

# ENVIRONMENTAL MANAGEMENT PROGRAMME

Draft – September 20233

THE PROPOSED BONSMARA SOLAR  
POWER PLANT NEAR CARLETONVILLE,  
GAUTENG PROVINCE



ENVIRONAMICS

## PROJECT DETAIL

<b>Reference No:</b>	14/12/16/3/3/2/2352
<b>Project Title:</b>	Proposed Angus Solar Power Plant near Carletonville, Gauteng Province
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## TABLE OF CONTENTS

1	INTRODUCTION .....	7
1.1	BACKGROUND .....	7
1.2	OBJECTIVES OF THE EMPR.....	10
1.3	ENVIRONMENTAL IMPACTS .....	10
1.4	DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP) .....	12
1.5	STRUCTURE OF THE REPORT .....	12
2	APPROACH TO THE EMPR.....	15
2.1	KEY DEFINITIONS USED IN THIS EMPR .....	16
2.2	KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT .....	18
2.3	ROLES AND RESPONSIBILITIES.....	18
2.3.1	Project Management Team.....	18
2.3.2	THE DEVELOPER.....	19
2.3.3	Principal Contractor/s .....	20
2.3.4	Construction Supervisor .....	21
2.3.5	Sub-contractors .....	21
2.3.6	SHE Representative .....	22
2.3.7	ECO .....	22
2.4	LIFECYCLE OF THE SOLAR ENERGY FACILITY.....	23
2.4.1	Pre-construction.....	23
2.4.2	Construction .....	23
2.4.3	Operation .....	24
2.4.4	Rehabilitation .....	24
2.4.5	Decommissioning .....	24
2.5	CHECKING AND CORRECTIVE ACTION .....	24

2.6	SITE DOCUMENTATION AND REPORTING .....	25
2.7	MONITORING .....	26
2.7.1	Programme Monitoring.....	26
2.8	MANAGEMENT REVIEW .....	27
2.9	MITIGATION AND MANAGEMENT MEASURES.....	27
3	ENVIRONMENTAL AWARENESS PLAN .....	119
4	AUDITING.....	120
5	EMPR AMENDMENT .....	121

## LIST OF TABLES

Table 1-1: Environmental impacts and management outcomes

Table 1-2: Structure of the report

Table 2-1: Approach to Impact Management

Table 2-2: Key definitions used in this EMPr

Table 2-3: Proposed Mitigation Measures during the Planning and Design Phase

Table 2-4: Proposed Mitigation Measures during the Construction Phase

Table 2-5: Proposed Mitigation Measures during the Operational Phase

Table 2-6: Proposed Mitigation Measures during the Decommissioning

Table 2-7: Proposed Mitigation Measures during the Post Closure Phase

## LIST OF FIGURES

Figure 1: Layout plan indicating site boundary, access points, and no-go areas

Figure 2: Environmental sensitivity map

## LIST OF ABBREVIATIONS

DFFE	Department of Forestry, Fisheries and the Environment
DM	District Municipality
DMRE	Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
EP	Equator Principles
EPFI	Equator Principles Financial Institutions
Environmental impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects.
GNR	Government Notice Regulation
I&AP	Interested and affected party
IDP	Integrated Development Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
MCLM	Merafong City Local Municipality
kV	Kilo Volt
Mitigate	Activities designed to compensate for unavoidable environmental damage.
MW	Megawatt
NEMA	National Environmental Management Act No. 107 of 1998
NERSA	National Energy Regulator of South Africa
NWA	National Water Act No. 36 of 1998
OHSA	Occupational Health and Safety Act (Act 85 of 1993)
PPP	Public Participation Process

PV	Photovoltaic
REIPPPP	Renewable Energy IPP Procurement Process
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
SHE	Safety, Health and Environment

# 1 INTRODUCTION

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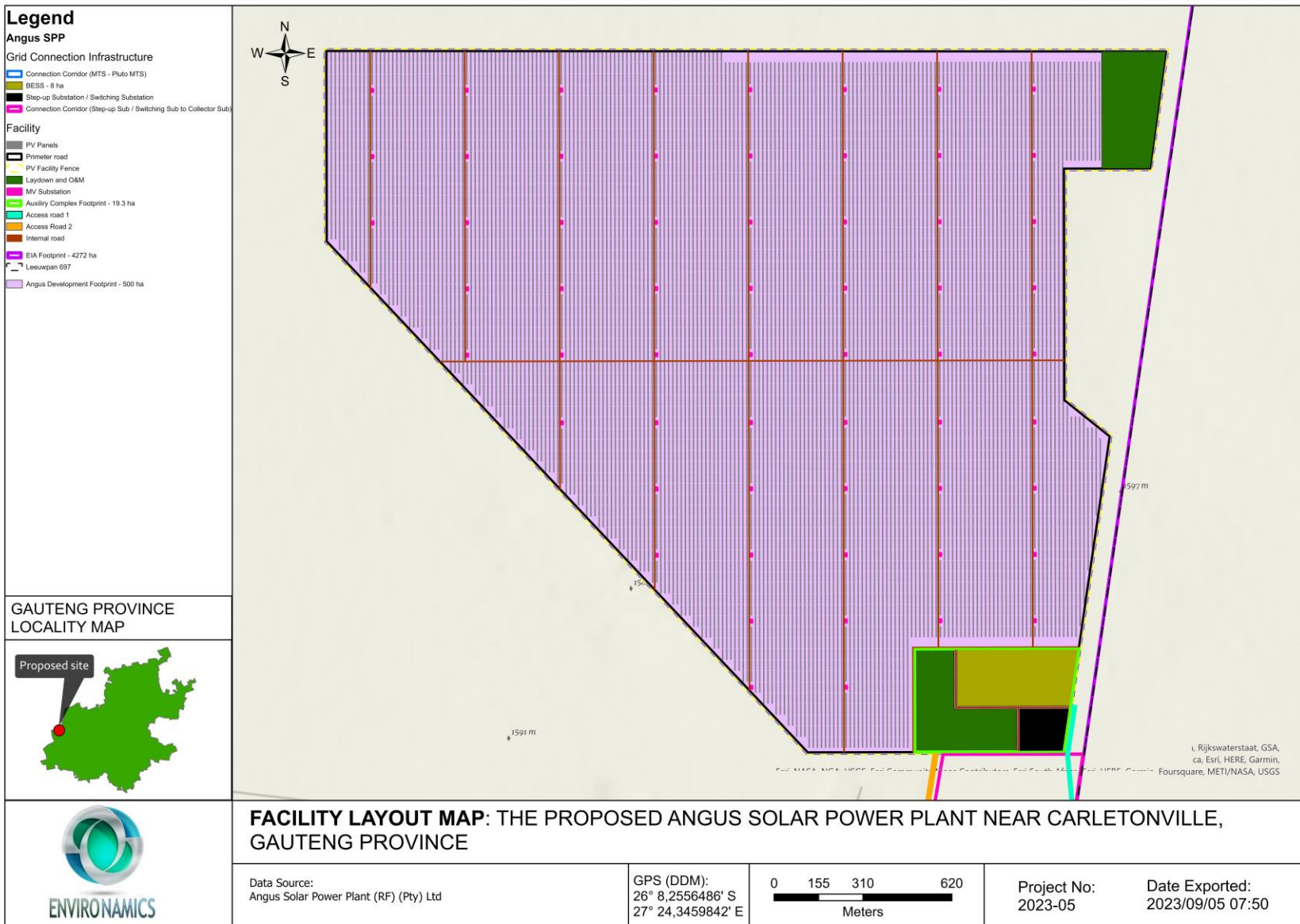
The purpose of the Environmental Management Programme (EMPr) is to ensure that the potential social and environmental impacts, risks and liabilities identified during the Environmental Impact Assessment process is effectively managed during the construction and operational phases of the Angus Solar Power Plant (RF) (Pty) Ltd. The EMPr specifies the mitigation and management measures to which the Developer is committed in relation to the establishment of the Photovoltaic Solar Energy and its associated infrastructure and shows how the project will mobilise organizational capacity and resources to implement these measures.

In order to comply with the requirements of GN R 326 (23), an EMPr has been compiled as part of the Environmental Impact Report (EIR). The content of the EMPr is structured in such a way as to comply with the requirements of Appendix 4 to GN R 326.

## 1.1 BACKGROUND

This EMPr has been compiled for the Angus Solar Power Plant near Carletonville, Gauteng Province. This solar energy facility is proposed to involve the following:

- Site clearing and preparation;
- Civil works;
- Construction of the PV panel array, on site substation, switching station and power line;
- Construction of supporting infrastructure in the form of office and ablution facilities;
- Construction of internal roads;
- Fencing; and
- Construction of a stormwater management system.



**Figure 1:** Layout plan indicating site boundary, plant boundary, internal roads and grid connection infrastructure



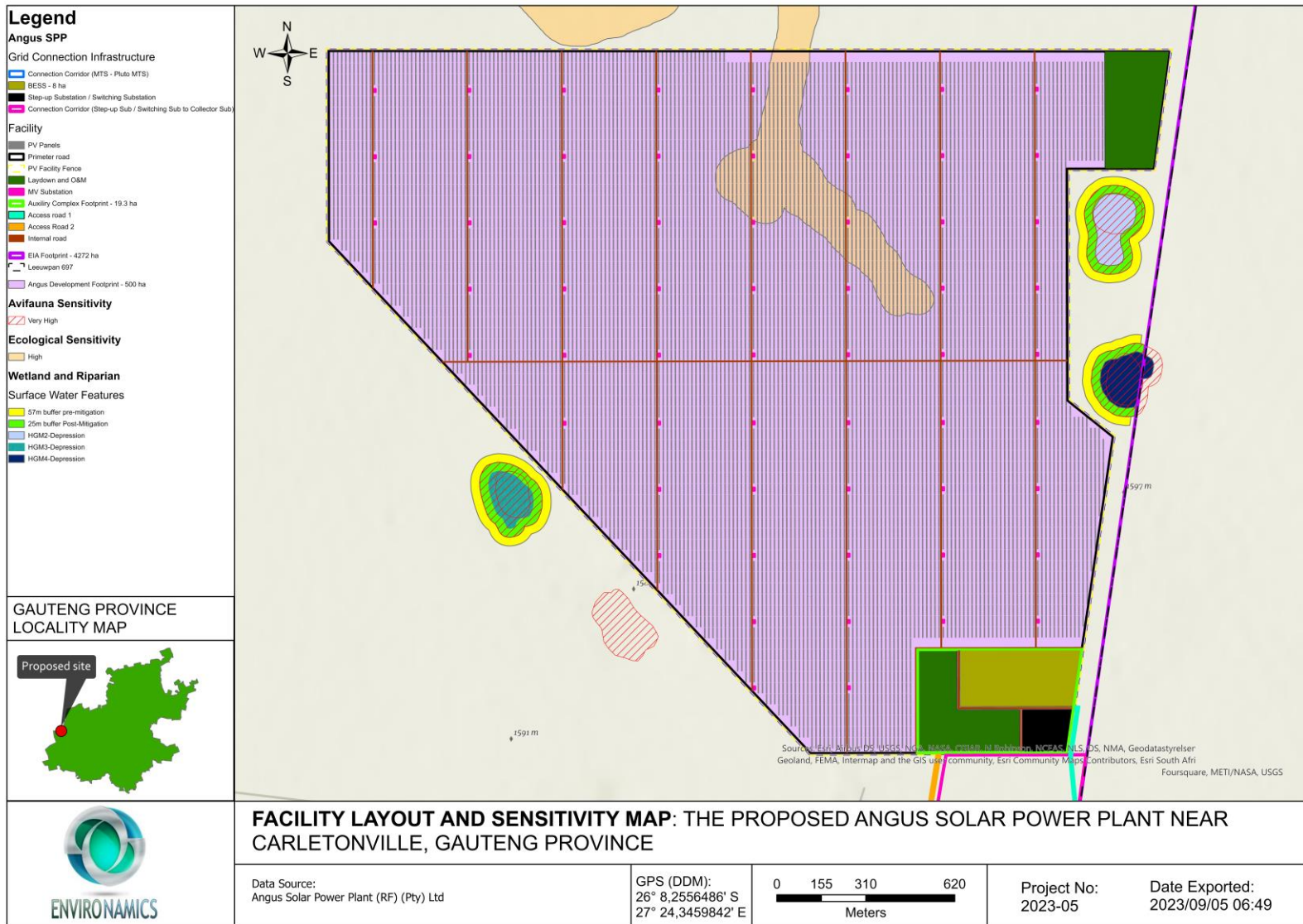


Figure 2: Layout and sensitivity map

## **1.2 OBJECTIVES OF THE EMPr**

The key objectives of the EMPr are to:

- Formalise and disclose the programme for environmental and social management;
- Ensure that appropriate management and mitigation measures and requirements are implemented from the start of the project;
- Ensure compliance to environmental legislation;
- Manage identified impacts;
- Ensure precautions against damage and claims arising from damage are taken timeously;
- Provide a framework for the implementation of environmental and social management initiatives.
- Ensure sufficient resources are allocated on the project budget so that the scale of the EMPr related activities are consistent with the significance of project impacts; and
- Provide feedback for continual improvement in environmental performance.

Best practice principles require that every reasonable effort be made to reduce and preferably to prevent negative impacts, while enhancing positive benefits, especially within the communities directly affected by the proposed project. These principles have guided the Environmental Impact Assessment process and the compilation of the EMPr.

The EMPr covers information on the management and mitigation measures that will be implemented to address impacts in respect of:

- Planning and design;
- Pre-construction and construction;
- Operation;
- Rehabilitation; and
- Decommissioning.

## **1.3 ENVIRONMENTAL IMPACTS**

The proposed development was assessed to have an overall low impact on the receiving environment. Refer to table 1-1 for aspects requiring specific mitigation within the development footprint as specified in this EMPr.

**Table 1-1:** Environmental impacts and management outcomes

<b>Impact</b>	<b>Significance (with mitigation)</b>	<b>Impact management outcomes</b>
<b>Construction phase</b>		
Impacts on fauna and flora	Negative Medium	To avoid or reduce the loss of fauna and flora
Impacts on surface water features	Negative Low	To avoid or reduce impact on the characteristics of the watercourse
Impacts on Avifauna	Negative Medium	To avoid the loss or fragmentation of habitats for avifauna.
Impacts on Agricultural Potential	Negative Low	To enhance erosion control and prevent soil loss
Visual Impact	Negative Low	To minimise visual impacts
Temporary employment opportunities	Positive Medium	To enhance the use of local skills and uplift the local community
Economic Multiplier Effect	Positive Medium	To enhance the use of local goods and services
Social Impact	Negative Low	To minimise the impact on the local resources and social networks.
Impacts on heritage resources	Negative Low	To avoid any loss of potential heritage resources
Impacts on paleontological resources	Negative Low	To avoid any loss of potential palaeontological resources
Impacts on existing service infrastructure (i.e., roads)	Negative Low	To avoid any damage to existing service infrastructure
<b>Operational phase</b>		
Visual Impact	Negative Low	To minimise visual impacts
Impacts on Avifauna	Negative Medium	To avoid habitat loss as well as to avoid increase mortality
Impacts on fauna and flora	Negative Low	To avoid the loss of biodiversity as much as possible
Impacts on surface water features	Negative Low	To avoid or reduce impact on the characteristics of the watercourse
Impacts on agricultural potential	Negative Low	To enhance erosion control and prevent soil loss
Impacts on heritage resources	Negative Low	To avoid any loss of potential heritage resources
Social Economic Impacts	Positive Medium	To enhance the contribution to Local Economic Development (LED) and social upliftment
Cumulative biophysical impacts resulting from similar development in the area	Negative Low	These types of developments are not located on ecological sensitive areas.
<b>Decommissioning phase</b>		

Impacts on fauna and flora	Negative Low	To avoid the loss of biodiversity as much as possible
Impacts on Avifauna	Negative Medium	To avoid habitat loss as well as to avoid increase mortality
Impacts on agricultural potential	Negative Low	To avoid soil erosion
Impacts on heritage resources	Negative Low	To avoid any loss of potential heritage resources
Socio-economic impacts (loss of employment)	Negative Low	Loss of local employment will occur

#### 1.4 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

Environamics was appointed by the applicant as the independent EAP to conduct the Environmental Impact Assessment Process and prepare all required reports such as the EMPr. All correspondence to the EAP can be directed to:

Contact person: Ms. Christia van Dyk  
 Postal Address: 14 Kingfisher Street, Tuscany Ridge Estate, Potchefstroom, 2531  
 Telephone: 078 470 5252 (Cell)  
 Electronic Mail: christia@environamics.co.za

And/or

Contact person: Mr. Herman (Attie) Alberts  
 EAPASA Registration: 2019/1328  
 Postal Address: 14 Kingfisher Street, Tuscany Ridge Estate, Potchefstroom, 2531  
 Telephone: 063 685 2093 (Cell)  
 Electronic Mail: herman@environamics.co.za

Regulation 13(1)(a) and (b) determines that an independent and suitably qualified and experienced EAP should conduct the Environmental Impact Assessment. In terms of the independent status of the EAP, a declaration is attached as Appendix A to the EIA report. The expertise of the EAP responsible for conducting the BA is also summarized in the curriculum vitae included as part of Appendix A.

#### 1.5 STRUCTURE OF THE REPORT

The implementation of an approved EMPr for the proposed activities is a requirement of the National Environmental Management Act (Act 107 of 1998) (NEMA) and will be a condition in the Environmental Authorisation (EA), should it be issued by the National Department of Forestry, Fisheries and the Environment (DFFE). As such, failure to comply with this EMPr will constitute an offence in terms of Section 24F of the NEMA and the holder of the EA (Applicant /

Developer) may be liable for penalties and/or legal action. Therefore, it is important that all responsible parties understand their duties and undertake them with duty and care.

This report is structured in accordance with the prescribed contents stipulated in Appendix 4 of Regulation No. 326. It consists of five sections demonstrating compliance to the specifications of the regulations as illustrated in Table 1-1.

**Table 1.2:** Structure of the report

Requirements for the contents of an EMPr as specified in the Regulations		Section in report
<b>Appendix 4(1) - An EMPr must comply with section 24N of the Act and include-</b>		
(a)	details of -	1.4
	(i) The EAP who prepared the EMPr;	
	(ii) The expertise of that EAP to prepare an EMPr, including a curriculum vitae.	
(b)	A detailed description of the aspects of the activity that are covered by the draft environmental management programme as identified by the project description.	2.3
(c)	a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers;	1.1
(d)	a description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the Basic Assessment process for all phases of the development including-	1.2 & 1.3
	(i) Planning and design;	
	(ii) Pre-construction activities;	
	(iii) Construction activities;	
	(iv) Rehabilitation of the environment after construction and where applicable post closure; and	
	(v) where relevant, operation activities	
(e)	a description and identification of impact management outcomes required for the aspects contemplated in paragraph (d);	1.3
(f)	a description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) and (e) will be achieved, and must, where applicable, include actions to -	2.8
	(i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;	
	(ii) comply with any prescribed environmental management standards or practices;	

	(iii) comply with any applicable provisions of the Act regarding closure, where applicable; and	
	(iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;	
(g)	the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	2.6
(h)	the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	2.6
(i)	an indication of the persons who will be responsible for the implementation of the impact management actions;	2.2
(j)	the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	2.8
(k)	the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	2.4
(l)	a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	4
(m)	An environmental awareness plan describing the manner in which—	3
	(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and	
	(ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment.	
(n)	any specific information that may be required by the competent authority.	N/A

This EMPr should form an integral part of the contract documents which will inform the Contractor/s of their duties in the fulfillment of the project objectives, with particular reference to the prevention and mitigation of environmental impacts caused by the proposed activities associated with the project as stipulated in the EMPr. The Contractor/s should note that conditions imposed by the EMPr are legally binding in terms of environmental legislation and that administrative and punitive actions can be taken against them should the conditions of the EMPr not be complied with. Furthermore, the EMPr is enforceable through additional conditions to the general conditions of contract that pertain to this project.

It is expected that the Contractor/s are conversant with all legislation pertaining to the environment, including provincial and local government ordinances, which may be applicable to the contract.

The EMPr is a dynamic document that will be periodically reviewed and updated. As part of on-going implementation, this EMPr has also been publicly disclosed during the Public Participation Process of the Basic Assessment process for this project. An opportunity has been provided to participating stakeholders to comment on it.

## 2 APPROACH TO THE EMPR

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This section introduces the approach to impact management – refer to Table 2-1. It also outlines the responsibilities of the Project Management Team. Table 2-3 to 2-7 details the range of approaches to be undertaken to manage project activities.

**Table 2-1:** Approach to Impact Management

Approach	Description
Avoidance	Avoiding activities that could result in adverse impacts and/or resources or areas considered sensitive.
Prevention	Preventing the occurrence of negative environmental impacts and/or preventing such an occurrence having negative impacts.
Preservation	Preventing any future actions that might adversely affect an environmental resource.
Minimization	Limiting or reducing the degree, extent, magnitude or duration of adverse impacts through scaling down, relocating, redesigning and/or realigning elements of the project.
Mitigation	Measures taken to minimise adverse impacts on the environment.
Enhancement	Magnifying and/or improving the positive effects or benefits of a project.
Rehabilitation	Repairing affected resources, such as natural habitats or water resources.
Restoration	Restoring affected resources to an earlier (possibly more stable and productive) state, typically 'background' or 'pristine' condition. These resources may include soils and biodiversity.
Compensation	Compensating for lost resources, and where possible, the creation, enhancement or protection of the same type of resource at another suitable and acceptable location.

## 2.1 KEY DEFINITIONS USED IN THIS EMPR

The key definitions used throughout this EMPr are listed in Table 2-2.

**Table 2-2:** Key definitions used in this EMPr

Term	Definition
Alien species	A species not indigenous to the area or out of its natural distribution range.
Alternatives	Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.
Assessment	The process of collecting, organising, analysing, interpreting and communicating information which is relevant.
Construction	Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity as per the EIA Regulations. Construction begins with any activity which requires Environmental Authorisation.
Decommissioning	To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.
DFFE	Department of Forestry, Fisheries and the Environment
Environment	As per definition in the NEMA.
Environmental Assessment Practitioner	An independent environmental consultant with experience in the management of EA applications in terms of the NEMA.
Environmental Authorisation (EA)	Means the authorisation issued by a competent authority (Department of Forestry, Fisheries and the Environment) of a listed activity or specified activity in terms of the National Environmental Management Act (No 107 of 1998) and the EIA Regulations promulgated under the Act.
Environmental Control Officer (ECO)	The ECO is appointed by the Developer to ensure compliance to the EMPr and conditions of the EA during construction and provides proof of compliance documentation to the Project Management Team. The role of ECO will be fulfilled by the Developer or its Agent's SHE Representative.
Environmental Impact	A change in the environment, whether adverse or beneficial, wholly or partly, resulting from an organisations' activities, products or services.



Environmental management	It is the responsibility of the entire Project Management Team to deal with environmental considerations during the management cycle of the project, i.e. policy, planning and design, implementation (preconstruction, construction and operation), monitoring and corrective action and review.
Interested and affected party (I&AP)	Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.
Incident	An undesired event that may result in a significant environmental impact, although can be managed through internal response and procedures.
Method Statement	A written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications.
Plan	Sets out the intended method and/or specific measures required to mitigate and/or enhance the negative and positive impacts of the Project. A plan usually focuses on one project phase, i.e. construction, operation or closure.
Pre-construction	The period prior to the commencement of construction, which may include activities which do not require Environmental Authorisation
Project Management Team	The responsibility of the EMPr implementation resides on this team. This team includes the Developer and/or his appointed Agent as well as appointed contractors and consultants, including the ECO.
Programme	Identifies a series of interrelated measures (often contained in detailed plans) for managing the environmental effects of the Project. A programme provides broad direction and covers more than one project phase.
Safety, Health and Environmental Representative (SHE representative)	<p>A representative of the Developer or it's Agent, appointed as a SHE representative, assisting the construction manager on Health, Safety and Environmental aspects of the project on the construction site. The SHE representative will also perform the functions of the ECO for the project.</p> <p>Each Principal Contractor/s may also have their own SHE representative, but the SHE representative as referred to in this EMPr, refers to the SHE representative acting on behalf of the Developer and/or his appointed Agent.</p>

## **2.2 KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT**

The following legislation and guidelines are applicable to the development and have informed the scope and content of the EMPr:

- National Environmental Management Act (Act No 107 of 1998)
- EIA Regulations, published under Chapter 5 of NEMA (GNR 545, GNR 546 in Government Gazette 33306 of 18 June 2010)
- Guidelines published in terms of NEMA EIA Regulations, specifically:
  - Companion to the NEMA EIA Regulations of 2010 (Draft Guideline; DEA, 2010)
  - Public Participation in the EIA process (DEA, 2010)
- International Standards – IFC Standards and Equator Principles (2013)

## **2.3 ROLES AND RESPONSIBILITIES**

The roles and responsibilities of the different legal appointments anticipated for the construction of the proposed Angus Solar Power Plant (RF) (Pty) Ltd will be dependent on the final Method Statements as well as the Health and Safety Plan to be compiled prior to the commencement of any site clearing and construction activities. The roles and responsibilities mentioned in this section of the EMPr will act as a guide for the compilation of the Health and Safety Plan.

### **2.3.1 Project Management Team**

The following individuals form part of the Project Management Team and will be required to sign the policy before commencement of any work on site:

- The Developer or its appointed Agent;
- Principal contractors appointed for the development;
- Construction supervisor;
- Subcontractors; and
- Safety, Health and Environment (SHE) representative (acting as the ECO).

The Project Management Team will be responsible for the following:

- Ensuring that the Contractor/s are aware of the specifications, legal constraints/requirements and the Developer's policies pertaining to activities taking place regarding the proposed project;
- Monitoring and inspecting contractors' written records to illustrate compliance with the EMPr;

- Familiarising themselves with the Environmental Impact Assessment and EMPr for this development, the conditions set out in the EA, and all relevant environmental legislation; and
- Ensuring that all commitments/conditions in the EMPr, EA and any other environmental permits are communicated and adhered to by all employees and contractors involved with the proposed development.

### **2.3.2 THE DEVELOPER**

The Developer as holder of the EA will be ultimately responsible for the implementation of all the relevant legislative requirements and compliance with the EMPr. To this end, the Developer will have the following responsibilities:

- The Developer will appoint Principal Contractor/s for each logical project phase in writing to assume the role of Principal Contractor/s as intended by the Construction Regulations and as determined by the Bills of Quantities;
- The Developer or its appointed Agent shall discuss and negotiate with the Principal Contractor/s the contents of the Health and Safety Plan of the both Principal Contractor/s and Sub-Contractor/s for approval;
- The Developer or its appointed Agent will take reasonable steps to ensure that the Health and Safety Plan of both the Principal Contractor/s and Sub-Contractor/s is implemented and maintained. The steps taken will include periodic audits at intervals of at least once every month;
- The Developer or its appointed Agent will prevent the Principal Contractor/s and/or the Sub-Contractor/s from commencing or continuing with construction work should the Principal Contractor/s and/or the Sub-Contractor/s at any stage in the execution of the works be found to:
  - have failed to comply with any of the administrative measures required by the Construction Regulations in preparation for the construction project or any physical preparations necessary;
  - have failed to implement or maintain their Health and Safety Plan;
  - have executed construction work, which is not in accordance with their Health and Safety Plan.
- Act in any way which may pose a threat to the Health and Safety of any person(s) present on the site of the works or in its vicinity, irrespective of him/them being employed or legitimately on the site of the works or in its vicinity; and
- The Developer or its appointed Agent will ensure compliance of all contractors and sub-contractors to the conditions set in the approved EMPr and EA.

- The Developer needs to give 14 (fourteen) days written notice to inform the DFFE that the activity will commence. The notification must include a date when the activity will commence as well as the reference number.

### **2.3.3 Principal Contractor/s**

The Principal Contractor/s appointed for the construction of the different phases of Angus Solar Power Plant (RF) (Pty) Ltd will be responsible for the following:

- Ensure that he/she is fully conversant with the requirements of the specifications of this EMPr and all relevant Health and Safety legislation. This EMPr is not intended to supersede the Occupational Health and Safety Act (Act 85 of 1993) (the Act) nor the Construction Regulations or any part of either. Those sections of the Act and the Construction Regulations which apply to the scope of work to be performed by the Principal Contractor/s in terms of this contract (entirely or in part) will continue to be legally required of the Principal Contractor/s to comply with. The Principal Contractor/s will in no manner or means be absolved from the responsibility to comply with all applicable sections of the Act, the Construction Regulations or any Regulations proclaimed under the Act or which may perceivable be applicable to this contract;
- Provide and demonstrate to the Developer a suitable and sufficiently documented Health and Safety Plan based on this EMPr, the Act and the Construction Regulations, which shall be applied from the date of commencement of and for the duration of execution of the works. This plan shall, as appendices, include the Health and Safety Plans of all sub-contractors for which he/she has to take responsibility in terms of this contract;
- Provide proof of his/her registration and good standing with the Compensation Fund or with a licensed compensation insurer prior to commencement with the works;
- In submitting his/her tender, the Principal Contractor/s will demonstrate that he/she has made provision for the cost of compliance with the specified occupational health and safety requirements, the Act and Construction Regulations (Note: This shall have to be contained in the conditions of tender upon which a tenderer's offer is based.);
- Consistently demonstrate his/her competence and the adequacy of his/her resources to perform the duties imposed on the Principal Contractor/s in terms of this Specification, the Act and the Construction Regulations;
- Ensure that a copy of his/her Health and Safety Plan is available on site and is presented upon request to the Client, an Inspector, Employee or Sub-contractors;
- Ensure that a Health and Safety file, which shall include all documentation required in terms of the provisions of this EMPr, the Act and the Construction Regulations, is opened and kept on site and made available to the Client or Inspector upon request. Upon completion of the works, the Principal Contractor/s shall hand over a consolidated Health and Safety file to the Developer;

- Throughout execution of the contract, the Principal Contractor/s will ensure that all conditions imposed on his sub-contractors in terms of the Act and the Construction Regulations are complied with as if they were the Principal Contractor/s;
- From time to time the Principal Contractors shall evaluate the relevance of the Health and Safety Plan and revise the same as required, following which a revised plan shall be submitted to the Developer and/or his/her Agent for approval;
- In terms of Construction Regulation 5(7), keep a Health and Safety file on site at all times that must include all documentation required in terms of the Act and Regulations and must also include a list of all Contractors and sub-contractors on site that are accountable to the Principal Contractor/s and the agreements between the parties and details of work being done;
- Comply with the EMPr and EA commitments and any other legislative requirements as applicable to their workings;
- Adhere to any instructions issued by the Thabazimbi Local Municipality's Environmental Manager and/or the Developer and/or his/her Agent and/or the ECO / SHE Representative;
- Submit an environmental report on any environmental incidents that have occurred within 48 hours of the incident occurring; and
- Arrange that all employees and those of the sub-contractors receive appropriate training prior to the commencement of construction, taking cognisance of this EMPr and EA.

These functions will be performed by the Construction Supervisor of each Principal Contractor/s.

### **2.3.4 Construction Supervisor**

The Construction Supervisor will be responsible for:

- Ensuring compliance with the EMPr and EA commitments and any other legislative requirements as applicable to their workings;
- Adhering to any instructions issued by the Thabazimbi Municipality's Environmental Manager and/or the Developer and/or his/her Agent and/or the ECO / SHE Representative; and
- Ensuring that all employees receive adequate training on the requirements of the conditions as set out in the EA and EMPr.

### **2.3.5 Sub-contractors**

Sub-contractors are responsible for:

- Ensuring compliance of their workforce with the requirements of the conditions as set out in the EA and EMPr, and any other legislative requirements as applicable to their workings; and
- Reporting any health, safety and environmental incidents to the construction supervisor within 24 hours of the incident.

### **2.3.6 SHE Representative**

The SHE Representative will be responsible for:

- Reporting to the Developer and/or it's Agent;
- Familiarising him / herself with the project and EMPr, and ensuring compliance with the relevant legislation applicable to the project and Thabazimbi Local Municipality (MCLM) Health, Safety and Environment Policy as well as the Health and Safety Specifications and procedures;
- Authorising the removal of personnel and / or equipment should they contravene the requirements of any applicable Health and Safety legislation and policies;
- Advising the Developer on environmental issues and recommendations for the proposed development;
- Arranging for liaison with interested and affected parties (I&APs) on environmental issues of concern, should the need arise;
- Ensuring that all environmental and health and safety conditions are undertaken by all staff and contractors on site; and
- Ensuring that corrective actions are followed up and closed out in accordance with the conditions set out in the EMPr.

### **2.3.7 ECO**

And independent ECO is to be appointed prior to the commencement of any authorized activities. Once appointed, the name of the ECO must be submitted to the Director: Compliance Monitoring at the DFFE. This is the responsibility of the developer/owner. The ECO will be responsible for the following:

- Reporting directly to the Developer and/or its Agent;
- Familiarising him / herself with the project and EMPr, and ensuring compliance with the relevant legislation applicable to the project as well as the Health and Safety Specifications and procedures;
- Communicating the contents and conditions of the EMPr and EA to the Principal Contractor/s and sub-contractor's employees. Training will be required to ensure all staff members are aware of the requirements of the EMPr;

- Monitoring the implementation of the conditions of the EMPr and EA throughout the project by means of site inspections and meetings;
- Recommending amendments to the EMPr;
- Undertaking regular monthly site inspections to assess compliance with the conditions of the EMPr and EA and take appropriate action to rectify non-conformances;
- Liaising with environmental statutory bodies, including but not limited to Thabazimbi Local Municipality's Environmental Manager, and the DFFE, where deemed necessary;
- Compiling monthly progress reports during the construction phase for submission to the Developer and/or his Agent and competent authorities (DEFF);
- Advising the Developer on environmental issues and recommendations for the proposed development;
- Arranging for liaison with I&APs on environmental issues of concern, should the need arise;
- Recording all environmental concerns raised by I&APs;
- Ensuring that all environmental and health and safety conditions are undertaken by all staff and contractors on site; and
- Ensuring that corrective actions are promptly followed up and closed out.

## **2.4 LIFECYCLE OF THE SOLAR ENERGY FACILITY**

The EMPr has recommended mitigation and management measures to avoid or minimise negative impacts and optimise the benefits arising from the positive impacts during the life-cycle of the development.

### **2.4.1 Pre-construction**

The primary task of the pre-construction phase will include surveying, pegging and search and rescue of plants and animal as required by Condition 66 of the EA.

### **2.4.2 Construction**

The primary focus on project management for the construction phase will include:

- Transportation of equipment and machinery to the site location;
- Setting up a construction camp and laydown areas;
- Development of temporary materials and waste storage and control measures;
- Stripping of surface vegetation and removal of vegetation, building rubble and domestic waste from site to the Thabazimbi Local Municipality Landfill Site;

- Stripping and stockpiling of topsoil and sub soil from the site for later use for rehabilitation and landscaping; and
- Site rehabilitation following the construction phase, of areas that have been disturbed and are not part of the on-going operational phase of the proposed project.

### **2.4.3 Operation**

The operational phase of the residential development will involve the following:

- Maintenance and washing of PV panels;
- Maintenance and monitoring of battery management system;
- Maintenance of the stormwater management system;
- Solid waste removal.

### **2.4.4 Rehabilitation**

Rehabilitation activities associated with Angus Solar Power Plant (RF) (Pty) Ltd are around the rehabilitation of disturbed areas outside of the infrastructure footprint, such as the construction camp and laydown area. The topsoil stripped during the construction phase of the project must be used to rehabilitate these disturbed areas. The topsoil can also be used for landscaping purposes.

The rehabilitation measures are to be undertaken in such a way that it ensures the rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed.

### **2.4.5 Decommissioning**

The PV facility will be operational for between 20 – 25 years from where the technology of the panels will be upgraded or the site will be decommissioned.

## **2.5 CHECKING AND CORRECTIVE ACTION**

Checking and implementing corrective action forms an important component of the EMPr management cycle. These ensure that:

- The required EMPr and EA conditions are being implemented on the site;
- The desired outcomes are being achieved and potential impact managed;
- On-going weekly inspections of operational controls and general state of operation; and
- Internal monthly audits to assess the compliance to the EMPr and EA or to focus on a particular performance issue; and



- Quarterly external audits by an independent professional for the duration of the construction phase.

Many potential impacts are difficult to monitor quantitatively, such as soil erosion and waste management. However, an on-going, but pragmatic, inspection regime must be developed that allows for potential environmental transgressions to be identified proactively so that mitigation can be quickly and effectively implemented.

There are several mechanisms for implementing corrective action both during the construction and operational phases. The main instruments used to address non-compliances are the following:

- Verbal instructions – Minor transgressions from an established procedure;
- Written instructions – Normally following an audit; and
- Contract Notice – Following a breach in contract.

These instruments must be included in the contracts between the Developer and the Principal Contractors as a means of deterring personnel from contravening the conditions of the EA and the EMPr.

## **2.6 SITE DOCUMENTATION AND REPORTING**

All non-conformances will be recorded and reported to the Developer and/or its Agent. These non-conformances will be rated according to a weighing methodology to be developed that will be used to determine the significance of each incident. Considering the transient nature of construction, continual daily visual inspections will be conducted by the SHE representative. The following documentation will be required on site:

- Complaints register;
- Environmental Incident Register;
- Disposal certificates of waste and waste water generated as a result of the proposed development;
- Monthly internal audit reports;
- Quarterly external audit reports;
- Method statements with potential environmental impacts included;
- Non-conformance reports;
- Written corrective action instructions;
- EA; and
- EMPr and associated amendments.

The findings of all inspections and internal audits will be structured into instructive reporting providing information to all members of the Project Management Team. Corrective actions must be clearly defined where required. Within the reporting function a structured review component must be enforced. This review function will assist in prescribing necessary corrective actions.

Within the reporting structure it will be necessary to incorporate a review function that continually assesses the reporting and prescribes any necessary corrective action. The purpose of the review function is for the Developer to review the environmental management performance during all phases, and to propose measures to improve performance focusing on continual improvement.

## **2.7 MONITORING**

All programmes and plans forming part of this document will be subject to monitoring. The monitoring of the compliance with the conditions of the EA and the EMPr will be done on a monthly basis during construction by the ECO / SHE representative and annually during the operational phase by Angus Solar Power Plant (RF) (Pty) Ltd. Monitoring will have two elements namely:

- Routine monitoring against set standards or performance criteria;
- Annual review or evaluation. This will focus on the assessment of the effectiveness of the plan or programme.

During the construction phase, the Project Management Team will be responsible for monitoring and inspecting contractors' written records to illustrate compliance with the EMPr. This falls under the inspection role of the SHE Representative / ECO. This compliance monitoring is to verify that the responsible parties are adhering to the procedures, management conditions, and specifications contained in this EMPr.

### **2.7.1 Programme Monitoring**

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

- Occurrence of alien vegetation as well as any possible (albeit unlikely) sensitive species;
- Water usage on a monthly basis;
- Waste Management Programmes used to manage the generation and disposal of waste on site; and
- Rehabilitation of the construction sites, post construction and continually during operation.

## **2.8 MANAGEMENT REVIEW**

The Developer will review the EMPr at annual intervals during the operational phase. The purpose of the management review is to ensure that the conditions of the EMPr are still relevant, and to propose measures for improving the performance in the spirit of continuous improvement.

## **2.9 MITIGATION AND MANAGEMENT MEASURES**

The mitigation and management measures identified to address the anticipated and potential impacts identified during the Environmental Impact Assessment process is presented in Table 2-3 to Table 2-7.

**Table 2-3:** Proposed Mitigation Measures during the Planning and Design Phase

POTENTIAL ENVIRONMENTAL IMPACT DURING PLANNING AND DESIGN (NATURE OF THE IMPACT)	RECOMMENDED MITIGATION MEASURES		
	Management and mitigation measures	Timeframe	Responsibility
<b>General Management Measures</b>			
Contractors and sub-contractors may not have sufficient knowledge and understanding of the potential impacts of construction or the requirements of the EMP, leading to impacts identified under each aspect.	Compliance with the requirements of the EMP will form part of the construction contract.	Upon appointment of Principal Contractors	Developer and/or appointed Agent
	A construction plan and method statement must be submitted by the Principal contractor and approved by the Developer and/or his appointed Agent prior to the start of activities on site. It should cover all aspects of site establishment, construction and site disestablishment and describe how the EMP will be complied with.	Prior to commencement of site preparation and construction	Developer and/or appointed Agent
	Emergency action plans must be devised and approved by the Developer and/or his appointed Agent to deal with any risks identified, such as unplanned disruption of services.	Prior to commencement of site preparation and construction	Developer and/or appointed Agent
Impacts on the environment as a result of inappropriate design and planning.	<ol style="list-style-type: none"> <li>1. Carry out a Hazardous Operating Procedures (HAZOP) assessment of the design to ensure that all practical measures to minimise the impact of operations on the environment have been included and to identify what emergency plans need to be developed.</li> <li>2. Reduce the construction phase through careful logistical planning.</li> </ol>	Prior to issuing of EA	Developer and/or appointed Agent
Site demarcation and compliance	<ol style="list-style-type: none"> <li>1. Before construction begins, all areas to be developed must be clearly demarcated with fencing or orange construction barriers where applicable.</li> <li>2. All Construction Camps are to be fenced off in such a manner that unlawful entry is prevented and access is controlled. Signage shall be</li> </ol>	Prior to commencement of site preparation and construction	Developer and/or appointed Agent

	<p>erected at all access points in compliance with all applicable occupational health and safety requirements. All access points to the Construction Camp should be controlled by a guard or otherwise monitored, to prevent unlawful access.</p> <ol style="list-style-type: none"> <li>3. The Contractor and ECO must ensure compliance with conditions described in the EA.</li> <li>4. Records of compliance/non-compliance with the conditions of the authorisation must be kept and be available on request.</li> <li>5. Records of all environmental incidents must be maintained and a copy of these records be made available to the department on request throughout the project execution.</li> <li>6. In terms of onsite associated infrastructure and buildings, clear planning must be implemented to minimise vegetation clearing. Consolidating infrastructure as much as possible and making use of areas that already disturbed, where possible, is preferred.</li> <li>7. All development activities should be restricted to specific recommended areas. The Environment Control Officer (ECO) should control these areas.</li> <li>8. Storage of equipment, fuel and other materials should be limited to demarcated areas.</li> <li>9. Layouts should be adapted to fit natural patterns rather than imposing rigid geometries.</li> <li>10. The entire development footprint should be clearly demarcated prior to initial site clearance and prevent construction personnel from leaving the demarcated area. This would only be applicable to the construction phase of the proposed development.</li> <li>11. As much of the natural habitat as possible should be preserved during construction and operation to lessen the operational impacts and to reduce the irreversibility of impacts.</li> <li>12. Construction activities must remain within defined construction areas. No construction / disturbance will occur outside these areas.</li> <li>13. Peripheral impacts around the development footprint sites on the surrounding vegetation of the area should be avoided and a monitoring programme should be implemented to ensure the impacts are kept to a minimum, while the rehabilitation of the site should be prioritized after</li> </ol>		
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	<p>construction has been completed.</p> <ol style="list-style-type: none"> <li>14. The ECO should advise the construction team in all relevant matters to ensure minimum destruction and damage to the environment. The ECO should enforce any measures that he/she deem necessary.</li> <li>15. Regular environmental training should be provided to construction workers to ensure the protection of the habitat, fauna and flora and their sensitivity to conservation</li> <li>16. Ensure protection of important resources by establishing protective buffers to exclude unintentional disturbance. All possible efforts must be made to ensure as little disturbance as possible to the sensitive features such as surrounding woodland and riparian woodland outside the project area during construction</li> <li>17. Demarcate all riparian/wetland boundaries with pegs and danger tape.</li> <li>18. Edge effects of pre-construction and construction activities, including erosion, sedimentation, and alien/weed control, need to be strictly managed in wetland areas as well as their associated buffer zones.</li> <li>19. A buffer zone of 15 meters should be implemented around the wetlands to prevent sediment changes.</li> <li>20. A stormwater plan must be developed with the aid of an engineer to ensure that water runoff is diverted off the site without pooling and stagnation or erosion. Financial provision for closure will include the estimated costs for erosion control post-construction and post-decommissioning.</li> <li>21. All internal roads considered should conform to the geometric and pavement design parameters as indicated on the design standard certificate.</li> <li>22. Adequate traffic accommodation signage must be erected and maintained on either side of the access, on the gravel road, throughout the construction phase of the Angus SPP.</li> <li>23. In addition, traffic accommodation signage should also be erected at affected major intersections on the transportation routes.</li> </ol>		
Establishment of a Construction camp	1. Site establishment shall take place in an orderly manner and all required	Prior to commencement of	Developer and/or appointed Agent

	<p>amenities shall be installed at camp sites before the main workforce move onto site.</p> <ol style="list-style-type: none"> <li>2. All construction equipment must be stored within this construction camp.</li> <li>3. All associated oil changes etc (no servicing) must take place within this camp on a sealed surface such as a concrete slab.</li> <li>4. An area for the storage of hazardous materials must be established that conforms to the relevant safety requirements and that provides for spillage prevention and containment.</li> <li>5. All Construction Camps shall be provided with portable fire extinguishing equipment, in accordance with all relevant legislation and must be readily accessible.</li> <li>6. The Contractor must provide sufficient ablution facilities, in the form of portable/VIP toilets, at the Construction Camps, and must conform to all relevant health and safety standards and codes. No pit latrines, French drain systems or soak away systems shall be allowed and toilets may not be situated within 50 meters of any surface water body or 1:100 year flood line. A sufficient number of toilets must be provided to accommodate the number of personnel working in the area.</li> <li>7. The Contractor must inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed.</li> <li>8. No open veld fires will be allowed for cooking or heating unless in designated areas and under supervision. LP Gas may be used, provided that all required safety measures are in place. The Contractor must take specific measures to prevent the spread of veld fires, caused by activities at the campsites. These measures may include appropriate instruction of employees about fire risks and the construction of firebreaks around the site perimeter.</li> </ol>	site preparation and construction	
Appointment of labour	<ol style="list-style-type: none"> <li>1. Where reasonable and practical Angus Solar Power Plant (RF) (Pty) Ltd should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories.</li> <li>2. Where feasible, efforts should be made to employ local contractors that are compliant with Broad Based Black Economic Empowerment (BBBEE)</li> </ol>	Prior to commencement of site preparation and construction	Developer and/or appointed Agent

	<p>criteria.</p> <ol style="list-style-type: none"> <li>3. Before the construction phase commences Angus Solar Power Plant (RF) (Pty) Ltd should meet with representatives from the BBLM to establish the existence of a skills database for the area. If such as database exists, it should be made available to the contractors appointed for the construction phase.</li> <li>4. The local authorities, community representatives, and organisations on the interested and affected party database must be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that Angus Solar Power Plant (RF) (Pty) Ltd intends following for the construction phase of the project.</li> <li>5. The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.</li> </ol>		
<p>Training of site staff</p>	<p>Ensure that all staff have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimization of environmental harm, by:</p> <ol style="list-style-type: none"> <li>1. Environmental awareness training for construction staff, concerning the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artifacts.</li> <li>2. Where feasible training and skills development programmes for local workers should be initiated prior to the initiation of the construction phase.</li> <li>3. Project manager shall ensure that the training and capabilities of the Contractor’s site staff are adequate to carry out the designated tasks.</li> <li>4. Staff operating equipment (such as loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks.</li> <li>5. No operator shall be permitted to operate critical items of mechanical equipment without having been trained by the Contractor and certified competent by the Project Manager.</li> <li>6. Staff should be educated as to the need to refrain from indiscriminate</li> </ol>	<p>Prior to commencement of site preparation and construction</p>	<p>Developer and/or appointed Agent</p>



	<p>waste disposal and/or pollution of local soil and water resources and receive the necessary safety training.</p> <ol style="list-style-type: none"> <li>7. Staff must be trained in the hazards and required precautionary measures for dealing with hazardous substances.</li> <li>8. Spillage packs must be available at construction areas.</li> </ol>		
Public consultation of the site	<ol style="list-style-type: none"> <li>1. A meeting must be held with the landowner.</li> <li>2. Provide a mechanism through which information could be exchanged between the project proponent and stakeholders.</li> <li>3. Compile and implement a grievance mechanism procedure for the public. This procedure will include details of the contact person who will be receiving issues raised by I&amp;APs, and the process that will be followed to address issues.</li> <li>4. Identify relevant stakeholders and engage them at applicable stages of the development.</li> <li>5. Surrounding communities must be kept informed, through the identified and agreed consultation channels, of the commencement of construction.</li> <li>6. Solicit views and concerns from the public and allow them to suggest mitigations and enhancement measures.</li> <li>7. Determine stakeholder satisfaction levels.</li> <li>8. The BBLM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.</li> <li>9. Angus Solar Power Plant (RF) (Pty) Ltd should consider the option of establishing a monitoring forum that includes local farmers and develop a Code of Conduct for construction workers. This committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site.</li> </ol>	Pre-construction and construction	Principal Contractor
Site clearing	<ol style="list-style-type: none"> <li>1. Site clearing must take place in a phased, environmentally acceptable</li> </ol>	Site preparation prior to construction	Principal Contractor

	<p>manner, as and when required.</p> <ol style="list-style-type: none"> <li>2. Areas which are not to be constructed on within two months must not be cleared to reduce erosion risks.</li> <li>3. The area to be cleared must be clearly demarcated and this footprint strictly maintained to limit vegetation clearing.</li> <li>4. Soil that is removed from the site must be removed to an approved spoil site or a licensed landfill site.</li> <li>5. The necessary silt fences and erosion control measures must be implemented in areas where these risks are more prevalent.</li> <li>6. Clearing of vegetation should be scheduled for the drier winter months and limited to areas immediately needed for construction.</li> <li>7. Vegetation stripping should occur in parallel with the progress of construction to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment. Only selected plant species must be used in the re-vegetation process.</li> <li>8. The removal of indigenous plants should be kept to a minimum necessary.</li> <li>9. Trim, rather than fell of woody species along the edges of the development site where possible.</li> <li>10. The clearing and damage of plant growth in the riparian and wetland areas should be restricted to the actual road crossing where possible, and not into the sensitive adjacent areas.</li> <li>11. Where protected plants such as geophytes will need to be cleared or pruned, permits should be obtained from the relevant authority.</li> </ol>		
Erosion	<ol style="list-style-type: none"> <li>1. Design an effective system of storm water run-off control, where it is required - that is at any points where run-off water might accumulate. The system must effectively collect and safely disseminate any run-off water from all accumulation points and it must prevent any potential down slope erosion.</li> </ol>	Once-off, during the design of the facility	Developer and/or appointed Agent

<p>Establishment of a Social and Environmental Management System</p>	<ol style="list-style-type: none"> <li>1. Performance Standard One underscores the importance of managing social and environmental performance throughout the life of a project.</li> <li>2. An effective social and environmental management system is a dynamic, continuous process initiated by management and involving communication between the client, its workers and the local communities directly affected by the project. The client must develop a Social and Environmental Management System, appropriate to the nature and scale of the project and commensurate to the level of social and environmental risks and impacts.</li> </ol>	<p>Prior to construction</p>	<p>Principal Contractor</p>
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**Table 2-4:** Proposed Mitigation Measures during the Construction Phase

POTENTIAL ENVIRONMENTAL IMPACT DURING CONSTRUCTION (NATURE OF THE IMPACT)	RECOMMENDED MITIGATION MEASURES		
	Management and mitigation measures	Timeframe	Responsibility
<b>Construction Camp</b>			
Site of the construction camp	<ol style="list-style-type: none"> <li>1. The size of the construction camp should be minimised.</li> <li>2. Adequate parking must be provided for site staff and visitors. The Contractor must attend to drainage of the camp site to avoid standing water and/or sheet erosion.</li> <li>3. Secure the site, working areas and excavations in an appropriate manner.</li> <li>4. Restrict construction activities to daylight hours in order to negate or reduce the visual impacts of lighting.</li> <li>5. Suitable control measures over the Contractor’s yard, plant and material storage to mitigate any visual impact of the construction activity must be implemented.</li> </ol>	Construction phase	Principal Contractor, Environmental Liaison Officer and Environmental Control Officer
Storage of materials (including hazardous materials)	<ol style="list-style-type: none"> <li>1. Choice of location for storage areas must consider prevailing winds, distances to water bodies, general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary.</li> <li>2. Storage areas must be designated, demarcated and fenced if necessary.</li> <li>3. Storage areas should be secure to minimise the risk of crime. They should also be safe from access by unauthorised persons i.e. children/animals etc.</li> <li>4. Fire prevention facilities must be present at all storage facilities.</li> <li>5. Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage area(s). These pollution prevention measures for storage should include a bund wall high enough to contain at least 110% of any stored volume, and this should be situated away from drainage lines in a site with the approval of the Project Manager. The bund</li> </ol>	Construction phase	Principal Contractor, Environmental Liaison Officer and Environmental Control Officer

	<p>wall must be high enough to contain 110% of the total volume of the stored hazardous material with an additional allocation for potential stormwater events.</p> <ol style="list-style-type: none"> <li>6. All fuel storage areas must be roofed to avoid creation of dirty stormwater.</li> <li>7. These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of stormwater from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources.</li> <li>8. Material Safety Data Sheets (MSDSs) shall be readily available on site for all chemicals and hazardous substances to be used on site. Where possible the available, MSDSs should additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes.</li> <li>9. Storage areas containing hazardous substances/materials must be clearly signposted.</li> <li>10. Staff dealing with these materials/substances must be aware of their potential impacts and follow the appropriate safety measures.</li> <li>11. An approved waste disposal contractor must be employed to remove, transport and recycle waste oil, if practical. The Contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training.</li> <li>12. All excess cement and concrete mixes are to be contained on the construction site prior to disposal off site.</li> <li>13. All major spills as specified in the contractor emergency response procedure of any materials, chemicals, fuels or other potentially hazardous or pollutant substances must be cleaned immediately, and the cause of the spill investigated. Preventative measures must be identified and submitted to the Principal Contractor and ECO for information. Emergency response procedures to be followed and implemented.</li> <li>14. Emergency and spillage plans need to be developed and submitted to the</li> </ol>		
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	relevant authorities for approval.		
Drainage of the construction camp	<p>Surface drainage measures must be established in the Construction Camps so as to prevent:</p> <ul style="list-style-type: none"> <li>• Ponding of water;</li> <li>• Erosion as a result of accelerated runoff; and,</li> <li>• Uncontrolled discharge of polluted runoff.</li> </ul>	Construction phase	Principal Contractor, Environmental Liaison Officer and Environmental Control Officer
<b>Construction Traffic and Access</b>			
Construction traffic	<ol style="list-style-type: none"> <li>1. Construction routes and required access roads must be clearly defined and carefully planned to limit any intrusion on the neighbouring property owners and road users and to limit any accident risks.</li> <li>2. Provision of adequate and strategically placed traffic warning signs and control measures along the surfaced service road via the D1235 or R511 to warn road users of the construction activities taking place for the duration of the construction phase. Warning signs must be always visible, especially at night.</li> <li>3. Delivery of equipment must be undertaken with the minimum amount of trips to reduce the carbon footprint of these activities.</li> <li>4. Avoid heavy vehicle activity during “peak” hours (when children are taken to school, or people are driving to work).</li> <li>5. Access of all construction and material delivery vehicles should be strictly controlled, especially during wet weather to avoid compaction and damage to the topsoil structure.</li> <li>6. Damping down of the un-surfaced roads must be implemented to reduce dust and nuisance.</li> <li>7. Vehicles and equipment shall be serviced regularly to avoid the contamination of soil from oil and hydraulic fluid leaks etc.</li> <li>8. Servicing must be done in dedicated service areas on site or else off site if no such area exists.</li> <li>9. Oil changes must take place on a concrete platform and over a drip tray to avoid pollution.</li> <li>10. Soils compacted by construction shall be deep ripped to loosen compacted</li> </ol>	Construction phase	Principal Contractor and Environmental Liaison Officer

	<p>layers and re-graded to even running levels.</p> <ol style="list-style-type: none"> <li>11. All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.</li> <li>12. Vehicles carrying material that can be wind-blown should be covered with a suitable material.</li> <li>13. All drivers must be qualified, obey traffic rules, follow speed limits and be made aware of the potential road safety issues.</li> <li>14. Implement penalties for reckless driving to enforce compliance to traffic rules.</li> <li>15. All construction vehicles must be roadworthy and drivers must have the relevant licenses for the type of vehicles they are operating; and</li> <li>16. All vehicle drivers need to strictly adhere to the rules of the road.</li> <li>17. The developer and EPC Contractor must ensure that all fencing along access roads is maintained in the present condition or repaired if disturbed due to construction activities.</li> <li>18. The developer and EPC Contractor must ensure that the roads utilised for construction activities are either maintained in the present condition or upgraded if disturbed due to construction activities.</li> <li>19. The EPC Contractor must ensure that damage / wear and tear caused by construction related traffic to the access roads is repaired before the completion of the construction phase.</li> <li>20. A method of communication must be implemented whereby procedures to lodge complaints are set out for the local community to express any complaints or grievances with the construction process.</li> <li>21. Gravel roads used will need to be maintained in an appropriate condition. Re-gravelling may be necessary as a maintenance measure (also relevant to the operation phase).</li> </ol>		
Access to the site	<ol style="list-style-type: none"> <li>1. The main routes on the site must be clearly signposted and printed delivery maps must be issued to all suppliers and sub-contractors.</li> <li>2. Planning of access routes to the site for construction purposes must be done in conjunction with the Contractor and the Landowner. All agreements reached should be documented and no verbal agreements</li> </ol>	Construction phase	Principal Contractor and Environmental Liaison Officer

	<p>should be made. The Contractor shall clearly mark all access roads. Roads not to be used shall be marked with a "NO ENTRY for construction vehicles" sign.</p> <ol style="list-style-type: none"> <li>3. Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.</li> <li>4. Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access routes. The development (including the development footprint and contractor's equipment camp) must also be secured and fenced and clearly demarcated.</li> <li>5. Electrical fencing should be constructed in a manner which allows for the passage of small and medium sized mammals and small avifauna. Steel palisade fencing (20 cm gaps min) is a good option in this regard as it allows most medium-sized mammals to pass between the bars, but remains an effective obstacle for humans. Alternatively, the lowest strand or bottom of the fence should be elevated to 30cm above the ground which should be sufficient to allow smaller animals, reptiles and tortoises to pass through (tortoises retreat into their shells when electrocuted and eventually succumb from repeated shocks), but still remain effective as a security barrier.</li> <li>6. Stripping of vegetation for access roads should be restricted and existing roads should be used as far as possible.</li> <li>7. The movement of all vehicles within the site must be on designated roadways.</li> <li>8. Signage must be established at appropriate points warning of turning traffic and the construction site, identifying speed limits, travel restrictions and other standard traffic control information. All signage must be in accordance with the prescribed standards and must be appropriately maintained for the duration of the construction period.</li> <li>9. The access point situated off the R36 must be formalised to standard, which will in all probability be a requirement as part of the wayleave approval of the Thabazimbi Local Municipality and the Gauteng Department: Police, Roads and Transport.</li> </ol>		
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Maintenance of the road	<ol style="list-style-type: none"> <li>1. Where necessary suitable measures shall be taken to rehabilitate damaged areas.</li> <li>2. Contractors should ensure that access roads are maintained in good condition by attending to potholes, corrugations and stormwater damages as soon as these develop.</li> <li>3. If necessary, staff must be employed to clean surfaced roads adjacent to construction sites where materials have spilt.</li> <li>4. The contractor must ensure that damage caused by construction related traffic to the D1235 or R511is repaired before the completion of the construction phase. The costs associated with the repair must be borne by the contractor.</li> </ol>	Construction phase	Principal Contractor and Environmental Liaison Officer
Noise	<p>Movement of heavy construction vehicles through residential areas should be timed to avoid peak morning and evening traffic periods. In addition, movement of heavy construction vehicles through residential areas should not take place over weekends.</p> <p>Ensure all vehicles are road worthy, drivers are qualified and are aware of potential noise issue.</p> <p>A grievance mechanism should be implemented.</p>	Construction phase	Principal Contractor and Environmental Liaison Officer
General mitigation regarding construction traffic and access	<ol style="list-style-type: none"> <li>1. The Contractor shall meet safety requirements under all circumstances. All equipment transported shall be clearly labelled as to their potential hazards according to specifications. All the required safety labelling on the containers and trucks used shall be in place.</li> <li>2. The Contractor shall ensure that all the necessary precautions against damage to the environment and injury to persons are taken.</li> <li>3. Care for the safety and security of community members crossing access roads should receive priority at all times.</li> <li>4. No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the</li> </ol>	Construction phase	Principal Contractor and Environmental Liaison Officer

	<p>Contractor.</p> <ol style="list-style-type: none"> <li>5. All relevant permits for abnormal loads must be applied for from the relevant authority (pre-construction).</li> <li>6. Stagger component delivery to site.</li> <li>7. Reduce the construction period.</li> <li>8. The use of mobile batch plants and quarries in close proximity to the site.</li> <li>9. Staff and general trips should occur outside of peak traffic periods.</li> <li>10. Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase</li> </ol>		
<b>Environmental education and Training</b>			
Environmental training	<ol style="list-style-type: none"> <li>1. The project manager must appoint an ECO prior to construction.</li> <li>2. Ensure that all site personnel have a basic level of environmental awareness training. The Contractor must submit a proposal for this training to the ECO for approval. Topics covered should include: <ul style="list-style-type: none"> <li>• What is meant by “Environment”</li> <li>• Why the environment needs to be protected and conserved</li> <li>• How construction activities can impact on the environment</li> <li>• What can be done to mitigate against such impacts?</li> <li>• Awareness of emergency and spills response provisions</li> <li>• Social responsibility during construction e.g. being considerate to local residents</li> </ul> </li> <li>3. Training should be undertaken by a party such as the ECO who has sufficient expertise and knowledge of environmental issues.</li> <li>4. It is the Contractor’s responsibility to provide the site foreman with no less than 1 hour’s environmental training and to ensure that the foreman has sufficient understanding to pass this information onto the construction staff.</li> <li>5. Training should be provided to the staff members in the use of the appropriate fire-fighting equipment. Translators are to be used where necessary.</li> <li>6. Use should be made of environmental awareness posters on site.</li> <li>7. The need for a “clean site” policy also needs to be explained to the</li> </ol>	Construction phase	Angus Solar Power Plant (RF) (Pty) Ltd

	<p>workers.</p> <p>8. Staff operating equipment (such as loaders, etc.) shall be adequately trained and sensitized to any potential hazards associated with their tasks.</p>		
Monitoring of environmental training	The Contractor must monitor the performance of construction workers to ensure that the points relayed during their introduction have been properly understood and are being followed. If necessary, the ECO and/or a translator should be called to the site to further explain aspects of environmental or social behaviour that are unclear. Toolbox talks are recommended.	Construction phase	Angus Solar Power Plant (RF) (Pty) Ltd
<b>Soils and Geology</b>			
Mitigation for soil compaction	The most effective mitigation will be the minimisation of the project footprint by using the existing roads in the area and not create new roads to prevent other areas also getting compacted.	Construction phase	Principal Contractor and Environmental Liaison Officer
Chemical soil pollution	<ol style="list-style-type: none"> <li>1. All waste generated on site during construction should be stored in waste bins and removed from site on a regular basis.</li> <li>2. Vehicles accessing the site should regularly be checked for fuel and oil spills. In case of spillage, the contaminated soil should be removed and transported to a designated waste site.</li> <li>3. Broken or old batteries or components of the PV plant should be stored in a demarcated area in quarantine for the shortest period possible until it can be collected and taken to a special chemical waste facility.</li> <li>4. Refuelling points must be well managed and if any soils are contaminated, it must be stripped and disposed of at a registered hazardous waste dumping site.</li> <li>5. Any excess or waste material or chemicals should be removed from the site and discarded in an environmentally friendly way. The ECO should enforce this rule rigorously.</li> <li>6. Spill kits should be on-hand to deal with spills immediately.</li> <li>7. All vehicles should be inspected for oil and fuel leaks on a regular basis. Vehicle maintenance yards on site should make provision for drip trays</li> </ol>	Construction phase	Principal Contractor and Environmental Liaison Officer

	that will be used to capture any spills. Drip trays should be emptied into a holding tank and returned to the supplier.		
Guidelines for the stripping and storage of topsoil	<ol style="list-style-type: none"> <li>1. The Contractor must, prior to the commencement of earthworks determine the average depth of topsoil and agree on this with the ECO. The full depth of topsoil must be stripped from areas affected by construction and related activities prior to the commencement of major earthworks. This must include the building footprints, working areas and storage areas. Topsoil must be reused where possible to rehabilitate disturbed areas.</li> <li>2. Care must be taken not to mix topsoil and subsoil during stripping.</li> <li>3. Should any topsoil become polluted the Contractor must remove the polluted soil to the full depth of pollution and replace it at his own expense with clean topsoil.</li> <li>4. Removed polluted topsoil must be transported to a licensed landfill site.</li> <li>5. The topsoil must be conserved on site in and around the pit area.</li> <li>6. Topsoil should be stored at slope that inhibits erosion (this requirement is also relevant for subsoil and overburden stockpile).</li> </ol>	Construction phase	Principal Contractor and Environmental Liaison Officer
Soil stripping	<ol style="list-style-type: none"> <li>1. No soil stripping must take place on areas within the site that the Contractor does not require for construction works or areas of retained vegetation.</li> <li>2. Topsoil must not be stripped or stockpiled when it is raining or when the soil is wet as compaction will occur.</li> <li>3. Subsoil and overburden in all construction and laydown areas should be stockpiled separately to be returned for backfilling in the correct soil horizon order.</li> <li>4. Construction vehicles must only be allowed to utilise existing tracks or pre-planned access routes.</li> </ol>	Construction phase	Principal Contractor and Environmental Control Officer
Guidelines for soil stockpiles	<ol style="list-style-type: none"> <li>1. Stockpiles should not be situated such that they obstruct natural water pathways.</li> </ol>	Construction phase	Principal Contractor and Environmental

	<ol style="list-style-type: none"> <li>2. Stockpiles must not exceed 2m in height unless otherwise permitted by the Engineer.</li> <li>3. If stockpiles are exposed to windy conditions or heavy rain, they must be covered either by vegetation or geofabric, depending on the duration of the project. Stockpiles may further be protected by the construction of berms or low brick walls around their bases.</li> <li>4. Stockpiles must be kept clear of weeds and alien vegetation growth by regular weeding.</li> <li>5. Should topsoil be stockpiled for longer than 6 months it must be vegetated.</li> <li>6. Where contamination of soil is expected, analysis must be done prior to disposal of soil to determine the appropriate disposal route. Proof from an approved waste disposal site where contaminated soils are dumped if and when a spillage/leakage occurs should be attained and given to the project manager.</li> <li>7. Dispose of all subsurface spoils from excavations where they will not impact on undisturbed land.</li> <li>8. If an activity will mechanically disturb the soil below surface in any way, then any available topsoil must first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface. Record GPS positions of all occurrences of below-surface soil disturbance (e.g. excavations). Record the date of topsoil stripping and replacement. Check that topsoil covers the entire disturbed area. The depth of topsoil stripping is dependent on the specific field conditions. The maximum depth should be 30cm. If additional unconsolidated material exists below 30cm and needs to be removed for construction purposes, it must be stripped and stockpiled separately from the upper 30cm topsoil. Such material should only be used for fill below a topsoil layer, and not used for spreading on the surface. If there is less than 30cm of unconsolidated soil material above a limiting layer of rock or hardpan, then the entire depth must be stripped and stockpiled as topsoil, even if it contains a high proportion of coarse fragments.</li> </ol>		Control Officer
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	<p>9. Topsoil should be retained in the area below the panels (or mirrors). It is not desirable to strip and stockpile this topsoil for the whole of the operational phase. It will be much more effective for rehabilitation, to retain the topsoil in place. If levelling requires significant cutting, topsoil should be temporarily stockpiled and then re-spread after cutting, so that there is a covering of topsoil over the entire surface before the panels are mounted.</p>		
Erosion	<ol style="list-style-type: none"> <li>1. Undertake a periodic site inspection to record the occurrence of erosion and re-vegetation progress of all areas that require re-vegetation. This must be undertaken every four months.</li> <li>2. Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site to stabilize disturbed soil against erosion.</li> <li>3. The project must be divided into as many phases as possible, to ensure that the exposed areas prone to erosion are minimal at any specific time.</li> <li>4. Cover disturbed soils as completely as possible, using vegetation or other materials.</li> <li>5. Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices.</li> <li>6. Protect sloping areas and drainage channel banks that are susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas.</li> <li>7. Repair all erosion damage as soon as possible to allow for sufficient rehabilitation growth.</li> <li>8. Gravel roads to the construction sites must be well drained to limit soil erosion.</li> <li>9. Control the flow of runoff to move the water safely off the site without destructive gully formation.</li> <li>10. Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas.</li> <li>11. Implement an effective system of storm water run-off control, where it is</li> </ol>	Construction phase	Environmental Control Officer

	<p>required - that is at any points where run-off water might accumulate. The system must effectively collect and safely disseminate any run-off water from all accumulation points, and it must prevent any potential down slope erosion.</p> <p>12. Areas that are denuded during construction must be re-vegetated with indigenous vegetation to prevent erosion during flood events etc.</p>		
Storage of fuel on site	<ol style="list-style-type: none"> <li>1. Less than 80 cubic meters of fuel is permitted to be stored on site at any one time.</li> <li>2. Topsoil and subsoil to be protected from contamination. This must be monitored on a monthly basis by a visual inspection of diesel/oil spillage and pollution prevention facilities.</li> <li>3. Fuel and material storage must be away from stockpiles.</li> <li>4. Concrete and chemicals must be mixed on an impervious surface and provisions must be made to contain spillages or overflows into the soil.</li> <li>5. Any storage tanks containing hazardous materials must be placed in banded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material.</li> </ol>	Construction phase	Principal Contractor and Environmental Control Officer
Mixing of concrete on site	<ol style="list-style-type: none"> <li>1. The concrete batching plant must be contained within a banded area.</li> <li>2. Concrete mixing must only take place within designated areas.</li> <li>3. Ready mixed concrete must be utilised where possible.</li> <li>4. No vehicles transporting concrete to the site may be washed on site.</li> <li>5. If a batching plant is necessary, run-off should be managed effectively to avoid contamination of other areas of the site. Run-off from the batch plant must not be allowed to enter the stormwater system.</li> </ol>	Construction phase	Principal Contractor and Environmental Control Officer
Earth works	<ol style="list-style-type: none"> <li>1. Soils compacted during construction must be deeply ripped to loosen compacted layers and re-graded to even running levels. Topsoil must be re-spread over landscaped areas.</li> <li>2. It is recommended that a suitably qualified engineering geologist or</li> </ol>	Construction phase	Principal Contractor and Environmental Control Officer

	<p>geotechnical engineer inspect all foundation trenches prior to construction in order to identify and evaluate any soil characteristics in variance with that found during the detailed geotechnical investigation.</p>		
<b>Erosion Control</b>			
<p>Erosion control actions that need to be implemented during construction</p>	<ol style="list-style-type: none"> <li>1. Wind screening and stormwater control must be undertaken to prevent soil loss from the site.</li> <li>2. The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion.</li> <li>3. Other erosion control measures that can be implemented are as follows: <ul style="list-style-type: none"> <li>o Brush packing with cleared vegetation</li> <li>o Mulch or chip packing</li> <li>o Planting of vegetation</li> <li>o Hydroseeding/hand sowing</li> </ul> </li> <li>4. Sensitive areas need to be identified prior to construction so that the necessary precautions can be implemented.</li> <li>5. All erosion control mechanisms need to be regularly maintained.</li> <li>6. Seeding of topsoil and subsoil stockpiles to prevent wind and water erosion of soil surfaces must be undertaken.</li> <li>7. Retention of vegetation where possible to avoid soil erosion.</li> <li>8. Vegetation clearance must be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time.</li> <li>9. Re-vegetation of disturbed surfaces must occur immediately after construction activities are completed. This must be done through seeding with indigenous grasses.</li> <li>10. No impediment to the natural water flow other than approved erosion control works is permitted.</li> <li>11. To prevent stormwater damage, the increase in stormwater run-off resulting from construction activities must be estimated and the drainage system assessed accordingly. A drainage plan must be submitted to the Engineer for approval and must include the location and design criteria of any temporary stream crossings.</li> </ol>	<p>Construction phase</p>	<p>Environmental Control Officer</p>



	<ol style="list-style-type: none"> <li>12. Stockpiles not used in three (3) months after stripping must be seeded to prevent dust and erosion.</li> <li>13. The project should be divided into as many phases as possible, to ensure that the exposed areas prone to erosion are minimal at any specific time.</li> <li>14. Cover disturbed soils as completely as possible, using vegetation or other materials.</li> <li>15. Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices.</li> <li>16. Protect sloping areas and drainage channel banks that are susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas.</li> <li>17. Repair all erosion damage as soon as possible to allow for sufficient rehabilitation growth.</li> <li>18. Gravel roads to the construction sites must be well drained to limit soil erosion.</li> <li>19. Control the flow of runoff to move the water safely off the site without destructive gully formation.</li> <li>20. Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas.</li> <li>21. Clearing of vegetation should be scheduled for the drier winter months and limited to areas immediately needed for construction. Vegetation stripping should occur in parallel with the progress of construction to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment. Only selected plant species must be used in the re-vegetation process.</li> <li>22. Minimize soil exposure around the solar development. Re-vegetate exposed areas surrounding the solar development and allow a sufficient buffer between the development to prevent sedimentation into the wetlands / rivers.</li> <li>23. Manage water effectively on, to, within, and from this site.</li> <li>24. Employ sediment capture techniques and stormwater attenuation</li> </ol>		
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	<p>techniques.</p> <p>25. All development activities should be restricted to the footprint areas of the proposed development. The Environment Site Officer (ESO) should demarcate and control these areas. Storage of building equipment, fuel and other materials should be limited to demarcated areas. Layouts should be adapted to fit natural patterns rather than imposing rigid geometries.</p> <p>26. The Environment Control Officer (ECO) should advise the construction team in all relevant matters to ensure minimum destruction and damage to the environment and specifically wetlands. The ECO should enforce any measures that he/she deem necessary. Regular environmental training should be provided to construction workers to ensure the protection of the habitat, fauna and flora and their sensitivity to conservation.</p> <p>27. Rehabilitation of the development area after construction have been completed should be considered a high priority and all areas rehabilitated should be audited after construction has ceased by a suitably qualified environmentalist.</p> <p>28. Environmental monitoring of environmental aspects should be implemented during and after the construction phase of the development to ensure that minimal impact is caused to the wetlands of the area.</p>		
<b>Water Use and Quality</b>			
Water use	<p>1. Develop a sustainable water supply management plan to minimise the impact to natural systems by managing water use, avoiding depletion of aquifers and minimising impacts to water users.</p> <p>2. Water must be used sparingly and reused, recycled or treated where possible.</p>	Construction phase	Engineer
	<p>Consultation must be undertaken with key stakeholders to understand any conflicting water use demands and the community's dependency on water resources and conservation requirements within the area.</p>	Construction phase	Environmental Control officer

<p>Management of water quality</p>	<ol style="list-style-type: none"> <li>1. The quality and quantity of effluent streams discharged to the environment including stormwater must be managed and treated to meet applicable effluent discharge guidelines.</li> <li>2. Quality of water being discharged must be tested on a monthly basis.</li> <li>3. Discharge to surface water must not result in contaminant concentrations in excess of local ambient water quality criteria outside a scientifically established mixing zone.</li> <li>4. Efficient oil and grease traps or sumps must be installed and maintained at refuelling facilities, workshops, fuel storage depots, and containment areas and spill kits must be available with emergency response plans.</li> </ol>	<p>Construction phase</p>	<p>Environmental Control officer</p>
<p>Stormwater management</p>	<ol style="list-style-type: none"> <li>1. A comprehensive stormwater management plan for hard surfaces is to make up part of the final project design, which must include appropriate ways of handling stormwater within the site.</li> <li>2. The site must be managed in order to prevent pollution of drains, downstream watercourses or groundwater, due to suspended solids and silt or chemical pollutants.</li> <li>3. Silt fences must be used to prevent any soil entering the stormwater drains.</li> <li>4. Temporary cut off drains and berms may be required to capture stormwater and promote infiltration.</li> <li>5. Promote a water saving mind set with construction workers in order to ensure less water wastage.</li> <li>6. New stormwater construction must be developed strictly according to specifications from engineers in order to ensure efficiency.</li> <li>7. Hazardous substances must be stored at least 20m from any water bodies on site to avoid pollution.</li> <li>8. The installation of the stormwater system must take place as soon as possible to attenuate stormwater from the construction phase as well as the operation phase.</li> <li>9. Earth, stone and rubble is to be properly disposed of, or utilised on site so as not to obstruct natural water path ways over the site. i.e. these</li> </ol>	<p>Construction phase</p>	<p>Environmental Control officer</p>

	<p>materials must not be placed in stormwater channels, drainage lines or rivers.</p> <p>10. There must be periodic checking of the site's drainage system to ensure that the water flow is unobstructed.</p> <p>11. If a batching plant is necessary, run-off must be managed effectively to avoid contamination of other areas of the site. Untreated runoff from the batch plant must not be allowed to get into the stormwater system or nearby streams, rivers, wetlands or erosion channels or dongas.</p>		
Protection of groundwater resources	<ol style="list-style-type: none"> <li>1. No unauthorised groundwater abstraction may occur on the site.</li> <li>2. Should any water be discharged from site, the water is to comply with national effluent standards. No contaminated water must be discharged from site.</li> <li>3. No activities must be allowed to encroach into a water course or feature without a Water Use License being in place from the Department of Water and Sanitation (DWS).</li> </ol>	Construction phase	Environmental Control officer
Sanitation	<ol style="list-style-type: none"> <li>1. Adequate sanitary facilities and ablutions must be provided for construction workers (1 toilet per every 15 workers) at appropriate locations on site.</li> <li>2. The facilities must be regularly serviced and appropriately maintained to reduce the risk of surface or groundwater pollution.</li> <li>3. Ablution or sanitation facilities must not be located within 100m of any water courses or features.</li> </ol>	Construction phase	Environmental Control officer
Concrete mixing	Concrete contaminated water must not enter soil or any natural drainage system as this disturbs the natural acidity of the soil and affects plant growth.	Construction phase	Environmental Control officer
Public areas	<ol style="list-style-type: none"> <li>1. Food preparation areas must be provided with adequate washing facilities and food refuse must be stored in sealed refuse bins which must be removed from site on a regular basis.</li> </ol>	Construction phase	Environmental Control officer

	<ol style="list-style-type: none"> <li>2. The Contractor must take steps to ensure that littering by construction workers does not occur and persons must be employed on site to collect litter from the site and immediate surroundings, including litter accumulating at fence lines.</li> <li>3. No washing or servicing of vehicles on site.</li> </ol>		
<b>Surface and ground water</b>			
Sanitation on site	<ol style="list-style-type: none"> <li>1. Adequate sanitary facilities and ablutions must be provided for construction workers (1 toilet per every 15 workers).</li> <li>2. Water saving devices and technologies such as the use of dual flush toilets should be considered.</li> <li>3. The facilities must be regularly serviced to reduce the risk of surface or groundwater pollution.</li> </ol>	Construction phase	Principal Contractor and Environmental Control officer
Use and storage of hazardous materials	<ol style="list-style-type: none"> <li>1. Use and or storage of materials, fuel and chemicals which could potentially leak into the ground must be controlled.</li> <li>2. All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material.</li> <li>3. Any hazardous substances must be stored at least 20m from any of the water bodies on site.</li> <li>4. The Contractor (monitored by the Environmental Control or Liaison Officer) should be responsible for ensuring that potentially harmful materials are properly stored in a dry, secure, ventilated environment, with concrete or sealed flooring and a means of preventing unauthorised entry.</li> <li>5. Contaminated wastewater must be managed by the Contractor to ensure existing water resources on the site are not contaminated. All wastewater from general activities in the camp must be collected and removed from the site for appropriate disposal at a licensed commercial facility.</li> </ol>	Construction phase	Principal Contractor and Environmental Control officer

Concrete mixing	Concrete contaminated water must not enter soil or any natural drainage system as this disturbs the natural acidity of the soil and affects plant growth.	Construction phase	Principal Contractor and Environmental Control officer
Public areas	No washing or servicing of vehicles on site.	Construction phase	Principal Contractor and Environmental Control officer
Water resources	<ol style="list-style-type: none"> <li>1. Site staff shall not be permitted to use any other open water body or natural water source adjacent to or within the designated site for the purposes of bathing, washing of clothing or for any construction or related activities.</li> <li>2. Municipal water (or another source approved by the ECO) must instead be used for all activities such as washing of equipment or disposal of any type of waste, dust suppression, concrete mixing, compacting, etc.</li> <li>3. Relevant departments and other emergency services must be contacted in order to deal with spillages and contamination of aquatic environments.</li> </ol>	Construction phase	Principal Contractor and Environmental Control officer
Site specific mitigation measures for surface water	<ol style="list-style-type: none"> <li>1. Restrict the disturbance and clearance footprint to within 5 m on either side of the proposed powerline route (10 m disturbance corridor).</li> <li>2. Avoid wetlands and buffers where feasible.</li> <li>3. Implement a rehabilitation plan for any disturbed wetlands. Cleared areas must be rehabilitated and stabilised to avoid impacts to adjacent wetland and buffer areas.</li> <li>4. Although the prescribed post-mitigation buffer as per the national buffer determination tool is 15 m attempt wherever possible to maintain a 33 m buffer on the delineated wetlands to lower the potential for bird collisions which are highest near water resources.</li> <li>5. Reduce the disturbance footprint and the unnecessary clearing of vegetation when traversing the identified drainage lines.</li> <li>6. Make use of existing access routes as much as possible, before new routes are considered. Any selected “new” route must not encroach into the wetland areas.</li> <li>7. Keep tower base excavation and soil heaps neat and tidy.</li> </ol>	Construction phase	Principal Contractor and Environmental Control officer

	<ol style="list-style-type: none"> <li>8. Limit construction activities in proximity (&lt; 50 m) to wetlands to the dry season when storms are least likely to wash concrete and sand into wetlands. This is only where towers are within wetlands and buffer areas.</li> <li>9. Ensure soil stockpiles and concrete / building sand are sufficiently safeguarded against rain wash.</li> <li>10. Mixing of concrete must under no circumstances take place in any wetland or their buffers. Scrape the area where mixing and storage of sand and concrete occurred to clean once finished.</li> <li>11. Limit the placement of towers within wetlands and buffer areas where feasible.</li> <li>12. Do not situate any of the construction material laydown areas within any wetland or buffer area. Try adhere to a 30 m buffer in these instances.</li> <li>13. No machinery should be allowed to parked in any wetlands or buffer areas.</li> <li>14. Promptly remove all alien and invasive plant species that may emerge during construction (i.e. weedy annuals and other alien forbs) must be removed.</li> <li>15. Limit soil disturbance</li> <li>16. The use of herbicides is not recommended in or near wetlands (opt for mechanical removal).</li> <li>17. Appropriately stockpile topsoil cleared from the powerline footprint.</li> <li>18. Clearly demarcate powerline construction footprint, and limit all activities to within this area.</li> <li>19. Minimize unnecessary clearing of vegetation beyond the tower footprints and powerline corridors.</li> <li>20. Lightly till any disturbed soil around the tower footprint to avoid compaction.</li> <li>21. Re-instate topsoil and lightly till transmission tower disturbance footprint.</li> <li>22. Make sure all excess consumables and building materials / rubble is removed from site and deposited at an appropriate waste facility.</li> <li>23. Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) or construction materials on site (e.g. concrete) in such a way as to prevent them leaking</li> </ol>		
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	<p>and entering wetland or buffer areas.</p> <ol style="list-style-type: none"> <li>24. Mixing of concrete must under no circumstances take place within the wetland or buffer areas.</li> <li>25. Check for oil leaks, keep a tidy operation, and promptly clean up any spills or litter.</li> <li>26. Provide appropriate sanitation facilities for workers during construction and service them regularly.</li> <li>27. The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected must be disposed of at a licensed disposal facility;</li> <li>28. The Contractor must be in possession of an emergency spill kit that must be complete and available at all times on site;</li> <li>29. Any possible contamination of topsoil by hydrocarbons must be avoided. Any contaminated soil must be treated in situ or be placed in containers and removed from the site for disposal in a licensed facility;</li> </ol>		
<p>Site specific mitigation measures for groundwater</p>	<ol style="list-style-type: none"> <li>1. Inventories should be made of all substances that are potentially hazardous to groundwater, which will be stored, used or transported over the sites. The risk of each substance to the groundwater should be considered.</li> <li>2. All areas in which substances potentially hazardous to groundwater are stored, loaded, worked with or disposed of should be securely bunded (impermeable floor and sides) to prevent accidental discharge to groundwater.</li> <li>3. A groundwater monitoring programme (quality and groundwater levels) should be designed and installed for the site should groundwater be abstracted. Monitoring boreholes should be securely capped, and must be fitted with a suitable sanitary seal to prevent surface water flowing down the outside of the casing. Full construction details of monitoring boreholes must be recorded when they are drilled (e.g. screen and casing lengths, diameters, total depth, etc). Sampling of monitoring boreholes should be done according to recognised standards.</li> </ol>	<p>Construction phase</p>	<p>Principal Contractor and Environmental Control officer</p>



<b>Waste Management</b>			
General considerations	<ol style="list-style-type: none"> <li>1. Construction methods and materials should be carefully considered in view of waste reduction, re-use and recycling opportunities.</li> <li>1. Construction contractors must provide specific detailed waste management plans to deal with all waste streams.</li> <li>2. Specific areas must be designated on-site for the temporary management of various waste streams. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of runoff, seepage and vermin control.</li> <li>3. Adequate weather and vermin proof waste bins and skips (covered at minimum with secured netting or shade cloth) should be placed on site. Separate bins should be provided for general and hazardous waste.</li> <li>4. Documentation (waste manifest) must be maintained detailing the quantity, nature and fate of any regulated waste. Waste disposal records must be available for review at any time.</li> </ol>	Duration of the activity	Principal Contractor
Litter management	<ol style="list-style-type: none"> <li>1. Refuse bins must be placed at strategic positions to ensure that litter does not accumulate within the construction site.</li> <li>2. The Contractor shall supply waste collection bins where such is not available and all solid waste collected shall be disposed of at registered/licensed landfill.</li> <li>3. A housekeeping team should be appointed to regularly maintain the litter and rubble situation on the construction site.</li> <li>4. If possible and feasible, all waste generated on site must be separated into glass, plastic, paper, metal and wood and recycled. An independent contractor can be appointed to conduct this recycling.</li> <li>5. Littering by the employees of the Contractor shall not be allowed under any circumstances. The ECO shall monitor the neatness of the work sites as well as the Contractor campsite.</li> <li>6. Skip waste containers should be maintained on site. These should be kept covered and arrangements made for them to be collected regularly.</li> <li>7. All waste must be removed from the site and transported to a landfill site</li> </ol>	Construction phase	Environmental Liaison Officer

	<p>promptly to ensure that it does not attract vermin or produce odours.</p> <ol style="list-style-type: none"> <li>8. Where a registered waste site is not available close to the construction site, the Contractor shall provide a method statement with regard to waste management.</li> <li>9. A certificate of disposal shall be obtained by the Contractor and kept on file, if relevant.</li> <li>10. Under no circumstances may solid waste be burnt on site.</li> <li>11. All waste must be removed promptly to ensure that it does not attract vermin or produce odours.</li> </ol>		
Hazardous waste management	<ol style="list-style-type: none"> <li>1. All waste hazardous materials must be carefully stored as advised by the ECO, and then disposed of offsite at a licensed landfill site, where practical. Incineration may be used where relevant.</li> <li>2. Contaminants to be stored safely to avoid spillage.</li> <li>3. Machinery must be properly maintained to keep oil leaks in check.</li> <li>4. All necessary precaution measures shall be taken to prevent soil or surface water pollution from hazardous materials used during construction and any spills shall immediately be cleaned up and all affected areas rehabilitated.</li> <li>5. Ensure compliance with all national, regional and local legislation with regard to the storage handling and disposal of hydrocarbons, chemicals, solvents, and any other harmful and hazardous substances and materials. The onus is on the Contractor to identify and interpret the applicable legislation.</li> <li>6. SABS approved spill kits to be available and easily accessible.</li> </ol>	Construction phase	Environmental Liaison Officer
Sanitation	<ol style="list-style-type: none"> <li>1. Staff shall be sensitised to the fact that they should use the available mobile chemical toilets at all times. No indiscriminate sanitary activities on site shall be allowed.</li> <li>2. Ablution facilities shall be within 50m from workplaces. There should be enough toilets available to accommodate the workforce (minimum requirement 1:15 workers). Male and females must be accommodated</li> </ol>	Construction phase	Environmental Liaison Officer

	<p>separately where possible.</p> <ol style="list-style-type: none"> <li>3. Toilets shall be serviced regularly, and the ECO shall inspect toilets regularly.</li> <li>4. Under no circumstances may open areas, neighbours fences or the surrounding bush be used as a toilet facility.</li> <li>5. The construction of “Long Drop” toilets is forbidden, but rather toilets connected to the sewage treatment plant.</li> <li>6. Potable water must be provided for all construction staff.</li> </ol>		
Remedial actions	<ol style="list-style-type: none"> <li>1. An effective monitoring system must be put in place to detect any leakage or spillage during their transportation, handling, installation and storage.</li> <li>2. Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance is identified.</li> <li>3. Depending on the nature and extent of the spill, contaminated soil must be either excavated or treated on-site. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible.</li> <li>4. Excavation of contaminated soil must involve careful removal of soil using appropriate tools/machinery to storage containers until treated or disposed of at a licensed hazardous landfill site.</li> <li>5. The ECO must determine the precise method of treatment for polluted soil. This could involve the application of soil absorbent materials as well as oil-digestive powders to the contaminated soil.</li> <li>6. If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent material.</li> <li>7. If necessary, oil absorbent sheets or pads must be attached to leaky machinery or infrastructure.</li> <li>8. Materials used for the remediation of petrochemical spills must be used according to product specifications and guidance for use.</li> <li>9. Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment and stored in adequate containers until appropriate disposal.</li> <li>10. In the event of a major spill or leak of contaminants, the relevant</li> </ol>	Duration of the project	Environmental Liaison Officer and Principal Contractor

	<p>administering authority must be notified immediately as per the notification of emergencies/incidents.</p> <ol style="list-style-type: none"> <li>11. Routine servicing and maintenance of vehicles should not take place on site (except for emergencies, in which case an appropriate drip tray must be used to contain any fuel or oils).</li> <li>12. Keep a record of all hazardous substances stored on site. Clearly label all the containers storing hazardous waste.</li> <li>13. Any water that collects in bunds must not be allowed to stand. Should the water be contaminated, it is to be removed and treated as hazardous waste. Clean stormwater contained within the bunds may be reused.</li> <li>14. The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded and stored in compliance with Material Safety Data Sheets (MSDS) files and applicable regulations and safety instructions.</li> <li>15. Transport of all hazardous substances must be in accordance with the relevant legislation and regulations.</li> <li>16. Upon completion of construction, the area must be cleared of potentially polluting materials.</li> </ol>		
<b>Flora</b>			
Destruction and fragmentation of habitat	<ol style="list-style-type: none"> <li>1. Vegetation removal must be limited to the PV plants construction site.</li> <li>2. Vegetation removal must be phased in order to reduce impact of construction.</li> <li>3. All flora not interfering with the operation of the PV plants construction shall be left undisturbed clearly marked and indicated on the site plan.</li> <li>4. Construction site office and laydown areas must be clearly demarcated, and no encroachment must occur beyond demarcated areas.</li> <li>5. Materials should not be delivered to the site prematurely which could result in additional areas being cleared or affected.</li> <li>6. No vegetation to be used for firewood.</li> <li>7. Exotic and invasive plant species should not be allowed to establish, if the development is approved.</li> <li>8. Areas to be cleared must be clearly fenced off to eliminate the potential</li> </ol>	Pre-construction and Construction phase	Environmental Liaison Officer/ Principal Contractor

	<p>for unnecessary clearing.</p> <ol style="list-style-type: none"> <li>9. Strict and regular auditing of the PV plants construction process to ensure containment of the construction and laydown areas.</li> <li>10. Soils must be kept free of petrochemical solutions that may be kept on site during construction. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora.</li> <li>11. The removal of indigenous plants must be kept to a minimum necessary. Trim, rather than fell of woody species along the edges of the development site where possible.</li> <li>12. The clearing and damage of plant growth in the riparian and wetland areas must be restricted to the actual road crossing where possible, and not into the sensitive adjacent areas. Where protected plants such as geophytes will need to be cleared or pruned, permits must be obtained from the relevant authority.</li> <li>13. Peripheral impacts around the development footprint, on the surrounding vegetation of the area, should be avoided and a monitoring programme should be implemented to ensure the impacts are kept to a minimum, while the rehabilitation of the site should be prioritised after construction has been completed and again after the decommissioning phase. Indigenous grass species that are present in this area should be sown.</li> <li>14. During construction, sensitive habitats must be avoided by construction vehicles and equipment, wherever possible, to reduce potential impacts. Only necessary damage must be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place.</li> <li>15. All development activities should be restricted to specific recommended areas. Storage of equipment, fuel and other materials must be limited to demarcated areas. The facility layout must be adapted to fit natural patterns rather than imposing rigid geometries. The entire development footprint must be clearly demarcated prior to the initial site clearance and prevent construction personnel from leaving the demarcated area. This would only be applicable to the construction phase of the proposed development.</li> </ol>		
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	<p>16. The ECO must advise the construction team in all relevant matters to ensure minimum destruction and damage to the environment. The ECO should enforce any measures that he/she deem necessary. Regular environmental training should be provided to construction workers to ensure the protection of the habitat, fauna and flora and their sensitivity to conservation.</p> <p>17. Monitoring must be implemented during the construction phase to ensure that minimal impact is caused to the fauna and flora of the area.</p> <p>18. Use existing facilities (e.g., impacted areas) to the extent possible to minimise the amount of new disturbance.</p> <p>19. Ensure protection of important resources by establishing protective buffers to exclude unintentional disturbance. All possible efforts must be made to ensure as little disturbance as possible to sensitive features, such as the riparian area, during construction.</p> <p>20. Construction activities must remain within defined construction areas. No construction / disturbance will occur outside these areas.</p>		
Rehabilitation	<p>1. All damaged areas shall be rehabilitated upon completion of the contract.</p> <p>2. Rehabilitate disturbed areas as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish.</p> <p>3. Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to construction.</p> <p>4. All natural areas impacted during construction must be rehabilitated with locally indigenous grasses typical of the representative botanical unit.</p> <p>5. Rehabilitation must take place in a phased approach as soon as possible.</p> <p>6. Rehabilitation process must make use of species indigenous to the area.</p> <p>7. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas.</p>	Construction phase	Environmental Liaison Officer/ Principal Contractor
Utilisation of resources	Gathering of firewood, fruit, muti plants, or any other natural material onsite or in areas adjacent to the site is prohibited unless with prior approval of the	Construction phase	Environmental Liaison Officer

	ECO.		
Exotic/Alien vegetation	<ol style="list-style-type: none"> <li>1. Alien vegetation on the site will need to be controlled.</li> <li>2. The Contractor should be responsible for implementing a programme of weed control (particularly in areas where soil has been disturbed); and grassing of any remaining stockpiles to prevent weed invasion. This must include monitoring and eradication.</li> <li>3. The spread of exotic species occurring throughout the site should be controlled.</li> <li>4. Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. Weeds and invader plants will be controlled in the manner prescribed for that category by the CARA or in terms of Working for Water guidelines. The control of these species should even begin prior to the construction phase considering that small populations of these species was observed during the field surveys.</li> <li>5. Institute strict control over materials brought onto site, which should be inspected for seeds of noxious plants and steps taken to eradicate these before transport to the site. Routinely fumigate or spray all materials with appropriate low-residual herbicides prior to transport to or in a quarantine area on site. The contractor is responsible for the control of weeds and invader plants within the construction site for the duration of the construction phase. Alien invasive tree species listed by the CARA regulations should be eradicated.</li> <li>6. Rehabilitate disturbed areas as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish.</li> <li>7. Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds. Once detected, an eradication/control programme should be implemented to ensure that the species' do not spread to surrounding natural ecosystems.</li> </ol>	Construction phase	Environmental Liaison Officer/ Principal Contractor

	8. The footprint area of the construction site must be kept to a minimum.		
Herbicides	<ol style="list-style-type: none"> <li>1. Herbicide use shall only be allowed according to contract specifications. The application shall be according to set specifications and under supervision of a qualified technician. The possibility of leaching into the surrounding environment shall be properly investigated and only environmentally friendly herbicides shall be used.</li> <li>2. Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.</li> </ol>	Construction phase	Environmental Liaison Officer
Site specific mitigation measures for flora	<ol style="list-style-type: none"> <li>1. Brush cutting should be implemented beneath the panels, no vegetation clearing should be permitted.</li> <li>2. Areas rated as High sensitivity in proximity to the development areas must be avoided as much is feasible. Avoided areas must be declared as 'no-go' areas during the life of the project, and all efforts must be made to prevent access to these areas from construction workers and machinery. Mitigated development in medium sensitivity areas is permissible.</li> <li>3. Areas outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. Clearing of vegetation should be minimized and avoided where possible. It is recommended that areas to be developed be specifically demarcated so that during the construction phase, only the demarcated areas be impacted upon.</li> <li>4. All laydown, chemical toilets etc. should be restricted to medium sensitivity areas. Any materials may not be stored for extended periods of time and must be removed from the project area once the construction phase has been concluded. No permanent construction phase structures should be permitted. Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials where possible. No storage of vehicles or equipment will be allowed outside of the designated project areas.</li> <li>5. Any individual of the protected plants that are present needs a relocation</li> </ol>	Construction phase	Environmental Liaison Officer



	<p>or destruction permit in order for any individual that may be removed or destroyed due to the development. High visibility flags must be placed near any protected plants in order to avoid any damage or destruction of the species. If left undisturbed the sensitivity and importance of these species needs to be part of the environmental awareness program. All protected plants should be relocated where feasible. If the plants cannot be relocated seed must be collected and utilised as part of the rehabilitation process.</p> <ol style="list-style-type: none"> <li>6. Any woody material removed can be shredded and used in conjunction with the topsoil to augment soil moisture and prevent further erosion</li> <li>7. Existing access routes, especially roads, must be made use of.</li> <li>8. Areas that are denuded during construction need to be re-vegetated with indigenous vegetation according to a habitat rehabilitation plan, to prevent erosion during flood and wind events and to promote the regeneration of functional habitat. This will also reduce the likelihood of encroachment by invasive alien plant species. All grazing mammals must be kept out of the areas that have recently been re-planted.</li> <li>9. A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site.</li> <li>10. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use.</li> <li>11. No servicing of equipment on site unless necessary.</li> <li>12. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers.</li> <li>13. Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them from leaking and entering the environment.</li> <li>14. Construction activities and vehicles could cause spillages of lubricants, fuels and waste material negatively affecting the functioning of the ecosystem.</li> <li>15. • Appropriately contain any generator diesel storage tanks, machinery</li> </ol>		
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	<p>spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them from leaking and entering the environment.</p> <p>16. All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the project area.</p> <p>17. It must be made an offence for any staff to take/ bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.</p> <p>18. A fire management plan needs to be complied and implemented to restrict the impact fire would have on the surrounding areas.</p> <p>19. All construction waste must be removed from site at the closure of the construction phase.</p>		
<b>Fauna</b>			
Protection of fauna on site	<ol style="list-style-type: none"> <li>1. A qualified Environmental Control Officer must be on site when construction begins. A site walk through is recommended by a suitably qualified ecologist prior to any construction activities, preferably during the wet season. In situations where the protected plants must be removed, the proponent may only do so after the required permission/permits have been obtained in accordance with national and provincial legislation. In the abovementioned situation the development of a search, rescue and recovery program is suggested for the protection of these species. Should animals not move out of the area on their own, relevant specialists must be contacted to advise on how the species can be relocated.</li> <li>2. Clearing and disturbance activities must be conducted in a progressive linear manner, from the north to the south of the project area and over several days, so as to provide an easy escape route for all small mammals and herpetofauna.</li> <li>3. The areas to be disturbed must be specifically and responsibly demarcated to prevent the movement of staff or any individual into the surrounding environments, signs must be put up to enforce this.</li> </ol>	Construction phase	Environmental Control Officer

	<ol style="list-style-type: none"> <li>4. The duration of the activities should be minimized to as short a term as possible, to reduce the period of disturbance on fauna.</li> <li>5. Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to reptile species and nocturnal mammals.</li> <li>6. No trapping, killing, or poisoning of any wildlife is to be allowed and signs must be put up to enforce this. Monitoring must take place in this regard.</li> <li>7. Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (green/red) lights should be used wherever possible.</li> <li>8. All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must be enforced to ensure that road killings and erosion is limited.</li> <li>9. Schedule activities and operations during least sensitive periods, to avoid migration, nesting, and breeding seasons.</li> <li>10. Any holes/deep excavations must be dug and planted in a progressive manner and shouldn't be left open overnight. Should any holes remain open overnight they must be properly covered temporarily to ensure that no small fauna species fall in, and subsequently inspected prior to backfilling.</li> <li>11. Wildlife-permeable fencing with holes large enough for mongoose and other smaller mammals should be installed every 50m, the holes must not be placed in the fence where it is next to a major road as this will increase road killings in the area.</li> <li>12. Use environmentally friendly cleaning and dust suppressant products.</li> <li>13. Once the development layout has been confirmed, the footprint area must be fenced off appropriately in segments pre-construction to allow animals to move or be moved out of these areas before breaking ground activities occur. Construction activities must take place systemically and the perimeter fence should not be completed (i.e., leaving sections unfenced to allow fauna to escape) until systematic clearing is completed.</li> </ol>		
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<b>Avifauna</b>			
Displacement, disturbance, loss of avian habitats	<ol style="list-style-type: none"> <li>1. The areas to be developed must be specifically demarcated to prevent movement into surrounding environments.</li> <li>2. Very High sensitivity areas must be declared No-go areas, they must be demarcated to ensure no vehicles or people move into these areas.</li> <li>3. Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further.</li> <li>4. Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil functioning, such as its filtering and buffering characteristics, while maintaining habitats for both below and above-ground biodiversity.</li> <li>5. Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty et al, 2017; Sinha et al, 2018).</li> <li>6. Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion. This will also reduce the likelihood of encroachment by alien invasive plant species. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are indigenous to this vegetation type.</li> <li>7. A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment.</li> <li>8. No cement/concrete may be mixed on site and must be brought in off site</li> </ol>	Construction phase	Environmental Liaison Officer

	<p>to ensure the water sources does not get polluted and that successful rehabilitation of the construction areas can take place</p> <ol style="list-style-type: none"> <li>9. Leaking equipment and vehicles must be repaired immediately or be removed from project area to facilitate repair.</li> <li>10. A fire management plan needs to be complied to restrict the impact of fire.</li> </ol>		
Direct impacts on Avifauna	<ol style="list-style-type: none"> <li>1. All personnel should undergo environmental induction with regards to avifauna and in particular awareness about not harming, collecting, or hunting terrestrial species, and owls, which are often persecuted out of superstition. Signs must be put up to enforce this.</li> <li>2. The duration of the construction should be kept to a minimum to avoid disturbing avifauna.</li> <li>3. Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (red/green) lights should be used wherever possible.</li> <li>4. All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limit (20 km/h), to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.</li> <li>5. All project activities must be undertaken with appropriate noise mitigation measures to avoid disturbance to avifauna population in the region</li> <li>6. All areas to be developed must be walked through prior to any activity to ensure no nests or avifauna species are found in the area. Should any Species of Conservation Concern be found and not move out of the area, or their nests be found in the area a suitably qualified specialist must be consulted to advise on the correct actions to be taken.</li> <li>7. The design of the proposed PV and grid lines must be of a type or similar structure as endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa (Jenkins et al., 2015).</li> <li>8. Infrastructure should be consolidated where possible in order to minimise</li> </ol>	Construction phase	Environmental Liaison Officer

	<p>the amount of ground and air space used.</p> <ol style="list-style-type: none"> <li>9. The loop in loop out lines must join in at the closest point to the existing line as possible.</li> <li>10. All the parts of the infrastructure must be nest proofed and anti-perch devices placed on areas that can lead to electrocution</li> <li>11. Use environmentally friendly cleaning and dust suppressant products</li> <li>12. Fencing mitigations for ClearVu or similar fencing:</li> <li>13. If needed, any top strands must be smooth wire, barbed wire must be avoided;</li> <li>14. Routinely monitor all fencing for any collisions and mortality, as well as trapped fauna.</li> <li>15. Place markers/diverters on fences, especially towards the top</li> <li>16. A specialist must be consulted if any collisions or mortalities are observed.</li> <li>17. Conventional fencing mitigations: <ol style="list-style-type: none"> <li>a. Top 2 strands must be smooth wire</li> <li>b. Routinely retention loose wires</li> <li>c. Minimum 300 mm between wires</li> <li>d. Place markers on fences</li> </ol> </li> <li>18. As far as possible power cables within the project site should be thoroughly insulated and preferably buried.</li> <li>19. Any exposed parts must be covered (insulated) to reduce electrocution risk</li> <li>20. The BESS must be enclosed in a structure with a non-reflective surface</li> <li>21. Non-polarising white strips must be fitted along the edges of the panels to reduce reflection and therefore similarity to water and deter birds and insects (Horvath et al, 2010).</li> <li>22. Overhead cables/lines must be fitted with bird diverters or flappers.</li> <li>23. There is little to no information on the recovery of the avifauna community subsequent to the closure of SEFs within South Africa. A post-closure monitoring regime is recommended for the proposed project to document any impacts and this data must be used for improving rehabilitation measures</li> <li>24. All infrastructure including powerlines must be removed if the facility is</li> </ol>		
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	decommissioned		
<b>Air Quality</b>			
Dust control measures	<ol style="list-style-type: none"> <li>1. Wheel washing and damping down of un-surfaced and un-vegetated areas.</li> <li>2. Retention of vegetation where possible will reduce dust travel.</li> <li>3. Clearing activities must only be done during agreed working times and permitting weather conditions to avoid drifting of sand and dust into neighbouring areas.</li> <li>4. Damping down of all exposed soil surfaces with a water douser or sprinklers when necessary to reduce dust.</li> <li>5. The Contractor shall be responsible for dust control on site to ensure no nuisance is caused to the neighbouring communities.</li> <li>6. Any complaints or claims emanating from the lack of dust control shall be attended to immediately by the Contractor.</li> <li>7. Any dirt roads that are utilised by the workers must be regularly maintained to ensure that dust levels are controlled.</li> <li>8. Ensure that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.</li> <li>9. A speed limit should be enforced on dirt roads (preferably 30-40km/h).</li> <li>10. Implement standard dust control measures, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) of construction areas and access roads, and ensure that these are continuously monitored to ensure effective implementation.</li> <li>11. Dust suppression measures must be implemented for heavy vehicles such as a wetting gravel roads on a regular bases</li> </ol>	Construction phase	Environmental Liaison Officer
Odour control	<ol style="list-style-type: none"> <li>1. Regular servicing of vehicles in order to limit gaseous emissions.</li> <li>2. Regular servicing of onsite toilets to avoid potential odours.</li> </ol>	Pre-construction and construction	Environmental Liaison Officer

	3. Regular emptying of waste bins, as and when required		
Rehabilitation	The Contractor should commence rehabilitation of exposed soil surfaces as soon as practical after completion of earthworks.	Pre-construction and construction	Environmental Liaison Officer
Fire prevention	<ol style="list-style-type: none"> <li>1. No open fires shall be allowed on site under any circumstance.</li> <li>2. No firewood or kindling may be collected from the site or the surrounds, without explicit approval from the ECO.</li> <li>3. The Contractor must always have operational fire-fighting equipment available on site. The level of firefighting equipment must be assessed and evaluated through a typical risk assessment process. All staff should be trained in firefighting and how to use the fire-fighting equipment.</li> <li>4. A firebreak should be implemented before the construction phase. The firebreak should be controlled and constructed around the perimeters of the project site.</li> <li>5. No staff (except security) should be accommodated overnight on site</li> <li>6. Contractors need to ensure that any construction related activities that might pose potential fire risks, are done in the designated areas where it is also managed properly.</li> <li>7. Precautionary measures need to be taken during high wind conditions or during the winter months when the fields are dry.</li> <li>8. The contractor should enter an agreement with the local farmers before the construction phase that any damages or losses during the construction phase related to the risk of fire and that are created by staff during the construction phase, are borne by the contractor.</li> </ol>	Pre-construction, construction and operation	Environmental Liaison Officer
<b>Noise and Vibrations</b>			
Mitigation of noise and vibrations	<ol style="list-style-type: none"> <li>1. The construction phase must aim to adhere to the relevant noise regulations and limit noise to within standard working hours in order to reduce disturbance of dwellings in close proximity to the development.</li> <li>2. Construction site yards, workshops, concrete batching plants, and other</li> </ol>	Environmental Liaison Officer	Environmental Liaison Officer



	<p>noisy fixed facilities should be located away from noise sensitive areas. Once the proposed final layouts are made available by the Contractor(s), the sites must be evaluated in detail and specific measures designed into the system.</p> <ol style="list-style-type: none"> <li>3. Truck traffic should be routed away from noise sensitive areas, where possible.</li> <li>4. Noise levels must be kept within acceptable limits.</li> <li>5. Noisy operations should be combined so that they occur where possible at the same time.</li> <li>6. Construction activities are to be contained to reasonable hours during the day and early evening. Night-time activities near noise sensitive areas should not be allowed.</li> <li>7. Construction workers to wear necessary ear protection gear.</li> <li>8. Noise from labourers must be controlled.</li> <li>9. Noise suppression measures must be applied to all construction equipment. Construction equipment must be kept in good working order and where appropriate fitted with silencers which are kept in good working order. Should the vehicles or equipment not be in good working order, the Contractor may be instructed to remove the offending vehicle or machinery from site.</li> <li>10. The Contractor must take measures to discourage labourers from loitering in the area and causing noise disturbance. Where possible labour shall be transported to and from the site by the Contractor or his Sub-Contractors by the Contractors own transport.</li> <li>11. Implementation of enclosure and cladding of processing plants.</li> <li>12. Applying regular and thorough maintenance schedules to equipment and processes. An increase in noise emission levels very often is a sign of the imminent mechanical failure of a machine.</li> <li>13. Limit noise generating activities to normal daylight working hours and avoid weekends and public holidays.</li> <li>14. The movement of heavy vehicles associated with the construction phase should be timed to avoid weekends, public holidays, and holiday periods where feasible.</li> </ol>		
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	<p>15. All vehicles must be road-worthy, and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.</p> <p>16. Communication, complaints, and grievance channels must be implemented, and contact details of the CLO must be provided to the local community in the study area.</p>		
Site specific mitigation measures for noise and vibration	<p>1. During construction care should be taken to ensure that noise from construction vehicles and plant equipment does not intrude on the surrounding residential areas. Plant equipment such as generators, compressors, concrete mixers as well as vehicles should be kept in good operating order and where appropriate have effective exhaust mufflers.</p> <p>2. Gravel roads used during construction of the plant should be kept in good order. Corrugations and drainage ruts should not be allowed to develop as these can contribute to mechanical rattling and banging noise on vehicles traversing these roads.</p>	Environmental Liaison Officer	Environmental Liaison Officer
<b>Energy Use</b>			
The use of energy and actions that need to be implemented during construction	<p>1. Energy saving lighting must be implemented across the board.</p> <p>2. Minimal lighting, while maintaining health and safety regulations, must be kept on during the night operations.</p> <p>3. Equipment not in use must be switched off and unplugged to save on unnecessary energy costs.</p>	Construction phase	Environmental Liaison Officer
<b>Employment</b>			
Labour	<p>1. The use of labour intensive construction measures should be used where appropriate.</p> <p>2. Where feasible, training and skills development programmes should be initiated prior to the commencement of the construction phase.</p> <p>3. No informal vending stations may be allowed on or near the construction site.</p> <p>4. Angus Solar Power Plant (RF) (Pty) Ltd and the contractor(s) should, in consultation with representatives from the contractor, develop a code of</p>	Construction phase	Principal Contractor

	<p>conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation.</p> <ol style="list-style-type: none"> <li>5. A database of local companies, specifically Historically Disadvantaged Individuals (HDIs) which qualify as potential service providers (e.g., construction companies, security companies, catering companies, waste collection companies, transportation companies etc.) should be created and companies listed thereon should be invited to bid for project-related work where applicable.</li> <li>6. A local employment policy should be adopted to maximise opportunities made available to the local labour force.</li> <li>7. Labour should be sourced from the local labour pool, and only if the necessary skills are unavailable should labour be sourced from (in order of preference) the greater Thabazimbi Local Municipality, Waterberg District Municipality, Gauteng Province, South Africa, or elsewhere.</li> <li>8. Local procurement is encouraged along with engagement with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods and products from local suppliers where feasible.</li> </ol>		
Effective communication	<p>Before construction commences, representatives from the local municipality, community leaders, community-based organisations and the surrounding landowners, should be informed of the details of the contractors, size of the workforce and construction schedules.</p>	Pre-construction phase	Developer
Recruitment plan	<ol style="list-style-type: none"> <li>1. Recruitment must comply with national employment and labour laws.</li> <li>2. Where reasonable and practical, Angus Solar Power Plant (RF) (Pty) Ltd's service providers should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories.</li> <li>3. The Project Manager must ensure that all staff working on the proposed project is in possession of a South African Identity Card or a relevant work permit.</li> </ol>	Construction phase	Principal Contractor

	<ol style="list-style-type: none"> <li>4. Ensure adequate advertising in the project community areas, local papers for skilled labour.</li> <li>5. Local community leaders must be utilised to source labour.</li> <li>6. The recruitment process must be equitable and transparent. A concerted effort must be made to guard against nepotism and/or any form of favouritism during the process.</li> <li>7. The recruitment of skilled labour must follow standard advertising process in national newspapers and interview based selection.</li> <li>8. Record of official complaints by employees to authorities i.e. Labour and Social Security.</li> <li>9. As far as possible local contractors that are compliant with Broad-Based Black Economic Empowerment (B-BBEE) criteria should be used. Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.</li> <li>10. The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.</li> <li>11. Establish and maintain a healthy worker-management relationship.</li> <li>12. Suppliers should as far as possible be sourced locally.</li> </ol>		
Enhancement of opportunities for businesses and service providers	<ol style="list-style-type: none"> <li>1. A database of local companies, specifically Historically Disadvantaged Individuals (HDIs) which qualify as potential service providers (e.g., construction companies, security companies, catering companies, waste collection companies, transportation companies etc.) should be created and companies listed thereon should be invited to bid for project related work where applicable.</li> <li>2. Local procurement is encouraged along with engagement with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods and products from local suppliers where feasible.</li> </ol>	Construction phase	Principal Contractor
<b>Occupational Health and Safety</b>			
Work safety	<ol style="list-style-type: none"> <li>1. All staff should undergo a general health and safety induction and simplified environmental awareness training.</li> </ol>	Construction phase	Principal Contractor and Environmental Liaison Officer

	<ol style="list-style-type: none"> <li>2. Implementation of safety measures, work procedures and first aid must be implemented on site.</li> <li>3. Workers should be thoroughly trained in using potentially dangerous equipment.</li> <li>4. Contractors must ensure that all equipment is maintained in a safe operating condition.</li> <li>5. A safety officer must be appointed.</li> <li>6. A record of health and safety incidents must be kept on site.</li> <li>7. Any health and safety incidents must be reported to the Project Manager immediately.</li> <li>8. First aid facilities must be available on site at all times and a number of employees trained to carry out first aid procedures.</li> <li>9. Workers have the right to refuse work in unsafe conditions.</li> <li>10. The Contractor shall take all the necessary precautions against the spreading of disease such as measles, foot and mouth, etc.</li> <li>11. A record shall be kept of drugs administered or precautions taken and the time and dates when this was done. This can then be used as evidence in court should any claims be instituted against Angus Solar Power Plant (RF) (Pty) Ltd or the Contractor.</li> <li>12. The Contractor must ensure that all construction workers are well educated about HIV/AIDS and the risks surrounding this disease. The location of the local clinic where more information and counselling is offered must be indicated to workers.</li> <li>13. Material stockpiles or stacks must be stable and well secured to avoid collapse and possible injury to site workers/local residents.</li> <li>14. The contractor should provide transport to and from the site on a daily basis for low and semi-skilled construction workers. This will enable the contractor to effectively manage and monitor the movement of construction workers on and off the site</li> <li>15. Where necessary, the contractors should make the necessary arrangements to enable low and semi-skilled workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks</li> </ol>		
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	16. It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.		
Work facilities	Eating areas should be regularly serviced and cleaned to ensure the highest possible standards of hygiene and cleanliness.	Construction phase	Principal Contractor and Environmental Liaison Officer
Management of construction site and construction workers	<ol style="list-style-type: none"> <li>1. All construction vehicles must adhere to clearly defined and demarcated roads. No driving outside of the development boundary must be permitted.</li> <li>2. The siting of the construction equipment camp/s must take cognisance of any sensitive areas identified in the EIA Report. The location of this construction equipment camp/s must be approved by the project Environmental Liaison Officer.</li> <li>3. Practical phased development and vegetation clearing must be practiced so that cleared areas are not left un-vegetated and vulnerable to erosion for extended periods of time.</li> <li>4. Road borders must be regularly maintained to ensure that vegetation remains short to serve as an effective firebreak.</li> <li>5. Rehabilitate all disturbed areas at the construction equipment camp as soon as construction is complete within an area.</li> <li>6. Ensure waste storage facilities are maintained and emptied on a regular basis.</li> <li>7. Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm. This can be achieved through the provision of appropriate environmental awareness training to all personnel. Records of all training undertaken must be kept.</li> <li>8. Ensure compliance with all national, regional and local legislation with regard to the storage, handling and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.</li> <li>9. Ensure ablution facilities are appropriately maintained. Ablutions must be cleaned regularly and associated waste disposed of at a</li> </ol>	Construction phase	Principal Contractor and Environmental Liaison Officer

	<p>registered/permitted waste disposal site. Ablutions must be removed from site when construction is completed.</p> <p>10. Cooking and eating of meals must take place in a designated area. No fires are allowed on site. No firewood or kindling may be gathered from the site or surrounds.</p> <p>11. All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area. Particular attention needs to be paid to food waste.</p> <p>12. A Method Statement should be compiled for the management of pests and vermin within the site, specifically relating to the canteen area if applicable.</p> <p>13. No disturbance of flora or fauna must be undertaken outside of the demarcated construction area/s.</p> <p>14. Workers must be aware of the importance of not polluting rivers or wetlands (especially those located outside of the project site) and the significance of not undertaking activities that could result in such pollution, and this awareness must be promoted throughout the construction phase.</p> <p>15. Contractors must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.</p> <p>16. On completion of the construction phase, all construction workers must leave the site within one week of their contract ending.</p>		
Hazardous substances	The siting of the construction equipment camp/s must take cognisance of any sensitive areas identified in the EIA Report. The location of this construction equipment camp/s must be approved by the project EO.	Construction phase	Principal Contractor and Environmental Liaison Officer
Machine and equipment	As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	Construction phase	Principal Contractor and Environmental Liaison Officer
Fitness for work	Practical phased development and vegetation clearing must be practiced so that cleared areas are not left un-vegetated and vulnerable to erosion for extended periods of time.	Construction phase	Principal Contractor and Environmental

			Liaison Officer
Travel and remote site health	Road borders must be regularly maintained to ensure that vegetation remains short to serve as an effective firebreak. An emergency fire plan (refer to <b>Appendix I</b> ) must be developed with emergency procedures in the event of a fire.	Construction phase	Principal Contractor and Environmental Liaison Officer
Protective gear	Rehabilitate all disturbed areas at the construction equipment camp as soon as construction is complete within an area.	Construction phase	Principal Contractor and Environmental Liaison Officer
Site safety	Ensure waste storage facilities are maintained and emptied on a regular basis.	Construction phase	Principal Contractor and Environmental Liaison Officer
Construction equipment safety	All equipment used for construction, including drills, TLB's must be in good working order with up-to-date maintenance records.	Construction phase	Principal Contractor and Environmental Liaison Officer
Procedure in the event of a petrochemical spill	<ol style="list-style-type: none"> <li>1. A spill kit needs to be kept on site to address any unforeseen spillages.</li> <li>2. The individual responsible for or who discovers the petrochemical spill must report the incident to the Project Manager, Contractor or ECO.</li> <li>3. The problem must be assessed, and the necessary actions required will be undertaken.</li> <li>4. The immediate response must be to contain the spill.</li> <li>5. The source of the spill must be identified, controlled, treated or removed wherever possible.</li> </ol>	Construction phase	Principal Contractor and Environmental Liaison Officer
Fire management	<ol style="list-style-type: none"> <li>1. All construction staff must be trained in fire hazard control and firefighting techniques.</li> <li>2. All flammable substances must be stored in dry areas which do not pose an ignition risk to the said substances.</li> <li>3. Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined</li> </ol>	Construction phase	Principal Contractor and Environmental Liaison Officer



	<p>to areas where the risk of fires has been reduced.</p> <ol style="list-style-type: none"> <li>4. No open fires will be allowed on site.</li> <li>5. Smoking may only be conducted in demarcated areas.</li> <li>6. Road borders must be regularly maintained to ensure that vegetation remain short to serve as an effective firebreak.</li> <li>7. A firebreak should be implemented before the construction phase. The firebreak should be controlled and implemented around the perimeters of the project site.</li> <li>8. Adequate fire-fighting equipment should be provided and readily available on site and all staff should be trained in firefighting and how to use the fire-fighting equipment.</li> <li>9. No staff (except security) should be accommodated overnight on site and the contractor should ensure that no open fires are allowed on site. The use of cooking or heating implements should only be used in designated areas.</li> <li>10. Contractors need to ensure that any construction related activities that might pose potential fire risks, are done in the designated areas where it is also managed properly.</li> <li>11. Precautionary measures need to be taken during high wind conditions or during the winter months when the fields are dry.</li> <li>12. The contractor should enter an agreement with the local farmers before the construction phase that any damages or losses during the construction phase related to the risk of fire and that are created by staff during the construction phase, are borne by the contractor.</li> </ol>		
<p>Safety of surrounding residents</p>	<p>All I&amp;AP's must be notified in advance of any known potential risks associated with the construction site and the activities on it. Examples of these are:</p> <ul style="list-style-type: none"> <li>• Blasting</li> <li>• Risk to residence along haulage roads/access routes</li> </ul> <p>On-going communication with the affected and surrounding landowners is important to maintain during the construction and operational phases of the solar energy facility. Any issues and concerns raised should be addressed as far</p>	<p>Construction and operational phase</p>	<p>Principal Contractor and Environmental Liaison Officer</p>

	as possible in as short a timeframe as possible.		
Emergency evacuation plan	<ol style="list-style-type: none"> <li>1. Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.</li> <li>2. All permanent staff must undergo safety training.</li> </ol>	Construction phase	Principal Contractor and Environmental Liaison Officer
Maintenance	The PV plant and surrounding areas are to be regularly maintained. A maintenance schedule must be drawn up and records of all maintenance kept.	Construction phase	Principal Contractor and Environmental Liaison Officer
<b>Security</b>			
Security actions that need to be implemented during construction	<ol style="list-style-type: none"> <li>1. A security company must be employed to guard the construction site and monitor access. This company must also be utilised for the operation phase.</li> <li>2. Unsocial activities such as consumption or illegal selling of alcohol, drug utilisation or selling and prostitution on site shall be prohibited. Any persons found to be engaged in such activities should receive disciplinary or criminal action taken against them.</li> <li>3. Only pre-approved staff must be permitted to stay within the staff accommodation which will be provided.</li> <li>4. Construction workers must be easily identifiable by wearing uniforms and identification tags/induction cards.</li> <li>5. The site must be fenced, where necessary to prevent any loss or injury to persons during the construction phase.</li> <li>6. No alcohol/ drugs to be present on site.</li> <li>7. No firearms allowed on site or in vehicles transporting staff to / from site (unless used by security personnel).</li> <li>8. Construction staff are to make use of the facilities provided for them, as opposed to ad-hoc alternatives (e.g. fires for cooking, the use of surrounding bush as a toilet facility are forbidden).</li> <li>9. Trespassing on private/ commercial properties adjoining the site is</li> </ol>	Construction phase	Principal Contractor and Environmental Liaison Officer

	<p>forbidden.</p> <ol style="list-style-type: none"> <li>10. Driving under the influence of alcohol is prohibited.</li> <li>11. All employees must undergo the necessary safety training and wear the necessary protective clothing.</li> <li>12. The site must be secured in order to reduce the opportunity for criminal activity in the locality of the construction site.</li> <li>13. Working hours should be kept within daylight hours during the construction phase, and / or as any deviation that is approved by the relevant authorities.</li> <li>14. Provide transportation for workers to prevent loitering within or near the project site outside of working hours.</li> <li>15. The perimeter of the construction site should be appropriately secured to prevent any unauthorised access to the site. The fencing of the site should be maintained throughout the construction period.</li> <li>16. The appointed EPC Contractor must appoint a security company to ensure appropriate security procedures and measures are implemented.</li> <li>17. Access in and out of the construction site should be strictly controlled by a security company appointed to the project.</li> <li>18. A community liaison officer (CLO) should be appointed as a grievance mechanism. A method of communication should be implemented whereby procedures to lodge complaints are set out for the local community to express any complaints or grievances with the construction process.</li> <li>19. The EPC Contractor should implement a stakeholder management plan to address neighbouring farmer concerns regarding safety and security.</li> <li>20. The project proposed must prepare and implement a Fire Management Plan; this must be done in conjunction with surrounding landowners.</li> <li>21. The EPC Contractor must prepare a Method Statement which deals with fire prevention and management.</li> </ol>		
<b>Social Environment</b>			
Social environment actions that need	1. All contact with the affected parties shall be courteous at all times. The	Construction phase	Principal Contractor and Environmental

<p>to be implemented during construction</p>	<p>rights of the affected parties shall be respected at all times.</p> <ol style="list-style-type: none"> <li>2. A complaints register should be kept on site. Details of complaints should be incorporated into the audits as part of the monitoring process. This should be in carbon copy format, with numbered pages. Any missing pages must be accounted for by the Contractor.</li> <li>3. Damage to infrastructure shall not be tolerated and any damage shall be rectified immediately by the Contractor. A record of all damage and remedial actions shall be kept on site.</li> <li>4. All existing private access roads used for construction purposes, shall be maintained at all times to ensure that the local people have free access to and from their properties. Speed limits shall be enforced in such areas and all drivers shall be sensitised to this effect.</li> <li>5. Care must be taken not to damage irrigation equipment, lines, channels and crops.</li> <li>6. Angus Solar Power Plant (RF) (Pty) Ltd must hold contractors liable for compensating farmers in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers.</li> <li>7. Contractors appointed by Angus Solar Power Plant (RF) (Pty) Ltd must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.</li> <li>8. All vehicles must be road worthy, and drivers must be qualified, obey traffic rules, follow speed limits and be made aware of the potential road safety issues.</li> <li>9. Heavy vehicles should be inspected regularly to ensure their road worthiness.</li> <li>10. Provision of adequate and strategically placed traffic warning signs, that have to be maintained for the duration of the construction phase, and control measures along the D1235 or R511 to warn road users of the construction activities taking place for the duration of the construction phase. Warning signs must be always visible, especially at night.</li> <li>11. Implement penalties for reckless driving to enforce compliance to traffic rules.</li> </ol>		<p>Liaison Officer</p>
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	<ol style="list-style-type: none"> <li>12. Avoid heavy vehicle activity during “peak” hours (when children are taken to school, or people are driving to work).</li> <li>13. The developer and EPC Contractor must ensure that all fencing along access roads is maintained in the present condition or repaired if disturbed due to construction activities.</li> <li>14. The developer and EPC Contractor must ensure that the roads utilised for construction activities are either maintained in the present condition or upgraded if disturbed due to construction activities.</li> <li>15. The EPC Contractor must ensure that damage / wear and tear caused by construction related traffic to the access roads is repaired before the completion of the construction phase.</li> <li>16. A method of communication must be implemented whereby procedures to lodge complaints are set out for the local community to express any complaints or grievances with the construction process.</li> </ol>		
Influx of people	<ol style="list-style-type: none"> <li>1. Ensure that employment procedures/policies are communicated to local stakeholders, especially community representative organisations and ward councillors.</li> <li>2. Have clear rules and regulations for access to the construction site to control loitering. Consult with the local SAPS to establish standard operating procedures for the control and/or removal of loiterers at the construction site.</li> <li>3. The appointed EPC Contractor must appoint a security company to ensure appropriate security procedures and measures are implemented.</li> <li>4. A CLO should be appointed as a grievance mechanism. A method of communication should be implemented whereby procedures to lodge complaints are set out for the local community to express any complaints or grievances with the construction process.</li> <li>5. The EPC Contractor should implement a stakeholder management plan to address neighbouring farmer concerns regarding safety and security.</li> <li>6. Develop and implement a local procurement policy which prioritises “locals first” to prevent the movement of people into the area in search of work.</li> </ol>	Construction phase	Principal Contractor and Environmental Liaison Officer

	<ol style="list-style-type: none"> <li>7. Engage with local community representatives prior to construction to facilitate the adoption of the locals first procurement policy.</li> <li>8. Provide transportation for workers (from Carletonville and surrounds) to ensure workers can easily access their place of employment and do not need to move closer to the project site.</li> <li>9. Working hours should be kept between daylight hours during the construction phase, and / or as any deviation that is approved by the relevant authorities.</li> <li>10. Compile and implement a grievance mechanism.</li> <li>11. Appoint a Community Liaison Officer (CLO) to assist with the procurement of local labour.</li> <li>12. Prevent the recruitment of workers at the project site.</li> <li>13. Establish clear rules and regulations for access to the proposed site.</li> <li>14. Inform local community organisations and policing forums of construction times and the duration of the construction phase.</li> <li>15. Establish procedures for the control and removal of loiterers from the construction site.</li> <li>16. Appoint security company and implement appropriate security procedures to ensure that workers do not remain onsite after working hours.</li> </ol>		
Change to municipal infrastructure	<ol style="list-style-type: none"> <li>1. Where possible, construction workers should be housed within the local community to reduce the possible additional strain on local resources.</li> <li>2. Contractors to supply and install infrastructure needed to access municipal services, e.g. water and sewerage pipelines. On site, sufficient portable services must be available (e.g. portable toilet facilities) and serviced regularly to prevent contamination.</li> <li>3. The use of local labour during construction will negate the need for additional housing; therefore, contractors are again urged to make use of as much local labour as possible.</li> </ol>	Construction phase	Principal Contractor and Environmental Liaison Officer
Integration with local communities	<ol style="list-style-type: none"> <li>1. An aggressive STI and HIV/AIDS awareness campaign must be launched, which is not only directed at construction workers but also at the community as a whole.</li> </ol>	Construction phase	Principal Contractor and Environmental Liaison Officer

	<ol style="list-style-type: none"> <li>2. Local women must be empowered. This could be achieved by employing them to work on the project, which in turn would decrease their (financial) vulnerability.</li> <li>3. Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.</li> <li>4. Ensure all vehicles are road worthy, drivers are qualified and are made aware of the potential noise and dust issues.</li> </ol>		
Potential loss of productive farmland	<ol style="list-style-type: none"> <li>1. The proposed site for the Angus SPP needs to be fenced off prior to the construction phase and all construction related activities should be confined in this fenced off area.</li> <li>2. Livestock grazing on the proposed site need to be relocated.</li> <li>3. All affected areas, which are disturbed during the construction phase, need to be rehabilitated prior to the operational phase and must be continuously monitored by the Environmental Control Officer (ECO).</li> </ol>	Construction phase	Principal Contractor
<b>Heritage</b>			
Mitigation of the impact that the new development may have on potential archaeological features or finds on the site	<ol style="list-style-type: none"> <li>1. The contractors and workers must be notified that archaeological sites might be exposed during the construction activities;</li> <li>2. All discoveries shall be reported immediately to a heritage practitioner so that an investigation and evaluation of the finds can be made. Acting upon advice from these specialists, the ECO will advise the necessary actions to be taken;</li> <li>3. Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site; and</li> <li>4. Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the NHRA, Section 51(1). A person or entity, e.g. the ECO, should be tasked to take responsibility for the heritage sites and held accountable for any damage.</li> <li>5. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich</li> </ol>	Construction phase	Principal Contractor and Environmental Liaison Officer

	<p>eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Sityhilelo Ngcatsha/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule;</p> <p>6. The following conditions apply with regards to the appointment of specialists: i) If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.</p> <p>7. The Contractor must ensure that his workforce is aware of the necessity of reporting any possible historical or archaeological finds to the ECO so that appropriate action can be taken.</p> <p>8. Any discovered artefacts shall not be removed under any circumstances. The position of the find is to be marked (flag). The Principal Contractor and ECO are to be notified. The ECO is to inform the Developer and the Developer contacts the standby archaeologist and/or palaeontologist.</p> <p>9. Any destruction of a site can only be allowed once a permit is obtained and the site has been mapped and noted. Permits shall be obtained from the SAHRA should the proposed site affect any world heritage sites or if any heritage sites are to be destroyed or altered.</p> <p>10. Known sites should be clearly marked, so that they can be avoided during construction activities.</p>		
Palaeontology	<p>1. The ECO for this project must be informed that the Adelaide Subgroup (Beaufort Group, Karoo Supergroup) has a Very High Palaeontological Sensitivity.</p> <p>2. If Palaeontological Heritage is uncovered during surface clearing and excavations the Chance Find Protocol, attached, should be implemented immediately. Fossil discoveries ought to be protected and the ECO/site manager must report to South African Heritage Resources Agency (SAHRA)</p>	Construction phase	Principal Contractor, Environmental Liaison Officer & Environmental Control Officer



	<p>(Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation (recording and collection) can be carried out.</p> <ol style="list-style-type: none"> <li>3. Before any fossil material can be collected from the development site the specialist involved would need to apply for a collection permit from SAHRA. Fossil material must be housed in an official collection (museum or university), while all reports and fieldwork should meet the minimum standards for palaeontological impact studies proposed by SAHRA (2012).</li> <li>4. Recommended mitigation of chance fossil finds during the construction phase of the solar facility and associated grid connection involves safeguarding of the fossils (preferably <i>in situ</i>) by the responsible ECO and reporting of finds to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za).</li> <li>5. Where appropriate, judicious sampling and recording of fossil material and associated geological data by a qualified palaeontologist, appointed by the developer, may be required by the relevant heritage regulatory authorities. Any fossil material collected should be curated within an approved repository (museum / university fossil collection) by a qualified palaeontologist.</li> <li>6. All major site clearance and excavation work must be monitored for fossil remains.</li> <li>7. Substantial well-preserved fossils (stromatolites, vertebrate bones, teeth) to be safeguarded, preferably in situ, and reported by ECO to SAHRA.</li> <li>8. Recording and sampling of significant new fossil finds by professional palaeontologist.</li> </ol>		
<b>Community Engagement</b>			
Community engagement	<ol style="list-style-type: none"> <li>1. A communication guideline to be drafted and agreed upon with authority representatives and affected communities.</li> <li>2. Open and transparent community engagement to be followed as culturally appropriate.</li> </ol>	Construction phase	Environmental Liaison Officer

	3. Records (written) to be kept of all community engagements (e.g. complaints, resolutions, etc)		
<b>Visual Impact</b>			
Visual issues and actions that need to be implemented during the construction phase	<ol style="list-style-type: none"> <li>1. Ensure that vegetation is not unnecessarily removed during the construction phase.</li> <li>2. Vegetation cover (i.e., either natural or cultivated) immediately adjacent to the development footprint must be maintained.</li> <li>3. Reduce the construction period through careful logistical planning and productive implementation of resources.</li> <li>4. Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e., in already disturbed areas) where possible.</li> <li>5. Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.</li> <li>6. Dust suppression should be implemented during construction especially near roads where dust may cause reduced visibility. Due to a scarcity of water in the region, contractors should source alternative ways to implement dust suppression. One such way could be the use of fine gravel stone on roads with heavy traffic.</li> <li>7. Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.</li> <li>8. Any additional external lighting of the facility must be limited.</li> <li>9. Existing roads should be utilised wherever possible. New roads should be planned to take due cognisance of the topography to limit cut and fill requirements. The construction/upgrade of roads should be undertaken properly, with adequate drainage structures in place to minimise the risk of erosion.</li> <li>10. Implement good housekeeping through the removal of rubble, litter and construction material, if it is not removed daily to a registered landfill site, then it should be stored appropriately until removal can take place.</li> <li>11. Rehabilitate cleared areas as soon as possible.</li> <li>12. Mitigation of lighting impacts includes the pro-active design, planning and</li> </ol>	Construction phase	Environmental Liaison Officer

	<p>specification lighting for the facility by a lighting engineer. The correct specification and placement of lighting and light fixtures for the PV plant and the ancillary infrastructure will go far to contain rather than spread the light. Mitigation measures include:</p> <ul style="list-style-type: none"> <li>• Shielding the sources of light by physical barriers (walls, vegetation, or structures.)</li> <li>• Limiting mounting heights of lighting fixtures, or alternatively using footlights or bollard level lights.</li> <li>• Making use of minimum lumen or wattage lights.</li> <li>• Making use of downlighters, or shielded fixtures.</li> <li>• Making use of low-pressure sodium lighting or other types of low impact lighting.</li> <li>• Making use of motion detectors for security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.</li> </ul> <p>13. Reduce construction activities between 07:00 and 18:00, where possible, in order to reduce the impacts of construction lighting.</p> <p>14. Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of construction works within an area.</p> <p>15. Fires and fire hazards need to be managed appropriately.</p> <p>16. Screening should be implemented by erection of the security fence, and by retaining existing and establishing additional vegetation. The growth of vegetation will improve screening into the operational phase.</p> <p>17. Environmental compliance should be overseen by an Environmental Control Officer</p>		
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**Table 2-5: Proposed Mitigation Measures during the Operational Phase**

POTENTIAL ENVIRONMENTAL IMPACT DURING OPERATION (NATURE OF THE IMPACT)	RECOMMENDED MITIGATION MEASURES		
	Management and mitigation measures	Timeframe	Responsibility
<b>Construction Site Decommissioning</b>			
Removal of equipment	<ol style="list-style-type: none"> <li>1. All structures comprising the construction camp are to be removed from site.</li> <li>2. The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc, and these shall be cleaned up.</li> <li>3. All hardened surfaces within the construction camp area should be ripped, all imported materials removed, and the area shall be top soiled and regressed using the guidelines set out in the re-vegetation that forms part of this document.</li> </ol>	When beneficiaries take occupation	Principal Contractor. Developer, Environmental Control officer and Environmental Liaison Officer
Temporary services	<ol style="list-style-type: none"> <li>1. The Contractor must arrange the cancellation of all temporary services.</li> <li>2. Temporary roads must be closed and access across these, blocked.</li> <li>3. All areas where temporary services were installed are to be rehabilitated to the satisfaction of the ECO.</li> </ol>	When beneficiaries take occupation	Principal Contractor. Developer, Environmental Control officer and Environmental Liaison Officer
Associated infrastructure	<ol style="list-style-type: none"> <li>1. Surfaces are to be checked for waste products from activities such as concreting or asphaltting and cleared in a manner approved by the Engineer.</li> <li>2. All surfaces hardened due to construction activities are to be ripped and imported material thereon removed.</li> <li>3. All rubble is to be removed from the site to an approved disposal site as approved by the Engineer. Burying of rubble on site is prohibited.</li> <li>4. The site is to be cleared of all litter.</li> <li>5. Fences, barriers and demarcations associated with the construction phase</li> </ol>	When beneficiaries take occupation	Principal Contractor. Developer, Environmental Control officer and Environmental Liaison Officer

	<p>are to be removed from the site unless stipulated otherwise by the Engineer.</p> <ol style="list-style-type: none"> <li>6. All residual stockpiles must be removed to spoil or spread on site as directed by the Engineer.</li> <li>7. All leftover building materials must be returned to the depot or removed from the site.</li> <li>8. The Contractor must repair any damage that the construction works has caused to neighbouring properties, specifically, but not limited to, damage caused by poor stormwater management.</li> </ol>		
Rehabilitation plan	Rehabilitate and re-vegetate cleared areas with indigenous plant species.	When beneficiaries take occupation	Principal Contractor. Developer, ECO and Environmental Liaison Officer
<b>Operation and Maintenance</b>			
Maintenance	<ol style="list-style-type: none"> <li>1. All applicable standards, legislation, policies and procedures must be adhered to during operation.</li> <li>2. Regular ground inspection of the power plant must take place to monitor their status.</li> <li>3. Regular inspection of Battery Management System including the inert fire system.</li> </ol>	Operational phase	Developer
Replacement of solar panels as part of the maintenance process	<p>Should panels be required to be replaced, the following will apply:</p> <ol style="list-style-type: none"> <li>1. Materials and panels are to be stored within the previously disturbed construction laydown area. No disturbance of areas outside of these areas should occur.</li> <li>2. Full clean-up of all materials must be undertaken after the removal and replacement of the solar panel arrays and associated infrastructure is complete, and disturbed areas appropriately rehabilitated.</li> <li>3. Most of the materials used for solar panel systems can be recycled. The majority of the glass and semiconductor materials can be recovered and</li> </ol>	Operational phase	Developer

	<p>re-used or recycled. Recyclable materials must be transported off-site by truck and managed at appropriate facilities in accordance with relevant waste management regulations. No waste materials may be left on-site.</p> <p>4. Waste material which cannot be recycled shall be disposed of at an appropriately licensed waste disposal site or as required by the relevant legislation.</p>		
Public awareness	The emergency preparedness plan must be ready for implementation always should an emergency situation arise.	Operational phase	Developer
<b>Soil Erosion and Geology</b>			
Soil erosion	<ol style="list-style-type: none"> <li>1. To avoid soil erosion, it will be a good practice to design stormwater canals into which the water from the panels can be channeled. These canals should reduce the speed of the water and allow the water to drain slowly onto the land.</li> <li>2. Another important measure is to avoid stripping land surfaces of existing vegetation by only allowing vehicles to travel on existing roads and not create new roads.</li> <li>3. Facilitate re-vegetation of denuded areas throughout the site.</li> <li>4. Undertake a periodic (bi-annual) site inspection to record the progress of all areas that require re-vegetation.</li> <li>5. If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.</li> <li>6. Speed limits must be put in place to reduce erosion. Soil surface must be wetted as necessary to reduce the dust generated by the project activities. Speed bumps and signs must be erected to enforce slow speed.</li> <li>7. Only existing roads access and walk paths must be made use of</li> </ol>	Operational phase	Developer
Monitoring and reporting	<p>Specific activities that should be monitored include:</p> <ul style="list-style-type: none"> <li>• Erosion potential (specifically in and around roads and stormwater</li> </ul>	Operational phase	Developer

	<p>discharge points).</p> <ul style="list-style-type: none"> <li>Identified problem areas</li> </ul>		
Geology	<ol style="list-style-type: none"> <li>Surface drainage should be provided to prevent water ponding.</li> <li>Bulk infrastructure should be designed by a specialist.</li> </ol>	Operational phase	Developer
<b>Surface and Groundwater</b>			
Surface water	<ol style="list-style-type: none"> <li>Correct drainage of the site should ensure that contaminants do not impact upon the riparian areas and wetlands.</li> <li>The stormwater system on the proposed site needs to be regularly maintained to ensure effective working.</li> </ol>	Operational phase	Developer
Monitoring and reporting	<p>Specific activities that should be monitored include:</p> <ul style="list-style-type: none"> <li>Erosion potential (specifically in and around roads and stormwater discharge points).</li> <li>Stormwater management and design</li> <li>Identified problem areas</li> </ul>	Operational phase	Developer
Site specific mitigation measures for surface water	<ol style="list-style-type: none"> <li>Clear vegetation in line with the 2010 Eskom Environmental Procedure Document entitled "Procedure for vegetation clearance and maintenance within overhead powerline servitudes".</li> <li>Avoid the use of herbicides and diesel to treat stumps within the wetland and buffer areas.</li> <li>Make use of existing access routes as much as possible, before new routes are considered. Any selected "new" route must not encroach into the wetland areas.</li> <li>In line with the 2010 Eskom Environmental Procedure Document entitled "Procedure for vegetation clearance and maintenance within overhead powerline servitudes" all alien vegetation along the transmission servitude should be managed in terms of the Regulation GNR.1048 of 25 May 1984 (as amended) issued in terms of the Conservation of Agricultural Resources Act, Act 43 of 1983. By this Eskom is obliged to control category</li> </ol>	Operational phase	Developer

	1, 2 and 3 plants to the extent necessary to prevent or to contain the occurrence, establishment, growth, multiplication, propagation, regeneration and spreading such plants within servitude areas.		
Site specific mitigation measures for groundwater	<ol style="list-style-type: none"> <li>1. Inventories should be made of all substances that are potentially hazardous to groundwater, which will be stored, used or transported over the sites. The risk of each substance to the groundwater should be considered.</li> <li>2. All areas in which substances potentially hazardous to groundwater are stored, loaded, worked with or disposed of should be securely bunded (impermeable floor and sides) to prevent accidental discharge to groundwater.</li> <li>3. A groundwater monitoring programme (quality and groundwater levels) should be designed and installed for the site. Monitoring boreholes should be securely capped and must be fitted with a suitable sanitary seal to prevent surface water flowing down the outside of the casing. Full construction details of monitoring boreholes must be recorded when they are drilled (e.g. screen and casing lengths, diameters, total depth, etc). Sampling of monitoring boreholes should be done according to recognised standards.</li> </ol>	Operational phase	Developer
<b>Biodiversity (Fauna and Flora)</b>			
Vegetation	<ol style="list-style-type: none"> <li>1. Indigenous vegetation must be maintained, and all exotics removed as they appear and disposed of appropriately.</li> <li>2. Re-vegetation of the disturbed site is aimed at approximating as near as possible to the natural vegetative conditions prevailing prior to construction.</li> <li>3. Vegetative re-establishment shall, as far as possible, make use of indigenous or locally occurring plant varieties.</li> <li>4. Continued monitoring and eradication of alien invasive plant species are imperative.</li> <li>5. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas during and following rehabilitation.</li> </ol>	Operational phase	Developer



Other fauna	No faunal species must be harmed by maintenance staff during any routine maintenance at the development.	Operational phase	Developer
Site specific mitigation measures	<ol style="list-style-type: none"> <li>1. All temporary stockpile areas, litter and dumped material and rubble must be removed and discarded with in an environmentally friendly way</li> <li>2. Undeveloped areas that were degraded due to human activities must be rehabilitated.</li> <li>3. Hazardous chemicals must be stored on an impervious surface and protected from the elements. These chemicals must be strictly controlled, and records kept of when it was used and by whom</li> <li>4. All vehicles should be inspected for oil and fuel leaks on a regular basis.</li> <li>5. Any alien plant observed should be reported to the environmental manager and should be removed as soon as possible.</li> <li>6. Regular monitoring (monthly) for damage to the environment as well as establishment of alien plant species must be conducted.</li> <li>7. Peripheral impacts around the development footprint sites on the surrounding vegetation of the area should be avoided and a monitoring programme should be implemented to ensure the impacts are kept to a minimum, while the rehabilitation of the site should be prioritized after construction has been completed.</li> <li>8. Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.</li> <li>9. Ensure protection of important resources by establishing protective buffers to exclude unintentional disturbance. All possible efforts must be made to ensure as little disturbance as possible to the sensitive features such as surrounding woodland and riparian woodland outside the project area during construction.</li> <li>10. Repair all erosion damage as soon as possible to allow for sufficient rehabilitation growth.</li> <li>11. Gravel roads to the site must be well drained to limit soil erosion.</li> <li>12. Control the flow of runoff to move the water safely off the site without destructive gully formation.</li> </ol>	Operational phase	Developer

	<ol style="list-style-type: none"> <li>13. Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas.</li> <li>14. Any excess or waste material or chemicals should be removed from the site and discarded in an environmentally friendly way. The ECO should enforce this rule rigorously.</li> <li>15. Spill kits should be on-hand to deal with spills immediately.</li> <li>16. All vehicles should be inspected for oil and fuel leaks on a regular basis. Vehicle maintenance yards on site should make provision for drip trays that will be used to capture any spills. Drip trays should be emptied into a holding tank and returned to the supplier.</li> <li>17. Limit human activity in the no-developed areas as well as the completed areas to the minimum required for ongoing operation</li> <li>18. All vehicles should be inspected for oil and fuel leaks on a regular basis.</li> <li>19. All temporary stockpile areas, litter and dumped material and rubble must be removed and discarded with in an environmentally friendly way</li> <li>20. Undeveloped areas that were degraded due to human activities must be rehabilitated.</li> <li>21. No unauthorised removal of plant or animal species allowed.</li> <li>22. Where holes for poles pose a risk to animal safety, they should be adequately cordoned off to prevent animals falling in and getting trapped and/or injured. This could be prevented by the constant excavating and backfilling during planting of the poles along the lines.</li> <li>23. Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for the raptors occurring in the area. The use of poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist.</li> <li>24. Mitigation measures mentioned for the construction phase above must be implemented for any maintenance of the development that may be undertaken during the operation phase.</li> <li>25. Correct rehabilitation with locally indigenous species.</li> <li>26. Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion and the edge effect are avoided.</li> </ol>		
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	<p>27. Constant maintenance of the area to ensure re-colonisation of floral species.</p> <p>28. Regular removal of alien species which may jeopardise the proliferation of indigenous species.</p> <p>29. Regular maintenance of bird flappers and guards must be undertaken.</p> <p>30. Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. Weeds and invader plants will be controlled in the manner prescribed for that category by the CARA or in terms of Working for Water guidelines. The control of these species should even begin prior to the construction phase considering that small populations of these species was observed during the field surveys.</p> <p>31. Institute strict control over materials brought onto site, which should be inspected for seeds of noxious plants and steps taken to eradicate these before transport to the site. Routinely fumigate or spray all materials with appropriate low-residual herbicides prior to transport to or in a quarantine area on site. The contractor is responsible for the control of weeds and invader plants within the construction site for the duration of the construction phase. Alien invasive tree species listed by the CARA regulations should be eradicated.</p> <p>32. Rehabilitate disturbed areas as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish.</p> <p>33. Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds. Once detected, an eradication/control programme should be implemented to ensure that the species' do not spread to surrounding natural ecosystems.</p>		
<b>Avifauna</b>			
Displacement, disturbance, collisions with panels and power line and electrocution	1. Implement a bird monitoring program (BMP) for the Angus Solar Power Plant (RF) (Pty) Ltd.	Operational phase	Developer

	<ol style="list-style-type: none"> <li>2. Limit ongoing human activity to the minimum required for ongoing operation.</li> <li>3. Control noise to minimum.</li> <li>4. Rehabilitate with indigenous vegetation.</li> <li>5. Retain indigenous vegetation throughout as much as possible.</li> <li>6. Limit roadways and vehicle speeds.</li> <li>7. Panels to be flat at night, preferably low sheen/matt surfaces, quarterly fatality monitoring.</li> <li>8. Quarterly fatality monitoring and record keeping must be undertaken throughout the project life.</li> <li>9. The design of the proposed solar plants and grid line must be of a type of similar structure as endorse by the Eskom-EWT Strategic Partnership on Birds and energy Birdlife South Africa</li> </ol>		
Nesting on site	<ol style="list-style-type: none"> <li>1. Avoid the use of lattice-type structures in order to minimise perching and nesting opportunities.</li> <li>2. Minimise standing water.</li> <li>3. Inspect all PV modules at least once a month throughout the year for any nest-building activity.</li> <li>4. Maintenance staff require basic training in order to know what to look for and how to fill in the Bird Incident Forms.</li> </ol>	Operational phase	Developer
<b>Waste Management</b>			
Recycling and litter management	<ol style="list-style-type: none"> <li>1. The site should be kept clear of litter at all times.</li> <li>2. Solid waste separation and recycling must take place for the duration of the operational phase for the development.</li> <li>3. All waste must be removed promptly to ensure that it does not attract vermin or produce odours.</li> <li>4. In house treatment procedures must be followed strictly.</li> <li>5. Solid waste must be collected on a regular basis and disposed of at the closest municipal landfill site.</li> <li>6. Package treatment plant must be regularly serviced.</li> </ol>	Operational phase	Developer

	<p>7. No solid waste may be burned or buried on site or disposed of by any other method on site.</p> <p>8. Broken or old batteries or components of the PV plant must be stored in a demarcated area in quarantine for the shortest period possible until it can be collected and taken to a special chemical waste facility.</p> <p>9. Once the batteries become obsolescent, either due to the facility decommissioning or the batteries reaching their useful design life and require replacement, the used batteries will be broken down and recycled as far as possible and unrecoverable wastes disposed of through appropriate channels.</p> <p>10. Litter, spills, fuels, chemical and human waste in and around the project area must be minimized and controlled according to the waste management plan.</p> <p>11. Refuse bins must be responsibly emptied and secured.</p> <p>12. Where a registered disposal facility is not available close to the project area, the contractor must provide a method statement with regards to waste management. Under no circumstance may domestic waste be burned on site.</p>		
<b>Health and Safety</b>			
Emergency evacuation plan	Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.	Operational phase	Developer
Maintenance	The PV plant is to be regularly maintained. A maintenance schedule must be drawn up and records of all maintenance kept.	Operational phase	Developer
Fire safety	Firefighting equipment in the form of fire hydrants or fire extinguishers must be available on the site. These must be regularly maintained by an appropriate company.	Operational phase	Developer

Storage and handling of hazardous waste, hazardous substances and dangerous goods	<ol style="list-style-type: none"> <li>1. Transformer oil containers must be regularly maintained to ensure that leaks do not occur.</li> <li>2. A spill kit needs to be kept on site to address any unforeseen spillages.</li> <li>3. Transport of all hazardous substances must be in accordance with the relevant legislation.</li> <li>4. The bund wall surrounding the transformer oil containers must be regularly maintained to ensure that any spills are completely contained.</li> <li>5. Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.</li> <li>6. Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.</li> <li>7. Develop and adhere to a procedure for the safe handling of battery cells during the undertaking of maintenance activities.</li> <li>8. Ensure that service providers dispose of used batteries properly by requesting and retaining receipts for disposal/refurbishment.</li> <li>9. Immediately report significant spillages and initiate an environmental site assessment for risk assessment and remediation if necessary.</li> <li>10. Emergency response arrangements and systems, such as foam pourers, firefighting systems and cooperation with emergency responders must be implemented. Preventive measures could include maintenance procedures to prevent the occurrence of loss of containment, as well as strict control of ignition sources and other measures which may be required according to standards such as those prescribed by the South African National Standards System.</li> </ol>	Operational phase	Developer
<b>Risks associated with the BESS</b>			
Gas release with subsequent fire and explosion	<ol style="list-style-type: none"> <li>1. The battery management system (BMS) is essential to the safety and performance of the entire ESS system: it has a controlling and monitoring function, hence its specifications and functions need to be checked, tested and validated. Controlling and monitoring the state of charge (SoC) of the battery cell through its parameters (current, voltage, temperature) during charging and discharging is a critical function based on which functional</li> </ol>	Operational phase	Developer

	<p>safety for fault protection is designed.</p> <ol style="list-style-type: none"> <li>2. In order to ensure normal operation, optimum power output and service life, the system will require cooling at high temperatures and heating in cold weather.</li> <li>3. The BESS should be located away from critical buildings or equipment. Where spatial separation is not possible, provide exterior protection such as a passive thermal barrier, or active fire protection such as drenchers. An appropriate distance must be maintained between containers to safeguard against propagation.</li> <li>4. Install battery and battery management systems/electrical switch gear in separate rooms.</li> <li>5. Put battery and battery management systems/electrical switch gear in separate rooms, with fire resistive construction (two-hour fire rated) to adequately cut-off the room from surrounding exposures.</li> <li>6. Provide signage on site specifying how electrical and chemical fires should be dealt with by first responders, and the potential risks to first responders (e.g. toxic fumes). Provide suitable firefighting equipment on site.</li> <li>7. Provide fire-rated compartmentation and adequate separation between battery units.</li> <li>8. Provide adequate fire doors that are maintained in the closed position and equipped with automatic closure mechanisms. Where insulated metal panels (IMPs) are used, these must contain a mineral wool core and be installed in accordance with the terms of their approval. Only non-combustible IMPs should be installed.</li> <li>9. Ensure proper management of cable/service penetrations. Cable penetrations must be adequately sealed to meet the fire resistance of the compartment (two-hour fire resistance rating). Heating, ventilation and air conditioning ducts must have fire dampers provided that automatically close on activation of the fire alarm. Establish a permit to access system to manage changes to service or cable penetrations under an audited system.</li> <li>10. Extensive monitoring of the battery states such as voltage, temperature, current etc. as well as redundant monitoring and control in terms of a fail-safe battery-management-system (BMS) is crucial for a safe operation of</li> </ol>		
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	<p>BESS. Maintenance and inspection schedules must be set up. The BMS, the inverter control unit and the BESS supervisory control and data acquisition (SCADA) system must closely monitor the BESS. If one of these fails, the BESS needs to be shut down.</p> <ol style="list-style-type: none"> <li>11. Automatic fire detection must be in place, with early warning smoke detection or very early warning highly sensitive smoke detection. The system design must include continuous remote monitoring.</li> <li>12. Consider automatic fire sprinklers and water mist for active fire protection.</li> <li>13. To ensure that BESS remain at an acceptable risk level, owners and operators of both permanent or portable BESS must follow design standards and best practices, regularly maintain the system's equipment (as well as safety systems and related equipment), train personnel, and communicate with local emergency responders on the storage system's hazards.</li> </ol>		
<p>Appropriate operation and maintenance of the battery energy storage system (BESS)</p>	<ol style="list-style-type: none"> <li>1. Compile (and adhere to) a procedure for the safe handling of the battery cells.</li> <li>2. Ensure that battery supplier user guides, safety specifications and Material Safety Data Sheets (MSDS) are filed on site at all times.</li> <li>3. Operate, maintain and monitor the BESS as per the supplier specifications.</li> <li>4. Compile method statements for approval by the Technical/SHEQ Manager for battery cell, electrolyte and battery call / container replacement. Maintain the method statements on site.</li> <li>5. Ensure that all maintenance contractors / staff are familiar with the supplier's specifications.</li> <li>6. Provide signage on site specifying the types of batteries in use and the risk of exposure to hazardous material and electric shock.</li> <li>7. Maintain strict access control to the battery storage area.</li> <li>8. Undertake regular visual checks of the BESS equipment to identify signs of damage or leaks.</li> <li>9. Provide environmental awareness training to all personnel on site. Training should include a discussion of: <ul style="list-style-type: none"> <li>• Potential impact of electrolyte spills on groundwater;</li> <li>• Suitable disposal of waste and effluent; and</li> </ul> </li> </ol>		



- How incidents and suggestions for improvement can be reported.

**Visual Impact**

Maintenance and lighting

1. Vegetation cover (i.e., either natural or cultivated) immediately adjacent to the development footprint must be maintained.
2. Maintenance and good housekeeping of the power plant must be undertaken.
3. Lighting must be kept to a minimum and restricted to low level, downward facing lights to reduce light spill.
4. Lighting must be inward and downward pointing to reduce glare in surrounding areas.
5. Security lighting should make use of down-lights to minimise light spill, and motion detectors where possible so that lighting at night is minimised.
6. Mitigation of lighting impacts includes the pro-active design, planning and specification lighting for the facility by a lighting engineer.
7. Where sensitive visual receptors are likely to be affected (e.g., residents of homesteads in close proximity to the power plant), it is recommended that the developer enter into negotiations with property owners regarding the potential screening of visual impacts at the receptor site. This may entail the planting of vegetation or trees. Visual screening has been found to be most effective when placed at the receptor itself.
8. Similar screening (e.g., vegetation barriers or vegetation berms) may be considered along boundaries of the power plant that is adjacent to roads, mitigating the potential visual impact on observers travelling along the road.
9. Rehabilitated areas must be monitored for rehabilitation failure and remedial action must be implemented as and when required.
10. Roads must be maintained to eliminate erosion and suppress dust.
11. Create a "Green Energy" awareness campaign, educating the local community and potentially tourists on the benefits of renewable energy.
12. Regular maintenance of exteriors and associated infrastructure must be

Operational phase

Developer

	undertaken. Maintain general appearance of the facility as a whole.		
<b>Employment</b>			
Labour	Training of labourers to benefit individuals beyond completion of the project.	Operational phase	Developer
Recruitment plan	<ol style="list-style-type: none"> <li>1. Recruitment must comply with national employment and labour laws.</li> <li>2. The Project Manager must ensure that all staff working on the proposed project are in possession of a South African Identity Card or a relevant work permit.</li> <li>3. Ensure adequate advertising in the project community areas, local papers for skilled labour.</li> <li>4. Local community leaders must be utilised to source labour.</li> <li>5. The recruitment process must be equitable and transparent. A concerted effort will be made to guard against nepotism and/or any form of favouritism during the process.</li> <li>6. The recruitment of skilled labour will follow standard advertising process in national newspapers and interview based selection.</li> <li>7. Record of official complaints by employees to authorities i.e. Labour and Social Security.</li> <li>8. Where feasible, efforts should be made to employ local contractors that are compliant with Black Economic Empowerment (BEE) criteria.</li> <li>9. The recruitment selection process must seek to promote gender equality and the employment of women wherever possible.</li> <li>10. Establish, maintain a healthy worker-management relationship.</li> <li>11. It is recommended that local employment policy is adopted to maximise the opportunities made available to the local community.</li> <li>12. Vocational training programs should be established to promote the development of skills.</li> </ol>	Operational phase	Developer

Grievance mechanism	<ol style="list-style-type: none"> <li>1. A grievance mechanism as part of the management system should be established.</li> <li>2. The grievance procedure does not replace normal manager-employee dialogue, but is another open form of communication.</li> <li>3. The procedure should assist employees to resolve grievance situations quickly and effectively in order to restore harmonious working conditions for all employees.</li> <li>4. Management is responsible for listening and responding to all employee concerns raised through this procedure.</li> <li>5. In all cases, matters will be dealt with in as confidential a manner as possible.</li> </ol>	Construction and operational phase	Developer
<b>Social Environment</b>			
Corporate social investment	<ol style="list-style-type: none"> <li>1. Consult with the community to determine their needs. Following a top-down approach without community consultation can result in irrelevant interventions that are disregarded by the community.</li> <li>2. Angus Solar Power Plant (RF) (Pty) Ltd should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project;</li> <li>3. A CNA must be conducted to ensure that the LED and social upliftment programmes proposed by the project are meaningful.</li> <li>4. Ongoing communication and reporting are required to ensure that maximum benefit is obtained from the programmes identified, and to prevent the possibility for such programmes to be misused.</li> <li>5. The programmes should be reviewed on an ongoing basis to ensure that they are best suited to the needs of the community at the time (bearing in mind that these are likely to change over time).</li> </ol>	Operational phase	Developer

Sense of place and tourism	<ol style="list-style-type: none"> <li>1. Job opportunities should be afforded to local individuals as far as possible to enhance their sense of place.</li> <li>2. Tourists visiting the area should be made aware of South Africa's movement towards renewable energy. This could be implemented by constructing a visitor's centre on the property allocated to the proposed solar farm which should be open to school fieldtrips, the local community, and tourists.</li> </ol>	Operational phase	Developer
<b>Heritage Resources</b>			
Mitigation of the impact that the new development may have on potential archaeological artifacts on the site	<ol style="list-style-type: none"> <li>1. The contractors and workers should be notified that archaeological sites might be exposed during the construction activities;</li> <li>2. Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, shall cease immediately and the Environmental Control Officer (ECO) shall be notified as soon as possible;</li> <li>3. All discoveries shall be reported immediately to a heritage practitioner so that an investigation and evaluation of the finds can be made. Acting upon advice from these specialists, the ECO will advise the necessary actions to be taken;</li> <li>4. Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site; and</li> <li>5. Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the NHRA, Section 51(1). A person or entity, e.g. the ECO, should be tasked to take responsibility for the heritage sites and held accountable for any damage.</li> </ol>	Construction and operational phase	Developer

**Table 2-6:** Proposed Mitigation Measures during the Decommissioning Phase

POTENTIAL ENVIRONMENTAL IMPACT DURING DECOMMISSIONING (NATURE OF THE IMPACT)	RECOMMENDED MITIGATION MEASURES		
	Management and mitigation measures	Timeframe	Responsibility
<b>Ongoing Stakeholder involvement</b>			
General	<ol style="list-style-type: none"> <li>1. Closure must be planned from inception through adequate social planning and infrastructure development that can be maintained by the communities after closure and opportunities to redirect skills must be sought.</li> <li>2. Community to be notified, as culturally appropriate, timeously of the planned decommissioning.</li> <li>3. Recommend that a meeting with community leader(s) be held before decommissioning commence to inform them: <ul style="list-style-type: none"> <li>• What activities will take place during the decommissioning phase.</li> <li>• How these activities will impact upon the communities and/or their properties.</li> <li>• Regarding the timeframes of scheduled activities.</li> </ul> </li> <li>4. Regular interaction between Angus Solar Power Plant (RF) (Pty) Ltd and community leader(s) during the decommissioning phase.</li> <li>5. A reporting office/channel to be established should community members experience problems with contractors/sub-contractors during the decommissioning phase.</li> <li>6. A register to be kept of problems reported by community members and the steps taken to address/ resolve it.</li> </ol>	Decommissioning phase	Angus Solar Power Plant (RF) (Pty) Ltd
<b>Community Health and Safety Responsibility</b>			
Community health and safety responsibility	<ol style="list-style-type: none"> <li>1. Demarcated routes to be established for construction vehicles to ensure the safety of communities, especially in terms of road safety and communities to be informed of these demarcated routes.</li> <li>2. Where dust is generated by trucks passing on gravel roads, dust mitigation to be enforced.</li> </ol>	Decommissioning phase	Angus Solar Power Plant (RF) (Pty) Ltd

	3. Any infrastructure that would not be decommissioned must be appropriately locked and/or fenced off to ensure that it does not pose any danger to the community.		
<b>General site considerations</b>			
General site decommissioning considerations	<ol style="list-style-type: none"> <li>1. All temporary fencing and danger tape must be removed once the construction phase has been completed.</li> <li>2. All hardened surfaces within the construction camp area must be diced, all imported materials removed, and the area shall be top soiled and re-vegetated.</li> <li>3. Temporary roads (if any) must be closed and access across these blocked.</li> <li>4. The area that previously housed the construction equipment camp is to be checked for spills of substances such as oil, paint, etc. and these should be cleaned up.</li> <li>5. A method statement must be developed to guide the safe decommissioning of Battery storage which will consider appointment of accredited battery recyclers.</li> </ol>	Following completion of construction activities in an area: decommissioning phase	Principal Contractor and Angus Solar Power Plant (RF) (Pty) Ltd
<b>Waste Management</b>			
Waste management	<ol style="list-style-type: none"> <li>1. All decommissioned equipment must be removed from site and disposed of at a registered land fill. Records of disposal must be kept.</li> <li>2. The panels need to be disposed of appropriately and returned to the manufacturer to be recycled.</li> <li>3. Rubble or waste that could accompany the construction effort, if the development is approved, should be removed during and after construction. Measures must be taken to avoid any spills and infiltration of petroleum fuels or any chemical pollutants into the soil during construction phase</li> <li>4. The applicant must ensure that the final disposal site can accept the waste and the anticipated volumes thereof. Any hazardous waste must be disposed of at a hazardous waste disposal site.</li> </ol>	Decommissioning phase	Angus Solar Power Plant (RF) (Pty) Ltd

<b>Surface and Groundwater Responsibility</b>			
Surface and groundwater responsibility	<ol style="list-style-type: none"> <li>1. Removal of any historically contaminated soil as hazardous waste.</li> <li>2. Removal of hydrocarbons and other hazardous substances by a suitable contractor to reduce contamination risks.</li> <li>3. Removal of all substances which can result in groundwater (or surface water) contamination.</li> <li>4. Re-vegetation of exposed soil surfaces must be undertaken to ensure no erosion in these areas.</li> <li>5. Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.</li> <li>6. Compaction of soils should be limited and / or avoided as far as possible. Compaction will reduce water infiltration and will result in increased runoff and erosion. Where any disturbance of the soil takes place (have taken place in the past), these areas must be stabilised and any alien plants which establish should be cleared and follow-up undertaken for at least 2 years thereafter and preferably longer. Where compaction becomes apparent, remedial measures must be taken (e.g., "ripping" the affected area).</li> <li>7. Reseed any areas where earthworks have taken place with indigenous grasses to prevent further erosion.</li> <li>8. Erosion control mechanisms must be established as soon as possible.</li> <li>9. If compaction occurs, rectification can be done by application and mixing of manure, vegetation mulch or any other organic material into the area. Use of well cured manure is preferable as it will not be associated with the nitrogen negative period associated with organic material that is not composted.</li> <li>10. Vehicle traffic should not be allowed on the rehabilitated areas, except on allocated roads. It will have a negative impact due to the dispersive/compaction characteristics of soils and its implications on the long term.</li> <li>11. Appropriate design and mitigation measures must be developed and implemented to minimise impacts on the natural flow regime of the watercourse i.e., through placement of structures/supports and to</li> </ol>	Decommissioning phase	Angus Solar Power Plant (RF) (Pty) Ltd.

	<p>minimise turbulent flow in the watercourse.</p> <p>12. The indiscriminate use of machinery within the riparian area will lead to compaction of soils and destruction of vegetation and must therefore be strictly controlled.</p> <p>13. Perform scheduled maintenance to be prepared for storm events. Ensure that culverts have their maximum capacity, ditches are cleaned, and that channels are free of debris and brush than can plug structures.</p> <p>14. After decommissioning all materials have to be disposed of in a responsible manner.</p> <p>15. After decommissioning, the site has to be rehabilitated by sowing indigenous grass species. The control and monitoring of declared invaders must continue for five years after decommissioning.</p>		
<b>Biodiversity Responsibility</b>			
Loss of habitat	<ol style="list-style-type: none"> <li>1. Maintain footprint strictly during decommissioning.</li> <li>2. Existing access roads must be used.</li> <li>3. All infrastructure must be removed from the site.</li> <li>4. Plant vegetation species for rehabilitation that will effectively bind the loose material, and which can absorb run-off from the mining areas.</li> <li>5. Rehabilitate all the land where infrastructure has been demolished.</li> <li>6. Monitor the establishment of the vegetation cover on the rehabilitated sites to the point where it is self-sustaining.</li> <li>7. Protect rehabilitation areas until the area is self-sustaining.</li> <li>8. Diversion trenches and storm water measures must be maintained</li> <li>9. Water management facilities must stay operational and maintained and monitored until such a stage is reached where it is no longer necessary.</li> <li>10. All the monitoring and reporting on the management and rehabilitation issues to the authorities must continue till closure of the mine is approved.</li> <li>11. Monitor and manage invader species and alien species on the rehabilitated land until the natural vegetation can outperform the invaders or aliens.</li> <li>12. Refer to mitigation measures for the construction phase needed during the closure phase that are relevant.</li> </ol>	Decommissioning phase	Angus Solar Power Plant (RF) (Pty) Ltd



	<ol style="list-style-type: none"> <li>13. Re-vegetation of affected areas must be made a priority to avoid erosion. Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.</li> <li>14. Suitable stormwater/wind controls must be put in place until rehabilitation is complete.</li> <li>15. Constant removal of alien invasive species in and around plant.</li> <li>16. Newly rehabilitated areas must be adequately demarcated and access restricted (specifically vehicular access) until vegetation is established. Appropriate signage must be established and maintained to ensure personnel are aware of these areas.</li> <li>17. Monitoring should be implemented during the decommissioning phase to ensure that minimal impact is caused to the fauna and flora of the area.</li> <li>18. After decommissioning, infrastructure has to be removed and disposed of in a responsible manner.</li> <li>19. After decommissioning, the site has to be rehabilitated by sowing indigenous grass species. The control and monitoring of declared invaders have to continue for five years after decommissioning.</li> </ol>		
Surface Water features	<ol style="list-style-type: none"> <li>1. Plant vegetation species for rehabilitation that will effectively bind the loose material, and which can absorb run-off from the development areas.</li> <li>2. Rehabilitate all the land where infrastructure has been demolished.</li> <li>3. Monitor the establishment of the vegetation cover on the rehabilitated sites to the point where it is self-sustaining.</li> <li>4. Protect rehabilitation areas until the area is self-sustaining.</li> <li>5. Diversion trenches and storm water measures must be maintained</li> <li>6. Water management facilities must stay operational and maintained and monitored until such a stage is reached where it is no longer necessary.</li> <li>7. The development areas must be shaped to make it safe.</li> <li>8. All the monitoring and reporting on the management and rehabilitation issues to the authorities must continue till closure of the site is approved.</li> <li>9. Monitor and manage invader species and alien species on the rehabilitated land until the natural vegetation can outperform the invaders or aliens.</li> </ol>	Decommissioning phase	Angus Solar Power Plant (RF) (Pty) Ltd

	<p>10. Refer to mitigation measures for the construction phase needed during the closure phase that are relevant</p>		
Negative effect of human activities on fauna and road mortalities	<p>11. No staff should be accommodated on the site. If practical, construction workers should stay in one of the nearby villages and transported daily to the site.</p> <p>12. The ECO should regularly inspect the site, including storage facilities and compounds and eradicate any invasive or exotic plants and animals.</p> <p>13. Maintain proper firebreaks around the entire development footprint.</p> <p>14. Educate construction workers regarding risks and correct disposal of cigarettes.</p> <p>15. More fauna is normally killed the faster vehicles travel. A speed limit should be enforced (preferably 40 km/hour). It can be considered to install speed bumps in sections where the speed limit tends to be disobeyed. (Speed limits will also lessen the probability of road accidents and their negative consequences).</p> <p>16. Travelling at night should be avoided or limited as much as possible.</p>	Decommissioning phase	Angus Solar Power Plant (RF) (Pty) Ltd
Edge effect	<p>1. The Contractor should be responsible for implementing a programme of weed control.</p> <p>2. Present exotic and invasive plant species should be eradicated at the site.</p> <p>3. By no means should any declared invaders, be planted or allowed to establish if the development is approved.</p> <p>4. All exotic vegetation must be removed from the site (if present).</p>	Decommissioning phase	Angus Solar Power Plant (RF) (Pty) Ltd
Erosion and loss of topsoil	<p>1. Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion.</p> <p>2. Undertake a periodic site inspection to record the occurrence of and re-vegetation progress of all areas that require re-vegetation. This must be undertaken every 4 months during the decommissioning phase, and then every 6 months after completion of decommissioning, until final sign-off is</p>	Decommissioning phase	Angus Solar Power Plant (RF) (Pty) Ltd

	<p>achieved.</p> <ol style="list-style-type: none"> <li>3. If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.</li> <li>4. Record GPS positions of all occurrences of below-surface soil disturbance (e.g. excavations). Record the date of topsoil stripping and replacement. Check that topsoil covers the entire disturbed area.</li> </ol>		
<b>Air Pollution Responsibility</b>			
Air pollution responsibility	<ol style="list-style-type: none"> <li>1. Regular maintenance of equipment to ensure reduced exhaust emissions.</li> <li>2. A speed limit should be enforced on dirt roads (preferably 30-40km/h).</li> <li>16. Implement standard dust control measures, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) of construction areas and access roads, and ensure that these are continuously monitored to ensure effective implementation.</li> </ol>	Decommissioning phase	Angus Solar Power Plant (RF) (Pty) Ltd
<b>Noise and Vibrations</b>			
Noise and vibrations	<ol style="list-style-type: none"> <li>1. The decommissioning phase must aim to adhere to the relevant noise regulations and limit noise to within standard working hours in order to reduce disturbance of dwellings in close proximity to the development.</li> <li>2. Any noisy fixed facilities should be located away from noise sensitive areas.</li> <li>3. Truck traffic should be routed away from noise sensitive areas, where possible.</li> <li>4. Noise levels must be kept within acceptable limits.</li> <li>5. Noisy operations should be combined so that they occur where possible at the same time.</li> <li>6. Construction workers to wear necessary ear protection gear.</li> <li>7. Noisy activities to take place during allocated construction hours.</li> </ol>	Decommissioning phase	Angus Solar Power Plant (RF) (Pty) Ltd

	<ol style="list-style-type: none"> <li>8. Noise from labourers must be controlled.</li> <li>9. Noise suppression measures must be applied to all construction equipment. Construction equipment must be kept in good working order and where appropriate fitted with silencers which are kept in good working order. Should the vehicles or equipment not be in good working order, the Contractor may be instructed to remove the offending vehicle or machinery from site.</li> <li>10. The Contractor must take measures to discourage labourers from loitering in the area and causing noise disturbance. Where possible labour shall be transported to and from the site by the Contractor or his Sub-Contractors by the Contractors own transport.</li> <li>11. Implementation of enclosure and cladding of processing plants.</li> <li>12. Applying regular and thorough maintenance schedules to equipment and processes.</li> </ol>		
Site specific mitigation measures	<ol style="list-style-type: none"> <li>1. During decommissioning care should be taken to ensure that noise from construction vehicles and plant equipment does not intrude on the surrounding residential areas.</li> <li>2. Gravel roads used should be kept in good order. Corrugations and drainage ruts should not be allowed to develop.</li> </ol>	Decommissioning phase	Angus Solar Power Plant (RF) (Pty) Ltd
<b>Decommissioning Traffic</b>			
Decommissioning traffic	<ol style="list-style-type: none"> <li>1. Routes and required access roads must be clearly defined.</li> <li>2. The removal of equipment must be undertaken with the minimum amount of trips to reduce the carbon footprint of these activities.</li> <li>3. Access of all vehicles must be strictly controlled, especially during wet weather to avoid compaction and damage to the topsoil structure.</li> <li>4. Damping down of the un-surfaced roads must be implemented to reduce dust and nuisance.</li> <li>5. Vehicles and equipment must be serviced regularly to avoid the contamination of soil from oil and hydraulic fluid leaks etc.</li> <li>6. Servicing must be done in dedicated service areas on site or else off site if</li> </ol>	Decommissioning phase	Angus Solar Power Plant (RF) (Pty) Ltd

	<p>no such area exists.</p> <ol style="list-style-type: none"> <li>7. Oil changes must take place on a concrete platform and over a drip tray to avoid pollution.</li> <li>8. Soils compacted by construction vehicles shall be deep ripped to loosen compacted layers and re-graded to even running levels.</li> </ol>		
Access	<ol style="list-style-type: none"> <li>1. The main routes on the site must be clearly signposted and printed delivery maps must be issued to all suppliers and Sub-contractors.</li> <li>2. Contractor must clearly mark all access roads. Roads not to be used must be marked with a "NO ENTRY for construction vehicles" sign.</li> </ol>	Decommissioning phase	Angus Solar Power Plant (RF) (Pty) Ltd
Noise	<p>Movement of heavy construction vehicles through residential areas must be timed to avoid peak morning and evening traffic periods. In addition, movement of heavy construction vehicles through residential areas must not take place over weekends.</p>	Decommissioning phase	Angus Solar Power Plant (RF) (Pty) Ltd
General	<ol style="list-style-type: none"> <li>1. The Contractor must meet safety requirements under all circumstances. All equipment transported must be clearly labelled as to their potential hazards according to specifications. All the required safety labelling on the containers and trucks used must be in place.</li> <li>2. The Contractor must ensure that all the necessary precautions against damage to the environment and injury to persons are taken.</li> <li>3. Care for the safety and security of community members crossing access roads must receive priority at all times.</li> </ol>	Decommissioning phase	Angus Solar Power Plant (RF) (Pty) Ltd
<b>Visual Impact</b>			
Visual impact	<ol style="list-style-type: none"> <li>1. Ensure that vegetation is not unnecessarily cleared or removed during the construction period.</li> <li>2. Reduce the decommissioning period through careful logistical planning and productive implementation of resources.</li> <li>3. Plan the placement of lay-down areas and potential temporary</li> </ol>	Decommissioning phase	Angus Solar Power Plant (RF) (Pty) Ltd

	<p>construction camps in order to minimise vegetation clearing (i.e., in already disturbed areas) where possible.</p> <ol style="list-style-type: none"> <li>4. Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.</li> <li>5. Implement good housekeeping through the removal of rubble, litter and construction material, if it is not removed daily to a registered landfill site, then it should be stored appropriately until removal can take place.</li> <li>6. Dust suppression should be implemented especially near roads where dust may cause reduced visibility. Due to a scarcity of water in the region, contractors should source alternative ways to implement dust suppression. One such way could be the use of fine gravel stone on roads with heavy traffic.</li> <li>7. Restrict activities to daylight hours in order to negate or reduce the visual impact associated with lighting.</li> <li>8. Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of decommissioning activities.</li> </ol>		
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**Table 2-7:** Proposed Mitigation Measures during the Post Closure Phase

<b>POTENTIAL ENVIRONMENTAL IMPACT DURING POST CLOSURE (NATURE OF THE IMPACT)</b>	<b>RECOMMENDED MITIGATION MEASURES</b>		
	<b>Management and mitigation measures</b>	<b>Timeframe</b>	<b>Responsibility</b>
<p>Due to the permanent nature of the proposed development, it is unlikely that closure will be implemented. No impacts are therefore anticipated for the post closure phase of the proposed development.</p>			

### 3 ENVIRONMENTAL AWARENESS PLAN

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The successful implementation of the conditions of the EMPr and EA is dependent on the adequate distribution of the requirements of the said conditions to all stakeholder associated with the proposed Angus Solar Power Plant (RF) (Pty) Ltd. An Environmental Awareness Plan must be commissioned by the Developer prior to commencement of pre-construction activities, to familiarise all the members of the Project Management Team and their respective employees with the conditions of the EMPr and EA.

The implementation of the Environmental Awareness Plan should include the following:

- Compilation of summaries of the conditions of the EMPr and EA;
- Distribution of summaries and full documents to members of the Project Management Team;
- Induction of all employees (the SHE Representative should induct all construction workers) and visitors prior to commencement of site clearing and construction activities making them aware of:
  - Legal obligations as per NEMA, EMPr and EA;
  - Roles and responsibilities;
  - Mitigation measures applicable to their functions on site; and
  - Potential penalties for non-compliance.

The Environmental Awareness Plan must take into account the preferred language of the employees on site and must be presented in a language that they will understand.

The key to the successful implementation of the EMPr is appropriate monitoring and review to ensure effective functioning of the EMPr and to identify and implement corrective measures in a timely manner. In the event where discrepancies are identified, the problem must be investigated and attended to. All the results obtained during environmental monitoring must be documented for audit purposes.

An audit of the environmental monitoring and management actions undertaken is essential to ensure that it is effective in operation, is meeting specified goals, and performs in accordance with relevant regulations and standards. Audits should be conducted during the construction phase of the facility to ensure compliance with the management measures contained in the EMPr. The construction audit schedule is as follows:

- Monthly internal audits by the SHE representative / ECO;
- One post-construction audit by an independent external auditor;
- Annual internal audits for the first five years of the operational phase of each of the five phases; and
- Audits every five years of the overall compliance to the EA and EMPr conditions and recommendations for amendments for the remainder of the life of Angus Solar Power Plant (RF) (Pty) Ltd.

The audits will incorporate the monthly reports submitted by the SHE Representative. The frequency of the operational phase audits may be increased should the findings of the audits find that the conditions of the EMPr and EA are not being complied with.



## 5 EMPr AMENDMENT

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Amendments to the EMPr may be required as the project proceeds. The EMPr must be reviewed annually during the operational phase and any proposed amendments to the EMPr, as may be specified in the audit reports, must be confirmed with the Developer prior to being issued as a formal amendment application to DFFE. Copies of the amendments will be issued to all registered I&APs.

# Appendices

# **Appendix A: CV of the EAP**

# Appendix B: Bird incident form

Bird Incident Form	
PV facility name:	
Observer name:	
Date:	Time:
The incident:	Type:
	Likely cause:
The animal:	Species:
	Age class:
	Sex:
	Condition of remains:
Location:	GPS:
	Nearest PV hardware:
Remarks:	
Photos:	

## APPENDIX C: ENVIRONMENTAL AWARENESS AND FIRE MANAGEMENT PLAN

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
<b>A. DESIGN PHASE</b>					
1. Potential impacts resulting from the lack of overall compliance with the conditions of the EA (issued by the DEA).	Prevent non-compliance with the conditions of the EA.	1.1. Audit the implementation of the EMPr requirements.	Audit report on compliance with actions and monitoring requirements.	• Weekly	• Project Developer
		1.2. Establish clear and transparent reporting of the activities undertaken with regard to all recommendations included in the EMPr.	Audit report on compliance with actions and monitoring requirements.	• Weekly	• Project Developer
<b>B. CONSTRUCTION PHASE</b>					
2. Potential risk of fire due to construction activities or behaviour of staff on site during the construction phase.	Prevent fire on site resulting of workers smoking or starting fires (i.e. cooking, heating purposes).	1.1. Designate smoking areas, as well as areas for cooking, where the fire hazard could be regarded as insignificant.	Ad-hoc checks to ensure workers are smoking or cooking in designated areas only.	• Daily	• ECO & Contractor
		1.2. Educate workers on the dangers of open and/or unattended fires.	Ensure fire safety requirements are well understood and respected by construction personnel. Carry out Environmental Awareness Training. Conduct audits of the signed attendance registers.	• On-going • Once-off training and ensure that all new staff are inducted • Monthly	• ECO & Contractor • ECO/ Contractor • ECO
		1.3. Open fires must be prohibited. Appropriate fire safety training should also be provided to staff that are to be on the site for the duration of the construction phase.	Ensure fire safety requirements are well understood and respected by construction personnel. Provide basic fire safety training.	• On-going	• ECO & Contractor
		1.4. Ensure that cooking takes place in a designated area shown on the site map. Ensure that no firewood or kindling may be gathered from the site or surrounds.	Check compliance with specified conditions using a report card and allocate fines when necessary.	• On-going	• ECO & Contractor
		1.5. Fire-fighting equipment must be made available at various appropriate locations on the construction site.	Ensure fire safety requirements are well understood and respected by workers.	• On-going • Bi-annually	• ECO & Contractors • Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			Assurance of functionality of fire extinguishers via inspections and certification by an accredited fire service company.		
3. Inappropriate behaviour of civil contractors and sub-contractors during the construction phase.	Prevent unnecessary impacts on the surrounding environment by ensuring that contractors are aware of the requirements of the EMPr.	3.1. Ensure that the EMPr and the EA (should it be granted by the DEA), are included in all tender documentation and contractors and sub-contractor's contracts.	Check compliance with specified conditions using a report card and allocate fines when necessary.	On-going	ECO & Contractor
		3.2. Contractors and sub-contractors must use the ablution facilities situated in a designated area within the site; and no bathing/washing should be permitted outside the designated area.	Check compliance with specified conditions using a report card and allocate fines when necessary.	On-going	ECO & Contractor
	Ensure that contractors and sub-contractors do not induce impacts on the surrounding environment as a result of unplanned pollution on site.	3.3. All litter will be deposited in a clearly labelled, closed, animal-proof disposal bin in the construction area; particular attention needs to be paid to food waste.	Check compliance with specified conditions using a report card and allocate fines when necessary.	On-going	ECO & Contractor
	Ensure that actions by on-site contractors and sub-contractors and workers are properly managed in order to minimise impacts to surrounding environment.	3.4. No person other than qualified specialist or personnel authorised by the Project Developer, will disturb or remove plants outside the demarcated construction area.	Check compliance with specified conditions using a report card and allocate fines when necessary.	On-going	ECO & Contractor
		3.5. No person other than qualified specialist or personnel authorised by the Project Developer, will disturb animals on the site.	Check compliance with specified conditions using a report card and allocate fines when necessary.	On-going	ECO & Contractor
		3.6. Educate workers on site about suitable behaviour on site and initiate environmental awareness. Staff must be informed that no trapping, snaring or feeding of any animal will be allowed.	Carry out Environmental Awareness Training.  Conduct audits of the signed attendance registers	Once-off training and ensure that all new staff are inducted.  Monthly	Contractor/ ECO  ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
4. Inappropriate planning and of site camp establishment.	Ensure that environmental issues are taken into consideration in the planning for site establishment.	4.1. All construction activities, materials, equipment and personnel must be restricted to the actual construction area specified (as required to undertake the construction work). The construction area must be demarcated by the Contractor.	Monitor compliance and record non-compliance and incidents.	Before construction	ECO
		4.2. The Contractor should install and maintain Construction Site Information Boards in the position, quantity, design and dimensions specified by the Project Developer.	Monitor compliance and record non-compliance and incidents.	Before construction	ECO
		4.3. General building materials should be stored in appropriate designated areas on site such that there will be no runoff from these areas towards sensitive systems. The site camp must be removed after construction.	Monitor compliance and record non-compliance and incidents.	Before construction	ECO
5. Increased animal road mortality.	Reduction in animal mortality.	5.1. The construction staff should be made aware of the presence of fauna and within the proposed project area. The construction personnel and staff must also be made aware of the general speed limits on site and must be alert at all times for potential crossings and should be trained on how to react in these situations.	Carry out Environmental Awareness Training.  Conduct audits of the signed attendance registers.	Once-off training and ensure that all new staff are inducted.  Monthly	Contractor/ ECO  ECO
		5.2. To ensure that animals are not attracted to the site (and potentially resulting in increased road mortality), the waste collection bins and skips should be covered with suitable material, where appropriate, and the site camp must be kept clean on a daily basis.	Monitor the activities via visual inspections, and record and report any non-compliance.	Daily	Contractor & ECO
		5.3. Establish a monitoring programme to record the number of faunal road mortalities and collisions. If it is established that the number of collisions and faunal fatalities increase within an area, particularly with regards to smaller species (reptiles), then measures such as exclusion fences within these areas only should be installed.	Appropriate monitoring and recording should be undertaken.  Exclusion fences should be installed, if needed to direct animals to safe road crossings.	Weekly  As required	ECO  ECO & Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
6. Increased energy consumption during the construction phase.	Reduce energy consumption where possible.	6.1. Encourage the use of energy saving equipment at the site camp site (such as low voltage lights and low-pressure taps) and promote recycling. Construction personnel must be made aware of energy conservation practices as part of the Environmental Awareness Training programme.	Contractor to monitor energy usage via audits. Carry out Environmental Awareness Training. Conduct audits of the signed attendance registers.	Monthly  Once-off training and ensure that all new staff are inducted.  Monthly	Contractor  Contractor/ ECO  ECO
7. Impact on the regional water balance as a result of increased water usage.	Reduce water usage during the construction phase.	7.1. Water conservation should be practiced as follows: <ul style="list-style-type: none"> <li>• Cleaning methods utilised for cleaning vehicles, floors, etc. should aim to minimise water use (e.g., sweep before wash-down).</li> <li>• Ensure that regular audits of water systems are conducted to identify possible water leakages.</li> </ul> 7.2. Avoid the use of potable water for dust suppression during the construction phase and consider the use of alternative approved sources, where possible.	Monitor via site audits and record non-compliance and incidents.	Monthly	ECO
		7.3. Make construction personnel aware of the importance of limiting water wastage, as well as reducing water use.	Carry out Environmental Awareness Training with a discussion on water usage and conservation.  Conduct audits of the signed attendance registers.	Once-off training and ensure that all new staff are inducted.  Monthly	Contractor/ ECO  ECO



Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
<b>C. OPERATIONAL PHASE</b>					
8. Potential risk of fire due to behaviour of staff on site during the operational phase.	Ensure appropriate and efficient fire prevention during the operational phase.	8.1. Designate smoking areas as well as areas for cooking, where the fire hazard could be regarded as insignificant.	Random inspections during a month to ensure workers are smoking or starting fires in designated areas only.	Monthly	Facility Manager
		8.2. Educate workers on the dangers of open and/or unattended fires.	Ensure fire safety requirements are well understood and respected by operational personnel.	On-going	Facility Manager
			Carry out Environmental Awareness Training.	Once-off training and ensure that all new staff are inducted.	Facility Manager
			Conduct audits of the signed attendance registers.	Monthly	Facility Manager
8.3. Open fires must be prohibited. Appropriate fire safety training should also be provided to staff that are to be on the site for the duration of the operational phase.	Ensure fire safety requirements are well understood and respected by operational personnel. Provide basic fire safety training.	On-going	Project Developer		
8.4. Ensure that adequate fire-fighting equipment is available and easily accessible on site.	Ensure fire safety requirements are well understood and respected by workers.	On-going	Facility Manager		
		Assurance of functionality of fire extinguishers via inspections and certification by an accredited fire service company.	Bi-annually	Project Developer	
9. Increased energy consumption during the operational phase.	Reduce energy consumption where possible.	9.1. Encourage the use of energy saving equipment at the PV facility (such as low voltage lights and low-pressure taps) and promote recycling. Operational personnel must be made aware of energy conservation practices as part of the environmental awareness training programme.	Monitor energy usage via site investigations.  Conduct training for all operational personnel.	Monthly  As and when required and ensure that all new staff are inducted.	Facility Manager  Project Developer

10. Impact on the regional water balance as a result of increased water usage.	Reduce water usage during operations.	10.1 Water conservation to be practiced in line with Energy Saving Policies as follows: 10.2 Cleaning methods utilised for cleaning vehicles, floors, the offices etc. should aim to minimise water use (e.g., sweep before wash-down). <ul style="list-style-type: none"> <li>• Where possible, encourage the re-use of water.</li> <li>• Ensure that regular audits of water systems are conducted to identify possible water leakages.</li> </ul> 10.3 Consider installing water saving devices (e.g. dual flush toilets, automatic shut-off taps, etc.).	Record water usage during the operational phase, conduct audits and record non-compliance and incidents.	Monthly	Facility Manager
		10.4 Carry out environmental awareness training with a discussion on water usage and conservation and make operational personnel aware of the importance of limiting water wastage.	Conduct training for all operational personnel.	As and when required during operations and ensure that all new staff are inducted.	Facility Manager
11. Non respect of waste management practices.	Minimise the production of general waste.  Ensure compliance with relevant waste management legislation.  Minimise pollution of the environment.	11.1 Control and implement waste management plans. Ensure that relevant legislative requirements are respected. 11.2 Determine specific areas on site for temporary management of waste.	Control of waste management practices throughout operation phase.	Monthly	Facility Manager
		11.3 Promote waste reduction, re-use, and recycling opportunities on site during the operation phase. 11.4 Ensure an adequate and sustainable use of resources.	Monitor waste generation and collection throughout operation.	Monthly	Facility Manager
12. Excessive generation of wastewater on site during the operation phase.	Maintain reasonable levels of wastewater generation.	12.1 Wastewater must be collected and disposed of at a suitable licenced disposal facility. Proof of disposal (i.e., waste disposal slips or waybills) should be retained on file for auditing purposes.	Wastewater generation to be monitored throughout the operational phase.  Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.	Quarterly	Facility Manager

#### **D. DECOMMISSIONING PHASE**

13. Ensure that the construction mitigation and management measures are adhered to during the decommissioning phase.

## APPENDIX D: ALIEN INVASIVE VEGETATION MANAGEMENT PLAN

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
<b>A. CONSTRUCTION PHASE</b>					
1. Impacts due to establishment of alien invasive plants.	Avoid establishment and spread of alien invasive plants due to the project activities.	1.1 Establish an ongoing monitoring programme for construction phase to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act and Biodiversity Act).	Prepare monitoring programme which will monitor the presence of alien invasive species on the site. If any alien invasive species are detected then the distribution of these should be mapped (GPS co- ordinates of plants or concentrations of plants), number of individuals (whole site), age and/or size classes of plants and aerial cover of plants. The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area.	Once-off	ECO and Contractor
		1.2 Do not import soil stockpiles from areas with alien plants.	Monitor the presence of alien invasive species on the development site.	On-going	ECO and Contractor
		1.3 Rehabilitate disturbed areas as quickly as possible.	Rehabilitate disturbed areas and monitor the presence of alien invasive species on the development site.	On-going	ECO and Contractor
		1.4 Keep disturbance of indigenous vegetation to a minimum.	Monitor and manage vegetation clearing	On-going	ECO and Contractor

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
		1.5 Immediately control any alien plants that become established using registered control methods.	If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site), age and/or size classes of plants and aerial cover of plants. The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area. Any alien invasive should be cleared from site.	On-going	ECO and Contractor
		1.6 Machinery/plant equipment used for construction must be cleaned prior to coming to site	Clean equipment prior to it coming on site.	On-going	ECO and Contractor
		1.7 The shallow topsoil layer must be stockpiled separately from the subsoil layers, should the excavation exceed 0.5 m. When the construction has been completed, the topsoil layers, which contain seed and vegetative material, should be reinstated last to allow plants to rapidly re-colonise the bare soil areas	Stockpile the topsoil layer (0.5m top layer of soil) separately and used on site following the construction phase.  Establish an effective record keeping system for each area where soil is disturbed for constructional purposes. These records should be included in environmental performance reports and should include all the records below: Record the GPS coordinates of each area.  Record the date of topsoil stripping.	Daily (stockpiling) and once-off for the reinstatement of the topsoil layer	ECO and Contractor

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
			<p>Record the GPS coordinates of where the topsoil is stockpiled. Record the date of cessation of constructional (or operational) activities at the particular site. Photograph the area on cessation of constructional activities.</p> <p>Record date and depth of re-spreading of topsoil.</p> <p>Photograph the area on completion of rehabilitation and on an annual basis thereafter to show vegetation establishment and evaluate progress of restoration over time.</p>		
<b>B. OPERATIONAL PHASE</b>					
5.2 Impacts due to establishment of alien invasive plants.	Avoid establishment and spread of alien invasive plants.	2.1 Continue with ongoing monitoring programme to detect and quantify any alien species that may become established and identify the problem species during operational phase.	<p>Annual audit of project area and immediate surroundings. If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site), age and/or size classes of plants and aerial cover of plants.</p> <p>The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area.</p>	Annual	Operations and Maintenance Contractor

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
		2.2 Immediately control any alien plants that become established using registered control methods.	Take action to control alien plants as advised by a specialist.	Immediately	Operations and Maintenance Contractor
<b>C. DECOMMISSIONING PHASE</b>					
3. Rehabilitation of flora on site and alien plant removal programme.	Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to operational.	3.1 All natural areas must be rehabilitated with species indigenous to the area. Re-seed with locally- sourced seed of indigenous grass species that were recorded on site pre-construction.	Final external audit of area to confirm that area is rehabilitated to an acceptable level.	Once off	Lead Contractor with advice from specialist
		3.2 Maintain alien plant removal programme for 5 years after rehabilitation.	Monitor newly disturbed areas where infrastructure has been removed to detect and quantify any aliens that may become established for 5 years after decommissioning and rehabilitation. Final external audit of area to confirm that area is free of alien invasive plants after 5 years.	Once off  Yearly	Operations and Maintenance Contractor with advice from specialist

## APPENDIX F: OPEN SPACE MANAGEMENT PLAN

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
<b>A. DESIGN PHASE</b>					
1. Loss of vegetation and habitat fragmentation.	Keeping the area cleared of vegetation to a minimum.	1.1 Clearing of vegetation should be kept to a minimum and take into consideration the sensitivities on site.	Ensure that solar panel/array design and layout is uniform and well- adapted to the surrounding environment and that no areas are cleared of vegetation that are not required as part of the construction of the various infrastructure.	Once-off during design	Project Developer
2. Permanent barriers to animal movement and habitat fragmentation.	The reduction in the impact that barrier will have on animal movement within the area.	2.1 Fencing should allow for the passage of small and medium sized mammals and all forms of mesh fencing should be avoided.	This should be monitored by the ECO during the construction phase to determine where these measures should be installed.	Once-off during design	Contractor
		2.2 All remaining areas that are not impacted upon by the proposed development footprint should remain unfenced to allow for movement corridors between the remainder of the farm.	This should be monitored by the ECO during the construction phase to determine whether this has been done.	Once-off during design	Project Developer
		2.3 Pigtailed and/or flappers should be installed on the overhead cables where known flight paths of birds occur.	This should be monitored by the ECO during the construction phase to determine where these measures should be installed.	Once-off during design	Contractor
<b>B. CONSTRUCTION PHASE</b>					
3. Potential visual intrusion of construction activities on	Limiting negative visual impact caused by	3.1 Preparation of the solar field area (clearance of vegetation, grading, contouring and compacting) and solar field construction should be phased in a way that makes practical sense in order to	Plan activities during the construction phase so that it is optimally phased.	As required	ECO and Contractor



Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
existing views of sensitive visual receptors.	construction activities.	minimise the area of soil exposed and the shortest duration of exposure.			
4. Visual impacts of construction activities on the regional environment.	Limiting negative visual impact caused by construction activities.	4.1 Maintain good housekeeping on site to avoid litter and minimise waste.	Monitor throughout construction phase.	Continually as required	ECO and Contractor
		4.2 Demarcate clearance areas and minimise surface disturbance.	Monitor throughout construction phase.	Continually as required	ECO and Contractor
		4.3 Rehabilitation of temporarily cleared sites should start as soon as possible.	Monitor throughout construction phase.	Continually as required	ECO and Contractor
		4.4 Implement dust suppression management actions.	Monitor throughout construction phase.	Continually as required	ECO and Contractor
5. Permanent barriers to animal movement and habitat fragmentation.	The reduction in the impact that barrier will have on animal movement within the area.	5.1 Pigtailed and/or flappers should be installed on the overhead cables where known flight paths of birds occur.	The flight paths and birds observed in the area should be monitored by the ECO during the construction phase to determine where these measures should be installed.	Daily	ECO and Contractor
		5.2 Fencing should allow for the passage of small and medium sized mammals and all forms of mesh fencing should be avoided.	This should be monitored by the ECO during the operational phase to determine whether this is effective.	Once-off during design	Contractor
<b>C. OPERATIONAL PHASE</b>					
3. Potential visual intrusion of the proposed solar energy facility on the views of sensitive visual receptors.	Maintain an appropriate visual quality of solar energy facility to reduce visual impact on the rural landscape	a. Painted features should be maintained and repainted.	Continually as required.	During the operational phase	Operations and Maintenance Contractor

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
7. Potential impact of night lighting of a large solar energy facility on the nightscape of the region.	Ensure design and layout of facility and security lighting is managed. It will minimise light spill beyond project boundaries.	<p>7.1 Develop a lighting plan that will minimise light spill beyond project boundaries, avoid up-lighting and minimise lights in line with safety and security. The lighting plan should include and consider the following:</p> <ul style="list-style-type: none"> <li>• A lighting plan that documents the design, layout and technology used for lighting purposes should be prepared, indicating how nightscape impacts will be minimised;</li> <li>• The lighting plan should include a process for promptly addressing and mitigating complaints about potential lighting impacts;</li> <li>• Lighting of the facility should not exceed, in number of lights and brightness, the minimum required for safety and security;</li> <li>• Uplighting and glare (bright light) should be minimised using appropriate screening;</li> <li>• Low-pressure sodium light sources should be used to reduce light pollution;</li> <li>• Light fixtures should not spill light beyond the project boundary;</li> <li>• Timer switches or motion detectors should be used to control lighting in areas that are not occupied continuously; and</li> <li>• Lights should be switched off when not in use whenever it is in line with safety and security.</li> </ul>	Develop lighting plan and ensure that requirements are adhered to.	Monthly for the first year and then yearly	Project Developer
Mitigation		Monitoring			

Project aspect	Objectives	Management actions	Methodology	Frequency	Responsibility
		•			
8. Visual impacts due to the intrusion of a utility-scale solar energy facility on views of sensitive visual receptors.	Reduce effects of the intrusion of a utility-scale solar energy facility on views of sensitive visual receptors.	8.1 Painted features should be maintained and repainted when colour fades or paint flakes.	Ensure a good maintenance of the paint on all painted surface of the solar facility and associated buildings.	Twice a year	Operations and Maintenance Contractor
9. Permanent barriers to animal movement and habitat fragmentation.	Avoid or reduce bird collisions with or due to infrastructure related to the project.	9.1 The impact on birds must be monitored by environmental staff member during the first six months of the operational phases for each of the projects and in conjunction with any efforts made by Eskom through management measures included in their OEMP in minimising bird collisions.	<ul style="list-style-type: none"> <li>Record any evidence of bird collisions, injury or other bird-related incidents (with GPS coordinates).</li> <li>Where necessary, a bird specialist should oversee the recording and reporting of incidents, help with species identification, assess the significance of any impacts, and if required, suggest mitigation.</li> </ul>	Weekly for the first month, thereafter, monthly	Project Developer
		9.2 Annual monitoring by an avifaunal specialist. This should be based on a minimum of 3-5 days observations.	Monitor the flight paths of birds occurring on site, noting which birds are seen.	Annually	Project Developer

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
		9.3 Any avian mortality or injury at the facility should be duly recorded and reported.	Record any bird fatalities and undertake the necessary reporting to EWT or relevant authority.	When required	Project Developer
<b>D. DECOMMISSIONING PHASE</b>					
10. No specific impacts are associated with the decommissioning phase other than those from the operational phase that will still be relevant for the duration of the decommissioning phase due to on-going occupation of the area.		10.1 Disturbed and transformed areas should be contoured to approximate naturally occurring slopes to avoid lines and forms that will contrast with the existing landscapes	Final external audit of area to confirm that area is rehabilitated to an acceptable level.	Once off	Project Developer
		10.2 Stockpiled topsoil should be reapplied to disturbed areas and these areas should be re-vegetated using a mix of native species in such a way that the areas will form as little contrast in form, line, colour and texture with the surrounding undisturbed landscape.	Final external audit of area to confirm that area is rehabilitated to an acceptable level.	Once off	Project Developer
		10.3 Edges of re-vegetated areas should be feathered to reduce form and line contrasts with surrounding undisturbed landscape.	Final external audit of area to confirm that area is rehabilitated to an acceptable level.	Once off	Project Developer
		10.4 Working at night should be avoided.	This should be monitored to ensure that it is being undertaken.	Continuous	Project Developer
		10.5 Night lighting of reclamation sites should be minimised within requirements of safety and efficiency.	This should be monitored to ensure that it is being undertaken.	Continuous	Project Developer

## APPENDIX G: TRAFFIC MANAGEMENT PLAN INCLUDING TRANSPORTATION PLAN

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
<b>A. DESIGN PHASE</b>					
1. Increase traffic generation.	Manage impact that additional traffic generation will have on road network.	1.1 Should abnormal loads have to be transported by road to the site, a permit needs to be obtained from the Provincial Government Gauteng Department of Public Works, Roads and Transport	Ensure permits are obtained.	Once-off during final design phase	Contractor
		1.2 Registration details must be supplied for all vehicles that will use the Transnet Service Road to obtain official permit. All permit applications must be submitted.	Ensure permits are obtained.	Once-off during final design phase	Contractor
		1.3 Provide a Transport Traffic Plan to SANRAL	Prepare and submit plan.	Once-off during final design phase	Contractor
2. Decrease in quality surface condition of the roads.	Limit the deterioration of surface road condition.	2.1. A Road Maintenance Plan should be developed for the section of the Transnet Service Road that will be used and addresses the following: <ul style="list-style-type: none"> <li>– Grading requirements;</li> <li>– Dust suppressant requirements;</li> <li>– Drainage requirements;</li> <li>– Signage; and</li> <li>– Speed limits.</li> </ul>	Prepare plan.	Once-off during final design phase	Contractor

## B. CONSTRUCTION PHASE

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
3. Increase traffic generation.	Minimise the impact of the construction activities on the local traffic and avoid accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads.	3.1. Should abnormal loads have to be transported by road to the site, a permit needs to be obtained from the Provincial Government Gauteng (PGNW) Department of Public Works, Roads and Transport	Ensure permits are obtained.	During construction	Contractor and ECO
		3.2 Registration details must be supplied for all vehicles that will use the Transnet Service Road to obtain official permit. All permit applications must be submitted.	Ensure permits are obtained.	Once-off during final design phase	Contractor
		3.3 Ensure that roadworthy and safety standards are implemented at all time for all construction vehicles	Monitoring of condition of vehicles coming to site.	During construction	Contractor and ECO
		3.4 Plan trips so that it occurs during the day but avoid construction vehicles movement on the regional road during peak time (06:00-10:00 and 16:00-20:00).	Monitor and management traffic generated and when trips are made.	During construction	Contractor and ECO
4. Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads.	Avoidance of accidents.	4.1 Roadkill monitoring programme (inclusive of wildlife collisions record keeping) should be established and a product such as Animex fences installed, if needed, to direct animals to safe road crossings.	Appropriate monitoring should be undertaken and Clear-vu fences installed, if needed to direct animals to safe road crossings.	Weekly	Contractor and ECO
		4.2 Adhere to all speed limits applicable to all roads used. All heavy load vehicles maintain a speed limit of 40 km/hr in proposed section of the Transnet Freight Rail service road.	Ensure that speed limits are adhered to.	Daily	Contractor and ECO

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
		4.3 Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the Transnet Service Road to ensure safe entry and exit.	Implement clear signalisation.	On-going	Contractor and ECO
5. Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment.	Limit the release of noise, pollutants and dust emissions.	5.1 Implement management strategies for dust generation e.g. apply dust suppressant on the Transnet Service Road, exposed areas and stockpiles.	Ensure generation of dust to an adequate level.	On-going	Contractor and ECO
		5.2 Make provision for the repairing of subgrade deterioration (pot holes, dust holes) that might result due to loading of heavy construction vehicles on the proposed section. This requirement can be a condition based frequency consensus must be made with the Technical Supervisor Earthworks.	Make provision for repairs required to road.	Agree to with Transnet	Contractor and ECO
		5.3 Construction vehicles must have their lights on at all times. Lights to be properly set to no blind train drivers.	Ensure lights are on and properly set.	On-going	Contractor and ECO
		5.4 Postpone or reduce dust-generating activities during periods with strong wind.	Ensure dust management measures are in place to decrease the dust generated.	On-going	Contractor and ECO
		5.5 Earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased.	Ensure dust management measures are in place to decrease the dust generated.	On-going	Contractor and ECO
		5.6 Ensure that all construction vehicles are roadworthy and respect the vehicle safety standards implemented by the	Manage the air pollutants form construction vehicles	On-going	Contractor and ECO

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
		Project Developer.	through checking the condition of vehicles.		
		5.7 Avoid using old and noisy construction equipment and ensure equipment is well maintained.	Manage the air pollutants form construction vehicles through checking the condition of vehicles.	On-going	Contractor and ECO
6. Decrease in quality surface condition of the roads.	Limit the deterioration of surface road condition.	6.1 Construction activities will have a higher impact than the normal road activity and therefore the road should be inspected on a weekly basis for structural damage.	Ensure that road maintains current condition through photographic surveys and monitoring.	Weekly	Contractor and ECO
		6.2 Implement management strategies for dust generation e.g. apply dust suppressant on the Transnet Service Road, exposed areas and stockpiles.	Ensure dust management measures are in place to decrease the dust generated.	On-going	Contractor and ECO
7. Soil contamination from leakage from battery (during transport and on-site construction).	Avoid soil contamination during transportation and construction of batteries on site.	7.1 The transport vehicle should be identified with symbols: the vehicle, must be correctly identified, following international conventions, symbols and colours, identifying the fact that corrosive and hazardous products are being transported.	Check those trucks transporting batteries to site are appropriately identified with the required symbols.	On-going	Contractor and ECO
		7.2 PPE should be provided for the transport team and they should be trained in the use of the equipment, in case of any accident.	Provide PPE to transport team.	On-going	Contractor and ECO
		7.3 Drivers and personnel on site dealing with the battery storage's hazardous wastes should always be trained in emergency procedures, including fire, spilling, etc. and	Ensure that drivers and personnel are trained in handling the battery.	Monthly	Contractor and ECO



Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
		how to contact emergency response teams. Besides this, they should be aware of the specific kind of hazardous material is being transported and how to deal with it.			
<b>C. OPERATIONAL PHASE</b>					
8. Increase traffic generation.	Minimise the impact of the operational activities on the local traffic and avoid accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads.	8.1 Adhere to requirements made within Transport Traffic Plan.	Monitor the requirements as set out in the Plan as ensure that it is adhered to.	On-going	Operations and Maintenance Contractor
		8.2 Limit access to the site to personnel.	Maintain register of who comes to site and restrict access to personnel.	On-going	Operations and Maintenance Contractor
		8.3 Ensure that where possible, staff members carpool to site.	Monitor the requirements.	On-going	Operations and Maintenance Contractor
9. Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction	Limit the release of noise, pollutants and dust emissions.	9.1 Limit noisy maintenance/operational activities to daytime only.	Restrict noisy work for to the day time.	Monthly	Operations and Maintenance Contractor

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
Equipment.					
10. Decrease in quality of surface condition of the roads.	Maintain condition of road.	10.1 Implement requirements of the Road Maintenance Plan.	Adhere to requirements of the Road Maintenance Plan.	On-going	Operations and Maintenance Contractor
<b>D. DECOMMISSIONING PHASE</b>					
11. Ensure that the construction mitigation and management measures are adhered to during this phase.					

## APPENDIX H: STORM WATER MANAGEMENT PLAN

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
<b>A. DESIGN PHASE</b>					
1. Impact of the project if a detailed storm water management plan is not correctly prepared.	Watercourses present on site should retain their existing functioning and character throughout the lifetime of the solar facility.	1.1 Ensure that the development envelope avoids the watercourses (if any) shown in figures.	Check compliance with specified conditions.	Once-off during design followed by regular control	Contractor
		1.2 Prepare a detailed stormwater management plan outlining appropriate treatment measures to address runoff from disturbed portions of the site, such that they <ul style="list-style-type: none"> <li>1.2.1 do not result in concentrated flows into natural water courses i.e. provision should be made for temporary or permanent measures that allow for attenuation, control of velocities and capturing of sediment upstream of natural water courses;</li> <li>1.2.2 do not result in any necessity for concrete or other lining of natural water courses to protect them from concentrated flows off the development;</li> <li>1.2.3 do not divert flows out of their natural flow pathways, thus depriving downstream water courses of water.</li> </ul>	Check compliance with specified conditions.	Once-off during design followed by regular control	Contractor
<b>B. CONSTRUCTION PHASE</b>					
2. Diversion and impedance surface water flows – Changes	Prevent interference with natural run-off patterns,	2.1 Stormwater and any run-off generated by the hard surfaces should be discharged into retention swales or areas with rock rip-rap. These could be used to enhance the sense of place, if they are planted with indigenous vegetation.	Check compliance with specified conditions of the stormwater management plan.	Weekly or bi-weekly	ECO

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
to the hydrological regime and increased potential for erosion. And Diversion and increased velocity of surface water flows – reduction in permeable surfaces.	diverting flows and increasing the velocity of surface water flows.	2.2 The energy dissipation structures should be placed in manner that flows are managed prior to being discharged back into the natural waters courses, thus not only preventing erosion, but would support the maintenance of natural base flows within these systems, i.e. hydrological regime (water quantity and quality) is maintained.	Check compliance with specified conditions of the stormwater management plan.	Weekly or bi-weekly	ECO
		2.3 Any irrigation of the development area for landscaping or dust control purposes should be controlled, such that it does not result in any measurable increase in moisture being passed into natural drainage lines.	Check compliance with specified conditions of the stormwater management plan.	Weekly or bi-weekly	ECO
		2.4 Drainage along the sides of the roads should be designed so that it does not result in concentrated flows into water courses.	Check compliance with specified conditions of the stormwater management plan.	Weekly or bi-weekly	Contractor and ECO
3. Impact of changes to water quality.	Prevent contamination of watercourse and decrease in water quality.	3.1 Chemical storage containers must be regularly inspected so that any leaks are detected early and be surrounded by bunds.	Check compliance with specified conditions of the stormwater management plan.	Weekly or bi-weekly	ECO
		3.2 Littering and contamination of water sources during construction must be prevented by effective construction camp management.	Check compliance with specified conditions of the stormwater management plan.	Weekly or bi-weekly	ECO

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
		3.3 Emergency plans must be in place in case of spillages onto road surfaces and watercourses.	Check compliance with specified conditions of the stormwater management plan.	Weekly or bi-weekly	ECO
		3.4 No stockpiling should take place within a watercourse.	Check compliance with specified conditions of the stormwater management plan.	Weekly or bi-weekly	ECO
		3.5 All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds.	Check compliance with specified conditions of the stormwater management plan.	Weekly or bi-weekly	ECO
		3.6 Stockpiles must be located away from river channels i.e. greater than 32 m or outside of the 1:100 floodline whichever is greater.	Check compliance with specified conditions of the stormwater management plan.	Weekly or bi-weekly	ECO
		3.7 Erosion and sedimentation into water bodies must be minimised through the effective stabilisation (gabions and Reno mattresses) and the re-vegetation of any disturbed riverbanks.	Check compliance with specified conditions of the stormwater management plan.	Weekly or bi-weekly	ECO

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
		3.8. The construction camp and necessary ablution facilities meant for construction workers must be beyond any buffer shown in Figure.	Check compliance with specified conditions of the stormwater management plan.	Weekly or bi-weekly	ECO
		3.9. No ad hoc crossing of channels by vehicles during construction are allowed and access routes across the site should be strictly demarcated.	Check compliance with specified conditions of the stormwater management plan.	Weekly or bi-weekly	ECO
		3.10 No waste materials or sediments are left in the channel after construction.	Check compliance with specified conditions of the stormwater management plan.	Weekly or bi-weekly	Contractor and ECO
		3.11 Access routes across the site are strictly demarcated and selected with a view to minimising impacts on drainage lines.	Check compliance with specified conditions of the stormwater management plan.	Weekly or bi-weekly	Contractor and ECO
<b>C. OPERATIONAL PHASE</b>					
4. Impact due to release of wash water in the environment after use.	Prevent runoff into drainage lines onsite.	4.1 An operational phase stormwater management plan should be designed and implemented, with a view to preventing the passage of concentrated flows off hardened surfaces and onto natural areas.	ECO must monitor activities and record and report non-compliance.	Continuously during operational phase (i.e. regular interval to be determined by the ECO)	Operations and Maintenance Contractor

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
<b>D. DECOMMISSIONING PHASE</b>					
<p>5. The solar facility would be expected to run for a minimum period of 20 years, after which it would either be decommissioned, alternatively upgraded or an application submitted to obtain a new license. Should the plant be decommissioned, the solar field would be rehabilitated to its original (pre-development) state.</p> <p>In the (unlikely) event that none of the mitigation measures outlined for the Construction and Operational Phases of the project had been implemented, the period of time for recovery to take place would be extended. In the event that decommissioning occurred, and assuming implementation of mitigation measures, the hydrological regime should fully recover over time to present day conditions.</p>					

## APPENDIX I: EROSION MANAGEMENT PLAN

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
<b>A. CONSTRUCTION PHASE</b>					
1. Increased wind erosion and resultant deposition of dust.	Prevent wind erosion and resultant deposition of dust on the surrounding indigenous vegetation.  To have no erosion on and downstream of the site as a result of run-off from the site, or of wind erosion.	1.1 Sand, stone and cement should be stored in demarcated areas, and are covered or sealed to prevent wind erosion and resultant deposition of dust on the surrounding indigenous vegetation.	Check that sand, stone and cement are stored and handled as instructed.	Daily	ECO and Contractor
		1.2 During construction, efforts should be made to retain as much natural vegetation as possible on the site, to reduce disturbed areas and maintain plant cover, thus reducing erosion risks. All measures required for the treatment of runoff generated on the building platform during construction should be in place before site clearing commences.	Check that sand, stone and cement are stored and handled as instructed.	Daily	ECO and Contractor
2. Excessive loss of natural vegetation in development footprint area.	Prevent loss of natural vegetation through erosion.	2.1 Vegetation clearing during construction must be restricted to the footprint of the solar field and planned infrastructure only. It should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time.	ECO to be on site to monitor vegetation clearing.  Regular monitoring for erosion to ensure that no erosion problems are	Daily	ECO and Contractor



Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
			occurring at the site. All erosion problems observed should be rectified as soon as possible.		
		2.2 The shallow topsoil layer must be stockpiled separately from the subsoil layers, should the excavation exceed 0.5 m. When the construction has been completed, the topsoil layers, which contain seed and vegetative material, should be reinstated last to allow plants to rapidly re-colonise the bare soil areas.		Daily (stockpiling) and once-off for the reinstatement of the top soil layer	ECO and Contractor
		2.3 Re-seed with locally-sourced seed of indigenous grass species that were recorded on site pre-construction.	Re-seed with seeds of indigenous grass.	Once off	ECO with advice from specialist (if required)
<b>B. OPERATIONAL PHASE</b>					
3. Excessive loss of natural vegetation in development footprint area and resulting impacts on species of special concern.	Prevent loss of natural vegetation through erosion.	3.1 To prevent erosion, indigenous grasses that seed themselves below the solar arrays should be left to form a ground cover and kept short.	ECO to advise on seed to be used.	Monthly	Operations and Maintenance Contractor
		3.2 The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion. Other erosion control measures that can be implemented are as follows: 1) Brush packing with cleared vegetation, 2) Planting of vegetation, 3) Hydro seeding/hand sowing. All erosion control mechanisms need to be regularly maintained.	Monitor efficiency of erosion control measures.	Weekly or monthly	Operations and Maintenance Contractor

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
4. Manage habitat fragmentation (loss of landscape connectivity) and loss of Faunal Habitat.	Minimise habitat fragmentation and loss of connectivity.	4.1 Regular monitoring for erosion to ensure that no erosion problems are occurring at the site as a result of the roads and other infrastructure. All erosion problems observed should be rectified as soon as possible.	Regular monitoring for erosion to ensure that no erosion problems are occurring at the site. All erosion problems observed should be rectified.	Monthly	Operations and Maintenance Contractor
5. Increased wind erosion and resultant deposition of dust.	To have no erosion on and downstream of the site as a result of run-off from the site, or of wind erosion.	5.1 Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.	Include periodical site inspection in environmental performance reporting that inspects the effectiveness and integrity of the run-off control system and specifically records occurrence or not of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.	Monthly during construction phase, quarterly thereafter.	Operations and Maintenance Contractor

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
<b>C. DECOMMISSIONING PHASE</b>					
<p>6. No specific impacts are associated with the decommissioning phase other than those from the operational phase that will still be relevant for the duration of the decommissioning phase due to on-going occupation of the area.</p> <p>7. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas. Monitoring: Final external audit of area to confirm that area is rehabilitated to an acceptable level (once off event to be conducted by ECO).</p>					

## APPENDIX J: HARZADOUS SUBSTANCES LEAKAGE OR SPILLAGE MONITORING SYSTEM

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
<b>CONSTRUCTION PHASE</b>					
11.1. Contamination of soil and risk of damage to vegetation and/or fauna through spillage of concrete	Avoid soil contamination and risk of damage to vegetation and/or fauna through spillage of concrete	Concrete mixing area (if any) must be defined in the site map and restricted to this area. If any concrete mixing takes place on site, this is being done on board or plastic sheeting, which is to be removed from the site once concreting is completed; or in areas to be covered by further construction.	Check that sand, stone and cement are stored and handled as instructed	Daily	Contractor and ECO
		Any excess sand, stone and cement must be removed from site at the completion of the construction period and disposed of at a proper landfill site	Check that sand, stone and cement are stored and handled as instructed	Daily	Contractor and ECO
11.2. Contamination of soil and risk of damage to vegetation and/or fauna through spillage of fuels and oils	Avoid soil contamination and risk of damage to vegetation and/or fauna through spillage of fuels and oils	Check construction equipment daily (by Contractor) to ensure that no fuel spillage takes place from construction vehicles or machinery, and monitored weekly by ECO and ensure drip trays are present.	Check that no spills have taken place	Daily	Contractor and ECO
		Spilled fuel, oil or grease must be retrieved and contaminated soil removed, cleaned and replaced.	Check that no spills have taken place	Daily	Contractor and ECO
		Contaminated soil to be collected by the Contractor (under observation of ECO) and disposed of at a waste site designated for this purpose.	Check that no spills have taken place	Daily	Contractor and ECO

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
		<p>Portable bioremediation kit (to remedy chemical spills) is to be held on site and used as required.</p> <p>In case of a spillage of hazardous chemicals where contamination of soil occurs, depending on the degree of contamination, excavation and removal to a hazardous waste disposal site might be necessary. If the spillage is widespread, a specialist will need to be immediately appointed to deal with the issue, the DEA notified and the notification process stipulated in the National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (GN 331, 2 May 2014) should be followed.</p>	Ensure that a well maintained Portable bioremediation kit (to remedy chemical spills) is available on site and that site workers and contractors know its location and instructions	Daily	Contractor and ECO
		Bunded containment to be provided below and around any fuel storage containers.	Check that no spills have taken place	Daily	Contractor and ECO
11.3 Soil contamination from leakage from battery (during transport and onsite construction)	Avoid soil contamination during transport and construction of battery storage facility	Batteries must be transported inside containers	Check that this is undertaken	During transport of batteries	Contractor and ECO
		Containers must be well packed to the transport vehicle	Check that this is undertaken	During transport of batteries	Contractor and ECO
		A minimum set of equipment necessary to combat any simple spillage or leakage problems should be provided and the transport team trained on how to use it	Ensure that transport team know how to manage spills	During transport of batteries	Contractor and ECO
		The construction of the facility should adhere to the appropriate international standards and SANS requirements and should be located on an impermeable barrier/layer (e.g. concrete surface with acid lining)	Ensure that the facility adheres to the relevant SANS and international requirements	On-going	Contractor and ECO

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
		<p>Secondary containment may need to be constructed and must have a capacity of at least 110% of the largest storage tank's capacity. The secondary containment should include the following:</p> <ul style="list-style-type: none"> <li>▪ The off-loading point must be located in the bunded area to ensure that any potential spill during the offloading of the electrolyte solutions is contained;</li> <li>▪ Divert rainwater away from the bunded area to avoid rainwater mixing with electrolyte spillage potentially present within the secondary containment;</li> <li>▪ Ensure that the containment area is sloped to a sump; and</li> <li>▪ All drains should be covered.</li> <li>▪ Although highly unlikely, any spill/leakage from the battery storage facility must be attended to immediately and be handled in an environmental friendly manner (i.e. no discharge into the ground or any surface water body) and must be disposed of at an appropriate licenced hazardous waste disposal facility. According to the MSDSs attached in Appendix A:</li> <li>▪ Small Spills: Absorb spill with absorbent, inert material, place in a labelled container for disposal by licensed Hazardous Waste Contractor. Clean area with water and detergent. Dispose of cleanup materials in appropriate containers. Wear safety glasses with splash shields. Wear</li> </ul>	<p>Provide secondary containment according to the specifications</p> <p>Immediately attend to any spillage</p>	On-going	Contractor and ECO

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
		<p>appropriate gloves to prevent skin exposure.</p> <ul style="list-style-type: none"> <li>• Large Spills: Isolate and contain spill using absorbent pillows, mats or rolls. Keep unauthorized persons away from spill area. Contact Hazardous Materials Clean-up Contractor immediately for onsite response.</li> <li>• Empty containers may still contain trace amounts of this material and are still hazardous. This substance is hazardous to the environment. Do not dump into drains. Dispose of only through proper hazardous waste methods.</li> </ul>			
<b>OPERATIONAL PHASE</b>					
11.4 Contamination of soil and risk of damage to vegetation and/or fauna through spillage of fuels and oils	Avoid soil contamination and risk of damage to vegetation and/or fauna through spillage of fuels and oils	Maintenance equipment must be checked to ensure that no fuel spillage takes place from vehicles or machinery.	Implement specifications for maintenance equipment use as specified by Contractor	Monthly	Operations and Maintenance Contractor
		Spilled fuel, oil or grease is retrieved during operations where possible and contaminated soil removed, cleaned and replaced.	Implement specifications for removal and disposal of contaminated soil equipment use as specified by Contractor	Monthly	Operations and Maintenance Contractor
		Contaminated soil to be collected and disposed of at a waste site designated for this purpose.	Implement specifications for removal and disposal of contaminated soil equipment use as specified by Contractor	Monthly	Operations and Maintenance Contractor

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
		<p>Portable bioremediation kit (to remedy chemical spills) is to be held on site and used as required.</p> <p>In case of a spillage of hazardous chemicals where contamination of soil occurs, depending on the degree of contamination, excavation and removal to a hazardous waste disposal site might be necessary. If the spillage is widespread, a specialist will need to be immediately appointed to deal with the issue, the DFFE notified and the notification process stipulated in the National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (GN 331, 2 May 2014) should be followed.</p>	Ensure that a well-maintained Portable bioremediation kit (to remedy chemical spills) is available on site and that site workers and contractors know its location and instructions	Monthly	Operations and Maintenance Contractor
		Bunded containment to be provided below and around any fuel storage containers.	Implement specifications for maintenance equipment use as specified by Contractor	Monthly	Operations and Maintenance Contractor

#### DECOMMISSIONING PHASE

11.5 No specific impacts are associated with the decommissioning phase other than those from the operational phase that will still be relevant for the duration of the decommissioning phase due to on-going occupation of the area.