DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

7 October 2016

THE PROPOSED LUTZBURG SOLAR PLANT NEAR POSTMASBURG, NORTHERN CAPE PROVINCE

ENVIRONAMICS

PROJECT DETAIL

Reference No:	14/12/16/3/3/2/938
Project Title:	Proposed Lutzburg Solar Power Plant near Olifantshoek, Northern Cape Province
Authors:	Mrs. Carli Otte Ms. Marelie Griesel Ms. Liesl De Swardt
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LIST OF ABBREVIATIONS

BA	Basic Assessment
BAR	Basic Assessment Report
DEA	Department of Environmental Affairs
DM	District Municipality
DoE	Department of Energy
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
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
TLM	Tsantsabane 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
REIPPP	Renewable Energy IPP Procurement Process
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
SHE	Safety, Health and Environment

1 INTRODUCTION

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 Lutzburg Solar Power Plant (SPP). 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 982(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 982.

1.1 BACKGROUND

This EMPr has been compiled for the Lutzburg SPP near Olifantshoek, Northern Cape Province. This solar energy facility is proposed to involve the following:

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

  The Layout plan, Sensitivity- and Superimposed Layout map is included as part of the EMPR (refer to Figure 1, 2 & 3) and indicates the site boundary, plant boundary, internal roads and environmental sensitive areas.

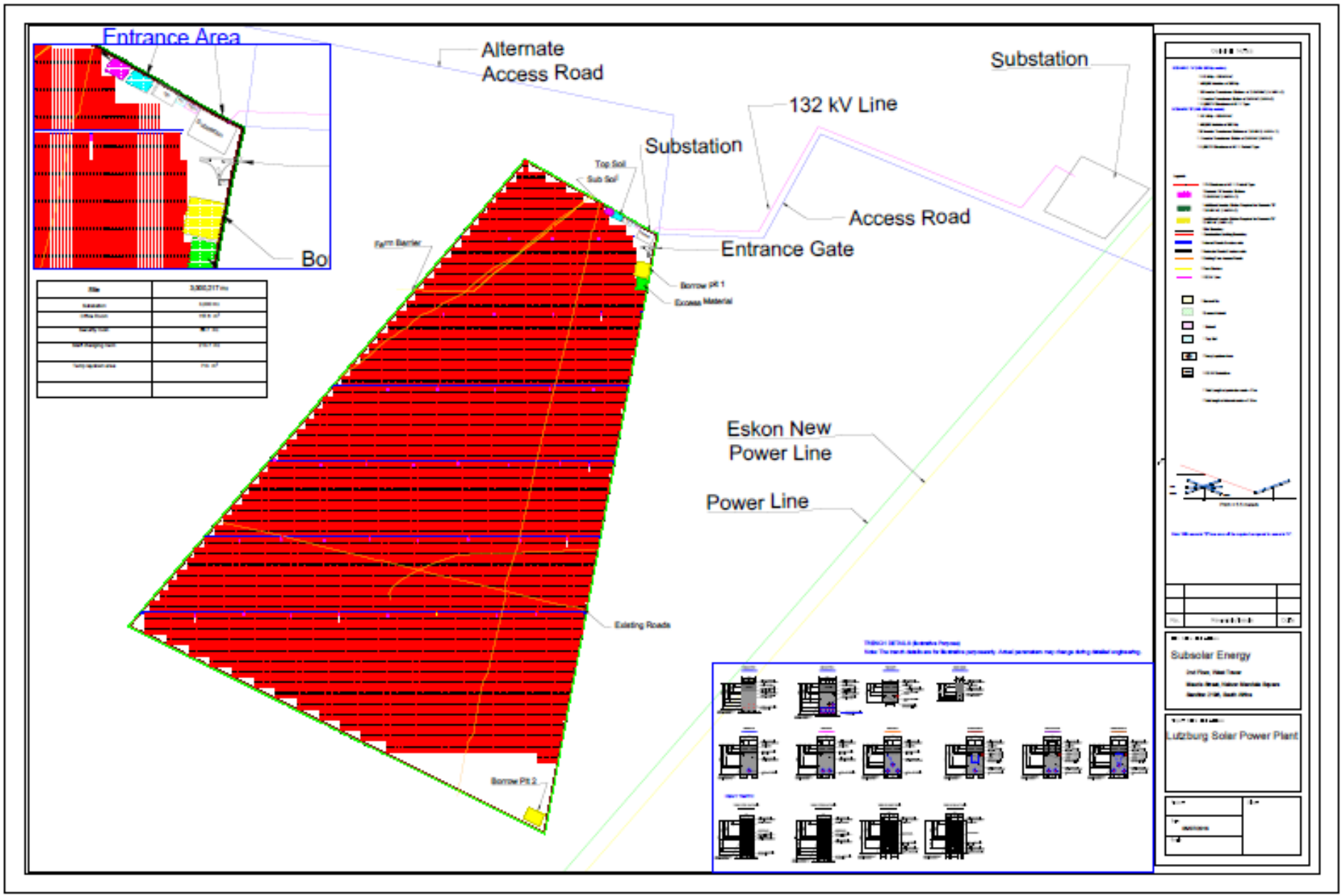

Figure 1: Layout plan indicating site boundary, plant boundary and internal roads.

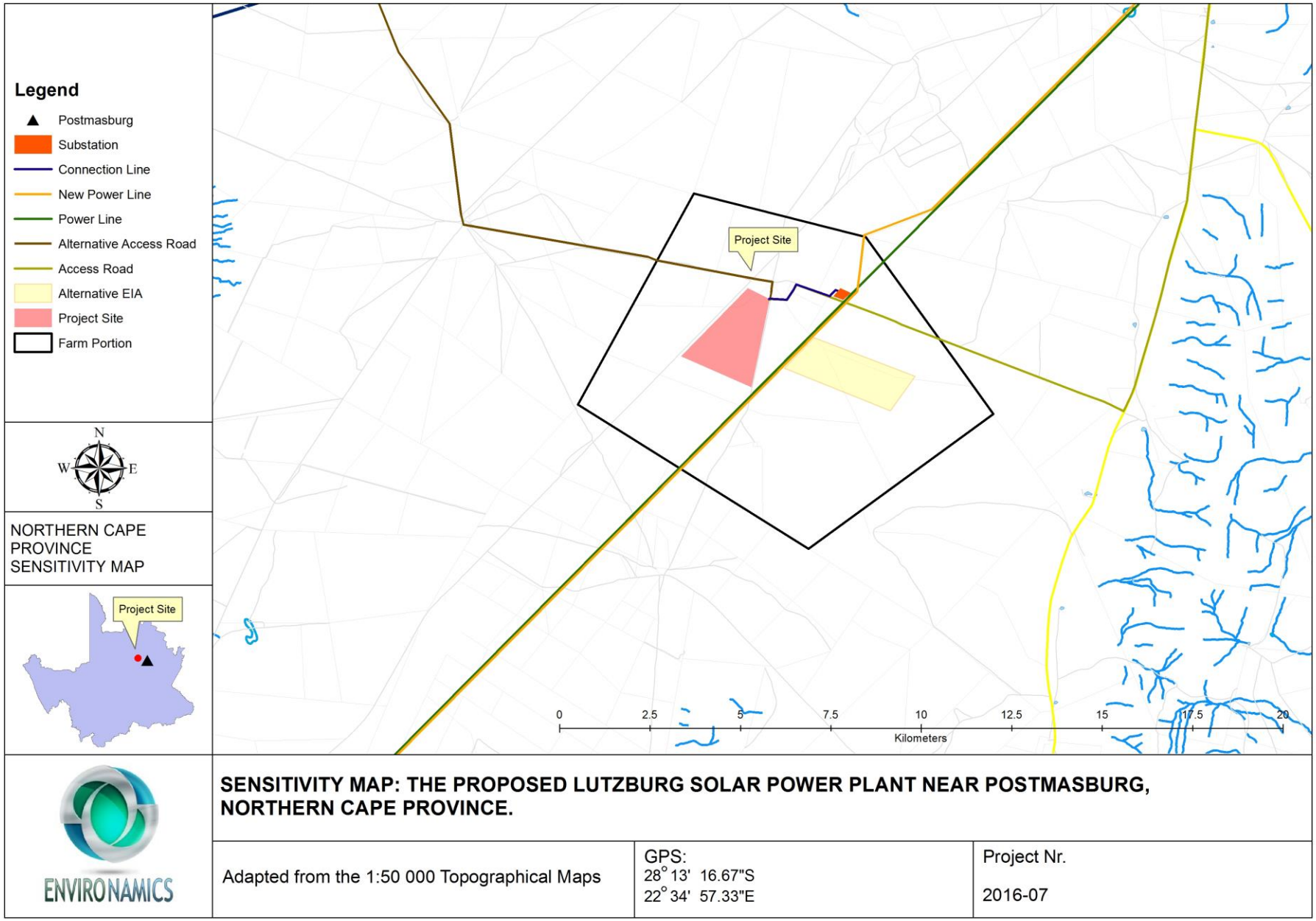

Figure 2: Sensitivity Map, indicating environmental sensitive areas and features.

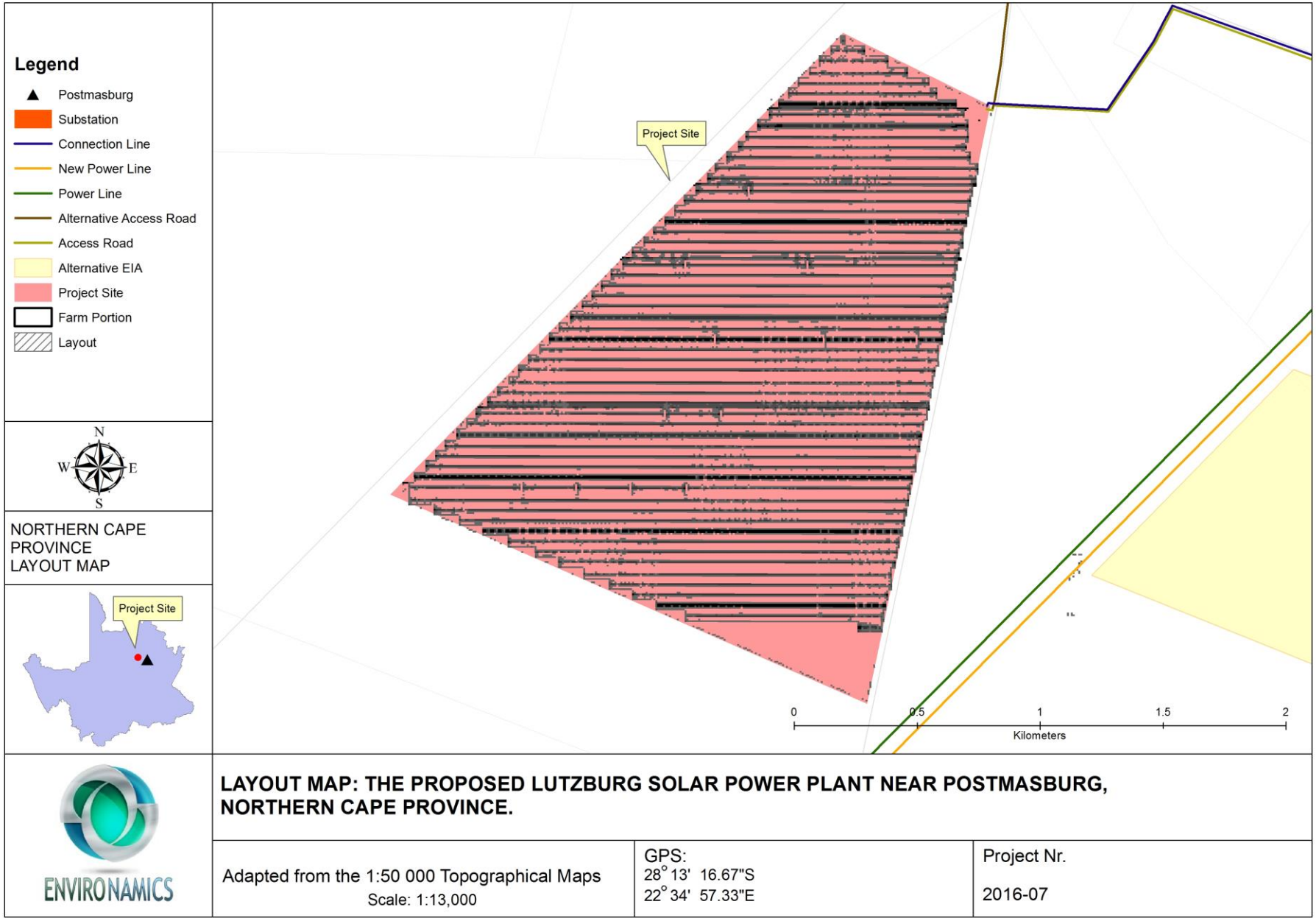

Figure 3: Superimposed Layout map, combining the final layout plan superimposed on the environmental sensitivity map.

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 the following phases of the development:

- 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 potential impacts requiring specific mitigation within the development footprint as specified in this EMPr.

Table 1-1: Environmental impacts and management outcomes

Potential Impact	Significance (prior to mitigation)	Impact management outcomes
Construction phase		
Impacts on fauna and flora	Negative Low	To avoid or reduce the loss of fauna and flora
Impacts on Avifauna	Negative Low	To avoid the loss or fragmentation of habitats for avifauna.
Impacts on soil and geology	Negative low	To enhance erosion control and prevent soil loss.
Temporary employment opportunities	Positive Medium	To enhance the use of local skills and uplift the local community
Traffic impacts	Negative Low	To mitigate the potential impact of an increased amount of construction vehicle and traffic in the region.
Impacts on existing service infrastructure	Negative Low	To avoid any damage to existing service infrastructure
Operational phase		
Impacts on fauna and flora	Negative Low	To avoid the loss of biodiversity as much as possible
Impacts on agricultural potential and soil	Negative Low	To enhance erosion control and prevent soil loss
Pressure on existing service infrastructure	Negative Low	To avoid any damage to existing service infrastructure
Visual Impact	Negative Low	To minimise visual impacts
Impact on Local Community	Medium Positive	Provide management measures for the establishment of a community trust.
Permanent employment opportunities	Positive Medium	To enhance the use of local skills and uplift the local community.
Impacts associated with the geology of the site	Negative Low	To enhance erosion control and prevent soil loss.
Additional electricity generation	Positive Medium	To enhance the use of renewable energy.
Decommissioning phase		
Impacts on agricultural potential and soils	Negative Low	To avoid soil erosion
Generation of waste (Existing service infrastructure)	Negative Low	To avoid or minimise the generation of waste.
Socio-economic impacts (loss of employment)	Negative Medium	Loss of local employment will occur

The creation of temporary employment	Positive Low	To enhance the positive impact related to employment opportunities.

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: Marélie Griesel

Postal Address: PO Box 6484, Baillie Park, 2526

Telephone: 018 290 8228 (w) 086 762 8336 (f) 081 756 9945(c)

Electronic Mail: admin@environamics.co.za

Regulation 13(1)(a) and (b) determines that an independent and suitably qualified and experienced EAP should conduct the EIA. In terms of the independent status of the EAP a declaration was included as part of the Environmental Impact Assessment Report. This EMPr was prepared by Marélie Griesel who has an Honour's degree in Environmental Management and more than 4 years of experience in environmental impact assessment (refer to Appendix A for the EAP's CV).

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 Environmental Affairs (DEA). 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.982. It consists of five sections demonstrating compliance to the specifications of the regulations as illustrated in Table 1-2.

Table 1.2: Structure of the report

Requirements for the contents of an EMPR as specified in the Regulations		Section in report
Appendix 4(1) - An EMPr must comply with section 24N of the Act and include-		
(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	2.3

	draft environmental management programme as identified by the project description.	
(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 EIA process for all phases of the development including-	1.2 & 1.3
	(i) Planning and design;	
	(ii) Pre-construction and Construction;	
	(iii) Operation;	
	(iv) Rehabilitation; and	
	(v) where relevant, decommissioning.	
(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.	Appendix B

This EMPr should form an integral part of the contract documents which will inform the Contractor(s) of their duties in the fulfilment 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 will also be publicly disclosed during the Public Participation Process of this project. An opportunity will be offered to participating stakeholders to comment on it.

2 APPROACH TO THE EMPR

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.
DEA	Department of Environmental Affairs.
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 Environmental Affairs) 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)	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. 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.

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 Sections 24(5) and 44 of NEMA (GNR 982, GNR 985 in Government Gazette 38282 of 4 December 2014)
- Guidelines published in terms of NEMA EIA Regulations:
- 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 Lutzburg 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 reports 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 DEA 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 Lutzburg SPP 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 renderer'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 TsantsabaneMunicipality'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 TsantsabaneMunicipality'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 Tsantsabane Local Municipality (TLM) 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

The 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 DEA. 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;
- 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 Tsantsabane Local Municipality's Environmental Manager, and the DEA, where deemed necessary;
- Compiling monthly progress reports during the construction phase for submission to the Developer and/or his Agent;
- 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;
- 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

2.4.1 Construction

The EMPr has recommended mitigation and management measures to avoid or minimise negative impacts and optimise the benefits arising from the positive impacts during construction activities. 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 a licensed 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.

2.4.2 Operation

The operational phase of the Lutzburg SPP will involve the following:

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

2.4.3 Rehabilitation

Rehabilitation activities associated with Lutzburg SPP 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.

2.4.4 Decommissioning

The operating period will be 20 – 25 years from the commencement date. Thereafter two rights of renewal periods of 40 years and 20 years will be relevant. It is anticipated that new PV technologies and equipment will be implemented, within the scope of the Environmental Authorisation, when influencing the profitability of the solar facility.

A likely extension of the plant's lifetime would involve putting new, more efficient, solar panels on the existing structures. The specifications of these new panels will be the same as the current one, but for that the conversion efficiency of sunlight to energy will be greater (comparable to new computer chips, that the same, but faster and more efficient). If, for whatever reason the plant halts operations, the Environmental Authorisation and contract with the landowner will be respected during the decommissioning phase. The following clauses are an extract from the contract indicating the commitment to the rehabilitation of the area.

Lessee's obligation on termination:

Subject to any Environmental Approval being required and subject to any condition attaching to an existing Environmental Approval, if any, the Lessee shall upon the termination of this Agreement be entitled to remove any Project Equipment, which equipment shall at all times be regarded as movable, notwithstanding the manner and method by which it is affixed or shall otherwise have acceded to the Leased Premises. If the Lessee fails to remove any Project Equipment within a period of 6 (six) months of this Agreement terminating, the same shall become the property of the Lessor (as far as permitted in Law) and the Lessee shall not have any claim against the Lessor for compensation or otherwise in respect of any Project Equipment not removed. However, if the Lessee fails to remove any Project Equipment despite being requested to do so, in writing, the Lessor may remove the same and restore the Leased Premises at the expense of the Lessee.

Notwithstanding the provisions of the clause above and subject to compliance with Environmental Law, the Lessee shall take such measures to rehabilitate the Leased Premises as the Lessor directs, in writing, for the purpose of restoring the Leased Premises to the condition in which it was before the commencement of any Works, including amongst others, decommissioning the Energy Facility. The Lessee undertakes to complete any such rehabilitation or decommissioning within 6 (six) months after the Termination Date.

As security for the above and to the extent required by the Lessor, the Lessee shall furnish to, or in favour of, the Lessor, such security (and for such amount) as is acceptable to the Lessor. The Parties specifically agree that the amount of security required by the Lessor should at all times be reasonable and should under no circumstances whatsoever exceed an amount reasonably deemed acceptable and appropriate to cover the total cost of rehabilitation of the Leased Premises.

The decommissioning process will consist of the following steps:

- The PV facility would be disconnected from the Eskom grid.
- The inverters and PV modules would be disconnected and disassembled.
- Concrete foundations (if used) would be removed and the structures would be dismantled.
- The underground cables would be unearthed and removed and buildings would be demolished and removed.
- The fencing would be dismantled and removed.
- The roads can be retained should the landowner choose to retain them, alternatively the roads will be removed and the compaction will be reversed.
- Most of the wires, steel and PV modules are recyclable and would be recycled to a reasonable extent. The Silicon and Aluminium in PV modules can be removed and reused in the production of new modules.
- Any rubble and non-recyclable materials will be disposed of at a registered landfill facility.

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 developments;
- 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 Lutzburg Solar Power Plant (RF) (Pty) Ltd. Monitoring will have two elements namely:

- Routine monitoring against set standards or performance criteria; and
- 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;
- 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

ENVIRONMENTAL ASPECTS RESULTING IN POTENTIAL IMPACT DURING PLANNING AND DESIGN	RECOMMENDED MITIGATION MEASURES		
	Management and mitigation measures	**Timeframe**	**Responsibility**
General Management Measures			
Contractors and sub-contractors may not have sufficient knowledge and understanding of the potential impacts of construction or the requirements of the EMPr, leading to impacts identified under each aspect.	Compliance with the requirements of the EMPr 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 EMPr 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.	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.	Prior to issuing of EA	Developer and/or appointed Agent
Site demarcation and compliance	1. Before construction begins, all areas to be developed must be clearly demarcated with fencing or orange construction barriers where applicable. 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 erected at all access points in compliance with all applicable occupational	Prior to commencement of site preparation and construction	Developer and/or appointed Agent

	health and safety requirements. All access points to the Construction Camp should be controlled by a guard or otherwise monitored, to prevent unlawful access. 3. The Contractor and ECO must ensure compliance with conditions described in the EA. 4. Records of compliance/non-compliance with the conditions of the authorisation must be kept and be available on request. 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.		
Establishment of a Construction camp	1. Site establishment shall take place in an orderly manner and all required amenities shall be installed at camp sites before the main workforce move onto site. 2. All construction equipment must be stored within this construction camp. 3. All associated oil changes etc (no servicing) must take place within this camp on a sealed surface such as a concrete slab. 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. 5. All Construction Camps shall be provided with portable fire extinguishing equipment, in accordance with all relevant legislation and must be readily accessible. 6. The Contractor must provide sufficient ablution facilities, in the form of portable/VIP toilets, at the Construction Camps, and shall 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 shall be provided to accommodate the number of personnel working in the area. 7. The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed.	Prior to commencement of site preparation and construction	Developer and/or appointed Agent

	No fires will be allowed and the Contractor must make alternative arrangements for heating. LP Gas may be used, provided that all required safety measures are in place. The Contractor shall 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.		
Appointment of labour	1. Where reasonable and practical Lutzburg Solar Power Plant (RF) (Pty) Ltd. should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories**.** 2. Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria. 3. Before the construction phase commences Lutzburg Solar Power Plant (RF) (Pty) Ltd. should meet with representatives from the TLM 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. 4. The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that Lutzburg Solar Power Plant (RF) (Pty) Ltd. intends following for the construction phase of the project. 5. The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.	Prior to commencement of site preparation and construction	Developer and/or appointed Agent
Training of site staff	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: 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	Prior to commencement of site preparation and construction	Developer and/or appointed Agent

	litter control and identification of archaeological artifacts. 2. Where feasible training and skills development programmes for local workers should be initiated prior to the initiation of the construction phase. 3. Project manager shall ensure that the training and capabilities of the Contractor's site staff are adequate to carry out the designated tasks. 4. Staff operating equipment (such as loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks. 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. 6. Staff should be educated as to the need to refrain from indiscriminate waste disposal and/or pollution of local soil and water resources and receive the necessary safety training. 7. Staff must be trained in the hazards and required precautionary measures for dealing with these substances. 8. Spillage packs must be available at construction areas.		
Public consultation regarding the SPP	1. Provide a mechanism through which information could be exchanged between the project proponent and stakeholders. 2. 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&APs, and the process that will be followed to address issues. 3. Identify relevant stakeholders and engage them at applicable stages of the EIA process. 4. Inform the public about the proposed PV development. 5. Surrounding communities must be kept informed, through the identified and agreed consultation channels, of the commencement of construction. 6. Solicit views and concerns from the public and allow them to suggest mitigations and enhancement measures	Pre-construction and construction	Principal Contractor

	7. Determine stakeholder satisfaction levels. 8. The TLM, 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. 9. Lutzburg 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.		
Site clearing	1. Site clearing must take place in a phased, environmentally acceptable manner, as and when required. 2. Areas which are not to be constructed on within two months must not be cleared to reduce erosion risks. 3. The area to be cleared must be clearly demarcated and this footprint strictly maintained to limit vegetation clearing. 4. Soil that is removed from the site must be removed to an approved spoil site or a licensed landfill site. 5. The necessary silt fences and erosion control measures must be implemented in areas where these risks are more prevalent.	Site preparation prior to construction	Principal Contractor
Establishment of a Social and Environmental Management System	1. Performance Standard One underscores the importance of managing social and environmental performance throughout the life of a project. 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 will establish and maintain 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.	Prior to construction	Principal Contractor

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

ENVIRONMENTAL ASPECTS RESULTING IN POTENTIAL IMPACT DURING CONSTRUCTION	RECOMMENDED MITIGATION MEASURES		
	Management and mitigation measures	**Timeframe**	**Responsibility**
Construction Camp			
Site of the construction camp	1. The size of the construction camp should be minimised. 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. 3. Suitable control measures over the Contractor's yard, plant and material storage to mitigate any visual impact of the construction activity must be implemented. 4. The proposed site for the Lutzburg SPP need to be fenced off prior to the construction phase and all construction related activities should be confined in this fenced off area.	Construction phase	Principal Contractor, Environmental Liaison Officer and Environmental Control Officer
Storage of materials (including hazardous materials)	1. Choice of location for storage areas must take into account prevailing winds, distances to water bodies, general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary. 2. Storage areas must be designated, demarcated and fenced if necessary. 3. Storage areas should be secure so as to minimise the risk of crime. They should also be safe from access by unauthorised persons i.e. children/animals etc. 4. Fire prevention facilities must be present at all storage facilities. 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	Construction phase	Principal Contractor, Environmental Liaison Officer and Environmental Control Officer

	drainage lines in a site with the approval of the Project Manager. The bund 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. 6. All fuel storage areas must be roofed to avoid creation of dirty stormwater. 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. 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. 9. Storage areas containing hazardous substances/materials must be clearly signposted. 10. Staff dealing with these materials/substances must be aware of their potential impacts and follow the appropriate safety measures. 11. An approved waste disposal contractor must be employed to remove 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. 12. All excess cement and concrete mixes are to be contained on the construction site prior to disposal off site. 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.		

	14. Emergency and spillage plans need to be developed and submitted to the relevant authorities for approval.		
Drainage of the construction camp	1. Surface drainage measures must be established in the Construction Camps so as to prevent: • Ponding of water; • Erosion as a result of accelerated runoff; and, • Uncontrolled discharge of polluted runoff.	Construction phase	Principal Contractor, Environmental Liaison Officer and Environmental Control Officer
Construction Traffic and Access			
Construction traffic	1. Construction routes and required access roads must be clearly defined and carefully planned to limit any intrusion on the neighboring property owners and road users and to limit any accident risks. 2. Delivery of equipment must be undertaken with the minimum number of trips to reduce the carbon footprint of these activities. 3. 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. 4. Damping down of the un-surfaced roads must be implemented to reduce dust and nuisance. 5. Vehicles and equipment shall be serviced regularly to avoid the contamination of soil from oil and hydraulic fluid leaks etc. 6. Servicing must be done in dedicated service areas on site or else off site if no such area exists. 7. Oil changes must take place on a concrete platform and over a drip tray to avoid pollution. 8. Soils compacted by construction shall be deep ripped to loosen compacted layers and re-graded to even running levels. 9. 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. 10. Vehicles carrying material that can be wind-blown should be covered with a suitable material.	Construction phase	Principal Contractor and Environmental Liaison Officer

Access to the site	1. The main routes on the site must be clearly signposted and printed delivery maps must be issued to all suppliers and Sub-contractors. 2. Planning of access routes to the site for construction purposes shall be done in conjunction with the Contractor and the Landowner. All agreements reached should be documented and no verbal agreements 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. 3. The movement of all vehicles within the site must be on designated roadways. 4. 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. 5. Access to the proposed Lutzburg SPP will be obtained from the gravel road. A new entrance road to the site need to be constructed, in order to minimize and/or avoid the movement of workers and vehicles at the entrance gate of the owner of the farm’s house.	Construction phase	Principal Contractor and Environmental Liaison Officer
Maintenance of the road	1. Where necessary suitable measures shall be taken to rehabilitate damaged areas. 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. 3. If necessary, staff must be employed to clean surfaced roads adjacent to construction sites where materials have spilt. 4. The contractor must repair any damages to the gravel roads on the site, during the construction phase, and any cost with regards to the repair of the roads must be borne by the contractor. 5. Adequate traffic accommodation signage must be erected and maintained on either side of the access on the trafficked routes throughout the construction period.	Construction phase	Principal Contractor and Environmental Liaison Officer
Noise	1. Movement of heavy construction vehicles through residential areas should be timed to avoid peak morning and evening traffic periods. In addition,	Construction phase	Principal Contractor and Environmental

	movement of heavy construction vehicles through residential areas should not take place over weekends.		Liaison Officer
General mitigation regarding construction traffic and access	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. 2. The Contractor shall ensure that all the necessary precautions against damage to the environment and injury to persons are taken. 3. Care for the safety and security of community members crossing access roads should receive priority at all times. 4. No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the Contractor. 5. All relevant permits for abnormal loads must be applied for from the relevant authority (pre-construction).	Construction phase	Principal Contractor and Environmental Liaison Officer
Environmental Education and Training			
Environmental training	1. The project manager must appoint an ECO prior to construction commencing. 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: • What is meant by "Environment" • Why the environment needs to be protected and conserved • How construction activities can impact on the environment • What can be done to mitigate against such impacts? • Awareness of emergency and spills response provisions • Social responsibility during construction e.g. being considerate to local residents 3. Training should be undertaken by a party such as the ECO who has sufficient expertise and knowledge of environmental issues.	Construction phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.

	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. 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. 6. Use should be made of environmental awareness posters on site. 7. The need for a "clean site" policy also needs to be explained to the workers. 8. Staff operating equipment (such as loaders, etc.) shall be adequately trained and sensitized to any potential hazards associated with their tasks.		
Monitoring of environmental training	1. 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	Principal Contractor and Environmental Liaison Officer
Soils and Geology			
Mitigation for soil compaction	1. 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. 2. All soils compacted as a result of construction activities falling inside the development footprint areas should be ripped and profiled after the construction phase.	Construction phase	Principal Contractor and Environmental Liaison Officer
Chemical soil pollution	1. All waste generated on site during construction should be stored in waste bins and removed from site on a regular basis. 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.	Construction phase	Principal Contractor and Environmental Liaison Officer

	3. No broken or old batteries or components of the PV plant should be dumped on or around the site but should be removed immediately and taken to a special chemical waste facility. 4. Refueling points should be well managed and if any soils are contaminated, it should be stripped and disposed of at a registered hazardous waste dumping site.		
Guidelines for the stripping and storage of topsoil	1. The Contractor should, prior to the commencement of earthworks determine the average depth of topsoil, and agree on this with the ECO. The full depth of topsoil should be stripped from areas affected by construction and related activities prior to the commencement of major earthworks. This should include the building footprints, working areas and storage areas. Topsoil must be reused where possible to rehabilitate disturbed areas. 2. Care must be taken not to mix topsoil and subsoil during stripping. 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. 4. Removed polluted topsoil should be transported to a licensed landfill site. 5. The topsoil must be conserved on site in and around the pit area.	Construction phase	Principal Contractor and Environmental Liaison Officer
Soil stripping	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. 2. Topsoil must not be stripped or stockpiled when it is raining or when the soil is wet as compaction will occour. 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. 4. Construction vehicles must only be allowed to utilise existing tracks or pre-planned access routes.	Construction phase	Principal Contractor and Environmental Control Officer
Guidelines for soil stockpiles	1. Stockpiles should not be situated such that they obstruct natural water	Construction phase	Principal Contractor

	pathways. 2. Stockpiles should not exceed 2m in height unless otherwise permitted by the Engineer. 3. If stockpiles are exposed to windy conditions or heavy rain, they should 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. 4. Stockpiles should be kept clear of weeds and alien vegetation growth by regular weeding. 5. Should topsoil be stockpiled for longer than 6 months it must be vegetated. 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. 7. Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them. 8. It must be ensured that topsoil stockpiles are located outside of any drainage lines and areas susceptible to erosion or siltation. 9. Stockpiles should also be placed away from areas known to contain hazardous substances such as fuel.		and Environmental Control Officer
Storage of fuel on site	1. Less than 50 cubic meters of fuel is permitted to be stored on site at any one time. 2. Topsoil and subsoil to be protected from contamination. This should be monitored on a monthly basis by a visual inspection of diesel/oil spillage and pollution prevention facilities. 3. Fuel and material storage must be away from stockpiles. 4. Concrete and chemicals must be mixed on an impervious surface and provisions should be made to contain spillages or overflows into the soil. 5. Any 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	Construction phase	Principal Contractor and Environmental Control Officer

	material.		
Mixing of concrete on site	1. The concrete batching plant must be contained within a bunded area. 2. Concrete mixing must only take place within designated areas. 3. Ready mixed concrete must be utilised where possible. 4. No vehicles transporting concrete to the site may be washed on site. 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.	Construction phase	Principal Contractor and Environmental Control Officer
Earth works	1. Soils compacted during construction should be deeply ripped to loosen compacted layers and re-graded to even running levels. Topsoil should be re-spread over landscaped areas. 2. It is recommended that a suitably qualified engineering geologist or 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.	Construction phase	Principal Contractor and Environmental Control Officer
Erosion Control			
Erosion control	1. Wind screening and stormwater control should be undertaken to prevent soil loss from the site. 2. The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion. 3. Other erosion control measures that can be implemented are as follows: o Brush packing with cleared vegetation o Mulch or chip packing o Planting of vegetation o Hydroseeding/hand sowing 4. Sensitive areas need to be identified prior to construction so that the necessary precautions can be implemented. 5. All erosion control mechanisms need to be regularly maintained.	Construction phase	Environmental Control Officer

	6. Seeding of topsoil and subsoil stockpiles to prevent wind and water erosion of soil surfaces. 7. Retention of vegetation where possible to avoid soil erosion. 8. Vegetation clearance should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time. 9. Re-vegetation of disturbed surfaces should occur immediately after construction activities are completed. This should be done through seeding with indigenous grasses. 10. No impediment to the natural water flow other than approved erosion control works is permitted. 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. 12. Stockpiles not used in three (3) months after stripping must be seeded to prevent dust and erosion.		
Water Use and Quality			
Water use	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. 2. Water must be used sparingly and reused, recycled or treated where possible.	Construction phase	Engineer
	1. Consultation with key stakeholders to understand any conflicting water use demands and the community's dependency on water resources and conservation requirements within the area.	Construction phase	Environmental Control officer
Management of water quality	1. The quality and quantity of effluent streams discharged to the environment including stormwater should be managed and treated to	Construction phase	Environmental Control officer

	meet applicable effluent discharge guidelines. 2. Quality of water being discharged must be tested on a monthly basis. 3. Efficient oil and grease traps or sumps should be installed and maintained at refuelling facilities, workshops, fuel storage depots, and containment areas and spill kits should be available with emergency response plans.		
Stormwater management	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. 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. 3. Silt fences should be used to prevent any soil entering the stormwater drains. 4. Temporary cut off drains and berms may be required to capture stormwater and promote infiltration. 5. Promote a water saving mind set with construction workers in order to ensure less water wastage. 6. New stormwater construction must be developed strictly according to specifications from engineers in order to ensure efficiency. 7. 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. 8. Earth, stone and rubble is to be properly disposed of, or utilized on site so as not to obstruct natural water path ways over the site. i.e. these materials must not be placed in stormwater channels, drainage lines or rivers. 9. There should be a periodic checking of the site's drainage system to ensure that the water flow is unobstructed. 10. If a batching plant is necessary, run-off should 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 or erosion channels or dongas.	Construction phase	Environmental Control officer

Protection of groundwater resources	1. No unauthorised groundwater abstraction may occour on the site 2. Should any water be discharged from site, the water is to comply with national effluent standards. No contaminated water may be discharged from site. 3. No activities shall 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).	Construction phase	Environmental Control officer
Sanitation	1. Adequate sanitary facilities and ablutions must be provided for construction workers (1 toilet per every 15 workers) at appropriate locations on site. 2. The facilities must be regularly serviced and appropriately maintained to reduce the risk of surface or groundwater pollution. 3. Ablution or sanitation facilities should not be located within 100m of any water courses or features.	Construction phase	Environmental Control officer
Concrete mixing	1. 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	1. Food preparation areas should be provided with adequate washing facilities and food refuse should be stored in sealed refuse bins which should be removed from site on a regular basis. 2. The Contractor should take steps to ensure that littering by construction workers does not occur and persons should be employed on site to collect litter from the site and immediate surroundings, including litter accumulating at fence lines. 3. No washing or servicing of vehicles on site.	Construction phase	Environmental Control officer
Surface and ground water			

Sanitation on site	1. Adequate sanitary facilities and ablutions must be provided for construction workers (1 toilet per every 15 workers). 2. Water saving devices and technologies such as the use of dual flush toilets should be considered. 3. The facilities must be regularly serviced to reduce the risk of surface or groundwater pollution.	Construction phase	Principal Contractor and Environmental Control officer
Use and storage of hazardous materials	1. Use and or storage of materials, fuel and chemicals which could potentially leak into the ground must be controlled. 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. 3. Any hazardous substances must be stored at least 30m from any of the water bodies on site. 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. 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 shall be collected and removed from the site for appropriate disposal at a licensed commercial facility.	Construction phase	Principal Contractor and Environmental Control officer
Water resources	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. 2. Municipal water (or another source approved by the ECO) should instead be used for all activities such as washing of equipment or disposal of any	Construction phase	Principal Contractor and Environmental Control officer

	type of waste, dust suppression, concrete mixing, compacting, etc. 3. Relevant departments and other emergency services should be contacted in order to deal with spillages and contamination of aquatic environments.		
Site specific mitigation measures for surface water	1. Where access roads (temporary or permanent) are constructed, stormwater management measures need to be implemented for the duration of the lifecycle of the roads. This specifically relates to the use of any appropriate stormwater structure that will assist in reducing the rate of run-off generated on access roads entering water courses and that will help prevent additional sediment loads entering the water courses. Structures can include silt nets, grass blocks or berms. 4. The implementation of an adequate stormwater management plan and associated structures tailored to the design of the proposed development and the underlying topography must be incorporated as part of the proposed development. The stormwater management design and plan should consider using structures that area semi-permeable, structures that impede or reduce the rate of run-off and structures that can accommodate the volume of run-off (such as attenuation dams/ponds). 5. Leakage of transformer oils must be prevented by constructing oil bunds to ensure that any oil spills are contained and not released into the environment.	Construction phase	Principal Contractor and Environmental Control officer
Site specific mitigation measures for groundwater	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. 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. 3. A groundwater monitoring programme (quality and groundwater levels) should be designed and installed for the site. Monitoring boreholes should	Construction phase	Principal Contractor and Environmental Control officer

	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.		
Waste Management			
General considerations	1. Construction methods and materials should be carefully considered in view of waste reduction, re-use and recycling opportunities. 2. Construction contractors must provide specific detailed waste management plans to deal with all waste streams. 3. 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. 4. 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. 5. 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.	Duration of the activity	Principal Contractor
Litter management	1. Refuse bins must be placed at strategic positions to ensure that litter does not accumulate within the construction site. 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. 3. A housekeeping team should be appointed to regularly maintain the litter and rubble situation on the construction site. 4. If possible and feasible, all waste generated on site must be separated into glass, plastic, paper, metal and wood and recycled. An independent	Construction phase	Environmental Liaison Officer

	contractor can be appointed to conduct this recycling. 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. 6. Skip waste containers should be maintained on site. These should be kept covered and arrangements made for them to be collected regularly. 7. All waste must be removed from the site and transported to a landfill site promptly to ensure that it does not attract vermin or produce odours. 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. 9. A certificate of disposal shall be obtained by the Contractor and kept on file, if relevant. 10. Under no circumstances may solid waste be burnt on site. 11. All waste must be removed promptly to ensure that it does not attract vermin or produce odours.		
Hazardous waste management	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. 2. Contaminants to be stored safely to avoid spillage. 3. Machinery must be properly maintained to keep oil leaks in check. 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. 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. 6. SABS approved spill kits to be available and easily accessible.	Construction phase	Environmental Liaison Officer

Sanitation	1. The Contractor shall install mobile chemical toilets on the site. 2. Staff shall be sensitised to the fact that they should use these facilities at all times. No indiscriminate sanitary activities on site shall be allowed. 3. 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 separately where possible. 4. Toilets shall be serviced regularly and the ECO shall inspect toilets regularly. 5. Toilets should be no closer than 30m or above the 1:100 year flood line from any natural or manmade water bodies or drainage lines or alternatively located in a place approved of by the Engineer. 6. Under no circumstances may open areas, neighbours fences or the surrounding bush be used as a toilet facility. 7. The construction of "Long Drop" toilets is forbidden, but rather toilets connected to the sewage treatment plant. 8. Potable water must be provided for all construction staff.	Construction phase	Environmental Liaison Officer
Remedial actions	1. An effective monitoring system must be put in place to detect any leakage or spillage during their transportation, handling, installation and storage. 2. Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance is identified. 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. 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. 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.	Duration of the project	Environmental Liaison Officer and Principal Contractor

	6. If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent material. 7. If necessary, oil absorbent sheets or pads must be attached to leaky machinery or infrastructure. 8. Materials used for the remediation of petrochemical spills must be used according to product specifications and guidance for use. 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. 10. In the event of a major spill or leak of contaminants, the relevant administering authority must be notified immediately as per the notification of emergencies/incidents. 11. Routine serving 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). 12. Keep a record of all hazardous substances stored on site. Clearly label all the containers storing hazardous waste. 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. 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. 15. Transport of all hazardous substances must be in accordance with the relevant legislation and regulations. 16. Upon completion of construction, the area must be cleared of potentially polluting materials.		
Flora			
Existing vegetation	1. Acacia erioloba, Acacia haematoxylon Boscia albitrunca and Prosopis	Pre-construction and Construction	Environmental Liaison Officer

	glandulosa tree species are found at this site. It is recommended that a permit at the relevant authorities should be applied for in case of any damage or removal of individual trees and that new Acacia erioloba, Acacia haematoxylon Boscia albitrunca and Prosopis glandulosa trees could be planted on site outside the present footprint. 2. If possible all the protected plant species need to be relocated to a suitable site nearby before the construction phase. 3. Vegetation removal must be limited to the PV plants construction site. 4. Vegetation to be removed as it becomes necessary rather than removal of all vegetation throughout the site in one step. 5. Vegetation removal must be phased in order to reduce impact of construction. 6. All plants not interfering with the operation of the PV plants construction shall be left undisturbed clearly marked and indicated on the site plan. 7. The construction area must be well demarcated and no construction activities must be allowed outside of this demarcated footprint. 8. Construction site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas. 9. Materials should not be delivered to the site prematurely which could result in additional areas being cleared or affected. 10. No vegetation to be used for firewood. 11. Exotic and invasive plant species should not be allowed to establish, if the development is approved. 12. Areas to be cleared must be clearly fenced off to eliminate the potential for unnecessary clearing. 13. Strict and regular auditing of the PV plants construction process to ensure containment of the construction and laydown areas. 14. 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.	phase	
Rehabilitation	1. All damaged areas shall be rehabilitated upon completion of the contract. 2. Re-vegetation of the disturbed site is aimed at approximating as near as	Construction phase	Environmental Liaison Officer

	possible the natural vegetative conditions prevailing prior to construction. 3. All natural areas impacted during construction must be rehabilitated with locally indigenous grasses typical of the representative botanical unit. 4. Rehabilitation must take place in a phased approach as soon as possible. 5. Rehabilitation process must make use of species indigenous to the area. Seeds from surrounding seed banks can be used for re-seeding. 6. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas. 7. Planting of indigenous tree species in areas not to be cultivated or built on must be encouraged.		
Utilisation of resources	1. 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 ECO.	Construction phase	Environmental Liaison Officer
Exotic vegetation	1. A management plan and proper follow-up strategy for the prevention of the establishment and/or further spread of new populations of alien/invasive species should be developed and enforced. 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. 3. The spread of exotic species occurring throughout the site should be controlled. 4. Removal of the alien and weed species encountered on the property must take place in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 and Section 28 of the National Environmental Management Act, 1998). Removal of species should take place throughout the construction, operational, closure/decommissioning and rehabilitation/ maintenance phases. 5. Proliferation of alien and invasive species is expected within any disturbed areas. These species should be eradicated and controlled to prevent their	Construction phase	Environmental Liaison Officer

	spread beyond the development/ decommissioning footprint.		
Herbicides	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. 2. The use of pesticides and herbicides on the site must be discouraged as these impact on important pollinator species of indigenous vegetation. 3. Care should be taken with the choice of herbicides to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicides used. Proper training should be given to contractors/applicators to avoid spraying indigenous vegetation.	Construction phase	Environmental Liaison Officer
Site specific mitigation measures for flora	1. Demarcation of sensitive areas prior to construction activities starting. 2. Use of appropriate construction methods in the sensitive area. 3. Intensive environmental audits (frequently in sensitive areas) by an independent party during this construction period. 4. A copy of the Environmental Impact Report (EIR) and associated Environmental Management Programme as well as the specialist study must be present at the construction site for easy reference to specialist recommendations in sensitive areas. 5. It is recommended that the construction crew be educated about the sensitivities involved in these areas as well as the potential species they could encounter. 6. Rehabilitation to be undertaken as soon as possible after construction. 7. Only vegetation within the study area must be removed. 8. Vegetation removal must be phased in order to reduce impact of construction. 9. Construction site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas.	Construction phase	Environmental Liaison Officer

	10. All natural areas impacted during construction must be rehabilitated with locally indigenous plant species. 11. A buffer zone should be established in areas where construction will not take place to ensure that construction activities do not extend into these areas. 12. Construction areas must be well demarcated and these areas strictly adhered to. 13. To minimise unnecessary disturbances the construction phase should not exceed its scheduled period. 14. Species, especially, geophytes should be located and rescued by transplanting specimens into a nursery or other safe site until they can be used during rehabilitation and/or landscaping.		
Fauna			
Protection of fauna on site	1. Demarcation of sensitive areas must be verified on site by the ECO prior to construction activities starting. 2. Use of appropriate construction techniques. 3. Rehabilitation to be undertaken as soon as possible after construction has been completed. 4. No trapping or snaring to fauna on the construction site should be allowed. 5. No faunal species must be disturbed, trapped, hunted or killed by maintenance staff during any routine maintenance at the development. 6. Livestock grazing on the proposed site need to be relocated.	Construction phase	Environmental Control Officer
Avifauna			
Habitat destruction	1. The footprint of construction related activities should be limited to the site and minimised where possible. 2. Schedule the habitat clearance to occur outside the breeding season of most of the species involved (April to July/August). 3. Trees and scrubs earmarked for removal should be examined for active nests by a knowledgeable person as soon is the project is approved. If	Construction phase	Environmental Liaison Officer

	none is found, the plants should be removed immediately, even if clearance of the area is scheduled for a later date. 4. If any active nests are found it will allow sufficient time for the birds to complete their breeding cycle after which the nest should be removed. 5. Corridors of natural vegetation should be maintained between developed areas on site (e.g. lay-down areas and PV panel field). 6. Consult an ecologist to give input into rehabilitation specifications. 7. The solar panels need to be constructed as far as possible from the pans (if any) that could attract any wetland species and sandgrouse. 8. Non-reflective glass must be used for all panels to reduce the risk of hornbills smashing the panels.		
Air Quality			
Dust control measures	1. Wheel washing and damping down of un-surfaced and un-vegetated areas. 2. Retention of vegetation where possible will reduce dust travel. 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. 4. Damping down of all exposed soil surfaces with a water dowser or sprinklers when necessary to reduce dust. 5. The Contractor shall be responsible for dust control on site to ensure no nuisance is caused to the neighbouring communities. 6. A speed limit of 30km/h must not be exceeded on site. 7. Any complaints or claims emanating from the lack of dust control shall be attended to immediately by the Contractor. 8. Any dirt roads that are utilised by the workers must be regularly maintained to ensure that dust levels are controlled. 9. 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.	Construction phase	Environmental Liaison Officer

Odour control	1. Regular servicing of vehicles in order to limit gaseous emissions. 2. Regular servicing of onsite toilets to avoid potential odours.	Pre-construction and construction	Environmental Liaison Officer
Rehabilitation	1. 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	1. No open fires shall be allowed on site under any circumstance. All cooking shall be done in demarcated areas that are safe and cannot cause runaway fires. 2. No firewood or kindling may be collected from the site or the surrounds, without explicit approval from the ECO. 3. The Contractor shall have operational fire-fighting equipment available on site at all times. The level of firefighting equipment must be assessed and evaluated through a typical risk assessment process. 4. A firebreak should be implemented before the construction phase. The firebreak should be controlled and constructed around the perimeters of the project site. 5. 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. 6. Precautionary measures need to be taken during high wind conditions or during the winter months when the fields are dry. 7. 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.	Pre-construction, construction and operation	Environmental Liaison Officer
Noise and Vibrations			
Mitigation of noise and vibrations	1. The construction phase must aim to adhere to the relevant noise regulations and limit noise to within standard working hours in order to	Pre-construction and construction	Environmental Liaison Officer

	reduce disturbance of dwellings in close proximity to the development. 2. Construction site yards, workshops, concrete batching plants, and other noisy fixed facilities should be located well 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 in to the system. 3. Truck traffic should be routed away from noise sensitive areas, where possible. 4. Noise levels must be kept within acceptable limits. 5. Noisy operations should be combined so that they occur where possible at the same time. 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. 7. Construction workers to wear necessary ear protection gear. 8. Noisy activities to take place during allocated construction hours. 9. Noise from labourers must be controlled. 10. 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. 11. 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. 12. Implementation of enclosure and cladding of processing plants. 13. 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.		
Site specific mitigation measures for	1. During construction care should be taken to ensure that noise from	Pre-construction	Environmental

noise and vibration	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. 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.	and construction	Liaison Officer
Energy Use			
The use of energy and actions that need to be implemented	1. Energy saving lighting must be implemented across the board. 2. Minimal lighting, while maintaining health and safety regulations, must be kept on during the night operations. 3. Equipment not in use must be switched off and unplugged to save on unnecessary energy costs.	Construction phase	Environmental Liaison Officer
Employment			
Labour	1. The use of labour intensive construction measures should be used where appropriate. 2. Training of labourers to benefit individuals beyond completion of the project. 3. No informal vending stations may be allowed on or near the construction site. 4. Lutzburg Solar Power Plant (RF) (Pty) Ltd. and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. Contractors need to ensure that all workers sign this code of conduct before the construction phase starts. 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. By doing this, workers will be legally informed of the associated risks on the property and that they would be held liable for any damages or losses. 5. A policy that no employment will be available at the gate should be implemented.	Construction phase	Principal Contractor

Recruitment plan	1. Recruitment must comply with national employment and labour laws. 2. Where reasonable and practical, Lutzburg 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. 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. 4. Ensure adequate advertising in the project community areas, local papers for skilled labour. 5. Local community leaders must be utilised to source labour. 6. 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. 7. The recruitment of skilled labour will follow standard advertising process in national newspapers and interview based selection. 8. Record of official complaints by employees to authorities i.e. Labour and Social Security. 9. Where feasible, efforts should be made to employ local contractors that are compliant with Black Economic Empowerment (BEE) criteria. 10. Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase. 11. The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. 12. Job seekers from the local community should be employed first. 13. Establish and maintain a healthy worker-management relationship.	Construction phase	Principal Contractor
Occupational Health and Safety			
Work safety	1. All staff should undergo a general health and safety induction and simplified environmental awareness training. 2. Implementation of safety measures, work procedures and first aid must be implemented on site. 3. Workers should be thoroughly trained in using potentially dangerous	Construction phase	Principal Contractor and Environmental Liaison Officer

	equipment. 4. Contractors must ensure that all equipment is maintained in a safe operating condition. 5. A safety officer must be appointed. 6. A record of health and safety incidents must be kept on site. 7. Any health and safety incidents must be reported to the Project Manager immediately. 8. First aid facilities must be available on site at all times and a number of employees trained to carry out first aid procedures. 9. Workers have the right to refuse work in unsafe conditions. 10. The Contractor shall take all the necessary precautions against the spreading of disease such as measles, foot and mouth, etc. 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 Lutzburg Solar Power Plant (RF) (Pty) Ltd. or the Contractor. 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 counseling is offered must be indicated to workers. 13. Material stockpiles or stacks must be stable and well secured to avoid collapse and possible injury to site workers/local residents. 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 contactor to effectively manage and monitor the movement of construction workers on and off the site 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 16. It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site. 17. The drivers of the vehicles must be qualified and all vehicles must be road		

	worthy. Drivers should also be made aware of the strict speed limits on and off site and the potential road safety issues on site. 18. Vehicles that are used for the transportation of loose building materials, like sand, should be fitted with covers to avoid spillage. 19. Measures for dust suppression should be implemented regularly to minimise dust pollution. An example hereof is the wetting of gravel roads. Authorisation to use groundwater for these purposes need to be gained.		
Work facilities	1. Eating areas should be regularly serviced and cleaned to ensure the highest possible standards of hygiene and cleanliness. 2. Fires are not to be allowed outside controlled areas.	Construction phase	Principal Contractor and Environmental Liaison Officer
Hazardous substances	1. Working areas should be provided with adequate ventilation and dust/fume extraction systems to ensure that inhalation exposure levels for potentially corrosive, oxidizing, reactive or siliceous substances are maintained and managed at safe levels.	Construction phase	Principal Contractor and Environmental Liaison Officer
Machine and equipment	1. Use of contrast colouring on equipment/ machinery including the provision of reflective markings to enhance visibility. 2. Use of moving equipment/machinery equipped with improved operator sight lines. 3. Issuing workers with high visibility clothing. 4. Use of reflective markings on structures, traffic junctions, and other areas with a potential for accidents. 5. Installing safety barriers in high risk locations.	Construction phase	Principal Contractor and Environmental Liaison Officer
Fitness for work	1. Review shift management systems to minimise risk of fatigue. Establish alcohol and other drugs policy for the operation.	Construction phase	Principal Contractor and Environmental Liaison Officer

Travel and remote site health	1. Develop programs to prevent both chronic and acute illnesses through appropriate sanitation and vector control systems. 2. Where food is prepared on site, food preparation storage and disposal should be reviewed regularly and monitored to minimise risk of illness.	Construction phase	Principal Contractor and Environmental Liaison Officer
Protective gear	1. Personal Protective Equipment (PPE) must be made available to all construction staff and must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn were necessary i.e. dust masks, ear plugs etc. 2. No person is to enter the site without the necessary PPE.	Construction phase	Principal Contractor and Environmental Liaison Officer
Site safety	1. The construction camp must remain fenced for the entire construction period. 2. Potentially hazardous areas are to be demarcated and clearly marked. 3. Adequate warning signs of hazardous working areas. 4. Emergency numbers for local police and fire department etc. must be placed in a prominent area. 5. Firefighting equipment must be placed in prominent positions across the site where it is easily accessible. This includes fire extinguishers, a fire blanket as well as a water tank. 6. Suitable conspicuous warning signs in English and all other applicable languages must be placed at all entrances to the site. 7. All speed limits must be adhered to.	Construction phase	Principal Contractor and Environmental Liaison Officer
Construction equipment safety	1. 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
Hazardous material storage	1. 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	Construction phase	Principal Contractor and Environmental Liaison Officer

	material. These areas should be roofed to avoid contamination of stormwater. 2. Material Safety Data Sheets (MSDS) which contain the necessary information pertaining to a specific hazardous substance must be present for all hazardous materials stored on the site.		
Procedure in the event of a petrochemical spill	1. A spill kit needs to be kept on site to address any unforeseen spillages. 2. The individual responsible for or who discovers the petrochemical spill must report the incident to the Project Manager, Contractor or ECO. 3. The problem must be assessed and the necessary actions required will be undertaken. 4. The immediate response must be to contain the spill. 5. The source of the spill must be identified, controlled, treated or removed wherever possible.	Construction phase	Principal Contractor and Environmental Liaison Officer
Fire management	1. Firefighting equipment should be present on site at all times. 2. All construction staff must be trained in fire hazard control and firefighting techniques. 3. All flammable substances must be stored in dry areas which do not pose an ignition risk to the said substances. 4. Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. 5. No open fires will be allowed on site. 6. Smoking may only be conducted in demarcated areas. 7. Road borders must be regularly maintained to ensure that vegetation remain short to serve as an effective firebreak.	Construction phase	Principal Contractor and Environmental Liaison Officer
Safety of surrounding residents	All I&AP's should be notified in advance of any known potential risks associated with the construction site and the activities on it. Examples of these are:	Construction	Principal Contractor and Environmental Liaison Officer

	• Blasting • Risk to residence along haulage roads/access routes 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 as possible in as short a timeframe as possible.		
Emergency evacuation plan	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. 2. All permanent staff must undergo safety training.	Construction phase	Principal Contractor and Environmental Liaison Officer
Maintenance	The PV plants 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
Security			
Security actions that need to be implemented during construction	1. A security company should be employed to guard the construction site and monitor access. This company should also be utilised for the operation phase. 2. Labour should be transported to and from the site to discourage loitering in adjacent areas and possible increase in crime or disturbance. 3. 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. 4. Only pre-approved staff must be permitted to stay within the staff accommodation which will be provided. 5. Construction workers should be easily identifiable by wearing uniforms and identification tags/induction cards. 6. The site shall be fenced, where necessary to prevent any loss or injury to persons during the construction phase.	Construction phase	Principal Contractor and Environmental Liaison Officer

	7. No alcohol/ drugs to be present on site. 8. No firearms allowed on site or in vehicles transporting staff to / from site (unless used by security personnel). 9. No harvesting of firewood from the site or from the business property adjacent to it without prior consent from the ECO. 10. 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). 11. Trespassing on private/ commercial properties adjoining the site is forbidden. 12. Driving under the influence of alcohol is prohibited. 13. All employees must undergo the necessary safety training and wear the necessary protective clothing. 14. The site must be secured in order to reduce the opportunity for criminal activity in the locality of the construction site. 15. Transportation for the construction workers need to be arranged by the contractor to ensure that there will be no trespassing of properties by any staff. Necessary arrangements to enable workers to return to their hometowns over weekends should also be arranged in order to reduce the risks posed to local family structures and social networks. 16. The proposed site of the Lutzburg SPP should be fenced off and the movement of construction workers should be limited to the vicinity of the site.		
Social Environment			
Social actions that need to be implemented	1. All contact with the affected parties shall be courteous at all times. The rights of the affected parties shall be respected at all times. 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. 3. Damage to infrastructure shall not be tolerated and any damage shall be	Construction phase	Principal Contractor and Environmental Liaison Officer

	rectified immediately by the Contractor. A record of all damage and remedial actions shall be kept on site. 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. 5. Care must be taken not to damage irrigation equipment, lines, channels and crops. 6. Lutzburg Solar Power Plant (RF) (Pty) Ltd. should 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 7. Contractors appointed by Lutzburg 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		
Influx of people	1. Ensure that employment procedures/polices are communicated to local stakeholders, especially community representative organisations and ward councillors. 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.	Construction phase	Principal Contractor and Environmental Liaison Officer
Additional municipal infrastructure	1. Where possible, construction workers should be housed within the local community to reduce the possible additional strain on local resources. 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. 3. The use of local labour during construction will negate the need for additional housing; therefore, contractors are again urged to make use of	Construction phase	Principal Contractor and Environmental Liaison Officer

	as much local labour as possible.		
Integration with local communities	1. An aggressive STI and HIV/AIDS awareness campaign should be launched, which is not only directed at construction workers but also at the community as a whole. 2. Local women should be empowered. This could be achieved by employing them to work on the project, which in turn would decrease their (financial) vulnerability.	Construction phase	Principal Contractor and Environmental Liaison Officer
Heritage Resources			
Mitigation of the impact that the new development may have on potential archaeological artifacts on the site	1. Any finds must be reported to the nearest National Monuments office to comply with the National Heritage Resources Act (Act No 25 of 1999) and to DEA. 2. Local museums as well as the South African Heritage Resource Agency (SAHRA) should be informed if any artefacts are uncovered in the affected area. 3. 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. 4. 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. 5. 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.	Construction phase	Principal Contractor and Environmental Liaison Officer

Paleontology	1. If during construction any archaeological, paleontological or other heritage resources are found, the operations must be stopped and a professional archaeologist or palaeontologist must be contacted for an assessment of the find. SAHRA (Mrs Colette Scheermeyer, tel. 021 462 4502) must also be alerted immediately. If the newly discovered heritage resource/s is considered significant, a Phase 2 mitigation assessment with a permit from the responsible heritage authority may be required. 2. Should substantial fossil remains (e.g. well-preserved fossil fish, reptiles or petrified wood) be exposed during construction, the ECO should carefully safeguard these, preferably in situ, and alert SAHRA as soon as possible so that appropriate action (e.g. recording, sampling or collection) can be taken by a professional palaeontologist.	Construction phase	Principal Contractor and Environmental Liaison Officer
Community Engagement			
Community engagement	1. A communication guideline to be drafted and agreed upon with authority representatives and affected communities. 2. Open and transparent community engagement to be followed as culturally appropriate. 3. Records (written) to be kept of all community engagements (e.g. complaints, resolutions, etc)	Construction phase	Environmental Liaison Officer
Visual Impact			
Visual issues and actions that need to be implemented	1. There is good screening opportunity since the land is relatively flat and with scattered trees and bushes. Generation of dust will increase the visibility of the project, and it is therefore important to employ techniques to suppress dust generation during construction. Other measures include: 2. Carefully plan to reduce the construction period. 3. Locate laydown and storage areas in zones of low visibility i.e. behind tall	Construction phase	Environmental Liaison Officer

	trees or in lower lying areas. 4. Dust suppression is important as dust will raise the visibility of the development. 5. As far as possible, restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting. 6. Any additional external lighting of the facility will be limited. 7. New road construction should be minimised and existing roads should be used where possible. 8. The contractor should maintain good housekeeping on site to avoid litter and minimise waste. 9. Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. 10. Although there are no readily erodible slopes on the site, erosion risks should be assessed and minimised as erosion scarring can create areas of strong visual contrast with the surrounding vegetation, which can often be seen from long distances since they will be exposed against the hill slopes. 11. Mitigation of lighting impacts includes the pro-active design, planning and 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. 12. Fires and fire hazards need to be managed appropriately. 13. 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.		

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

POTENTIAL ASPECTS RESULTING IN POTENTIAL ENVIRONMENTAL IMPACT DURING OPERATION	RECOMMENDED MITIGATION MEASURES		
	Management and mitigation measures	**Timeframe**	**Responsibility**
Construction Site Decommissioning			
Removal of equipment	1. All structures comprising the construction camp are to be removed from site. 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. 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.	When beneficiaries take occupation	Principal Contractor. Developer, Environmental Control officer and Environmental Liaison Officer
Temporary services	1. The Contractor must arrange the cancellation of all temporary services. 2. Temporary roads must be closed and access across these, blocked. 3. All areas where temporary services were installed are to be rehabilitated to the satisfaction of the ECO.	When beneficiaries take occupation	Principal Contractor. Developer, Environmental Control officer and Environmental Liaison Officer
Associated infrastructure	1. Surfaces are to be checked for waste products from activities such as concreting or asphalting and cleared in a manner approved by the Engineer. 2. All surfaces hardened due to construction activities are to be ripped and imported material thereon removed. 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. 4. The site is to be cleared of all litter. 5. Fences, barriers and demarcations associated with the construction phase	When beneficiaries take occupation	Principal Contractor. Developer, Environmental Control officer and Environmental Liaison Officer

	are to be removed from the site unless stipulated otherwise by the Engineer. 6. All residual stockpiles must be removed to spoil or spread on site as directed by the Engineer. 7. All leftover building materials must be returned to the depot or removed from the site. 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.		
Rehabilitation plan	1. Rehabilitate and re-vegetate cleared areas with indigenous plant species, such as Boscia albitrunca, Acacia erioloba, Prosopis glandulosa, and Acacia haematoxylon trees and Harpagophytum procumbens, Gomphocarpus fruticosus, Pentarrhinum insipidum, Pergularia daemia, Sarcostemma viminale, Huernia zebrine, Asclepias aurea species. 2. Establish a rehabilitation fund. This fund can be utilised for the rehabilitation of the proposed Lutzburg SPP in the decommissioning phase.	When beneficiaries take occupation	Principal Contractor. Developer, ECO and Environmental Liaison Officer
Operation and Maintenance			
Maintenance	1. All applicable standards, legislation, policies and procedures must be adhered to during operation. 2. Regular ground inspection of the power plants must take place to monitor their status.	Operational phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Public awareness	1. The emergency preparedness plan must be ready for implementation at all times should an emergency situation arise.	Operational phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Soil Erosion and Geology			
Soil erosion	1. To avoid soil erosion, it will be a good practice to design stormwater	Operational phase	Lutzburg Solar Power

	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. 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. 3. The facilitation of small stock grazing within the panel areas are recommended to mitigate loss of agricultural land use. 4. To prevent the erosion of topsoil, management measures may include berms, soil traps, hessian curtains and stormwater diversion away from areas susceptible to erosion.		Plant (RF) (Pty) Ltd.
Monitoring and reporting	1. Specific activities that should be monitored include: • Erosion potential (specifically in and around roads and stormwater discharge points). • Identified problem areas • The periods when the panel area is used for grazing of small stock to prove ongoing agricultural land use (Specifically record whether any predation to small stock occurs or not within the panel area). On the event of any predation taking place, the fence must be inspected and repaired to be jackal proof.	Monthly	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Geology	1. Surface drainage should be provided to prevent water ponding. 2. Bulk infrastructure should be designed by a specialist.	Operational phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Surface and Groundwater			
Surface water	1. The stormwater system on the proposed site needs to be regularly maintained to ensure effective working.	Operational phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Monitoring and reporting	1. Specific activities that should be monitored include: • Erosion potential (specifically in and around roads and stormwater	Monthly	Lutzburg Solar Power Plant (RF)

	discharge points). • Stormwater management and design • Identified problem areas 2. Development and implementation of an adequate stormwater management plan to be designed by an appropriate engineer. 3. Drainage measures must promote the dissipation of stormwater run-off.		(Pty) Ltd.
Site specific mitigation measures for groundwater	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. 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. 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.	Monthly	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Biodiversity (Fauna and Flora)			
Vegetation	1. Indigenous vegetation must be maintained and all exotics removed as they appear and disposed of appropriately. 2. Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to construction. 3. Vegetative re-establishment shall, as far as possible, make use of indigenous or locally occurring plant varieties within a 20-metre radius of the site. Reseeding of local indigenous plant species should be done in	Operational phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.

	between the developed infrastructure and all affected areas as well. 4. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas during and following rehabilitation.		
Fauna	1. No faunal species must be harmed by maintenance staff during any routine maintenance at the development.	Operational phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Site specific mitigation measures	1. Six monthly checks of the area should take place for the emergence of invader species. 2. 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. 3. Correct rehabilitation with locally indigenous species. 4. Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion and the edge effect are avoided. 5. Constant maintenance of the area to ensure re-colonisation of floral species. 6. Regular removal of alien species which may jeopardise the proliferation of indigenous species. Regular maintenance of bird flappers and guards must be undertaken.	Operational phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Avifauna			
Bird injury or mortality	1. A full post-construction bird monitoring protocol must be in place for the Lutzburg Solar Power Plant (RF) (Pty) Ltd. It is recommended that a full 12 months of post construction monitoring is done by trained ornithologists. 2. Bird scaring techniques including rotating prisms and experimental use of Torri lines need to be used if birds are found to impact the PV panels. 3. All power lines – *present and future* – must be marked with bird diverters to reduce the possible impact of the raptorial species. The priority areas - those with the highest mortality rate - should be considered first. 4. If, in the post-construction monitoring, hornbills are found to attack their own reflections in the panels, and smash them, then covering the affected	Operational phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.

	panels with a fine wire mesh is recommended. 5. It is also recommended that Lutzburg Solar Power Plant (RF) (Pty) Ltd install video cameras above some panels for post-construction monitoring of any mortality of birds in the vicinity, through direct observation and carcass searches in a systematic and regular fashion.		
Nesting on site	1. Avoid the use of lattice-type structures in order to minimise perching and nesting opportunities. 2. Minimise standing water. This will make it more difficult for the two swallow species to obtain mud for their nests and will minimise the risk of large congregating birds near the PV arrays. 3. Inspect each PV module at least once a month throughout the year for any nest-building activity. 4. Maintenance staff needs basic training in order to know what to look for and how to fill in the Bird Incident Forms.	Operational phase	Developer
Waste Management			
Recycling and litter management	1. The site should be kept clear of litter at all times. 2. Solid waste separation and recycling should take place for the duration of the operational phase for the development. 3. All waste must be removed promptly to ensure that it does not attract vermin or produce odours. 4. In house treatment procedures must be followed strictly. 5. Solid waste should be collected on a regular basis and disposed of at the closest municipal landfill site. 6. Package treatment plant must be regularly serviced. 7. No solid waste may be burned or buried on site or disposed of by any other method on site.	Operational phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Health and Safety			
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	Operational phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.

	in the case of an emergency.		
Maintenance	The PV plants are to be regularly maintained. A maintenance schedule must be drawn up and records of all maintenance kept.	Operational phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
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	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Storage and handling of hazardous waste	1. Transformer oil containers must be regularly maintained to ensure that leaks do not occur. 2. A spill kit needs to be kept on site to address any unforeseen spillages. 3. Transport of all hazardous substances must be in accordance with the relevant legislation. 4. The bund wall surrounding the transformer oil containers must be regularly maintained to ensure that any spills are completely contained.	Operational phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Visual Impact			
Maintenance and lighting	1. Lighting must be kept to a minimum and restricted to low level, downward facing lights to reduce light spill. 2. Lighting must be inward and downward pointing to reduce glare in surrounding areas. 3. Security lighting should make use of down-lights to minimise light spill, and motion detectors where possible so that lighting at night is minimised. 4. Mitigation of lighting impacts includes the pro-active design, planning and specification lighting for the facility by a lighting engineer. 5. Screening should be implemented by means of vegetation in conjunction with security fencing. 6. The power plants area and surrounds must be kept clean, tidy and well maintained to reduce negative visual impacts.	Operational phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.

	7. Rehabilitation of surrounding areas must take place with indigenous species. 8. Surrounding roads must be well maintained. 9. Regular maintenance of exteriors and associated infrastructure must be undertaken. 10. Reduce the trespass of lighting by using luminaires that prevents light from shining beyond the intended area and eliminates light directed upwards or at the horizontal. 11. Decreasing light intensity will reduce energy consumption and limit both skyglow and the area impacted by high-intensity direct light. 12. Lighting technologies emitting a narrow spectrum of light are likely to have less ecological impact compared to broader spectrum light sources.		
Employment			
Labour	1. Training of labourers to benefit individuals beyond completion of the project.	Operational phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Recruitment plan	1. Recruitment must comply with national employment and labour laws. 2. Where reasonable and practical, Lutzburg Solar Power Plant (RF) (Pty) Ltd.'s service providers should appoint local residents and implement a 'locals first' policy, especially for semi and low-skilled job categories. 3. 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. 4. Ensure adequate advertising in the project community areas, local papers for skilled labour. 5. Local community leaders must be utilised to source labour. 6. 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. 7. The recruitment of skilled labour will follow standard advertising process in national newspapers and interview based selection.	Operational phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.

	8. Record of official complaints by employees to authorities i.e. Labour and Social Security. 9. Where feasible, efforts should be made to employ local contractors that are compliant with Black Economic Empowerment (BEE) criteria. 10. Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the operation phase. 11. The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. 12. Establish, maintain a healthy worker-management relationship.		
Grievance mechanism	1. A grievance mechanism as part of the management system should be established. 2. The grievance procedure does not replace normal manager-employee dialogue, but is another open form of communication. 3. The procedure should assist employees to resolve grievance situations quickly and effectively in order to restore harmonious working conditions for all employees. 4. Management is responsible for listening and responding to all employee concerns raised through this procedure. 5. In all cases, matters will be dealt with in as confidential a manner as possible.	Construction and operational phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Social Environment			
Corporate social investment	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. 2. Lutzburg 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;	Operational phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.

Sense of place	1. Job opportunities should be afforded to local individuals as far as possible to enhance their sense of place.	Operational phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.

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**
Ongoing Stakeholder involvement			
General	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. 2. Community to be notified, as culturally appropriate, timeously of the planned decommissioning. 3. Recommend that a meeting with community leader(s) be held before decommissioning commence to inform them: • What activities will take place during the decommissioning phase. • How these activities will impact upon the communities and/or their properties. • Regarding the timeframes of scheduled activities. 4. Regular interaction between Lutzburg Solar Power Plant (RF) (Pty) Ltd. and community leader(s) during the decommissioning phase. 5. A reporting office/channel to be established should community members experience problems with contractors/sub-contractors during the decommissioning phase. 6. A register to be kept of problems reported by community members and the steps taken to address/ resolve it.	Decommissioning phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Community Health and Safety Responsibility			
Community health and safety responsibility	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. 2. Where dust is generated by trucks passing on gravel roads, dust mitigation to be enforced.	Decommissioning phase	Lutzburg 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.		
General site considerations			
General site decommissioning considerations	1. All temporary fencing and danger tape must be removed once the construction phase has been completed. 2. All hardened surfaces within the construction camp area should be diced, all imported materials removed, and the area shall be top soiled and re-vegetated. 3. Temporary roads (if any) must be closed and access across these blocked 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.	Following completion of construction activities in an area: decommissioning phase	Principal Contractor and Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Waste Management			
Waste management	1. All decommissioned equipment must be removed from site and disposed of at a registered land fill. Records of disposal must be kept. 2. The panels need to be disposed of appropriately and returned to the manufacturer to be recycled. 3. 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.	Decommissioning phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Surface and Groundwater Responsibility			
Surface and groundwater responsibility	1. Removal of any historically contaminated soil as hazardous waste. 2. Removal of hydrocarbons and other hazardous substances by a suitable contractor to reduce contamination risks. 3. Removal of all substances which can result in groundwater (or surface water) contamination. 4. Re-vegetation of exposed soil surfaces to ensure no erosion in these areas.	Decommissioning phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.

	5. Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.		
Biodiversity Responsibility			
Loss of habitat	1. Maintain footprint strictly during decommissioning. 2. Existing access roads must be used. 3. All infrastructure must be removed from the site. 4. 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. 5. Suitable stormwater/wind controls must be put in place until rehabilitation is complete. 6. Constant removal of alien invasive species in and around plant. 7. 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.	Decommissioning phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Edge effect	1. The Contractor should be responsible for implementing a programme of weed control. 2. Present exotic and invasive plant species, in particular *Prosopis glandulos*a, should be eradicated at the site. 3. By no means should any declared invaders, such as the mesquite tree (*Prosopis* species) be planted or allowed to establish if the development is approved. 4. All exotic vegetation must be removed from the site (if present).	Decommissioning phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Air Pollution Responsibility			
Air pollution responsibility	Regular maintenance of equipment to ensure reduced exhaust emissions.	Decommissioning phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.

Noise and Vibrations			
Noise and vibrations	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. 2. Any noisy fixed facilities should be located well away from noise sensitive areas. 3. Truck traffic should be routed away from noise sensitive areas, where possible. 4. Noise levels must be kept within acceptable limits. 5. Noisy operations should be combined so that they occur where possible at the same time. 6. Construction workers to wear necessary ear protection gear. 7. Noisy activities to take place during allocated construction hours. 8. Noise from labourers must be controlled. 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. 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. 11. Implementation of enclosure and cladding of processing plants. 12. Applying regular and thorough maintenance schedules to equipment and processes.	Decommissioning phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Site specific mitigation measures	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.	Decommissioning phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.

	2. Gravel roads used should be kept in good order. Corrugations and drainage ruts should not be allowed to develop.		
Decommissioning Traffic			
Decommissioning traffic	1. Routes and required access roads must be clearly defined. 2. The removal of equipment must be undertaken with the minimum number of trips to reduce the carbon footprint of these activities. 3. Access of all vehicles should be strictly controlled, especially during wet weather to avoid compaction and damage to the topsoil structure. 4. Damping down of the un-surfaced roads must be implemented to reduce dust and nuisance. 5. Vehicles and equipment shall be serviced regularly to avoid the contamination of soil from oil and hydraulic fluid leaks etc. 6. Servicing must be done in dedicated service areas on site or else off site if no such area exists. 7. Oil changes must take place on a concrete platform and over a drip tray to avoid pollution. 8. Soils compacted by construction vehicles shall be deep ripped to loosen compacted layers and re-graded to even running levels.	Decommissioning phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Access	1. The main routes on the site must be clearly signposted and printed delivery maps must be issued to all suppliers and Sub-contractors. 2. Contractor shall clearly mark all access roads. Roads not to be used shall be marked with a “NO ENTRY for construction vehicles" sign.	Decommissioning phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Noise	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.	Decommissioning phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.

General	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. 2. The Contractor shall ensure that all the necessary precautions against damage to the environment and injury to persons are taken. 3. Care for the safety and security of community members crossing access roads should receive priority at all times.	Decommissioning phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Visual Impact			
Visual impact	Generation of dust will increase the visibility of the project, and it is therefore important to employ techniques to suppress dust generation during decommissioning. Other measures include: 1. Carefully plan to reduce the decommissioning period. 2. Locate laydown and storage areas in zones of low visibility i.e. behind tall trees or in lower lying areas. 3. Existing roads should be used where possible. 4. The contractor should maintain good housekeeping on site to avoid litter and minimise waste. 5. Erosion risks should be assessed and minimised as erosion scarring can create areas of strong visual contrast with the surrounding vegetation, which can often be seen from long distances. 6. Mitigation of lighting impacts includes the pro-active design, planning and 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. 7. Fires and fire hazards need to be managed appropriately.	Decommissioning phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.
Employment			

Loss of employment	1. During the decommissioning phase, retrenchment packages should be made available to all staff being retrenched. 2. An Environmental Rehabilitation Trust fund should be established to cover all costs during the decommissioning phase. 3. During the decommissioning phase all related infrastructures associated with the proposed Lutzburg SPP should be dismantled and transported off-site. Funds should also be allocated to the rehabilitation of the site and the closure of the proposed Lutzburg SPP.	Decommissioning phase	Lutzburg Solar Power Plant (RF) (Pty) Ltd.

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

POTENTIAL ENVIRONMENTAL IMPACT DURING POST CLOSURE (NATURE OF THE IMPACT)	**RECOMMENDED MITIGATION MEASURES**		
	Management and mitigation measures	**Timeframe**	**Responsibility**
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.			

3 ENVIRONMENTAL AWARENESS PLAN

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 Lutzburg 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.

4 AUDITING

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;
- Quarterly independent external audits during the construction and site establishment phase by an independent external auditor;
- One post-construction audit by an independent external auditor;
- Annual 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 Lutzburg 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

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 DEA. Copies of the amendments will be issued to all registered I&APs.

Appendices

APPENDIX A: CV OF THE EAP

MS. MARELIE GRIESEL

Name:	*Marelie Griesel*
Date of Birth:	*29 April 1990*
Nationality:	*South African*
Profession:	*Environmental consultant*

Environmental Assessment Practitioner (EAP)

ACADEMIC QUALIFICATIONS:

B.Sc Tourism, Geography and Zoology
Hons.Env.Man.
M.Sc. Env.Man.(In process)

REGISTRATIONS:

IAIAsa

Environmental Assessment Practitioner

KEY QUALIFICATIONS:

Masters Degree in Environmental Management and Geography, North West University, SA (in progress)
Honors in Environmental Management (Hons.Env.Man.), North West University (NWU), SA (2012-2013)
B. Sc in Tourism, Geography & Zoology, North West University (NWU), SA (2009–2011)

Registered at:
International Association for Impact Assessment (IAIA)

PROJECT EXPERIENCE:

Involvement with environmental management projects and EIA applications:

Marelie Griesel has particular experience in Environmental Impact Assessment and (EIA) and Environmental Management Programmes (EMPr). Some of the projects are summarised below, which demonstrates her specialist competence:

- Environmental Management Programme for the Hawerklip Siding, near Delmas, Mpumalanga Province.
- Environmental Management Programme for the Diro Resources load out station near Kathu, Northern Cape Province.
- Fithteen (15) Basic Assessment projects in terms of the National Environmental Management Act (107/1998) and the Minerals and Petroleum Resources Act (28/2002).
- Thirty-four (34) EIA projects in terms of the National Environmental Management Act (107/1998) and the Minerals and Petroleum Resources Act (28/2002).

Marelie Griesel's experience with EIA processes and the intricacies around process management stems from her involvement in practice as well as research. Her main focus in her Master's research is of Environmental Impact Assessment debates in South Africa. She has extensive knowledge on Renewable Energy and more specific the environmental impacts surrounding photovoltaic solar energy facilities. She also has knowledge in environmental Impact Assessment in the mining industry, focusing on mining permits, prospecting rights and mining rights.

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
A. DESIGN PHASE					
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. CONSTRUCTION PHASE					
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. Ensure that contractors and sub-contractors do not induce impacts on the surrounding environment as a result of unplanned pollution on site. Ensure that actions by on-site contractors and sub-contractors and workers are properly managed in order to minimise impacts to surrounding environment.	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
		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
		3.4. No person other than a 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 a 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: • Cleaning methods utilised for cleaning vehicles, floors, etc. should aim to minimise water use (e.g. sweep before wash-down). • Ensure that regular audits of water systems are conducted to identify possible water leakages. 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
C. OPERATIONAL PHASE					
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. 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	Facility Manager Facility Manager 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. Assurance of functionality of fire extinguishers via inspections and certification by an accredited fire service company.	On-going Bi-annually	Facility Manager 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). • Where possible, encourage the re-use of water. • Ensure that regular audits of water systems are conducted to identify possible water leakages. 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 waste water on site during the operation phase.	Maintain reasonable levels of waste water generation.	12.1 Waste water 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.	Waste water 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. DECOMMISIONING 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
A. CONSTRUCTION PHASE					
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**
		1.5Immediately 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 top soil layer	ECO and Contractor

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	**Frequency**	**Responsibility**
			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. Record date and depth of re-spreading of topsoil. Photograph the area on completion of rehabilitation and on an annual basis thereafter to show vegetation establishment and evaluate progress of restoration over time.		
B. OPERATIONAL PHASE					
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.	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. The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area	• 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
C. DECOMMISSIONING PHASE					
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 E: PLANT RESCUE & PROTECTION INCLUDING RE-VEGETATION AND HABITAT PLAN

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
A. DESIGN PHASE					
1. Loss of Species of Special Concern (SSC) and protected species and their habitats	Minimise fragmentation and loss of SSC and protected species and their habitats through the careful siting and layout planning for the project	1.1 Avoid the removal of listed SSC and protected species as far as possible.	Prepare final layout plan and include the plan in the updated EMPr (with submission to DEA if required)	Once-off during design phase	Project Developer
		1.2 A buffer zone of 32 m must be implemented from the edge of the drainage lines on site (shown on the sensitivity map (Figure 2 and 3), in which no development or activities should take place. Note: The Environmental Authorisation from DEA may require that the Final Layout be submitted to DEA (and possibly other authorities such as government conservation bodies) prior to the start of construction. In this case, such specifications must be included into this section of the updated EMPr.	Prepare final layout plan and include the plan in the updated EMPr (with submission to DEA if required)	Once-off during design phase	Project Developer
B. CONSTRUCTION PHASE					
2. Excessive loss of natural vegetation in and outside development footprint area	Minimise loss of natural vegetation Prevent impacts on natural	2.1 Sensitive habitats and area outside project development should be clearly demarcated as no go areas during the construction phase to avoid accidental impacts. No development or activities should take place in the high sensitivity ecosystems (shown in sensitivity map)	Strict control over the behaviour of construction workers, restricting activities to within demarcated areas for construction. ECO must monitor activities and record and report non-compliance	Daily	ECO and Contractor

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
and veld degradation	vegetation in sensitive habitats and SSC		Strict control and proper education of staff to prevent misconduct. If ECO is absent, there should be a designated EO present to deal with any urgent issues.		
		2.2 The storm-water management plan must be implemented during the construction phase	Monitor storm water management efficiency	After rainfall events	Contractor
		2.3 Unnecessary impacts on surrounding natural vegetation must be avoided during construction. No construction vehicles should be allowed to drive around the veld. All construction vehicles should remain on properly demarcated roads.	Strict control over the behaviour of construction workers, restricting activities to within demarcated areas for construction Include periodical site inspection in environmental performance reporting that specifically records occurrence or not of off-road vehicle tracks in specific areas.	Daily	ECO and Contractor
		2.4 Re-vegetation of disturbed surfaces must occur immediately after construction activities are completed. Re-seed with locally-sourced seed of indigenous grass species that were recorded on site pre-construction.	Undertake following the construction phase.	Daily	ECO and Contractor
		2.5. The collection, hunting or harvesting of any plants, fuel wood or animals at the site during construction should be strictly forbidden and the staff educated to prevent this from happening.	Strict control over the behaviour of construction workers, restricting activities to within demarcated areas for construction	Daily	ECO and Contractor
		2.6 Fires should only be allowed within fire-safe demarcated areas.	Strict control over the behaviour of construction workers, restricting activities to within demarcated areas	Daily	ECO and Contractor

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
3. Impacts on species of special concern and their habitats	Minimise impacts on species of special concern and protected trees.	3.1 A plant rescue operation must be initiated to confirm that no other species are located within the development site.	ECO must undertake a final walkthrough of the site prior to commencement of construction to ensure no SCC will be impacted on	Once-off	ECO and Contractor
		3.2 Clearing of vegetation should be kept to a minimum, keeping the width and length of the earth works to a minimum.	Monitor activities and record and report non-compliance	Daily	ECO and Contractor
		3.3 Should SCC remain on site and the development occur without these species being disturbed, then the topsoil should be left intact around these SCCs and not stockpiled with other topsoil from the site	Monitor activities and record and report non-compliance	Daily	ECO and Contractor
		3.4 Avoid the removal of listed SSC or protected species as far as possible. Should any of the listed / protected species need to be removed, the requisite permits must be obtained prior to the removal of the species.	Monitor activities and record and report non-compliance	Daily	ECO and Contractor
4. Loss of vegetation, top soil and habitat fragmentation	Minimise the loss of seed bank present within the soil Ensure effective topsoil covering to conserve soil fertility on all disturbed areas, after they have been rehabilitated.	4.1 Wind screening must be undertaken to prevent soil loss from the site.	Monitor site for indication of erosion	Daily	ECO and Contractor
		4.2 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	See measures discussed in Appendix D 1	Daily (stockpiling) and once-off for the reinstatement of the top soil layer	ECO and Contractor
		4.3 Dispose of any sub-surface spoils from excavations where they will not impact on land that supports vegetation, or where they can be effectively	Stockpile the topsoil layer (0.5m top layer of soil) separately and use on site following the construction	Monthly (stockpiling) and once-off for the	ECO and Contractor

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	**Frequency**	**Responsibility**
		covered with topsoil.	phase	reinstatement of the top soil layer	
C. OPERATIONAL PHASE					
5. Loss of species of special concern and their habitats	Control loss of natural vegetation during operational. Prevent impacts on natural vegetation in sensitive habitats and species of special concern.	5.1 Unnecessary impacts on surrounding natural vegetation must be avoided. All operational and maintenance vehicles to remain on the roads and no off-road driving allowed.	Strict control over the behaviour of operational workers, restricting activities to within demarcated areas for operational Strict control and proper education of staff to prevent misconduct. If ECO is absent, there should be a designated EO present to deal with any urgent issues	Monthly	Operations and Maintenance Contractor
		5.2 The collection, hunting or harvesting of any plants, any protected trees, fuel wood or animals at the site should be strictly forbidden and the staff educated to prevent this from happening.	ECO must monitor activities and record and report non-compliance	Monthly	ECO & Operations and Maintenance Contractor
		5.3 All hazardous materials should be stored in the appropriate manner to prevent impacts on vegetation. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.	ECO must monitor activities and record and report non-compliance	Monthly	ECO & Operations and Maintenance Contractor
		5.4 Fires should only be allowed within fire-safe demarcated areas.	ECO must monitor activities and record and report non-compliance	Monthly	ECO & Operations and Maintenance Contractor

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	**Frequency**	**Responsibility**
		5.5 No unauthorized persons should be allowed onto the site.	ECO must monitor activities and record and report non-compliance	On-going	ECO & Operations and Maintenance Contractor
		5.6 The storm-water management plan must be implemented during the operational phase	Monitor storm water management efficiency	Monthly	ECO & Operations and Maintenance Contractor
		5.7 Any roads running down a slope must have water diversion structures present.	Monitor storm water management efficiency	Monthly	ECO & Operations and Maintenance Contractor
		5.8 Wind screening must be undertaken to prevent soil loss from the site.	ECO must monitor activities and record and report non-compliance	Monthly	ECO & Operations and Maintenance Contractor
D. DECOMMISSIONING PHASE					
6. Rehabilitation of flora on site	Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to operational.	6.1 All damaged areas shall be rehabilitated upon completion of the contract.	Final external audit of area to confirm that area is rehabilitated to an acceptable level	Once off	Project Developer with advice from specialist
		6.2 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	Project Developer with advice from specialist
		6.3 Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas.	Final external audit of area to confirm that area is rehabilitated to an acceptable level	Once off	Project Developer with advice from specialist

APPENDIX F: OPEN SPACE MANAGEMENT PLAN

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
A. DESIGN PHASE					
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 shown in Figure.	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
		2.3Pigtails 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. CONSTRUCTION PHASE					
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 is it 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 Pigtails 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
C. OPERATIONAL PHASE					
6. 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	6.1 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
	on the rural landscape				
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.	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: • A lighting plan that documents the design, layout and technology used for lighting purposes should be prepared, indicating how nightscape impacts will be minimised; • The lighting plan should include a process for promptly addressing and mitigating complaints about potential lighting impacts; • Lighting of the facility should not exceed, in number of lights and brightness, the minimum required for safety and security; • Uplighting and glare (bright light) should be minimised using appropriate screening; • Low-pressure sodium light sources should be used to reduce light pollution; • Light fixtures should not spill light beyond the project boundary; • Timer switches or motion detectors should be used to control lighting in areas that are not occupied continuously; and	Develop lighting plan and ensure that requirements are adhered to.	Monthly for the first year and then yearly	Project Developer

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
		• Lights should be switched off when not in use whenever it is in line with safety and security.			
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.	• Record any evidence of bird collisions, injury or other bird-related incidents (with GPS coordinates). • 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.	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
D. DECOMMISSIONING PHASE					
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.		10.1Disturbed 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
A. DESIGN PHASE					
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 Northern Cape (PGNC) 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: – Grading requirements; – Dust suppressant requirements; – Drainage requirements; – Signage; and – Speed limits.	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 Northern Cape (PGNC) 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 Road kill 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 Animex 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 that 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			
C. OPERATIONAL PHASE					
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	10.1Implement requirements of the Road Maintenance Plan.	Adhere to requirements of the Road Maintenance Plan	On-going	Operations and Maintenance Contractor
D. DECOMMISSIONING PHASE					
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
A. DESIGN PHASE					
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 through-out 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 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; 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; 1.2.3do not divert flows out of their natural flow pathways, thus depriving downstream water courses of water.	Check compliance with specified conditions	Once-off during design followed by regular control	Contractor
B. CONSTRUCTION PHASE					
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	3.1Chemical 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 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 are 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
C. OPERATIONAL PHASE					
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
D. DECOMMISSIONING PHASE					
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. 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.					

APPENDIX I: EROSION MANAGEMENT PLAN

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	Frequency	Responsibility
A. CONSTRUCTION PHASE					
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
		1.2During 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	Refer to Section 5.1 of the EMPr	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. OPERATIONAL PHASE					
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
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. 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).					

APPENDIX J: HARZADOUS SUBSTANCES LEAKAGE OR SPILLAGE MONITORING SYSTEM

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
CONSTRUCTION PHASE					
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 placed on site, this is be 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***
		Portable bioremediation kit (to remedy chemical spills) is to be held on site and used as required. 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.	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***
		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: ▪ 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; ▪ Divert rainwater away from the bunded area to avoid rainwater mixing with electrolyte spillage potentially present within the secondary containment; ▪ Ensure that the containment area is sloped to a sump; and ▪ All drains should be covered.	Provide secondary containment according to the specifications	On-going	
		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: ▪ 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	Immediately attend to any spillage	On-going	Contractor and ECO

Project aspect	Mitigation Objectives	Management actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		appropriate gloves to prevent skin exposure. • 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. • 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.			
OPERATIONAL PHASE					
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***
		Portable bioremediation kit (to remedy chemical spills) is to be held on site and used as required. 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.	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.					