed, rehabilitated, and monitored and how positive impacts will be maximised and aims to comply with section 24N of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as well as the Environmental Impact Assessment Regulations, 2014 as amended.

This section outlines the environmental management guideline measures as outlined in **Appendix 4** of the EIA Regulations as amended that will be undertaken to avoid or minimize impacts on the environment throughout all phases of the proposed development.

The main objectives of this EMPr are therefore to:

- Outline environmental management measures related to project activities and provide project contractors with guidelines for carrying out Construction activities in such a way as to minimize environmental impacts;
- Be used as a foundation for the specific environmental management instructions contained in Construction contract documents, where compliance will be a contractual obligation for contractor(s);
- Be used as an educational tool, for orientation and training of project personnel and contractors;
- To outline functions and responsibilities of responsible persons;
- To state standards and guidelines, which are required to be achieved in terms of environmental legislation;
- To create management structures that address concerns and complaints of the I&APs with regard to the development;
- To establish methods of monitoring and auditing environmental management practices during all phases of the development;
- To outline mitigation measures and environmental specifications which are required to be implemented for all phases of the project in order to minimize the extent of environmental impacts, and to manage environmental impacts associated with the proposed project; and
- To prevent long-term or permanent environmental degradation.

1.5 STRUCTURE OF THE EMPR

An EMPr provides mitigation and management measures for the two phases namely, Pre-construction, construction and operational phase. Refer to Table 3 for phase of the development.

Table 3: *Structure of the EMPr*

Category	Phases	Description
Category A	Pre-Construction	• This section will provide guidelines on construction activities including site establishment; environmental induction and training and awareness; site access and health and safety. Also provide guidelines on the construction methods and considerations.
Category B	Construction	• This section will provide guidelines on the construction methods and considerations. • This section also specifies environmental actions, procedures and responsibilities that are required.
Category C	Operation	• This section will provide guideline on the practice and responsibility as required for various activities during operation.
Category D	Rehabilitation	• This section of the EMPr provides management principles for the rehabilitation phase of the development. This will include best practice, procedures and responsibilities as required for various associated activities.

1.6 EMPR as a Live Document

The approach adopted for this EMPr is derived from the Deming Cycle (Figure 2), a cycle of continuous improvement that entails the reiterative actions of plan, do, check, act, and then return to the planning phase.



Figure 2: Deming Cycle

- **Plan**

Project-specific planning for the proposed project involves consideration of the legal triggers, the specifics of the proposed development, and the nature of the receiving environment. This provides a starting point for targeted environmental management objectives. Environmental performance indicators are then determined with measurable targets prescribed to monitor the environmental performance of the project. Achieving the targets depends on compliance with this EMPr and the legislative requirements that underpin it.

- **Do**

Throughout the development's life-span, the developer will be required to develop and maintain a Quality Management System (QMS), designed to ensure that best management practices are implemented on day-to-day management. Such a QMS should at least include the following information:

- Location and extent of associated infrastructure;
- Associated activities, such as the transportation of animals and equipment;
- Resources and experience required (staffing);
- Materials and equipment to be used;
- Management actions;
- Human resources used;
- Construction-operation monitoring activities;
- Emergency /disaster incident and reaction procedures.

These topics will be cross-linked into the contracts related to the development of the project.

❖ **Check**

A system of assessing monitoring results has been developed to check the environmental management performance. Continuous assessment facilitates proactive management of the environmental issues. Mitigation measures can then be successfully implemented on an ongoing basis to keep environmental indicators within their target thresholds. Moreover, the assessment system also enables the assessment of the efficiency of the EMPr. Regular auditing of environmental performance is prescribed to prove and preserve accountability.

❖ **Act**

The assessments and monitoring of the results and findings of the regular audits must be documented within a reporting system. Precautionary mitigation measures and corrective actions will be prescribed, and instructions will be given in order to implement these in the field. The findings of monitoring and auditing programmes can also be used to update the EMPr. Although the EMPr is a project-specific document, it is dynamic and should be updated regularly to address the changing circumstances of the scheme.

1.7 ENVIRONMENTAL CODE OF CONDUCT

One of the objectives of the EMPr is to ensure that all the workforce, contractors, sub-contractors, and operation staff have an understanding of environmental issues and potential impacts on-site activities. This environmental code of conduct provides the basic rules that must be strictly adhered to.

It is the responsibility of the Site Environmental Officer, the Environmental Officer and ECO (as appointed) to ensure that each contractor, sub-contractor and workforce understand and adhere to the Code of Conduct.

All persons are obliged to keep to the rules of this code of conduct. Ignorance, negligence, recklessness or a general lack of commitment resulting in environmental degradation or pollution must not be tolerated.

Environmental Rules

- Do not waste electricity, water or consumables,
- Only use authorised accesses,
- Do not litter,
- Dispose solid waste to the correct waste containers provided,
- Prevent pollution,
- Use the toilet facilities provided,
- Do not dispose contaminated wastewater to the storm water or the environment,
- Immediately report any spillage from containers, or vehicles,
- Do not burn or bury any waste in the site footprint,
- Do not trespass onto private properties,
- Know the environmental incident procedures.

2 IMPACT ASSESSMENT METHODOLOGY

In order for us to establish the significant issues that need to be addressed on the Pella Solar P V project, an impact assessment needs to be conducted to give insight into the key considerations. An environmental impact is the change to the environment, whether desirable or undesirable, that will result from the effect of an activity. An impact may be the direct or indirect consequence of an activity. A description of potential impacts or consequence of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space

2.1. IMPACT ASSESSMENT METHODOLOGY

The section below is the method used for determining the significance of impacts. Each of the impacts were listed taking into consideration different phases of the project (pre-construction, construction and operation phase). A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment was provided. Impacts and risks were identified, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts - (a) can be reversed; (b) may cause irreplaceable loss of resources; and (c) can be avoided, managed or mitigated.

The specialist studies are synthesised and integrated into the overall impact assessment and recommendations for mitigation are included in the EMPr (full reports are included as Appendices). The contents of all specialist reports include information as prescribed in Regulation 32(3) of the EIA Regulations, 2010 and provide preference ranking of the site.

In addition, the following was identified:

- Positive and negative impacts that the proposed activity will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

The following methodology was applied to the prediction and assessment of impacts/risks. Potential impacts were rated in terms of the direct, indirect and cumulative:

Table 4: *Potential Magnitude/Intensity/Severity Rating*

Potential Intensity Description (negative)	**Intensity**	**Score**
Change is slight, often not noticeable, natural functioning of environment not affected.	Minor	2
Natural functioning of environment is minimally affected. Natural, cultural and social functions and processes can be reversed to their original state.	Low	4
Environment remarkably altered, still functions, if in modified way. Negative impacts cannot be fully reversed.	Moderate	6
Cultural and social functions and processes disturbed – potentially ceasing to function temporarily.	High	8
Natural, cultural and social functions and processes permanently cease, and valued, important, sensitive or vulnerable systems or communities are substantially affected. Negative impacts cannot be reversed.	Very high	10

- Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.
- Indirect impacts of an activity are indirect or induced changes that may occur as a result of 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.
- Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

Nature of impact - this reviews the type of effect that a proposed activity will have on the environment and should include "what will be affected and how?"

Spatial extent – The size of the area that will be affected by the risk/impact:

Table 5: *Potential Extent*

Criteria: EXTENT – Describes the physical extent or spatial scale of the potential impact.		
RATING		**DESCRIPTION**
1	Site Specific	Impacts extending as far as the activity, limited to the site and its immediate surrounding
2	Local	Impacts extending within 5km from the site boundary.
3	Regional	Impacts extending to the district (20km from the boundary of the site)
4	Provincial	Impacts extending to provincial scale e.g. Northwest Province.
5	National	Impacts extending to within the country i.e. South Africa.
6	International	Impacts extending beyond international border/ the boarders of South Africa

Duration – The timeframe during which the risk/impact will be experienced:

Table 6: *Potential Duration*

Criteria: DURATION –Defines the temporal scale (For how long will the impact endure).		
RATING		**DESCRIPTION**
1	Immediate	Less than 1 year
2	Short term	1-5 years
3	Medium term	6-15 years
4	Long term	Between 16-30 years
5	Permanent	Over 30 years. Where mitigation either by natural processes or by human invention will not occur in such a way or in such time span that the impact can be considered transient.

Using the criteria above, the impacts were further be assessed in terms of the following:

- Probability – The probability of the impact/risk occurring:

Table 7: Probability

Criteria: PROBABILITY –Defines the likelihood of impact occurring.		
RATING		**DESCRIPTION**
1	Improbable	Where the possibility of the impact occurring is low.
2	Low	Where there is a low possibility that the impact will occur.
3	Medium	Where there is a medium possibility that the impact will occur (50 and 70%)
4	High	Where it is most likely that the impact will occur.
5	Definite	Where the impact will occur regardless of any prevention measures.

- Magnitude–The anticipated severity of the impact (Intensity + Extent + Duration):
- Extreme (extreme alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they permanently cease);
- Severe (severe alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease);
- Substantial (substantial alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease);
- Moderate (notable alteration of natural systems, patterns or processes, i.e. where the environment continues to function but in a modified manner); or
- Slight (negligible alteration of natural systems, patterns or processes, i.e. where no natural systems/environmental functions, patterns, or processes are affected).
- Significance – Will the impact cause a notable alteration of the environment? To determine the significance of an identified impact/risk, the consequence is multiplied by probability.

Impact Magnitude = Potential Intensity + duration + extent

Significance rating = Impact magnitude * Probability

Table 8: Guide to assessing risk/impact significance as a result of consequence and probability

"Significance"- attempts to evaluate the importance of a particular impact with mitigation measures included and also excluded. The significance was calculated using the following formula: **Significance = (Extent + Duration + Magnitude) X Probability**		
Significance of Predicted NEGATIVE Impacts		
Low	0 – 30	Where the impact will have a relatively small effect on the environment and will require minimum or no mitigation and as such have a limited influence on the decision
Medium	31 – 60	Where the impact can have an influence on the environment and should be mitigated and as such could have an influence on the decision unless it is mitigated.
High	61 - 100	Where the impact will definitely have an influence on the environment and must be mitigated, where possible. This impact will influence the decision regardless of any possible mitigation.
Significance of Predicted POSITIVE Impacts		
Low	0 – 30	Where the impact will have a relatively small positive effect on the environment.
Medium	31 – 60	Where the positive impact will counteract an existing negative impact and result in an overall neutral effect on the environment.
High	61 - 100	Where the positive impact will improve the environment relative to baseline conditions.

- Significance was rated as follows (based on Table 8 above)
    - Very low (the risk/impact may result in very minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);
    - Low (the risk/impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision making);

- Medium (the risk/impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated); or
- High (the risk/impacts will result in a considerable alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision making).
- Very high (the risk/impacts will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision making (i.e. the project cannot be authorized unless major changes to the engineering design are carried out to reduce the significance rating).

Impacts have been described both before and after the implementation of the proposed mitigation and management measures. The scenario "without mitigation" considers all management actions already proposed by the proponent as part of the project description. "With mitigation" assesses the significance rating of the potential impact, taking into account any additional management actions recommended by the specialist.

Linked to the above, for each impact assessment, mitigation measures are generally listed under the following three categories (as applicable):

- Mitigation measures inherent to the project design (i.e. mitigation/management actions that the proponent had planned to implement as part of the project description);
- Key management actions proposed by specialist (pertinent measures that will be written into, and enforced through the EMPr (Appendix 10) for implementation to ensure that the significance of the associated impact is acceptable); and
- Additional management actions proposed by the specialist (management actions to be considered by proponent and authority).

The impact assessment has attempted to quantify the magnitude of potential impacts (direct and cumulative effects) and outline the rationale used. Where appropriate, national standards are used as a measure of the level of impact.

Note that the concept of "irreplaceable loss of a resource" is to be taken into account in the Potential Intensity score of an impact. Irreplaceability of resource loss caused by impacts –

- High irreplaceability of resources (project will destroy unique resources that cannot be replaced, i.e. this is the least favourable assessment for the environment. For example, if the project will destroy unique wetland systems, these may be irreplaceable);
- Moderate irreplaceability of resources;
- Low irreplaceability of resources; or
- Resources are replaceable (the affected resource is easy to replace/rehabilitate, i.e. this is the most favourable assessment for the environment).

3 ASSESSMENT OF POTENTIAL IMPACTS

This Chapter identifies and evaluates the actual and potential environmental consequences of the proposed activity. Furthermore, the potential for mitigation of negative impacts and enhancement of positive impacts are described. The below impacts on the biophysical, socio-economic and cultural/historical environment have been assessed based on the methodology provided in Chapter 2. For each impact assessed, mitigation measures have been proposed to reduce or avoid negative impacts and enhance positive impacts. These mitigations were also incorporated in the EMPr to ensure that they are implemented during the various phases of the project.

Table 9: *Impact significance on Air pollution*

Theme	**Air**	
Phases	Construction	Operation Phase
Nature and Status of Impact.	• Generation of dust from construction activities. • Atmospheric pollution caused by engine emissions from construction activities. • Impacts on air quality	• Generation of dust and atmospheric pollution from vehicles monitoring the site
Extent	Local (2)	Local (2)
Duration	Temporary (1)	Long Term (4)
Intensity/Magnitude	High (8)	Moderate (6)
Probability	Definite (5)	High (4)
Confidence		

Level of Significance before mitigation (Inherent risk)	(2+1+8) *5= 55 Medium (-)	(2+4+6) *4=48 Medium (-)
Mitigation Measures	Construction	Operational phase
	• Loading and unloading materials slowly. • Speed restrictions on site. • Dust suppression to minimise dust. • Proper maintenance of vehicles and equipment. • Fumes emitted from vehicles and equipment shall be monitored and quickly be controlled. • Avoid much movement of construction vehicles over an un-surfaced road. • No waste shall be buried. • Only clear areas that is going to be worked on. • Sanction off the construction site by dust screens. • Cover construction materials and stockpiles with tarps or other materials to prevent dust emissions.	• Dust suppression shall be done. • Proper maintenance of vehicles
Level of Significance with Mitigation (Residual risks)	**Low**	**Low**

__Table 10:__ Impact significance on Terrestrial Fauna and Flora

Theme	**Terrestrial Fauna and Flora**	
Phases	Construction	Operation Phase
Nature and Status of Impact.	• Loss of faunal habitat and disturbance of fauna. • Destruction and loss of degraded bushveld including loss of fragmentation of vegetation communities in the adjacent natural areas. • Spreading of alien invasive vegetation	• The presence of the overhead powerline connecting the solar PV plant to the electricity grid has the potential to generate bird-collisions in the area.
Extent	Site (1)	Site (1)
Duration	Long Term (4)	Long Term (4)
Intensity/Magnitude	Minor (2)	Minor (2)

Probability	Definite (5)	Definite (3)
Confidence		
Level of Significance before mitigation (Inherent risk)	(1+4+2) *5= 35 Medium (-)	(1+4+2) *3=21 Low (-)
Mitigation Measures	Construction	Operational phase
	• An Alien Invasive Species Management Plan must be put in place for the duration of the construction phase of the project which must make provision for the following: ➢ Identification of the alien invasive species that have settled on the site ➢ Clear instructions on how to eradicated these species ➢ A schedule of eradication ➢ A schedule of regular monitoring of the success of the implementation • A qualified Environmental Control Officer must be present when clearing begins. • Drivers must keep a maximum speed of 30km/h keep the fauna species at their area. • Install rumble strips on roadsides to create noise and vibration, deterring animals from crossing roads. • Maintain vegetation near roadsides to reduce cover for possible wildlife attempting to cross. • The area to be developed must be demarcated to avoid impacting on an area that must not be used. • Minimise the impacted area and clear only what is required. • Maintain vegetation near roadsides to reduce cover for wildlife attempting to cross.	• The design of the planned overhead powerline requires careful consideration of the following suggestions: • Provision of bird perches along the powerline to make the powerline more visible to birds. • Making provision to have the powerline as low as possible. It is generally accepted that the lower the powerlines are above ground level, a reduction in the risk of bird-strikes will take place. • The Alien Invasive Management Plan must be established and implemented for the operational phase of the development. This plant must be in place when the development goes operational.

Level of Significance with Mitigation (Residual risks)	Low	**Low**

Table 11: Impact significance on Aquatic Ecosystems (Groundwater)

Theme	**Aquatic Ecosystem**	
Phases	Construction	Operation Phase
Nature and Status of Impact.	• Loss of catchment area and decreased water inputs. Aquatic features were identified within the boundaries of the study site and near the site. • Contamination of the area as a result	• N/A
Extent	Regional (3)	
Duration	Long Term (4)	
Intensity	Moderate (6)	
Probability	High (4)	
Confidence		
Level of Significance before mitigation (Inherent risk)	(3+4+6) *4= 52	
	Medium (-)	
Mitigation Measures	Construction	Operational Phase
	• Monitor and maintain construction equipment and material within bunded areas to avoid Leaking on the ground. • Chemical/mobile toilets must be maintained on regular basis to prevent leakage. • Monitor and maintain machines and vehicles for oil leaks. • Provide spill response kits near machines and vehicles for quick containment and cleanup of small leaks. • Develop and communicate an emergency response plan in case of large leaks or spills. • Store fuels and chemicals in secure containers and tanks to prevent leaks during storage. • A Stormwater Management Plan must be put in place for the construction phase of the development that will allow all the rainwater that fall within the study area to	• N/A

	be allowed to percolate into the substrate for continuous supply of the local groundwater.	
Level of Significance with Mitigation (Residual risks)	**Low**	**N/A**

__Table 12:__ Impact significance on Waste Management

Theme	**Waste Management**	
Phases	Construction	Operation Phase
Nature and Status of Impact.	• Pollution on site with general waste from construction activities (Domestic and construction waste) • Contamination of the area as a result of leaking portable toilet facilities.	• Domestic waste from maintenance workers replacing the batteries and security guards in the site. Contamination by leaking sewage from ablutions facilities.
Extent	Site (1)	Site (1)
Duration	Immediate (1)	Long Term (4)
Intensity	High (8)	Minor (2)
Probability	Definite (5)	Improbable (1)
Confidence		
Level of Significance before mitigation (Inherent risk)	(1+1+8) *5= 50	(1+4+2) *1=7
	Medium (-)	Low (-)
Mitigation Measures	Construction	Operational Phase
	• Provide bins at a demarcated area on site to dispose waste • Waste should be collected at regular basis • Waste generated must be disposed at a licensed landfill site • All construction materials should be stored in designated areas and removed regularly. • Waste bins should be provided at a designated area at the construction site.	• Appropriate waste bins with lids must be provided. • The waste must be disposed at a licensed waste disposal landfill site.

	• Implement a waste separation program, ensuring that workers separate recyclables from non-recyclables at the source. • Educate construction workers and contractors about waste reduction practices, recycling procedures, and the importance of minimizing waste generation. • Ensure the mobile toilets are on level ground to prevent sewage spillage. • Ensure an adequate number of mobile toilets are available to meet the needs overflow. • Encourage the use of biodegradable toilet papers reducing the environmental impact of waste. • Properly dispose of sewage waste by transporting it to a wastewater treatment facility or approved disposal site. • Develop a plan to address potential spills or emergencies, including spill containment, cleanup procedures, and reporting mechanisms. • Skips must be made available on-site into which all construction waste can be discarded. • All construction waste must be cleared from the site on a daily basis and placed in these skips. • The capacity of these skips must be monitored on a daily basis to ensure that a replacement skip can be arranged on the same day as the filled skips are removed. • The disposal of the content of these skips must be done at a municipal landfill site. • No dumping of construction waste on open areas on the property will be allowed. • No burial of construction waste within the project site or in the surrounding areas will be allowed.	• Create a waste reduction policy for your workplace that outlines goals and guidelines for minimizing waste generation. • Ensure the mobile toilets are on level ground to prevent sewage spillage.
Level of Significance with Mitigation (Residual risks)	**Low**	**low**

Table 13: Impact significance on Landscape and Visual Aspects

Theme	Landscape and Visual Aspects	
Phases	Construction	Operation Phase
Nature and Status of Impact.	• Visual intrusion, dust and noise. • Disruption of current land use (grazing and firewood collection) • Heavy construction equipment can be visually prominent and change the appearance of the construction site. • Piles of construction materials stored onsite can be visually intrusive.	• Reflection of sunlight from the solar panels could adversely affect birds • Night lights pollution impact
Extent	Site (1)	Local (2)
Duration	Immediate (1)	Permanent (5)
Intensity	Low (4)	Moderate (6)
Probability	Definite (5)	Low (2)
Confidence		
Level of Significance before mitigation (Inherent risk)	(1+1+4) *5= 30 Low (-)	(2+5+6) *2=56 Low (-)
Mitigation Measures	Construction	Operational Phase
	• Make use of the existing access road • Correct clothing (PPE) should be worn during construction. • Gradual removal of vegetation will reduce visual intrusion. • The construction site must be kept clean, free from litter and there must be proper littering bins within the site. • Use covering or wraps on construction equipment or fencing. • Design construction site lighting to minimize light pollution and glare. • Implement regular site clean-up to remove construction debris and litter, keeping the site and its surroundings visually appealing.	• The lighting of the facility should not exceed, in number of lights and brightness, the minimum required for safety and security. • Low-pressure sodium light sources should be used to reduce light pollution. • Use shielded and directional lighting fixtures to minimize light

		spillage beyond the site boundaries. • Planting the trees at the boundaries site.
Level of Significance with Mitigation (Residual risks)	**Low**	**low**

Table 14: Impact Significant on Noise Pollution

Theme	**Noise Pollution**	
Phases	Construction	Operation Phase
Nature and Status of Impact.	• Noise and vibration from construction machines and vehicles. • Noise from Construction activities	• N/A
Extent	Local (2)	
Duration	Immediate (1)	
Intensity/Magnitude	Moderate (6)	
Probability	Definite (5)	
Confidence		
Level of Significance before mitigation (Inherent risk)	(2+1+6) *5= 45	
	Medium (-)	
Mitigation Measures	Construction	Operational phase
	• All construction vehicles and equipment are to be kept in good repair to reduce operational noise levels. • Put silencer on machinery to minimize noise pollution. • Work within the set time for working to maintain noise (07h00 to 17h00). • A community noise complaint register should be kept onsite. • Respond to complaints regarding noise generation by reducing the impacts.	• N/A
Level of Significance with Mitigation (Residual risks)	**Low**	**N/A**

Table 15:Impact significant on Traffic and Road Network

Theme	**Traffic and Road Network**	
Phases	Construction	Operation Phase
Nature and Status of Impact.	• Change in quality of surface condition of the roads. • Impact on traffic	• N/A
Extent	Local (2)	
Duration	Immediate (1)	
Intensity	Low (4)	
Probability	Definite (5)	
Level of Significance before mitigation (Inherent risk)	(2+1+4) *5= 35	
	Low (-)	
Mitigation Measures	Construction	Operation Phase
	• Vehicles must road worthy, drivers must be qualified, and stick to the road limit speed. • Safety signs must be placed in the construction site. • Limit movement of vehicles during peak periods. • Enforce and display speed limits within the construction site to reduce the risk of collisions between vehicles and pedestrians. • Implement a traffic management plan. • Minimize the use of heavy vehicles to and from the construction site. • Develop a comprehensive transportation plan for construction vehicles that considers the condition and load-bearing capacity of roads. • Traffic safety measures must be put in place during the construction phase, this includes traffic warning signs and flagmen. • Enforce and display speed limits within the construction site to reduce the risk of collisions between vehicles and pedestrians.	• N/A
Level of Significance with Mitigation (Residual risks)	**Low**	**N/A**

Table 16: Impact significant on Heritage Aspects

Theme	Heritage Aspects	
Phases	Construction	Operation Phase
Nature and Status of Impact.	• There is no trace of archaeological or heritage evidence anticipated on site, should any heritage or archaeological resources be exposed during construction the construction will have to stop. • Destruction of archaeological remains • Disturbance of graves • Disturbance of buildings and structures older than 60 years old • Destruction public monuments and plaques	• N/A
Extent	Site specific (1)	
Duration	Short Term (2)	
Intensity	Low (4)	
Probability	Medium (3)	
Level of Significance before mitigation (Inherent risk)	(1+2+4) *3= 21	
	Low (-)	N/A
Mitigation Measures	Construction	Operation Phase
	• Should any heritage or archaeological resources be exposed during construction the construction will have to stop and be report and wait for a specialist to assess the place. • Modify the project design to avoid or minimize impacts on culturally and historically significant areas. • Construction management and workers must be educated about the value of historical buildings and structures.	N/A
Level of Significance with Mitigation (Residual risks)	**Low**	**N/A**

4 MANAGEMENT AND MONITORING PROCEDURE

4.1. ORGANIZATIONAL STRUCTURE AND RESPONSIBILITY

This section indicates the party responsible for implementing the environmental measures and action plans laid out in this EMPr.

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Proponent, Project Manager, Environmental Site Officer, Contractor/Operator and Environmental Control Officer are as detailed below.

- **Project Manager shall:**

The Project manager is the one responsible for ensuring that workers are complying with the environmental management measures and complying with all National Legislation and Standards that relates to management of the environment. The following responsibilities are to be fulfilled by the project manager:

- Be fully conversant with the EMPr for the project;
- Ensure that the Project Manager and the Contractor/Operator are aware of all specifications, legal constraints, standards and procedures pertaining to the project specifically with regard to the environment;
- Maintain the complaints register and queries by public at the site office;
- Ensure that all stipulations within the EMPr are communicated and adhered to by the Project Manager and the Contractor/Operator;
- Monitor the implementation of the EMPr throughout the project by means of regular site visits and meetings;
- Through the recommendation from the Environmental Officer the Project Manager can order the removal of any person(s) and/or equipment in contravention of the specifications of the EMPr;
- Enforce the Environmental specification on site; and
- Monitor the complaints with the EMPr.

❖ **The Contractor shall:**

- Be fully conversant with the EMPr;
- Ensure compliance with the EMPr;
- Ensure that all the environmental specifications contained within this EMPr are adhered to at the site;
- Regularly liaise with the Site Manager on matters relating to the environment; and
- Confine activities to the demarcated construction site;
- Provide information on previous environmental management experiences in terms of a relevant form contained in the contract document; and
- Comply with requirement of the ESO in terms of these specification and the project's specifications.

The above responsibilities listed for the Contractor will also apply to any appointed sub-consultants.

❖ **The Environmental Control Officer (ECO) shall**:

- Be fully conversant with the EMPr;
- Be fully conversant with all environmental legislation and ensure compliance;
- Monitor all site activities monthly, and report findings to the project manager and contractor;
- Ensure that all the environmental specifications contained within this EMPr are adhered to at the site;
- Regularly liaise with the Site Manager on matters relating to the environment; and
- Compile monthly reports as to the progress of the construction phases and report to all parties involved (Site Manager, Project Proponent);
- Conduct a once off training with the contractor on the EMPr and a general environment awareness;
- Come up with corrective action for any environmental non-compliance at the site.

❖ **Environmental Site Officer (ESO) shall:**

- Be fully conversant with the EMPr;
- Be conversant with the EMPr and all relevant environmental legislation applicable to the project, comply with them;
- Monitor site activities with compliance with the occupational health and safety standards and EMPr conditions;
- Collect and compile a comprehensive project health and safety risks assessment (HSRA);
- Assist the contractor with investigations of major incidents;
- Conducting daily inspection;
- Compiling a daily report and a monthly safety, health and environmental audit report
- Identify environmental incidents;
- If the specifications contained in the EMPr are not followed take appropriate actions;
- Maintain an environmental register that keeps record of all environmental incidents which occurred on site during construction.

4.2.ENVIRONMENTAL AWARENESS TRAINING

Training and environmental awareness is an integral part of a complete EMPr. The overall aim of the training is to ensure that all site staff is informed of their relevant requirements and obligations pertaining to the relevant authorizations, licences, permits and the approved EMPr and protection of the environment. Environmental awareness training courses should be run for all personnel on site. Two types of courses should be run, one for the Contractor's and all site staff and labourer's management and one for operational stuff workers. Courses shall be run in the morning during normal working hours at a suitable venue provided by the Project Manager. All attendees shall remain for the duration of the course and sign an attendance register on completion that clearly indicates participant's names, a copy of which shall be handed to the ECO. It is vital that all personnel are adequately trained to perform their designated tasks and duties to an accepted standard.

- The Project Manager shall allow for sufficient sessions to train all personnel. Subsequent sessions shall be run for any new personnel coming onto site. A Method Statement with respect to the organization of these courses shall be submitted.
- Notwithstanding the specific provisions of this clause, it is incumbent upon the Project Manager to convey the sentiments of the EMPr to all personnel and Subcontractors involved with the Works.

The training will be a once off event unless a new member joins, however, the contractor shall make provision for weekly training or Toolbox Talks which can correlate with construction activities undertaken week. The training and environmental awareness must be conducted among the project's workforce to encourage the implementation of environmentally practices throughout the project duration.

4.2.1. TOPICS COVERED BY THE ENVIRONMENTAL AWARENESS PROGRAMME SHOULD INCLUDE:

- What is meant by "Environment"?
- Why does the environment need to be protected and conserved?
- How can construction and operational activities impact on the environment?
- What can be done to mitigate against such impacts?
- Awareness of emergency and spills response provisions.
- What to do in case of emergency?
- In case of spills of hazardous chemical what action you must take?

4.2.2 EMERGENCY PREPARATION AND RESPONSE PLANS

The Pella Solar PV project owner must ensure the safety of his/her stuff workers, ensure that emergency procedures are set up prior to commencement work. The emergency procedures shall include, but not be limited to:

- Fire;
- Spills (ground contamination);
- Loss of utilities;
- Injuries and serious health conditions.
- Natural disaster;

- Use of hazardous substances;
- Physical threat, security, breach, crime.

The emergency procedure shall include responsible personnel and contact details of the emergency services. It shall be available to all relevant personnel and be clearly demarcated at the relevant location around the construction site/Solar Plant site.

The responsibility of the solar plant in responding to emergency situation include:

- The safety of all stuff, management and guest
- Physical and emotional well-being of all stuff, management and guest
- Protection of the Pella Solar PV facility, property, and the belongings of stuff, management and guest.

Table 17: *Emergency contacts details*

Contact	Phone number
SA Police	10111
Fire disaster management	031 361 0000
Ambulance	10177
Animal nuisance	031 311 2814
Building inspectorate	031 311 7883
Water fault & pollution	083 707 3013
Metro police	031 361 0000
Electricity Fault & breakdown	80 131 3111

5. LEGISLATION AND GUIDELINES

All the applicable environmental standards contained within the environmental legislation will be adhered to. Below are applicable legislations and guidelines for the proposed development and have been identified as applicable:

The Constitution of South Africa, 1996 (Act No.108 of 1996).

The Constitution of the Republic of South Africa, 1996[1] provides that, everyone has a right to an environment that is not harmful to their health or well-being. It further provides that, the environment should be protected for future generations through the implementation of the reasonable legislative and other measures that prevent pollution and ecological degradation.

National Environmental Management Act, 1998 (Act No.107 of 1998) as amended.

The National Environmental Management Act, 1998 (Act No.107 of 1998) (NEMA) is a 'principles-based Act' and is an overarching statute regulating various aspects of natural resources use, integrated environmental management and pollution control. The Act provides for the right to an environment that is not harmful to the health and wellbeing of the South African people; sustainable development, environmental protection, equitable distribution of natural resources; and the formulation of environmental management frameworks. Its definition of the environment includes the land and water of the earth, microorganisms, plant and animal life or a combination of those things, and the inter relationships among them. The Act aims to provide for cooperative environmental governance by establishing principles for decision making on matters affecting the environment, institutions that will promote co-operative governance, and procedures for coordinating environmental functions exercised by organs of state. Section 24 Provides for the prohibition, restriction and control of activities which are likely to have a detrimental effect on the environment.

[1] The constitution of the Republic of South Africa, 1996 (Act 108 of 1996).
Section 24

GNR No. 4558 27 March 2024

The Norms and Standards for the exclusion of the development and expansion of solar photovoltaic facilities in area of low or medium environmental sensitivity, in terms of section 24(10) of the National Management Environmental Act, 1998 (Act No.107 of 1998) and exclude, in terms of section 24(2)(d) of the National Environmental Management Act, 1998 (Act No.107 of 1998) activities identifies in terms of section24(2)(a) and (b) of the National Environmental Management Act, 1998 (Act No.107 of 1998) for the expansion of solar photovoltaic facilities, including any associated activity or infrastructure, from the requirement to obtain an environmental authorization, based on compliance with the norm.

Environmental Impact Assessment Regulation, 2014 as Amended

The Environmental Impact Assessment (EIA) Regulations promulgated under NEMA in 2014 provide a list of activities which are subject to an Environmental Authorisation (EA) process prior to construction or implementation. In accordance with the 2014 EIA Regulations, (as amended) an EIA process is required if any of the listed activities are triggered during the course of the project. According to the NEMA Regulations these activities may not commence without environmental authorization from the competent authority which requires the investigation, assessment and statement of potential impact of activities and must follow the procedure as described in the EIA Regulations.

National Water Act, 1998 (Act No.36 of 1998).

In terms of chapter 3 section 12-20, water resources are to be protected, used, developed, conserved, managed and controlled. This Act recognizes that water is a scarce resource; it is a natural resource that belongs to all of South Africa's people. The National Department of Water and Sanitation is responsible for the nation's water resource and also the Minister of Department of Water and Sanitation ensures that the water resource is "protected, used, developed, conserved, managed and controlled" through the implementation of this Act (National Water Act 36 of 1998).

This Act makes provisions for the protection of surface water and groundwater resources and their sustainable management for the prevention and remediation of the effects of pollution, and for the

control of emergency occurrences. Section 21 of the National Water Act (NWA) lists water uses for which a Water Use License will be required.

National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004)

The main objective of the Air Quality Act (NEMAQA) is the protection of the environment and human health in a sustainable (economic, social and ecological) development framework, through reasonable measures of air pollution control.

Occupational Health and Safety Act, 1993 (Act No.85 of 1993).

The Occupational Health and Safety Act make provisions in regulations Section 8 for the general duties of employers to their employees. The act provides for the health and safety of people at work utilising machinery and the protection of others against health and safety risks associated with activities on site/work. General Administrative Regulations (2003) describe the administration of the various OHS Regulations, including the designation of health and safety committees, the reporting and recording of incidents and occupational diseases. This Act is applicable to all contractors during the planning, construction and operational phases of the project.

To provide for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work.

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

The main focus of this act is upon agricultural resources, but it has an indirect implication for rivers and provides for the protection of agricultural land while regulations provide for the implementation of control measures for alien and invasive plant species. It is one of the primary statutes through which agricultural activities which negatively affect rivers may be regulated. Of particular importance are the promulgated regulations. The Act regulates rehabilitation of rivers insofar as that activity falls under the definition of conservation which, in relation to the natural agricultural resources, includes the protection, recovery and reclamation of those resources. The

Minister of Agriculture may prescribe control measures with which all land users must comply. Relevant to rivers are:

- The irrigation of land;
- The prevention or control of water logging or salination of land;
- The utilization and protection of vleis, marshes, water sponges, water courses and water sources;
- The regulation of the flow pattern of runoff water;
- The utilization and protection of vegetation;
- The control of weeds and invader plants;
- The protection of water sources against pollution on account of farming practices, and
- Any other matter, which the Minister may deem necessary or expedient in order to achieve the object of the Act.

Hazardous Substance Act (No15 of 1973).

Provides for the definition, classification, use, operation, modification, disposal or dumping of hazardous substances.

National Environmental Management: Waste Act, 2008 (Act No.59 of 2008).

During construction waste will be produced, in either liquid, solid and/or hazardous state, and this waste will be required to be adequately and appropriately disposed of. There are several Regulations or Acts that are applicable to the proposed development in terms of waste management. To reform the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development; to provide for institutional arrangements and planning matters; to provide for national norms and standards for regulating the management of waste by all spheres of government; to provide for specific waste management measures; to provide for the licensing and control of waste management activities; to provide for the remediation of contaminated land; to provide for the national waste information system; to provide for compliance and enforcement; and to provide for matters connected therewith.

National Heritage Resource Act (No 25 of 1999) and Regulations

No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or paleontological site. No person may, without a permit issued by the South African Heritage Resource Agency (SAHRA) or a provincial heritage resources authority destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority. Grave is widely defined in the Act to include the contents, headstone or other marker of such a place, and any other structure on or associated with such place.

This EMPr process also takes consideration the following legislation:

- **South African National Standard SANS 10103:2008 (The Measurement and Rating of Environmental Noise with Respect to Annoyance and Speech Communication).**
- **National Noise Control Regulations (1998).**
- **Moses Kotane Local Municipality Solid Waste Bylaw, 2019.**
- **Moses Kotane Local Municipality Environmental Bylaw, 2016.**
- **Moses Kotane Local Municipality Spatial Planning and Land Use Management Bylaw, 2016.**
- **Moses Kotane Local Municipality Water and Sanitation Bylaw, 2008.**

6. CONSTRUCTION ACTIVITIES

The “front-end” work of surveying, environmental flagging of preservation sites, access planning, and construction activities can result in localized environmental impacts. The following environmental management measures have been identified to avoid potential environmental concerns.

- Surveyors should make an effort to locate and mark all the activities that will be undertaken during construction.
- Work specifications will clearly define equipment limitation and procedures for working in the vicinity of these facilities.
- Typically, construction activities might include limited earthmoving, should earthmoving be required, appropriate erosion and sediment control measures will be developed and implemented.
- The contractor should follow **Engineering Council of South Africa (ECSA)** standards of putting up a standard board reflecting all the parties involved on the project and the details of the Emergency number.

7. PRE-CONSTRUCTION PHASE

This section of the EMPr outlines the environmental management principles, actions and responsibilities to be implemented prior to the commencement of construction activities. This phase is important to ensure that all necessary environmental, legal, and safety measures are in place to prevent potential environmental degradation during the construction phase. This phase also ensures proper site planning, environmental awareness, and compliance with all relevant legislation.

POTENTIAL ENVIRONMENTAL IMPACT (NATURE OF THE IMPACT)	**RECOMMENDED MITIGATION MEASURES**		
	MANAGEMENT AND MITIGATION MEASURES	**TIMEFRAMES**	**RESPONSIBILITIES**
CONSTRUCTION SITE ESTABLISHMENT			
Permits and regulatory compliance	❖ Prior to commencing any construction activities, it is imperative to fulfil all legal requirements pertaining to Environmental Authorisation, Water-Use Licenses, tree permit and any other relevant permits. ❖ Ensure comprehensive consultation of all pertinent legislation and policies and ensure strict compliance with these regulations. ❖ Integrate best practice guidelines into the planning process for both the construction and operation phases of the proposed project.	❖ Prior commencement of construction	❖ Contractor ❖ ECO
Lack of environmental awareness among workers	❖ Conduct site-specific induction and environmental awareness training for all workers.	❖ Prior commencement of construction	❖ Contractor ❖ ECO

Site clearance	❖ No areas falling outside of the approved footprint may be cleared for construction purposes. ❖ Adhere to SANS standards (SANS 2001-BS1:2008) or Eskom Bush Clearing procedure for site clearance.	❖ Prior to the commencement of construction.	❖ Contractor
Site Office	❖ The site layout must be made available to facilitate ready access for deliveries, facilitate works and to curtail any disturbance or security implications for the daily functions of the Pella Solar PV project and that of the public using the area. ❖ The site office must include designated areas for prefabricated offices, ablution facilities, equipment, and stockpiles. ❖ Down-lighting will be used at night and the Contractor shall ensure that lighting on site does not interfere with road traffic or cause a reasonably avoidable disturbance to the surrounding community or other users of the area. ❖ No accommodation facilities will be provided for on site. Those who are not local staff will be accommodated in suitable and established accommodation facilities in close proximity to the proposed PV Plant. ❖ The site office must include designated areas for prefabricated offices, ablution facilities, equipment, and stockpiles.	❖ Prior before commencement of construction.	❖ Contractor

	❖ Down-lighting will be used at night and the Contractor shall ensure that lighting onsite does not interfere with road traffic or cause a reasonably avoidable disturbance to the surrounding community or other users of the area. ❖ The development footprint must be fenced and access control measures implemented. ❖ The "no-go" areas must be demarcated to prevent workers from entering areas outside the construction domain. ❖ No washing of vehicles and equipment must be done on site unless a designated wash bay is on site. ❖ No servicing of vehicles must be done onsite, in the event of a breakdown or for emergency repairs suitable liner materials to protect the ground must be utilised, and the use of spill prevention measures must be adopted.		
Eating area	❖ The Contractor must ensure that a designated eating area within the construction site area is provided. ❖ The eating area must provide protection from the elements (rain, wind, sun). ❖ The eating areas should also be located away from construction noise, dust, waste storage areas, hazardous materials stores, fuel storage and dispensing areas and any other	❖ Prior before commencement of construction	❖ Contractor

	activity that may contaminate food or impair comfort. ❖ The eating areas shall provide adequate seating to accommodate the staff. ❖ An adequate number of rubbish bins shall be provided to contain the waste generated and emptied daily or as when required. ❖ The eating areas shall make provision for a smoking area, including seating and a fireproof sand filled container for extinguishing cigarettes. Smoking shall otherwise be prohibited across the site and in the work areas. ❖ The eating area must be kept clean and tidy.		
FENCING AND GATES INTALLATIONS			
Fencing, gates and Barricades.	❖ The site area/construction area must be fenced to prevent trespassing ❖ In places where temporary fencing is required, the Contractor shall erect such fencing when and where required and re-erect and maintain temporary fencing as necessary. ❖ Temporary fencing shall remain in position either until it is replaced by permanent fencing or until completion of the works. ❖ Any fences damaged by the Contractor shall be repaired as soon as possible at his/her cost and shall be of the standard of the original fence.	Prior to the commencement of construction.	❖ Contractor to implement management actions. ❖ Project manager.

	❖ All fences erected for construction purposes (e.g., fences around campsites, fencing around working area, etc.) should be inspected on a daily basis to detect whether any damage has occurred. ❖ Damaged fences/barricading shall be repaired immediately.		

8. CONSTRUCTION PHASE

This section of the EMPR provides management principles and mitigation measures for the construction phase of the project. Environmental actions, procedures and responsibilities as required during the construction phase are specified. These specifications will form part of the contract documentation and therefore the Contractor will be required to comply with these specifications to the satisfactory of the Project Manager and Environmental Control Officer. Please refer to Table 18 for the proposed mitigation measures.

Table 18: *Impact and Mitigation Measures in Construction Phase*

POTENTIAL ENVIRONMENTAL IMPACT (NATURE OF THE IMPACT)	RECOMMENDED MITIGATION MEASURES		
	MANAGEMENT AND MITIGATION MEASURES	**TIMEFRAMES**	**RESPONSIBILITIES**
ABLUTION FACILITIES			
Ablution Facilities	❖ Provide sufficient ablution facilities (e.g. mobile/portable/VIP toilets) at the construction camp/construction sites, which conform to all relevant health and safety standards and codes. ❖ A sufficient number of toilets shall be provided to accommodate the number of personnel working in any given area. ❖ Toilets may not be further than 100m from any working area. ❖ Toilet facilities supplied by the Contractor for the workers shall occur at a maximum ratio of 1 toilet per 10 workers. ❖ All staff to use the provided toilets at all times. All temporary/portable/mobile toilets shall be secured to the ground to prevent them from toppling over due to wind or any other cause.	❖ Continuously	❖ Contractor to implement management action. ❖ Project manager and ❖ ECO to check.

	❖ All sanitary fees that may be payable to any local authority shall be paid by the Contractor. ❖ Ablutions are to be cleaned/emptied on a regular basis, before they are full and contaminate the environment. ❖ The entrances to the toilets shall be adequately screened from public view. ❖ Sanitary hygiene bins shall be provided for female staff. ❖ Toilet paper shall be provided. ❖ The Contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied and that a licensed service provider removes the contents from site. ❖ Disposal of such waste is only acceptable at a licensed waste disposal facility and proof of such disposal should be kept on site. ❖ The mobile toilets should be placed at least 100m away from the stream, wetland or river.		
STORM AND WASTEWATER MANAGEMENT			
Decrease in groundwater and stormwater quality as a result of construction phase sedimentation and contamination.	❖ Storm water drainage lines must be constructed by the Contractor to divert runoff water around the construction site to prevent contamination of the water and ponding.	On-going	❖ Project manager ❖ ECO ❖ Contractor

	❖ All storm water drainage lines shall contain water flow arrestors to prevent erosive action on the sides of the drainage lines. ❖ The following measures must be implemented, both as erosion prevention and storm water control measures: ❖ Straw barriers (replaced when needed) should be installed in drainage paths to reduce velocity, and as a sediment trap during construction. Suspended solids carried by overland flow would be intercepted. These erosion barriers must be placed at intervals of 25-50 m apart in the drainage paths which would intercept suspended solids from entering the natural drainage paths. ❖ Rip-rap should be placed as liners for channel spines. These comprise packed stones with an average diameter of 100 mm, packed in the channels as lining material to control flow velocities and hence erosion. ❖ Earth cut-off channels at boundaries of the facility. These would assist in directing flow away from the site and reduce the possibility of flooding from runoff origination from outside the site. ❖ Provide erosion protection at channel outfalls and positions of high flow concentration. These comprise packed stones with an		

	average diameter of 200 mm, packed in the drainage path to control flow velocities and hence erosion. ❖ The sediment and erosion control measures should remain in place until construction is complete. The above noted sediment traps would require regular monitoring during construction and reinstatement as necessary. ❖ Road drainage to deflect storm water off the road surface will be required. This can be achieved effectively by constructing drainage deflection humps diagonally across the road surface. ❖ The drainage hump will reduce velocity. The following should be considered: ❖ Build the humps no more than 50m apart; ❖ Drainage humps must be constructed with a solid core of either stones or coarse gravel covered with road surface material to form a gradual slope on both sides, and should extend well beyond the edge of the roadway on each side to prevent water from simply flowing around the hump and back into the road; ❖ To prevent soil erosion the outflow area must be lined with tightly packed stones,		

	❖ To create a cobblestone effect. This acts as a silt trap and the water flow force is broken up and spread, preventing erosion. ❖ Any wastewater and/or storm water that is discharged during the construction phase will have to comply with the requirements of the National Water Act, specifically with the conditions set by the General Standard (Regulation 9225, Government Gazette, 18 May 1984) unless a licence is issued that sets specific standards for selected variables. ❖ Any erosion channels which develop during the construction period must be suitably backfilled, compacted and restored to a proper condition.		
NOISE MANAGEMENT			
Construction activities resulting in noise disturbance in the surrounding area.	❖ Put silencer on machinery to minimize noise pollution. ❖ Vehicle drivers should avoid driving in reverse to avoid siren sounding. ❖ No loud music should be allowed on site. ❖ Vehicles should abide by the speed restriction. ❖ There should be regular inspection and maintenance to reduce level of noise. ❖ Construction working hours and other noise generating activities should be restricted to	❖ On-going	❖ Contractor ❖ Project manager ❖ ECO

	between 07h00 and 18h00 on Mondays to Fridays, unless otherwise approved by the appropriate competent person in consultation with adjacent landowners/affected persons and ECO.		
HERITAGE RESOURCES			
Impact on unidentified Heritage artefacts.	❖ There are no structures which are more than 60 years old. But if unknown heritage artifacts are found, including graves, during excavations, the area should be marked and all activities in that vicinity will cease with immediate effect. SAHRA will be notified of the findings and operations at that specific site will only continue after the relevant organization has granted permission to do so.	On-going	❖ Contractor ❖ ECO
PROTECTION OF FAUNA AND FLORA			
Construction activities could result in the disturbance of unseen ground species during site clearance construction activities	❖ No trapping or hunting of fauna should be allowed on site during any phase of the proposed development. ❖ All activities must be contained within the PV Plant footprint to minimize disturbance outside these areas. ❖ A pollution control system/spill handling procedure must be implemented to limit impact of such occurrences and prevent discharge to the receiving environment.	On-going	❖ Contractor ❖ ECO

	❖ Edge effects of all construction activities, such as erosion and alien plant species. ❖ proliferation which may affect floral habitat, need to be strictly managed.		
AIR QUALITY			
Air pollution from vehicle emissions as well as dust from vehicle movements and stockpiles may have a negative impact on air quality	❖ Vehicles travelling to and from the construction site must adhere to the speed limits so as to avoid producing excessive dust and knocking off people animals (pets) and pedestrians, especially within the residential areas. ❖ A speed limit of 30 km/h must be adhered to on the construction site. ❖ High winds may pick up dust from the stockpiles. Screening of stockpiles may be required by utilising wooden supports and shade cloth. ❖ Fires by construction or project personnel are strictly prohibited. ❖ Vehicles and machinery are to be kept in good working order and meet the manufacturer's specifications. Should excessive emissions be observed, the contractor is to have the equipment checked/ maintained within 24 hours.	On-going	❖ Contractor ❖ ECO

	❖ Dust suppression should be undertaken daily during construction.		
ACCESS ROAD			
Impact on traffic	❖ The Contractor must comply with all driving, vehicle, licensing and driver ability requirements. ❖ Permission is required from the Project Manager for the movement of any vehicles and/or personnel outside of designated working areas. ❖ Water suppression for unpaved areas to the site should be applied during dry windy periods, using a water cart and/or fixed sprinklers. ❖ The Principal Contractor shall organize the site in such a manner that pedestrians and vehicles can move safely and without risks to health, including sufficient and suitable traffic routes and safe walkways with relevant signage. ❖ Traffic safety measures (e.g. traffic warning signs, flagmen) to be implemented. ❖ The Contractor should develop a temporary Traffic Management Plan.	❖ During Construction	❖ Project Applicant – employment target ❖ Project Manager to check ❖ Contractor to implement management actions
SOLID WASTE MANAGEMENT			

Pollution of the area with general waste (litter, construction material etc.) and hazardous waste (Oils, hydrocarbon etc.) produced during the construction phase may have negative impacts on the surrounding environment.	❖ All waste produced during the construction should be removed and disposed of at a registered Landfill Site (or an alternative appropriate landfill site) nearest to the work area. ❖ The waste must be stockpiled in a designated area within the site camp and transported to the Landfill Site on a regular basis. ❖ All construction materials should be stored in designated areas. ❖ No dumping of construction waste of excess construction materials will be allowed in the open spaces surrounding the construction sites. ❖ No waste is to be buried or burned on site. ❖ Chemical toilets are to be maintained in a clean state and serviced on a regular basis. ❖ The contractor is to ensure that the surrounding open spaces are not being used as an ablution facility. ❖ Appropriate disposal facilities, such as litter bins, must be provided within the construction camp and work areas. ❖ Bins and/or skips must be emptied regularly, and waste must be disposed of at a registered landfill site and proof of disposal kept on site.	❖ Weekly during ❖ construction	❖ Contractor ❖ Project Manager. ❖ ECO

HAZARDOUS SUBSTANCES			
Pollution of the environment due to the use of hazardous chemicals/ substances on site.	❖ The hazardous substances on site shall be listed on a register or hazardous substances inventory. ❖ An inventory provides employees with a source of information to assist in the management of hazardous substances in the workplace. ❖ This register should be kept as a live document for necessary updates as the project progresses. ❖ The inventory should be readily accessible to any employees who may be exposed to hazardous substances on site. ❖ Ensure employees know where to find it. It may be kept in a central location or provide a copy to each work area. ❖ Containers must remain labelled until the contents have been removed and the container has been completely cleaned (free of the substance) or the contents have been neutralized, cured or chemically deactivated. ❖ Labels for hazardous substances must not be removed from the container, defaced or altered. ❖ If a label on a container is illegible or incorrect, remove the container from use until it is appropriately labelled.	❖ On-going	❖ Contractor ❖ ECO

	❖ Ensure that mitigation measures determined during the risk assessment are fully implemented. ❖ Vehicles and/or trailers of goods in transport should be marked with a four-digit United Nations (UN) number. This number can be referenced by first responders (Fire fighters, Police Officers, and ambulance personnel) ❖ Emergency procedures on how to deal with accidental spillage should be available and known to the driver. ❖ Hazardous substances should only be stored in designated areas where potential spillages could be contained to prevent pollution of the environment e.g. use of permanent bunding and/or drip trays with sufficient capacity. ❖ The design and construction of hazardous substances storage facilities should be approved by engineer and should comply with SANS standards for hazardous substances. ❖ The site around the hazardous substance storage facilities should be kept free from obstruction and combustible rubbish. ❖ All hazardous substance storage facilities should be equipped with spill kits.		

	❖ Hazardous substance storage facilities need to be visually inspected on a regular basis for structural integrity. ❖ No smoking shall be allowed within the vicinity of the hazardous substance storage area. ❖ Ensure that there is adequate fire-fighting equipment at the hazardous substance stores. ❖ The appropriate symbolic signs should be displayed at the various hazardous substances' storage facilities in accordance with the requirements of SANS 1186-1. ❖ The facility should always be locked, and the key should be easily available, especially for emergency conditions. ❖ The hazardous substances storage facility should be secured i.e. either fenced or have walls and lockable entrance. The facility should have adequate containment for all the different liquids. ❖ A Spill Response plan should be developed for the management of Hazardous Chemicals/ Substances on site.		
SOCIAL ECONOMIC BENEFITS AND IMPACTS			
Job creation	❖ Create opportunities for the employment of women.	❖ On-going	❖ Project Applicant – employment target

	❖ Use local labour as far as possible, where necessary (e.g. unskilled labour). ❖ Training of labour to benefit individuals beyond completion of the project. ❖ Local people should be employed to increase support for the project and reduce the potential for criminal activities.		❖ Project Manager to check ❖ Contractor to implement management actions
EXISTING SERVICES AND INFRASTRUCTURE			
Existing Services and Infrastructure.	❖ Identify and record all existing services and infrastructure. ❖ Negotiations and agreements with owners and landowners regarding existing services and infrastructure to be undertaken prior to construction and adhered to throughout the project lifecycle. ❖ Conform to requirements of relevant service providers. Agreements to be in place. ❖ Ensure access to infrastructure is available to service providers and owners at all times. ❖ Immediately notify service providers of disturbance to services. Rectify disturbance to services, in consultation with service providers. Maintain a record of all disturbances and remedial actions on site. ❖ Notify landowners of any disruptions to essential services and infrastructure. ❖ Deviate/relocate landowners' existing services and infrastructure (e.g. reticulation,	❖ Continuously	❖ Proponent – acquire permits. ❖ Project Manager and ECO - to check. ❖ Contractor to implement management actions.

	irrigation lines, pump houses), where possible and if necessary, to accommodate project activities. ❖ Land compensation (if necessary) to adhere to legal framework. ❖ Adequate reinstatement and rehabilitation of environment affected as a result of the project.		
BATCHING PLANTS			
Ground water and soil contamination	❖ Mixing / decanting of all chemicals and hazardous materials takes place on a drip tray or impermeable surface. ❖ Ensure all hazardous storage tanks/drums/stores are designed and managed in order to prevent pollution of rains, groundwater and soil. ❖ No batching/mixing of cement shall occur directly on unprotected ground. ❖ Empty cement bags shall be stored for safe disposal of site in weatherproof containers to prevent windblown cement dust or be affected by rain or runoff events. ❖ The Contractor shall take all reasonable measures to prevent the spillage of cement/ concrete during batching and construction operations. During pouring, the soil surface shall be protected using plastic and all visible remains of concrete shall be physically	❖ During construction	❖ Contractor

	removed on completion of the cement/ concrete pour and appropriately disposed of. All spoiled and excess aggregate/ cement/ concrete shall be removed and disposed of via the solid waste management system. ❖ Where "readymix" concrete is used, the Contractor shall ensure that the delivery vehicles do not wash their chutes directly onto the ground. ❖ Any spillage resulting from the "readymix" delivery shall be immediately cleared and disposed of via the solid waste management system. Readymix trucks shall not be permitted to dump drum wash on site unless into designated contaminated water pond which is properly lined with impermeable materials, and which must be fully rehabilitated at completion.		
WATER SUPPLY MANAGEMNT			
Water abstraction, storage and conservation	❖ Any abstraction and storage of water for construction purposes must be approved by DWS. ❖ No illegal connection of pipelines is permitted. ❖ The Contractor will take all practical measures to minimise water use on site and	❖ On-going	❖ Contractor

	will immediately attend to any wastage. This will include but not limited to: ➢ Monitoring of pressure pipes for leaks. ➢ Closing taps when not in use. ➢ The quantity of water used for construction purposes must be monitored. ❖ Water derived from or generated through construction related activities that becomes contaminated must be treated to ensure compliance with National Water Act, specifically with the conditions set by the General Standard (Regulation 9225, Government Gazette, 18 May 1984) before being released back into the environment. ❖ The Contractor shall re-use or recycle as much of this water as possible.		
VISUAL IMPACTS			
Visual intrusion on existing views of sensitive visual receptors	❖ Measures to reduce visual intrusion must be implemented during construction. These may include but are not limited to: Screening off site during construction with the use of shade cloth. ❖ Put measures in place to ensure that construction boundaries are demarcated, the areas of surface disturbance are minimised,	❖ On-going	❖ Contractor ❖ ECO

	the construction site is neat, tidy and contained. ❖ Demarcate and strictly control parking areas so that vehicles are limited to specific areas only. ❖ Night lighting of the construction sites should be minimised within requirements of safety and efficiency.		
Night lighting impacts	❖ Timer switches or motion detectors (within safety requirements) should be used to control lighting in areas that are not occupied continuously. ❖ The lighting plan should include a process of promptly addressing and mitigating complaints about potential lighting impacts. ❖ Lighting of the facility should not exceed, in number of lights and brightness, the minimum required for safety and security. ❖ Low-pressure sodium light sources should be used to reduce light pollution. ❖ Light fixtures should not spill light beyond the project boundary. ❖ A lighting plan that documents the design, layout and technology used for lighting purposes should be prepared, indicating how nightscape impacts will be minimised.	❖ Once-off	❖ Contractor

LANDSCAPING AND REHABILITATION			
Landscaping and rehabilitation	❖ Contractor shall prepare a Rehabilitation Plan and Method Statement that must include, among other things, the following requirements: ➢ Control invasive plant species and weeds by means of uprooting, cutting or approved methods. ➢ Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers (or other approved method). If necessary, these areas should be fenced off to prevent vehicular, pedestrian and livestock access. ➢ Re-vegetation must match the vegetation type, which previously existed. ➢ Clear the site of all inert waste and rubble, including surplus rock and foundations. After the material has been removed, the site shall be re-instated and rehabilitated. ➢ Topsoil shall be spread evenly over the surface. The final prepared surface shall not be smooth but furrowed to follow the natural contours of the land. ➢ Work areas will be rehabilitated as soon as possible after completion of construction activities in an area, to minimise the potential	❖ During construction	❖ Contractor

	for erosion and maximise the established time after re-vegetation. ➢ Repair any damage to re-vegetated areas to maintain coverage		
FIRE PREVENTION			
Fire	❖ A designated smoking area within the camp site area must be provided, a fireproof sand filled container for extinguishing cigarettes. Smoking shall otherwise be prohibited across the site and in the works areas. ❖ Employees must be aware of the procedure to be followed in the event of a fire. ❖ Fire drills must be conducted every six months or as otherwise required by the OHSA. ❖ Adequate fire protection measures and firefighting equipment must be available at each work area and the camp site area to deal with the type and nature of fire that may arise. ❖ The Contractor shall prepare a Fire Prevention and Fire Emergency Method Statement. The Method Statement should include, but not limited to the following: ➢ Fire Fighting training for designated site staff. ➢ Sources of fire risk	❖ On-going	❖ Project Manager ❖ Contractor

	➢ Measures to comply with any requirements of local authority fire departments. ❖ Construct firebreaks around the site area before any other construction begins.		
STOCKPILING AND STOCKPILING AREAS			
Stockpiling and stockpiling area	❖ Prior to site establishment and any earthmoving operations, the Contractor will strip and stockpile all topsoil within the footprint of the construction activities. ❖ The following shall apply for the stripping, stockpiling and storage of topsoil: ❖ Soil shall be stripped in a phased manner, so as to retain vegetation cover for as long as possible to avoid prolonged exposure of soils to wind and water erosion. ❖ All topsoil shall be stockpiled separately from spoil material. ❖ No imported topsoil will be used as the final backfill layer. ❖ Topsoil stockpiles shall be convex and shall not exceed 2 metres in height. ❖ All stockpiles will be positioned and sloped to create the least visual impact. ❖ All stockpiles will not be allowed underneath trees or against the trunks of trees.	❖ During construction	❖ Contractor

	❖ All stockpiles will be constructed and maintained to avoid erosion of the material and contamination of the surrounding environment (including berms and hessian sheets to prevent erosion and sedimentation). ❖ The heights of stockpiles should be minimised as far as possible to reduce wind. ❖ Entrainment and stockpiles should be located as far away as possible from sensitive receptors. ❖ Weed control must be administered on all stockpiles. ❖ If the stockpiles start to erode significantly or cause dust problems, they shall be covered with hessian this is to be determined by the ECO. ❖ Vehicles transporting spoil material must be covered before leaving site.		
EXCAVATION OF FOUNDATIONS, CABLE TRENCHES, AND DRAINAGE SYSTEMS			
Excavation of foundations, cable trenches and drainages systems	❖ digging, use utility detection tools such as ground-penetrating radar or electromagnetic locators to identify the location of underground utilities such as gas lines, water pipes, and electrical cables ❖ Protect the edges of the excavated trenches, foundation pits by hard metal, wooden barrier or with suitable fencing, displaying	❖ During construction	❖ Contractor

	appropriate warning signs, warning tape and reflective tape. ❖ Check the excavations before and after rain. ❖ Keep the excavated earth away from the trenches. ❖ Backfill all minor and major excavated trenches which are required for site execution. ❖ If water is accumulated in the dug trench, dewater the trench by the certified pump which is been run by the electrician taking all necessary precautions. ❖ Barricade the trenches required for execution immediately.		
INSTALLATION OF FOUNDATIONS, CABLE TRENCHES, AND DRAINAGES SYSTEMS			
Installation of foundations, cable trenches, and drainages systems	❖ Properly compact the soil beneath the foundation to achieve the required density and stability. ❖ Ensure proper grading and drainage around the foundation to prevent water accumulation and soil erosion. ❖ Engage qualified engineers or geotechnical experts to ensure that the foundation design meets safety standards and local building codes. ❖ Install cable trenches according to industry standards and specifications.	❖ During construction	❖ Contractor

	❖ Ensure proper depth and width of trenches to accommodate the cables and provide adequate protection. ❖ Use suitable backfill materials and compaction methods to prevent settling or damage to the cables. ❖ Design drainage systems to effectively manage surface water and prevent flooding or soil erosion. ❖ Use appropriate materials for drainage pipes and structures and ensure proper installation to prevent leaks or blockages. ❖ Implement measures to protect water quality, such as installing sediment traps or using environmentally friendly construction materials.		
HEALTH			
Spreading of diseases	❖ There should be an emergency plan to deal with an outbreak of diseases e.g. Covid 19. ❖ Train the staff regularly on the containments of disease outbreak and how to prevent further spread. ❖ Water must be inspected on regular basis by taking water samples to test and monitor the quality of water. ❖ Provide comprehensive training to staff on proper hygiene and sanitation. ❖ Provision of condoms in the site	❖ On-going	❖ Contractor ❖ ECO

SAFETY OF THE PUBLIC			
Traffic Management	❖ Develop a traffic management plan to minimize disruptions and ensure the safe flow of vehicles around the construction site. ❖ Use signage, flaggers, and traffic cones to direct traffic and pedestrians safely.	❖ During construction	❖ Contractor ❖ ECO ❖ Project manager
Pedestrian Safety	❖ Provide designated walkways and crossings for pedestrians, separate from construction areas and vehicle traffic. ❖ Use barricades or barriers to keep pedestrians away from hazardous construction zones.	❖ During construction	❖ Contractor
Community Engagement	❖ Engage with local stakeholders, including residents, businesses, and community organizations, to address concerns and gather feedback. ❖ Consider community preferences and concerns when planning construction activities and mitigation measures. ❖ Ensure compliance with local building codes, environmental regulations, and permitting requirements. ❖ Obtain necessary permits and approvals from regulatory agencies before commencing construction. ❖ Communicate with the local community about the construction schedule, potential impacts, and safety measures.	❖ Prior before commencement of construction	❖ Contractor ❖ Project manager

	❖ Establish channels for residents to report concerns or emergencies related to the construction site.		
Management of Labour Force.	❖ Prevent trespassing of construction workers onto private property. ❖ Construction workers must be provided with identity cards and must wear identifiable clothing and remain within the working servitude for the project. ❖ Make suitable provision for transport and/or accommodation for the workforce. ❖ Creating nuisances and disturbances in or near communities shall be prohibited. ❖ Machine/vehicle operators shall receive clear instructions to remain within demarcated access routes and construction areas. ❖ Designated and demarcated smoking areas should be provided, with special bins for discarding of cigarette butts.	❖ On-going	❖ Contractor
WORKSHOP, EQUIPMEINT MAINTENANCE AND STORAGE			
Workshop, equipment maintenance and storage	❖ Locate the workshop in an area that minimizes disturbance to nearby residents and sensitive environmental areas. ❖ Design the workshop with proper ventilation and lighting to create a safe and comfortable working environment.	❖ On-going	❖ Contractor

	❖ Ensure adequate space for equipment maintenance, storage of tools, spare parts, and materials. ❖ Implement spill containment measures such as drip pans, absorbent materials, and spill kits to prevent contamination of soil and water in case of leaks or spills. ❖ Store hazardous materials such as lubricants, solvents, and chemicals in secure and properly labeled containers to prevent accidental spills. ❖ Regularly inspect storage areas for leaks or signs of contamination and address any issues promptly. ❖ Install soundproofing materials and acoustic barriers to minimize noise emissions from workshop operations. ❖ Schedule noisy maintenance activities during times when nearby residents are least likely to be disturbed. ❖ Use vibration isolation pads or mounts for heavy equipment to reduce vibrations transmitted to nearby structures. ❖ Develop and enforce strict safety protocols for equipment maintenance activities, including lockout/tagout procedures, confined space entry protocols, and use of personal protective equipment (PPE).		

	❖ Conduct regular safety training sessions for workshop personnel to ensure awareness of hazards and proper safety procedures. ❖ Maintain emergency response equipment such as fire extinguishers, first aid kits, and eye wash stations, and ensure all personnel are trained in their use. ❖ Establish a preventive maintenance program for workshop equipment to minimize breakdowns and ensure reliable operation. ❖ Conduct regular inspections of tools, machinery, and storage facilities to identify and address any maintenance issues promptly. ❖ Keep maintenance records and logbooks to track equipment usage, repairs, and servicing.		
FINALISING SOLAR PV PANELS AREAS			
Finalising solar PV panels areas	❖ Plan construction access routes to minimize disruption to surrounding areas and reduce the risk of soil compaction, erosion, or habitat fragmentation. Use existing roads or pathways whenever possible to minimize new disturbances. ❖ Clear the construction site responsibly, minimizing habitat destruction and soil disturbance. Implement erosion control measures such as silt fences, straw bales, or	❖ Once-off	❖ Contractor

	sediment basins to prevent soil erosion and sedimentation of nearby water bodies. ❖ Ensure compliance with local building codes, zoning regulations, and permitting requirements for solar installations. This may include setbacks, fire safety regulations, and other considerations specific to your location. ❖ Plan the layout of the electrical components, including inverters, wiring, and conduit paths, to minimize energy losses and ensure efficient energy production. ❖ Calculate the spacing between solar panels to avoid shading and optimize the use of available space. Factors such as panel tilt, shading, and maintenance access should be considered when determining panel spacing. ❖ Determine the optimal orientation and tilt angle for the solar panels based on the site's latitude and the desired energy output. Panels should typically face south to maximize sun exposure. ❖ Analyze the solar resource potential of the site, including factors such as solar irradiance, shading from nearby buildings or trees, and the tilt and orientation of the panels.		

9. OPERATIONAL PHASE

Although the project owner and contractor have no absolute control over the operational phase of this project, this section of the EMPr briefly provides management principles for the operational phase of the project. Environmental actions, procedures and responsibilities as required during the operational phase are specified. **Table 19** provides the management measures to be implemented during the Operational phase of the project.

Table 19: *Impact and Mitigation Measures in Operational Phase*

POTENTIAL ENVIRONMENTAL IMPACT (NATURE OF THE IMPACT)	**RECOMMENDED MITIGATION MEASURES**		
	Management and Mitigation Measures	**Timeframes**	**Responsibilities**
SANITATION			
Ablution Facilities	❖ The entrances to the toilets will be adequately screened from the public view. ❖ Sanitary hygiene bins will be provided for female staff. ❖ Ensure an adequate supply of soap, water, and hand sanitizer in restroom facilities. ❖ Regularly clean and disinfect restroom facilities to prevent the spread of germs and maintain hygiene standards. ❖ Provide training to workers on sanitation practices, including proper waste disposal, personal hygiene, and food safety. ❖ Raise awareness among workers about the importance of sanitation for their health and the environment, and encourage compliance with sanitation protocols	❖ Continuously	❖ perations and maintenance contractor

STORM AND WASTEWATER MANAGEMENT			
Storm and wastewater management	❖ Storm water drainage lines must be maintained to divert runoff water around the PV Plant to prevent ponding. ❖ All storm water drainage lines shall contain water flow arrestors to prevent erosive action on the sides of the drainage lines. ❖ The following measures must be implemented, both as erosion prevention and storm water control measures: ➢ Straw barriers (replaced when needed) should be installed in drainage paths to reduce velocity, and as a sediment trap during construction. Suspended solids carried by overland flow would be intercepted. These erosion barriers must be placed at intervals of 25-50 m apart in the drainage paths which would intercept suspended solids from entering the natural drainage paths. ➢ Rip-rap should be placed as liners for channel spines. These comprise packed stones with an average diameter of 100 mm, packed in the channels as lining material to control flow velocities and hence erosion. ➢ Earth cut-off channels at boundaries of the facility. These would assist in directing flow away from the site and reduce the possibility of flooding from runoff origination from outside the site. ➢ Provide erosion protection at channel outfalls and positions of high flow concentration. These comprise packed stones with an average diameter of 200 mm, packed in the drainage path to control flow velocities and hence erosion.	❖ On-going	❖ Operations and maintenance contractor

	❖ Road drainage to deflect storm water off the road surface will be required. This can be achieved effectively by constructing drainage deflection humps diagonally across the road surface. The drainage hump will reduce velocity. ❖ Any erosion channels which develop during the operation period must be suitably backfilled, compacted and restored to a proper condition.		
HERITAGE RESOURCES			
Alteration of the cultural and natural landscape by built elements	❖ Use neutral, earthy-coloured paint on the built elements of the development so as to reduce the visual contrast in the landscape.	❖ Continually as required	❖ Operations and maintenance contractor
PROTECTION OF FAUNA AND FLORA			
Bird collisions with PV panels and other infrastructure.	❖ Monitor bird fatalities – the monitoring plan must indicate what species are affected and at what time/season these occur and should follow Bird life SA recommendations. ❖ Monitoring must make note of bird species present and absent in terms of Southern African Brid Atlas Project (SABAP2) records for the area. ❖ Preferred habitat and areas of congregation must be noted.	❖ On-going	❖ Operations and maintenance contractor
Alien invasive species	❖ Removal of the alien and weed species encountered on the property must take place in order to comply with existing legislation National Environmental Management: Biodiversity Act 2004 (Act No 10 of 2004) Alien and Invasive Species Regulations, 2014.	❖ Every 3 months	❖ Operations and maintenance contractor

	❖ Care should be taken with the choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used.		
SOLID WASTE MANAGEMENT			
Pollution of the area with general waste, domestic waste, electronic waste	❖ Implement a waste segregation system to separate different types of waste, such as recyclables, non-recyclables, hazardous waste, and electronic waste. ❖ Provide clearly labeled waste bins and containers for each waste stream and ensure they are conveniently located throughout the plant site. ❖ Designate trained personnel responsible for waste collection, segregation, and disposal. ❖ Establish procedures for the proper handling, storage, and disposal of electronic equipment and components at the end of their lifecycle. ❖ Ensure that e-waste is collected separately from other waste streams and recycled or disposed of in accordance with environmental regulations. ❖ Partner with certified e-waste recyclers or refurbishes to responsibly manage electronic waste and prevent environmental contamination. ❖ Encourage the reuse of materials and equipment where feasible to minimize waste generation and conserve resources.	❖ Weekly during operational	❖ Operations and maintenance contractor

HAZARDOUS SUBSTANCES MANAGEMENT			
Pollution of the environment due to the use of hazardous chemicals/ substances on site.	❖ Identify and properly manage hazardous materials used in plant operations, such as batteries, lubricants, solvents, and chemicals. ❖ Store hazardous waste in designated areas equipped with appropriate containment measures, such as secondary containment systems and spill kits. ❖ Arrange for the safe transportation and disposal of hazardous waste through licensed contractors or facilities in accordance with regulatory requirements.	❖ On-going	❖ Operations and maintenance contractor
SOCIAL ECONOMIC BEHEFITS AND IMPACTS			
Job Creation and Economic Growth	❖ Solar plants create employment opportunities during the operational phase, including positions for maintenance technicians, engineers, and administrative staff. ❖ Local businesses may benefit from increased economic activity related to servicing the solar plant, such as supply of goods and services	❖ Continua lly	❖ Project Manager
Community Investment, Energy Access and Affordability	❖ Community investment initiatives, such as funding local infrastructure projects, education programs, or health services. ❖ These investments can improve the quality of life for residents in nearby communities and foster positive relationships between the plant and the local community. ❖ Solar energy generated by the plant contributes to energy access and affordability, particularly in regions with limited access to electricity or high energy costs.	❖ Continua lly	❖ Project Manager

	❖ Reduced reliance on fossil fuels can also mitigate the impact of energy price fluctuations on consumers. ❖ Solar plant operations provide opportunities for workforce development and training in renewable energy technologies. ❖ Training programs can help residents acquire skills and qualifications for employment in the growing renewable energy sector.		
WATER SUPPLY MANAGEMENT			
water supply management	❖ The Manager must take all practical measures to minimise water use on site and will immediately attend to any wastage. This will include but not limited to: ➢ Monitoring pressure pipes for leaks. ➢ Closing taps when not in use. ➢ Efficient use of water for washing of solar panels.	❖ Continually	❖ Operations and maintenance contractor
VISUAL IMPACTS			
Visual intrusion on the views of sensitive visual receptors	❖ Maintain rehabilitated surfaces until a self-sustaining stand of vegetation is established and visually adapted to the undisturbed surrounding vegetation. ❖ No new disturbance should be created during operations without approval by the Environmental Officer. ❖ Restoration of disturbed land should commence as soon after disturbance as possible. ❖ Dust and noxious weed control should be part of maintenance activities.	❖ On-going	❖ Operations and maintenance contractor

	❖ Road maintenance activities should avoid damaging or disturbing vegetation. ❖ Painted features should be maintained and repainted when colour fades or paint flakes. ❖ Use appropriately coloured materials for structures to blend in with the backdrop of the project where this is technically feasible and the colour or paint will not have a deleterious effect on the functionality of the structures.		
Night lighting impacts	❖ The lighting of the facility should not exceed, in number of lights and brightness, the minimum required for safety and security. ❖ Low-pressure sodium light sources should be used to reduce light pollution. ❖ Use shielded and directional lighting fixtures to minimize light spillage beyond the site boundaries.	❖ Continua lly	❖ Operations and maintenance contractor
FIRE PREVENTIONS			
Fire	❖ A designated smoking area within the site area must be provided, a fireproof sand filled container for extinguishing cigarettes. Smoking shall otherwise be prohibited across the site and in the works areas. ❖ Employees must be aware of the procedure to be followed in the event of a fire. ❖ Fire drills must be conducted every six months or as otherwise required by the OHSA. ❖ Adequate fire protection measures and firefighting equipment must be available at each work area and the camp site area to deal with the type and nature of fire that may arise. ❖ The Contractor shall prepare a Fire Prevention and Fire Emergency Method Statement. The Method Statement should include, but not limited to the following: ➢ Fire Fighting training for designated site staff.	❖ On-going	❖ Operations and maintenance contractor

	➢ Sources of fire risk ➢ Measures to comply with any requirements of local authority fire departments. ❖ Construct firebreaks around the site area before fire seasons		
HEALTH			
Spreading of diseases	❖ There should be an emergency plan to deal with an outbreak e.g. Covid 19. ❖ Train the stuff regularly on the containments of disease outbreak and how to prevent further spread. ❖ Provide comprehensive training to staff on proper hygiene and sanitation. ❖ Provision of condoms in the site	On-going	❖ Project manager

9.1. GENERAL OPERATIONS OF THE SOLAR PLANT

9.1.1. Components of Solar Plant

A solar power plant consists of several key components that work together to generate electricity from sunlight. Here are some of the main components:

- **Solar Panels (PV)**

Solar panels are the primary components that convert sunlight into electricity through the photovoltaic effect. They are made up of interconnected solar cells, usually made of silicon, that generate direct current (DC) electricity when exposed to sunlight.

- **Mounting Structures**

Mounting structures provide support for the solar panels and secure them in place. They can be installed on rooftops, ground-mounted structures, or solar tracking systems to optimize sunlight exposure throughout the day.

- **Inverters**

Inverters are essential components that convert the DC electricity produced by the solar panels into alternating current (AC) electricity, which is used in homes, businesses, and the electrical grid. Inverters also perform functions such as voltage regulation, power management, and grid synchronization.

- **Racking and Mounting Systems**

Racking and mounting systems are used to securely attach solar panels to rooftops or ground-mounted structures. They provide structural support, ensure proper alignment and orientation of the panels, and allow for easy installation and maintenance.

- **Electrical Wiring and Connectors**

Electrical wiring and connectors are used to interconnect solar panels, inverters, and other electrical components in the solar power system. They transmit electricity from the solar panels to the inverters and distribute power to the electrical load or grid connection point.

- **Monitoring and Control Systems**

Monitoring and control systems monitor the performance, efficiency, and output of the solar power plant in real-time. They collect data on energy production, system status, and environmental conditions, allowing operators to optimize performance, diagnose issues, and ensure the reliable operation of the system.

- **Transformers and Switchgear**

Transformers and switchgear are used to step up or step down the voltage of the electricity generated by the solar power plant and to connect it to the electrical grid. They also provide protection, isolation, and control functions to ensure the safe and reliable operation of the electrical system.

- **Balance of System (BOS) Components**

Balance of system (BOS) components include various auxiliary systems and equipment required for the operation of the solar power plant, such as combiner boxes, surge protectors, disconnect switches, grounding systems, and meteorological stations.

- **Energy Storage Systems**

Energy storage systems, such as batteries, are optional components that store excess electricity generated by the solar power plant for use during periods of low sunlight or high energy demand. They improve energy resilience, grid stability, and the integration of renewable energy sources into the electrical grid.

9.1.2. Solar Process for Electricity Generation

When sunlight strikes the solar panels, photons (light particles) from the sunlight interact with the silicon atoms in the PV cells, causing the release of electrons. This process creates an electric field across the layers of the PV cell, generating direct current (DC) electricity.

The DC electricity produced by the solar panels is collected and transferred to an inverter, which converts it into alternating current (AC) electricity. AC electricity is the standard form of electrical power used in homes, businesses, and the electrical grid. The converted AC electricity can be used to power electrical appliances, lighting, heating, and other devices in homes, businesses, or utilities. Excess electricity generated by the solar panels can be fed back into the electrical grid through a process called net metering, allowing users to receive credit or compensation for the surplus energy produced.

In some cases, solar energy systems may incorporate energy storage solutions such as batteries to store excess electricity generated during the day for use during periods of low sunlight or at night. Energy storage systems enable greater energy independence and resilience, particularly in off-grid or grid-tied systems with intermittent power supply.

Solar power systems can be connected to the electrical grid, allowing users to draw electricity from the grid when solar energy production is insufficient (e.g., at night or during cloudy weather) and export excess electricity to the grid when production exceeds demand.

Grid-connected solar systems provide flexibility and stability to the electrical grid, reducing reliance on fossil fuels and contributing to decarbonization efforts.

10. DECOMMISSIONING PHASE

While the decommissioning phase is not anticipated for the proposed development, the area will undergo rehabilitation after construction activities to restore the site to as close to its original state as possible. This process entails continuous monitoring and management of the site.

11. IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT PROGRAMME

The construction contractor must ensure that environmental management during construction and operation phases is carried out. A suitable qualified Environmental Officer will be responsible for ensuring compliance to the EMPr. The Environmental Control Officer on site will conduct regular site visits to ensure the success of the EMPr.

The Environmental Control Officer will:

- Know the contents and implications of the environmental report and monitor the implementation of the findings using the EMPr.
- Act as a guide, advisor and consultant to the contractor and client on environment issues during construction. This will be achieved by continuous auditing of the project, identification of problem areas and provisioning of action plans to avoid costly stoppages and /or environmental damage.
- Compile regular site inspection reports for the inclusion in the EMPr as an addendum if necessary.
- Ensure that a 'hotline' exists for reporting incidents and resolving any problems rapidly.
- And upgrade the EMPr as necessary and inform the relevant parties of the changes.

11.1. ENVIRONMENTAL AUDITS AND MONITORING

The construction contractor will submit reports on implementation of the environmental plan as described by the project proponent and authorities. An environmental audit will be conducted prior to the development and construction activities. This environmental audit will ensure that:

- Mitigation measures are implemented as prescribed in the Environmental Management Programme;
- The relevant authorities are kept informed about progress with the project and that they are given assurance that the project is implemented and managed as prescribed in the EMPr.
- Periodic inspections and/or audits are performed.
- Compliance to the conditions of the EMPr is adhered to and a report compiled.
- Reviews of conformance against policies and procedures stated in this document are performed. Supervisors in all work areas will conduct performance and compliance reviews, using the EMPr as guideline to ensure compliance.
- And inspections will occur on a monthly basis (or as required).

11.2. RECORD KEEPING

Documents to be maintained by the designated representative/ site agent are to include:

- Training records.
- Inspection records.
- Records of non-conformance and corrective action.
- Records of all complaints, concerns or issues and corrective action.
- Environmental Management Programme.
- All incidents reports.

All records will be kept for up to a year after the completion of the project or in accordance with other legal requirements as they apply.

11.3. EMPR UPDATES

The EMPr will be subject to on-going review throughout the course of the project to ensure its continued suitability, adequacy and effectiveness. This review may include but will not be limited to monitoring and measuring information, performance data, assessment and audit results and other relevant information and data.

12. SUMMARY OF RECOMMENDATIONS AND CONCLUSION

The proposed development will have minimal environmental impacts which are manageable through good engineering practices and following all environmental recommendations prescribed. Although all foreseeable actions and potential mitigations or management actions are contained in this document, the EMPr should be considered as a day-to-day management document. The EMPr thus sets out the environmental standards that are required to minimise the negative impacts and maximize the positive benefits of the local communities. An EMPr is a “live document”, and its continuous review and correct management will definitely result to the successful construction of the proposed development.

The contractor is to be made aware of the potential cost and timing implications needed to fulfill the implementation of the EMPr, thus adequately costing for these.