GENERIC ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) FOR THE DEVELOPMENT AND EXPANSION OF SUBSTATION INFRASTRUCTURE FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICITY




environmental affairs
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INTRODUCTION

1. Background

The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) requires that an environmental management programme (EMPr) be submitted where an environmental impact assessment (EIA) has been identified as the environmental instrument to be utilised as the basis for a decision on an application for environmental authorisation (EA). The content of an EMPr must either contain the information set out in Appendix 4 of the Environmental Impact Assessment Regulations, 2014, as amended (EIA Regulations) or must be a generic EMPr relevant to an application as identified and gazetted by the Minister in a government notice. Once the Minister has identified, through a government notice that a generic EMPr is relevant to an application for EA, that generic EMPr must be applied by all parties involved in the EA process, including but not limited to the applicant and the competent authority (CA).

2. Purpose

This document constitutes a generic EMPr relevant to applications for the development or expansion of substation infrastructure for the transmission and distribution of electricity, and all listed and specified activities necessary for the realisation of such infrastructure.

3. Objective

The objective of this generic EMPr is to prescribe and pre-approve generally accepted impact management outcomes and impact management actions, which can commonly and repeatedly be used for the avoidance, management and mitigation of impacts and risks associated with the development or expansion of substation infrastructure for the transmission and distribution of electricity. The use of a generic EMPr is intended to reduce the need to prepare and review individual EMPrs for applications of a similar nature.

4. Scope

The scope of this generic EMPr applies to the development or expansion of substation infrastructure for the transmission and distribution of electricity requiring EA in terms of NEMA. This generic EMPr applies to activities requiring EA, mainly activity 11 and 47 of the Environmental Impact Assessment Regulations Listing Notice 1 of 2014, as amended, and activity 9 of the Environmental Impact Assessment Regulations Listing Notice 2 of 2014, as amended, and all associated listed or specified activities necessary for the realization of such infrastructure.

5. Structure of this document

This document is structured in three parts with an Appendix as indicated in the table below:

Part	Section	Heading	Content
A		Provides general guidance and information and is **not legally binding**	Definitions, acronyms, roles & responsibilities and documentation and reporting.
B	1	Pre-approved generic EMPr template	Contains generally accepted impact management outcomes and impact management actions required for the avoidance, management and mitigation of impacts and risks associated with the development or expansion of substation infrastructure for the transmission and distribution of electricity, which are presented in the form of a template that has been pre-approved. The template in this section is to be completed by the contractor, with each completed page signed and dated by the holder of the EA prior to commencement of the activity. Where an impact management outcome is not relevant, the words "not applicable" can be inserted in the template under the "responsible persons" column. Once completed and signed, the template represents the EMPr for the activity approved by the CA and is legally binding. The template **is not required** to be submitted to the CA as once the generic EMPr is gazetted for implementation, it has been approved by the CA. To allow interested and affected parties access to the pre-approved EMPr template for consideration through the decision-making process, the EAP on behalf of the applicant /proponent must make the hard copy of this EMPr available at a public location and where the applicant has a website, the EMPr should also be made available on such publicly accessible website.
	2	Site specific information	Contains preliminary infrastructure layout and a declaration that the applicant/holder of the EA

Part	Section	Heading	Content
			will comply with the pre-approved generic EMPr template contained in Part B: Section 1, and understands that the impact management outcomes and impact management actions are **legally binding**. The preliminary infrastructure layout must be finalized to inform the final EMPr that is to be submitted with the basic assessment report (BAR) or environmental impact assessment report (EIAR), ensuring that all impact management outcomes and impact management actions have been either pre-approved or approved in terms of Part C. This section **must be** submitted to the CA together with the final BAR or EIAR. The information submitted to the CA will be considered to be incomplete should a signed copy of Part B: section 2 not be submitted. Once approved, this Section forms part of the EMPr for the development and is legally binding.
C		Site specific sensitivities/ attributes	If any specific environmental sensitivities/ attributes are present on the site which require site specific impact management outcomes and impact management actions, not included in the pre-approved generic EMPr, to manage impacts, these specific impact management outcomes and impact management actions must be included in this section. These specific environmental attributes must be referenced spatially and impact management outcomes and impact management actions must be provided. These specific impact management outcomes and impact management actions must be presented in the format of the pre-approved EMPr template (Part B: section 1) This section will not be required should the site contain no specific environmental sensitivities or attributes. However, if Part C is applicable to the site, it **is required** to be submitted together with the BAR or EIAR, for consideration of, and decision on, the application for EA. The information in this section must be prepared by an EAP and must contain his/her name and expertise including a curriculum vitae. Once

Part	Section	Heading	Content
			approved, Part C forms part of the EMPr for the site and is legally binding. This section applies only **to additional** impact management outcomes and impact management actions that are necessary for the avoidance, management and mitigation of impacts and risks associated with the specific development or expansion and which are not already included in Part B: section 1.
Appendix 1			Contains the method statements to be prepared prior to commencement of the activity. The method statements are **not required** to be submitted to the competent authority.

6. Completion of part B: section 1: the pre-approved generic EMPr template

The template is to be completed prior to commencement of the activity, by providing the following information for each environmental impact management action:

- For implementation
  - a 'responsible person',
  - a method for implementation,
  - a timeframe for implementation
- For monitoring
  - a responsible person
  - frequency
  - evidence of compliance.

The completed template must be signed and dated by the holder of the EA prior to commencement of the activity. The method statements prepared and agreed to by the holder of the EA must be appended to the template as Appendix 1. Each method statement must be signed and dated on each page by the holder of the EA. This template once signed and dated is legally binding. The holder of the EA will remain responsible for its implementation.

7. Amendments of the impact management outcomes and impact management actions

Once the activity has commenced, a holder of an EA may make amendments to the impact management outcomes and impact management actions in the following manner:

- Amendment of the impact management outcomes: in line with the process contemplated in Regulation 37 of the EIA Regulations; and
- Amendment of the impact management actions: in line with the process contemplated in Regulation 36 of the EIA Regulations.

8. Documents to be submitted as part of part B: section 2 site specific information and declaration

Part B: Section 2 has three distinct sub-sections. The first and third sub-sections are in a template format. Sub-section two requires a map to be produced.

Sub-section 1 contains the project name, the applicant's name and contact details, the site information, which includes coordinates of the property or farm in which the proposed substation infrastructure is proposed as well as the 21-digit Surveyor General code of each cadastral land parcel and, where available, the farm name.

Sub-section 2 is to be prepared by an EAP and must contain his/her name and expertise including a curriculum vitae. This sub-section must include a map of the site sensitivity overlaid with the preliminary infrastructure layout using the national web based environmental screening tool, when available for compulsory use at: https://screening.environment.gov.za/screeningtool. The sensitivity map shall identify the nature of each sensitive feature e.g. threatened plant species, archaeological site, etc. Sensitivity maps shall identify features both within the planned working area and any known sensitive features and within 50 m from the development footprint.

Sub-section 3 is the declaration that the applicant (s)/proponent (s) or holder of the EA in the case of a change of ownership must complete which confirms that the applicant/EA holder will comply with the pre-approved 'generic EMPr' template in Section 1 and understands that the impact management outcomes and impact management actions are legally binding.

(a) Amendments to Part B: Section 2 – site specific information and declaration

Should the EA be transferred, Part B: Section 2 must be completed by the new applicant/proponent and submitted with the application for an amendment of the EA in terms of regulations 29 or 31 of the EIA Regulations, whichever applies. The information submitted as part of such an application for an amendment to an EA will be considered to be incomplete should a signed copy of Part B: Section 2 not be submitted. Once approved, Part B: Section 2 forms part of the EMPr for the development and the EMPr becomes legally binding to the new EA holder.

PART A – GENERAL INFORMATION

1. DEFINITIONS

In this EMPr any word or expression to which a meaning has been assigned in the NEMA or EIA Regulations has that meaning, and unless the context requires otherwise –

"clearing" means the clearing and removal of vegetation, whether partially or in whole, including trees and shrubs, as specified;

"construction camp" is the area designated for key construction infrastructure and services, including but not limited to offices, overnight vehicle parking areas, stores, the workshop, stockpile and lay down areas, hazardous storage areas (including fuels), the batching plant (if one is located at the construction camp), designated access routes, equipment cleaning areas and the placement of staff accommodation, cooking and ablution facilities, waste and wastewater management;

"contractor" - The Contractor has overall responsibility for ensuring that all work, activities, and actions linked to the delivery of the contract, are in line with the Environmental Management Programme and that Method Statements are implemented as described.

"**hazardous substance**" is a substance governed by the Hazardous Substances Act, 1973 (Act No. 15 of 1973) as well as the Hazardous Chemical and Substances Regulations, 1995;

"method statement" means a written submission by the Contractor to the Project Manager in response to this EMPr or a request by the Project Manager and ECO. The method statement must set out the equipment, materials, labour and method(s) the Contractor proposes using to carry out an activity identified by the Project Manager when requesting the Method Statement. This must be done in such detail that the Project Manager and ECO is able to assess whether the Contractor's proposal is in accordance with this specification and/or will produce results in accordance with this specification;

The method statement must cover as a minimum applicable details with regard to:

(i) Construction procedures;
(ii) Plant, materials and equipment to be used;
(iii) Transporting the equipment to and from site;
(iv) How the plant/ material/ equipment will be moved while on site;
(v) How and where the plant/ material/ equipment will be stored;
(vi) The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
(vii) Timing and location of activities;
(viii) Compliance/ non-compliance; and
(ix) Any other information deemed necessary by the Project Manager.

"slope" means the inclination of a surface expressed as one unit of rise or fall for so many horizontal units;

"solid waste" means all solid waste, including construction debris, hazardous waste, excess cement/ concrete, wrapping materials, timber, cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers);

"spoil" means excavated material which is unsuitable for use as material in the construction works or is material which is surplus to the requirements of the construction works;

"topsoil" means a varying depth (up to 300 mm) of the soil profile irrespective of the fertility, appearance, structure, agricultural potential, fertility and composition of the soil;

"works" means the works to be executed in terms of the Contract

2. ACRONYMS and ABBREVIATIONS

CA	Competent Authority
cEO	Contractors Environmental Officer
dEO	Developer Environmental Officer
DPM	Developer Project Manager
DSS	Developer Site Supervisor
EAR	Environmental Audit Report
ECA	Environmental Conservation Act No. 73 of 1989
ECO	Environmental Control Officer
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
ERAP	Emergency Response Action Plan
EMPr	Environmental Management Programme Report
EAP	Environmental Assessment Practitioner
FPA	Fire Protection Agency
HCS	Hazardous chemical Substance
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act ,2004 (Act No. 10 of 2004)
NEMWA	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
MSDS	Material Safety Data Sheet
RI&AP's	Registered Interested and affected parties

3. ROLES AND RESPONSIBILITIES FOR ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) IMPLEMENTATION

The effective implementation of this generic EMPr is dependent on established and clear roles, responsibilities and reporting lines within an institutional framework. This section of the EMPr gives guidance to the various environmental roles and reporting lines, however, project specific requirements will ultimately determine the need for the appointment of specific person(s) to undertake specific roles and or responsibilities. As such, it must be noted that in the event that no specific person, for example, an environmental control officer (ECO) is appointed, the holder of the EA remains responsible for ensuring that the duties indicated in this document for action by the ECO are undertaken.

Table 1: *Guide to roles and responsibilities for implementation of an EMPr*

Responsible Person(s)	**Role and Responsibilities**
Developer's Project Manager (DPM)	Role The Project Developer is accountable for ensuring compliance with the EMPr and any conditions of approval from the competent authority (CA). Where required, an environmental control officer (ECO) must be contracted by the Project Developer to objectively monitor the implementation of the EMPr according to relevant environmental legislation, and the conditions of the environmental authorisation (EA). The Project Developer is further responsible for providing and giving mandate to enable the ECO to perform responsibilities, and he must ensure that the ECO is integrated as part of the project team while remaining independent. Responsibilities - Be fully conversant with the conditions of the EA; - Ensure that all stipulations within the EMPr are communicated and adhered to by the Developer and its Contractor(s); - Issuing of site instructions to the Contractor for corrective actions required; - Monitor the implementation of the EMPr throughout the project by means of site inspections and meetings. Overall management of the project and EMPr implementation; and - Ensure that periodic environmental performance audits are undertaken on the project implementation.

Responsible Person(s)	Role and Responsibilities
Developer Site Supervisor (DSS)	Role The DSS reports directly to the DPM, oversees site works, liaises with the contractor(s) and the ECO. The DSS is responsible for the day to day implementation of the EMPr and for ensuring the compliance of all contractors with the conditions and requirements stipulated in the EMPr. Responsibilities - Ensure that all contractors identify a contractor's Environmental Officer (cEO); - Must be fully conversant with the conditions of the EA. Oversees site works, liaison with Contractor, DPM and ECO; - Must ensure that all landowners have the relevant contact details of the site staff, ECO and cEO; - Issuing of site instructions to the Contractor for corrective actions required; - Will issue all non-compliances to contractors; and - Ratify the Monthly Environmental Report.
Environmental Control Officer (ECO)	Role The ECO should have appropriate training and experience in the implementation of environmental management specifications. The primary role of the ECO is to act as an independent quality controller and monitoring agent regarding all environmental concerns and associated environmental impacts. In this respect, the ECO is to conduct periodic site inspections, attend regular site meetings, pre-empt problems and suggest mitigation and be available to advise on incidental issues that arise. The ECO is also required to conduct compliance audits, verifying the monitoring reports submitted by the cEO. The ECO provides feedback to the DSS and Project Manager regarding all environmental matters. The Contractor, cEO and dEO are answerable to the Environmental Control Officer for non-compliance with the Performance Specifications as set out in the EA and EMPr. The ECO provides feedback to the DSS and Project Manager, who in turn reports back to the Contractor and potential and Registered Interested &Affected Parties' (RI&AP's), as required. Issues of non-compliance raised by the ECO must be taken up by the Project Manager, and resolved with the Contractor as per the conditions of his contract. Decisions regarding environmental procedures, specifications and requirements which have a cost implication (i.e. those that are deemed to be a variation, not allowed for in the

Responsible Person(s)	Role and Responsibilities
	Performance Specification) must be endorsed by the Project Manager. The ECO must also, as specified by the EA, report to the relevant CA as and when required. <u>Responsibilities</u> The responsibilities of the ECO will include the following: - Be aware of the findings and conclusions of all EA related to the development; - Be familiar with the recommendations and mitigation measures of this EMPr; - Be conversant with relevant environmental legislation, policies and procedures, and ensure compliance with them; - Undertake regular and comprehensive site inspections / audits of the construction site according to the generic EMPr and applicable licenses in order to monitor compliance as required; - Educate the construction team about the management measures contained in the EMPr and environmental licenses; - Compilation and administration of an environmental monitoring plan to ensure that the environmental management measures are implemented and are effective; - Monitoring the performance of the Contractors and ensuring compliance with the EMPr and associated Method Statements; - In consultation with the Developer Site Supervisor order the removal of person(s) and/or equipment which are in contravention of the specifications of the EMPr and/or environmental licenses; - Liaison between the DPM, Contractors, authorities and other lead stakeholders on all environmental concerns; - Compile a regular environmental audit report highlighting any non-compliance issues as well as satisfactory or exceptional compliance with the EMPr; - Validating the regular site inspection reports, which are to be prepared by the contractor Environmental Officer (cEO); - Checking the cEO's record of environmental incidents (spills, impacts, legal transgressions etc.) as well as corrective and preventive actions taken; - Checking the cEO's public complaints register in which all complaints are recorded, as well as action taken;

Responsible Person(s)	Role and Responsibilities
	- Assisting in the resolution of conflicts; - Facilitate training for all personnel on the site – this may range from carrying out the training, to reviewing the training programmes of the Contractor; - In case of non-compliances, the ECO must first communicate this to the Senior Site Supervisor, who has the power to ensure this matter is addressed. Should no action or insufficient action be taken, the ECO may report this matter to the authorities as non-compliance; - Maintenance, update and review of the EMPr; - Communication of all modifications to the EMPr to the relevant stakeholders.
developer Environmental Officer (dEO)	<u>Role</u> The dEOs will report to the Project Manager and are responsible for implementation of the EMPr, environmental monitoring and reporting, providing environmental input to the Project Manager and Contractor's Manager, liaising with contractors and the landowners as well as a range of environmental coordination responsibilities. <u>Responsibilities</u> - Be fully conversant with the EMPr; - Be familiar with the recommendations and mitigation measures of this EMPr, and implement these measures; - Ensure that all stipulations within the EMPr are communicated and adhered to by the Employees, Contractor(s) ; - Confine the development site to the demarcated area; - Conduct environmental internal audits with regards to EMPr and authorisation compliance (on cEO); - Assist the contractors in addressing environmental challenges on site; - Assist in incident management: - Reporting environmental incidents to developer and ensuring that corrective action is taken, and lessons learnt shared; - Assist the contractor in investigating environmental incidents and compile investigation reports; - Follow-up on pre-warnings, defects, non-conformance reports;

Responsible Person(s)	Role and Responsibilities
	- Measure and communicate environmental performance to the Contractor; - Conduct environmental awareness training on site together with ECO and cEO; - Ensure that the necessary legal permits and / or licenses are in place and up to date; - Acting as Developer's Environmental Representative on site and work together with the ECO and contractor;
Contractor	<u>Role</u> The Contractor appoints the cEO and has overall responsibility for ensuring that all work, activities, and actions linked to the delivery of the contract are in line with the EMPr and that Method Statements are implemented as described. External contractors must ensure compliance with this EMPr while performing the onsite activities as per their contract with the Project Developer. The contractors are required, where specified, to provide Method Statements setting out in detail how the impact management actions contained in the EMPr will be implemented during the development or expansion of substation infrastructure for the transmission and distribution of electricity activities. <u>Responsibilities</u> - project delivery and quality control for the development services as per appointment; - employ a suitably qualified person to monitor and report to the Project Developer's appointed person on the daily activities on-site during the construction period; - ensure that safe, environmentally acceptable working methods and practices are implemented and that equipment is properly operated and maintained, to facilitate proper access and enable any operation to be carried out safely; - attend on site meeting(s) prior to the commencement of activities to confirm the procedure and designated activity zones; - ensure that contractors' staff repair, at their own cost, any environmental damage as a result of a contravention of the specifications contained in EMPr, to the satisfaction of the ECO.

Responsible Person(s)	Role and Responsibilities
contractor Environmental Officer (cEO)	<u>Role</u> Each Contractor affected by the EMPr should appoint a cEO, who is responsible for the on-site implementation of the EMPr (or relevant sections of the EMPr). The Contractor's representative can be the site agent; site engineer; a dedicated environmental officer; or an independent consultant. The Contractor must ensure that the Contractor's Representative is suitably qualified to perform the necessary tasks and is appointed at a level such that she/he can interact effectively with other site Contractors, labourers, the Environmental Control Officer and the public. As a minimum the cEO shall meet the following criteria: <u>Responsibilities</u> - Be on site throughout the duration of the project and be dedicated to the project; - Ensure all their staff are aware of the environmental requirements, conditions and constraints with respect to all of their activities on site; - Implementing the environmental conditions, guidelines and requirements as stipulated within the EA, EMPr and Method Statements; - Attend the Environmental Site Meeting; - Undertaking corrective actions where non-compliances are registered within the stipulated timeframes; - Report back formally on the completion of corrective actions; - Assist the ECO in maintaining all the site documentation; - Prepare the site inspection reports and corrective action reports for submission to the ECO; - Assist the ECO with the preparing of the monthly report; and - Where more than one Contractor is undertaking work on site, each company appointed as a Contractor will appoint a cEO representing that company.

4. ENVIRONMENTAL DOCUMENTATION REPORTING AND COMPLIANCE

To ensure accountable and demonstrated implementation of the EMPr, a number of reporting systems, documentation controls and compliance mechanisms must be in place for all substation infrastructure projects as a minimum requirement.

4.1 Document control/Filing system

The holder of the EA is solely responsible for the upkeep and management of the EMPr file. As a minimum, all documentation detailed below will be stored in the EMPr file. A hard copy of all documentation shall be filed, while an electronic copy may be kept where relevant. A duplicate file will be maintained in the office of the DSS (where applicable). This duplicate file must remain current and up-to-date. The filing system must be updated and relevant documents added as required. The EMPr file must be made available at all times on request by the CA or other relevant authorities. The EMPr file will form part of any environmental audits undertaken as prescribed in the EIA Regulations.

4.2 Documentation to be available

At the outset of the project the following preliminary list of documents shall be placed in the filing system and be accessible at all times:

- Full copy of the signed EA from the CA in terms of NEMA, granting approval for the development or expansion;
- Copy of the generic and site specific EMPr as well as any amendments thereof;
- Copy of declaration of implementing generic EMPr and subsequent approval of site specific EMPr and amendments thereof;
- All method statements;
- Completed environmental checklists;
- Minutes and attendance register of environmental site meetings;
- An up-to-date environmental incident log;
- A copy of all instructions or directives issued;
- A copy of all corrective actions signed off. The corrective actions must be filed in such a way that a clear reference is made to the non-compliance record;
- Complaints register.

4.3 Weekly Environmental Checklist

The ECOs are required to complete a Weekly Environmental Checklist, the format of which is to be agreed prior to commencement of the activity. The ECOs are required to sign and date the checklist, retain a copy in the EMPr file and submit a copy of the completed checklist to the DSS on a weekly basis.

The checklists will form the basis for the Monthly Environmental Reports. Copies of all completed checklists will be attached as Annexures to the Environmental Audit Report as required in terms of the EIA Regulations.

4.4 Environmental site meetings

Minutes of the environmental site meetings shall be kept. The minutes must include an attendance register and will be attached to the Monthly Report that is distributed to attendees. Each set of minutes must clearly record "Matters for Attention" that will be reviewed at the next meeting.

4.5 Required Method Statements

The method statement will be done in such detail that the ECOs are enabled to assess whether the contractor's proposal is in accordance with the EMPr.

The method statement must cover applicable details with regard to:

- development procedures;
- materials and equipment to be used;
- getting the equipment to and from site;
- how the equipment/ material will be moved while on site;
- how and where material will be stored;
- the containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
- timing and location of activities;
- compliance/ non-compliance with the EMPr; and
- any other information deemed necessary by the ECOs.

Unless indicated otherwise by the Project Manager, the Contractor shall provide the following method statements to the Project Manager no less than 14 days prior to the commencement date of the activity:

- Site establishment – Camps, Lay-down or storage areas, satellite camps, infrastructure;
- Batch plants;
- Workshop or plant servicing;
- Handling, transport and storage of Hazardous Chemical Substance's;
- Vegetation management – Protected, clearing, aliens, felling;
- Access management – Roads, gates, crossings etc.;
- Fire plan;
- Waste management – transport, storage, segregation, classification, disposal (all waste streams);
- Social interaction – complaints management, compensation claims, access to properties etc.;
- Water – use (source, abstraction and disposal), access and all related information, crossings and mitigation;
- Emergency preparedness – Spills, training, other environmental emergencies;
- Dust and noise management methodologies;
- Fauna interaction and risk management – only if the risk was identified – wildlife interaction especially on game farms; and
- Heritage and palaeontology management.

The ECOs shall monitor and ensure that the contractors perform in accordance with these method statements. Completed and agreed method statements between the holder of the EA and the contractor shall be captured in Appendix 1.

4.6 Environmental Incident Log (Diary)

The ECOs are required to maintain an up-to-date and current Environmental Incident Log (environmental diary). The Environmental Incident Log is a means to record all environmental incidents and/or all non-compliance notice would not be issued. An environmental incident is defined as:

- Any deviation from the listed impact management actions (listed in this EMPr) that may be addressed immediately by the ECOs. (For example a contractor's staff member littering or a drip tray that has not been emptied);
- Any environmental impact resulting from an action or activity by a contractor in contravention of the environmental stipulations and guidelines listed in the EMPr which as a single event would have a minor impact but which if cumulative and continuous would have a significant effect (for example no toilet paper available in the ablutions for an afternoon); and
- General environmental information such as road kills or injured wildlife.

The ECOs are to record all environmental incidents in the Environmental Incident Log. All incidents regardless of severity must be reported to the Developer. The Log is to be kept in the EMPr file and at a minimum the following will be recorded for each environmental incident:

- The date and time of the incident;
- Description of the incident;
- The name of the Contractor responsible;
- The incident must be listed as significant or minor;
- If the incident is listed as significant, a non-compliance notice must be issued, and recorded in the log;
- Remedial or corrective action taken to mitigate the incident; and
- Record of repeat minor offences by the same contractor or staff member.

The Environmental Incident Log will be captured in the EAR.

4.7 Non-compliance

A non-compliance notice will be issued to the responsible contractor by the ECOs via the DSS or Project Manager. The non-compliance notice will be issued in writing; a copy filed in the EMPr file and will at a minimum include the following:

- Time and date of the non-compliance;
- Name of the contractor responsible;
- Nature and description of the non-compliance;
- Recommended / required corrective action; and
- Date by which the corrective action to be completed.
- The contractors shall act immediately when a notice of non-compliance is received and correct whatever is the cause for the issuing of the notice. Complaints received regarding activities on the development site pertaining to the environment shall be

recorded in a dedicated register and the response noted with the date and action taken. The ECO should be made aware of any complaints. Any non-compliance with the agreed procedures of the EMPr is a transgression of the various statutes and laws that define the manner by which the environment is managed. Failure to redress the cause shall be reported to the relevant CA for them to deal with the transgression, as it deems fit. The contractor is deemed not to have complied with the EMPr if, inter alia, There is a deviation from the environmental conditions, impact management outcomes and impact management actions activities, as approved in generic and site specific EMPr as relevant as set out in the EMPr, which deviation has, or may cause, an environmental impact.

4.8 Corrective action records

For each non-compliance notice issued, a documented corrective action must be recorded. On receiving a non-compliance notice from the DSS, the contractor's cEO will ensure that the corrective actions required take place within the stipulated timeframe. On completion of the corrective action the cEO is to issue a Corrective Action Report in writing to the ECOs. If satisfied that the corrective action has been completed, the ECOs are to sign-off on the Corrective Action Report, and attach the report to the non-compliance notice in the EMPr file. A corrective action is considered complete once the report has signed off by the ECOs.

4.9 Photographic record

A digital photographic record will be kept. The photographic record will be used to show before, during and post rehabilitation evidence of the project as well used in cases of damages claims if they arise. Each image must be dated and a brief description note attached.

The Contractor shall:

1. Allow the ECOs access to take photographs of all areas, activities and actions.

The ECOs shall keep an electronic database of photographic records which will include:

1. Pictures of all areas designated as work areas, camp areas, development sites and storage areas taken before these areas are set up;
2. All bunding and fencing;
3. Road conditions and road verges;
4. Condition of all farm fences;
5. Topsoil storage areas;
6. All areas to be cordoned off during construction;
7. Waste management sites;
8. Ablution facilities (inside and out);
9. Any non-conformances deemed to be "significant";
10. All completed corrective actions for non-compliances;
11. All required signage;
12. Photographic recordings of incidents;
13. All areas before, during and post rehabilitation; and
14. Include relevant photographs in the Final Environmental Audit Report.

4.10 Complaints register

The ECOs shall keep a current and up-to-date complaints register. The complaints register is to be a record of all complaints received from communities, stakeholders and individuals. The Complaints Record shall:

1. Record the name and contact details of the complainant;
2. Record the time and date of the complaint;
3. Contain a detailed description of the complaint;
4. Where relevant and appropriate, contain photographic evidence of the complaint or damage (ECOs to take relevant photographs); and
5. Contain a copy of the ECOs written response to each complaint received and keep a record of any further correspondence with the complainant. The ECO's written response will include a description of any corrective action to be taken and must be signed by the Contractor, ECO and affected party. Where a damage claim is issued by the complainant, the ECOs shall respond as described in (**section 4.11**) below.

4.11 Claims for damages

In the event that a Claim for Damages is submitted by a community, landowner or individual, the ECOs shall:

1. Record the full detail of the complaint as described in (**section 4.10**) above;
2. The DPM will evaluate the claim and associated damage and submit the evaluation to the Senior Site Representative for approval;
3. Following consideration by the DPM, the claim is to be resolved and settled immediately, or the reason for not accepting the claim communicated in writing to the claimant. Should the claimant not accept this, the ECO shall, in writing report the incident to the Developer's negotiator and legal department; and
4. A formal record of the response by the ECOs to the claimant as well as the rectification of the method of making payments not amount will be recorded in the EMPr file.

4.12 Interactions with affected parties

Open, transparent and good relations with affected landowners, communities and regional staff are an essential aspect to the successful management and mitigation of environmental impacts.

The ECOs shall:

1. Ensure that all queries, complaints and claims are dealt within an agreed timeframe;
2. Ensure that any or all agreements are documented, signed by all parties and a record of the agreement kept in the EMPr file;
3. Ensure that a complaints telephone numbers are made available to all landowners and affected parties; and
4. Ensure that contact with affected parties is courteous at all times;

4.13 Environmental audits

Internal environmental audits of the activity and implementation of the EMPr must be undertaken. The findings and outcomes included in the EMPr file and submitted to the CA at intervals as indicated in the EA.

The ECOs must prepare a monthly EAR. The report will be tabled as the key point on the agenda of the Environmental Site Meeting. The Report is submitted for acceptance at the meeting and the final report will be circulated to the Project Manager and filed in the EMPr file. At a frequency determined by the EA, the ECOs shall submit the monthly reports to the CA. At a minimum the monthly report is to cover the following:

- Weekly Environmental Checklists;
- Deviations and non-compliances with the checklists;
- Non-compliances issued;
- Completed and reported corrective actions;
- Environmental Monitoring;
- General environmental findings and actions; and
- Minutes of the Bi-monthly Environmental Site Meetings.

4.14 Final environmental audits

On final completion of the rehabilitation and/or requirements of the EA a final EAR is to be prepared and submitted to the CA. The EAR must comply with Appendix 7 of the EIA Regulations.

PART B: SECTION 1: Pre-approved generic EMPr template

5. IMPACT MANAGEMENT OUTCOMES AND IMPACT MANAGEMENT ACTIONS

This section provides a pre-approved generic EMPr template with aspects that are common to the development of substation infrastructure for the transmission and distribution of electricity. There is a list of aspects identified for the development or expansion of substation infrastructure for the transmission and distribution of electricity, and for each aspect a set of prescribed impact management outcomes and associated impact management actions have been identified. Holders of EAs are responsible to ensure the implementation of these outcomes and actions for all projects as a minimum requirement, in order to mitigate the impact of such aspects identified for the development or expansion of substation infrastructure for the transmission and distribution of electricity.

The template provided below is to be completed by providing the information under each heading for each environmental impact management action.

The completed template must be signed and dated on each page by both the contractor and the holder of the EA prior to commencement of the activity. The method statements prepared and agreed to by the holder of the EA must be appended to the template as Appendix 1. Each method statement must also be duly signed and dated on each page by the contactor and the holder of the EA. This template, once signed and dated, is legally binding. The holder of the EA will remain responsible for its implementation.

5.1 Environmental awareness training

Impact management outcome: All onsite staff are aware and understands the individual responsibilities in terms of this EMPr.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– All staff must receive environmental awareness training prior to commencement of the activities; – The Contractor must allow for sufficient sessions to train all personnel with no more than 20 personnel attending each course; – Refresher environmental awareness training is available as and when required; – All staff are aware of the conditions and controls linked to the EA and within the EMPr and made aware of their individual roles and responsibilities in achieving compliance with the EA and EMPr; – The Contractor must erect and maintain information posters at key locations on site, and the posters must include the following information as a minimum: a) Safety notifications; and b) No littering. – Environmental awareness training must include as a minimum the following: a) Description of significant environmental impacts, actual or potential, related to their work activities; b) Mitigation measures to be implemented when carrying out specific activities;						

c) Emergency preparedness and response procedures; d) Emergency procedures; e) Procedures to be followed when working near or within sensitive areas; f) Wastewater management procedures; g) Water usage and conservation; h) Solid waste management procedures; i) Sanitation procedures; j) Fire prevention; and k) Disease prevention. – A record of all environmental awareness training courses undertaken as part of the EMPr must be available; – Educate workers on the dangers of open and/or unattended fires; – A staff attendance register of all staff to have received environmental awareness training must be available. – Course material must be available and presented in appropriate languages that all staff can understand.						

5.2 Site Establishment development

Impact management outcome: Impacts on the environment are minimised during site establishment and the development footprint are kept to demarcated development area.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– A method statement must be provided by the contractor prior to any onsite activity that includes the layout of the construction camp in the form of a plan showing the location of key infrastructure and services (where applicable), including but not limited to offices, overnight vehicle parking areas, stores, the workshop, stockpile and lay down areas, hazardous materials storage areas (including fuels), the batching plant (if one is located at the construction camp), designated access routes, equipment cleaning areas and the placement of staff accommodation, cooking and ablution facilities, waste and wastewater management; – Location of camps must be within approved area to ensure that the site does not impact on sensitive areas identified in the environmental assessment or site walk through; – Sites must be located where possible on previously disturbed areas; – The camp must be fenced in accordance with ***Section 5.5: Fencing and gate installation***; and – The use of existing accommodation for contractor staff, where possible, is encouraged.						

5.3 Access restricted areas

Impact management outcome: Access to restricted areas prevented.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Identification of access restricted areas is to be informed by the environmental assessment, site walk through and any additional areas identified during development; – Erect, demarcate and maintain a temporary barrier with clear signage around the perimeter of any access restricted area, colour coding could be used if appropriate; and – Unauthorised access and development related activity inside access restricted areas is prohibited.						

5.4 Access roads

Impact management outcome: Minimise impact to the environment through the planned and restricted movement of vehicles on site.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance

– An access agreement must be formalised and signed by the DPM, Contractor and landowner before commencing with the activities; – All private roads used for access to the servitude must be maintained and upon completion of the works, be left in at least the original condition – All contractors must be made aware of all these access routes. – Any access route deviation from that in the written agreement must be closed and re-vegetated immediately, at the contractor's expense; – Maximum use of both existing servitudes and existing roads must be made to minimize further disturbance through the development of new roads; – In circumstances where private roads must be used, the condition of the said roads must be recorded in accordance with ***section 4.9: photographic record***; prior to use and the condition thereof agreed by the landowner, the DPM, and the contractor; – Access roads in flattish areas must follow fence lines and tree belts to avoid fragmentation of vegetated areas or croplands – Access roads must only be developed on a pre-planned and approved roads.						

5.5 Fencing and Gate installation

Impact management outcome: Minimise impact to the environment and ensure safe and controlled access to the site through the erection of fencing and gates where required.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Use existing gates provided to gain access to all parts of the area authorised for development, where possible; – Existing and new gates to be recorded and documented in accordance with **section *4.9: photographic record***; – All gates must be fitted with locks and be kept locked at all times during the development phase, unless otherwise agreed with the landowner; – At points where the line crosses a fence in which there is no suitable gate within the extent of the line servitude, on the instruction of the DPM, a gate must be installed at the approval of the landowner; – Care must be taken that the gates must be so erected that there is a gap of no more than 100 mm between the bottom of the gate and the ground; – Where gates are installed in jackal proof fencing, a suitable reinforced concrete sill must be provided beneath the gate; – Original tension must be maintained in the fence wires; – All gates installed in electrified fencing must be re-electrified; – All demarcation fencing and barriers must be maintained in good working order for the duration of the development activities;						

– Fencing must be erected around the camp, batching plants, hazardous storage areas, and all designated access restricted areas, where applicable; – Any temporary fencing to restrict the movement of life-stock must only be erected with the permission of the land owner. – All fencing must be developed of high quality material bearing the SABS mark; – The use of razor wire as fencing must be avoided; – Fenced areas with gate access must remain locked after hours, during weekends and on holidays if staff is away from site. Site security will be required at all times; – On completion of the development phase all temporary fences are to be removed; – The contractor must ensure that all fence uprights are appropriately removed, ensuring that no uprights are cut at ground level but rather removed completely.						

5.6 Water Supply Management

Impact management outcome: Undertake responsible water usage**.**

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– All abstraction points or bore holes must be registered with the DWS and suitable water meters installed to ensure that the abstracted volumes are measured on a daily basis; – The Contractor must ensure the following:						

a. The vehicle abstracting water from a river does not enter or cross it and does not operate from within the river; b. No damage occurs to the river bed or banks and that the abstraction of water does not entail stream diversion activities; and c. All reasonable measures to limit pollution or sedimentation of the downstream watercourse are implemented. – Ensure water conservation is being practiced by: a. Minimising water use during cleaning of equipment; b. Undertaking regular audits of water systems; and c. Including a discussion on water usage and conservation during environmental awareness training. d. The use of grey water is encouraged.						

5.7 Storm and waste water management

Impact management outcome: Impacts to the environment caused by storm water and wastewater discharges during construction are avoided.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Runoff from the cement/ concrete batching areas must be strictly controlled, and contaminated water must be collected, stored and either treated or disposed of off-site, at a location approved by the project manager; – All spillage of oil onto concrete surfaces must be controlled by the use of an approved absorbent material and the used absorbent material disposed of at an appropriate waste disposal facility;						

– Natural storm water runoff not contaminated during the development and clean water can be discharged directly to watercourses and water bodies, subject to the Project Manager's approval and support by the ECO; – Water that has been contaminated with suspended solids, such as soils and silt, may be released into watercourses or water bodies only once all suspended solids have been removed from the water by settling out these solids in settlement ponds. The release of settled water back into the environment must be subject to the Project Manager's approval and support by the ECO.						

5.8 Solid and hazardous waste management

Impact management outcome: Wastes are appropriately stored, handled and safely disposed of at a recognised waste facility.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– All measures regarding waste management must be undertaken using an integrated waste management approach; – Sufficient, covered waste collection bins (scavenger and weatherproof) must be provided; – A suitably positioned and clearly demarcated waste collection site must be identified and provided; – The waste collection site must be maintained in a clean and orderly manner;						

– Waste must be segregated into separate bins and clearly marked for each waste type for recycling and safe disposal; – Staff must be trained in waste segregation; – Bins must be emptied regularly; – General waste produced onsite must be disposed of at registered waste disposal sites/ recycling company; – Hazardous waste must be disposed of at a registered waste disposal site; – Certificates of safe disposal for general, hazardous and recycled waste must be maintained.						

5.9 Protection of watercourses and estuaries

Impact management outcome: Pollution and contamination of the watercourse environment and or estuary erosion are prevented.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– All watercourses must be protected from direct or indirect spills of pollutants such as solid waste, sewage, cement, oils, fuels, chemicals, aggregate tailings, wash and contaminated water or organic material resulting from the Contractor's activities; – In the event of a spill, prompt action must be taken to clear the polluted or affected areas; – Where possible, no development equipment must traverse any seasonal or permanent wetland – No return flow into the estuaries must be allowed and no disturbance of the Estuarine functional Zone should occur;						

– Development of permanent watercourse or estuary crossing must only be undertaken where no alternative access to tower position is available; – There must not be any impact on the long term morphological dynamics of watercourses or estuaries; – Existing crossing points must be favored over the creation of new crossings (including temporary access) – When working in or near any watercourse or estuary, the following environmental controls and consideration must be taken: a) Water levels during the period of construction; No altering of the bed, banks, course or characteristics of a watercourse b) During the execution of the works, appropriate measures to prevent pollution and contamination of the riparian environment must be implemented e.g. including ensuring that construction equipment is well maintained; c) Where earthwork is being undertaken in close proximity to any watercourse, slopes must be stabilised using suitable materials, i.e. sandbags or geotextile fabric, to prevent sand and rock from entering the channel; and d) Appropriate rehabilitation and re-vegetation measures for the watercourse banks must be implemented timeously. In this regard, the banks should be appropriately and incrementally stabilised as soon as development allows.						

5.10 Vegetation clearing

Impact management outcome: Vegetation clearing is restricted to the authorised development footprint of the proposed infrastructure.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
General: – Indigenous vegetation which does not interfere with the development must be left undisturbed; – Protected or endangered species may occur on or near the development site. Special care should be taken not to damage such species; – Search, rescue and replanting of all protected and endangered species likely to be damaged during project development must be identified by the relevant specialist and completed prior to any development or clearing; – Permits for removal must be obtained from the relevant CA prior to the cutting or clearing of the affected species, and they must be filed; – The Environmental Audit Report must confirm that all identified species have been rescued and replanted and that the location of replanting is compliant with conditions of approvals; – Trees felled due to construction must be documented and form part of the Environmental Audit Report; – Rivers and watercourses must be kept clear of felled trees, vegetation cuttings and debris; – Only a registered pest control operator may apply herbicides on a commercial basis and commercial application must be carried out under the supervision of a registered pest control						

operator, supervision of a registered pest control operator or is appropriately trained; – A daily register must be kept of all relevant details of herbicide usage; – No herbicides must be used in estuaries; – All protected species and sensitive vegetation not removed must be clearly marked and such areas fenced off in accordance to ***Section 5.3: Access restricted areas***. Alien invasive vegetation must be removed and disposed of at a licensed waste management facility.						

5.11 Protection of fauna

Impact management outcome: Disturbance to fauna is minimised.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– No interference with livestock must occur without the landowner's written consent and with the landowner or a person representing the landowner being present; – The breeding sites of raptors and other wild birds species must be taken into consideration during the planning of the development programme; – Breeding sites must be kept intact and disturbance to breeding birds must be avoided. Special care must be taken where nestlings or fledglings are present;						

– Special recommendations of the avian specialist must be adhered to at all times to prevent unnecessary disturbance of birds; – No poaching must be tolerated under any circumstances. All animal dens in close proximity to the works areas must be marked as Access restricted areas; – No deliberate or intentional killing of fauna is allowed; – In areas where snakes are abundant, snake deterrents to be deployed on the pylons to prevent snakes climbing up, being electrocuted and causing power outages; and – No Threatened or Protected species (ToPs) and/or protected fauna as listed according NEMBA (Act No. 10 of 2004) and relevant provincial ordinances may be removed and/or relocated without appropriate authorisations/permits.						

5.12 Protection of heritage resources

Impact management outcome: Impact to heritage resources is minimised.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Identify, demarcate and prevent impact to all known sensitive heritage features on site in accordance with the No-Go procedure in ***Section 5.3: Access restricted areas***; – Carry out general monitoring of excavations for potential fossils, artefacts and material of heritage importance; – All work must cease immediately, if any human remains and/or other archaeological, palaeontological and historical						

material are uncovered. Such material, if exposed, must be reported to the nearest museum, archaeologist/ palaeontologist (or the South African Police Services), so that a systematic and professional investigation can be undertaken. Sufficient time must be allowed to remove/collect such material before development recommences.						

5.13 Safety of the public

Impact management outcome: All precautions are taken to minimise the risk of injury, harm or complaints.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Identify fire hazards, demarcate and restrict public access to these areas as well as notify the local authority of any potential threats e.g. large brush stockpiles, fuels etc.; – All unattended open excavations must be adequately fenced or demarcated; – Adequate protective measures must be implemented to prevent unauthorised access to and climbing of partly constructed towers and protective scaffolding; – Ensure structures vulnerable to high winds are secured; – Maintain an incidents and complaints register in which all incidents or complaints involving the public are logged.						

5.14 Sanitation

Impact management outcome: Clean and well maintained toilet facilities are available to all staff in an effort to minimise the risk of disease and impact to the environment.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Mobile chemical toilets are installed onsite if no other ablution facilities are available; – The use of ablution facilities and or mobile toilets must be used at all times and no indiscriminate use of the veld for the purposes of ablutions must be permitted under any circumstances; – Where mobile chemical toilets are required, the following must be ensured: a) Toilets are located no closer than 100 m to any watercourse or water body; b) Toilets are secured to the ground to prevent them from toppling due to wind or any other cause; c) No spillage occurs when the toilets are cleaned or emptied and the contents are managed in accordance with the EMPr; d) Toilets have an external closing mechanism and are closed and secured from the outside when not in use to prevent toilet paper from being blown out; e) Toilets are emptied before long weekends and workers holidays, and must be locked after working hours; f) Toilets are serviced regularly and the ECO must inspect toilets to ensure compliance to health standards;						

– A copy of the waste disposal certificates must be maintained.						

5.15 Prevention of disease

Impact Management outcome: All necessary precautions linked to the spread of disease are taken.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Undertake environmentally-friendly pest control in the camp area; – Ensure that the workforce is sensitised to the effects of sexually transmitted diseases, especially HIV AIDS; – The Contractor must ensure that information posters on AIDS are displayed in the Contractor Camp area; – Information and education relating to sexually transmitted diseases to be made available to both construction workers and local community, where applicable; – Free condoms must be made available to all staff on site at central points; – Medical support must be made available; – Provide access to Voluntary HIV Testing and Counselling Services.						

5.16 Emergency procedures

Impact management outcome: Emergency procedures are in place to enable a rapid and effective response to all types of environmental emergencies.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Compile an Emergency Response Action Plan (ERAP) prior to the commencement of the proposed project; – The Emergency Plan must deal with accidents, potential spillages and fires in line with relevant legislation; – All staff must be made aware of emergency procedures as part of environmental awareness training; – The relevant local authority must be made aware of a fire as soon as it starts; – In the event of emergency necessary mitigation measures to contain the spill or leak must be implemented (see ***Hazardous Substances section 5.17***).						

5.17 Hazardous substances

Impact management outcome: Safe storage, handling, use and disposal of hazardous substances.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– The use and storage of hazardous substances to be minimised and non-hazardous and non-toxic alternatives substituted where possible; – All hazardous substances must be stored in suitable containers as defined in the Method Statement;						

– Containers must be clearly marked to indicate contents, quantities and safety requirements; – All storage areas must be bunded. The bunded area must be of sufficient capacity to contain a spill / leak from the stored containers; – Bunded areas to be suitably lined with a SABS approved liner; – An Alphabetical Hazardous Chemical Substance (HCS) control sheet must be drawn up and kept up to date on a continuous basis; – All hazardous chemicals that will be used on site must have Material Safety Data Sheets (MSDS); – All employees working with HCS must be trained in the safe use of the substance and according to the safety data sheet; – Employees handling hazardous substances / materials must be aware of the potential impacts and follow appropriate safety measures. Appropriate personal protective equipment must be made available; – The Contractor must ensure that diesel and other liquid fuel, oil and hydraulic fluid is stored in appropriate storage tanks or in bowsers; – The tanks/ bowsers must be situated on a smooth impermeable surface (concrete) with a permanent bund. The impermeable lining must extend to the crest of the bund and the volume inside the bund must be 130% of the total capacity of all the storage tanks/ bowsers (110% statutory requirement plus an allowance for rainfall); – The floor of the bund must be sloped, draining to an oil separator; – Provision must be made for refueling at the storage area by protecting the soil with an impermeable groundcover. Where						

dispensing equipment is used, a drip tray must be used to ensure small spills are contained; – All empty externally dirty drums must be stored on a drip tray or within a bunded area; – No unauthorised access into the hazardous substances storage areas must be permitted; – No smoking must be allowed within the vicinity of the hazardous storage areas; – Adequate fire-fighting equipment must be made available at all hazardous storage areas; – Where refueling away from the dedicated refueling station is required, a mobile refueling unit must be used. Appropriate ground protection such as drip trays must be used; – An appropriately sized spill kit kept onsite relevant to the scale of the activity/s involving the use of hazardous substance must be available at all times; – The responsible operator must have the required training to make use of the spill kit in emergency situations; – An appropriate number of spill kits must be available and must be located in all areas where activities are being undertaken; – In the event of a spill, contaminated soil must be collected in containers and stored in a central location and disposed of according to the National Environmental Management: Waste Act 59 of 2008. Refer to ***Section 5.7*** for procedures concerning ***storm and waste water management*** and ***5.8*** for ***solid and hazardous waste management.***						

5.18 Workshop, equipment maintenance and storage

Impact management outcome: Soil, surface water and groundwater contamination is minimised.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Where possible and practical all maintenance of vehicles and equipment must take place in the workshop area; – During servicing of vehicles or equipment, especially where emergency repairs are effected outside the workshop area, a suitable drip tray must be used to prevent spills onto the soil. The relevant local authority must be made aware of a fire as soon as it starts; – Leaking equipment must be repaired immediately or be removed from site to facilitate repair; – Workshop areas must be monitored for oil and fuel spills; – Appropriately sized spill kit kept onsite relevant to the scale of the activity taking place must be available; – The workshop area must have a bunded concrete slab that is sloped to facilitate runoff into a collection sump or suitable oil / water separator where maintenance work on vehicles and equipment can be performed; – Water drainage from the workshop must be contained and managed in accordance Section ***5.7: Storm and waste water management***.						

5.19 Batching plants

Impact management outcome: Minimise spillages and contamination of soil, surface water and groundwater**.**

Impact Management Actions	Implementation	Monitoring

	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Concrete mixing must be carried out on an impermeable surface; – Batching plants areas must be fitted with a containment facility for the collection of cement laden water. – Dirty water from the batching plant must be contained to prevent soil and groundwater contamination – Bagged cement must be stored in an appropriate facility and at least 10 m away from any water courses, gullies and drains; – A washout facility must be provided for washing of concrete associated equipment. Water used for washing must be restricted; – Hardened concrete from the washout facility or concrete mixer can either be reused or disposed of at an appropriate licenced disposal facility; – Empty cement bags must be secured with adequate binding material if these will be temporarily stored on site; – Sand and aggregates containing cement must be kept damp to prevent the generation of dust (Refer to ***Section 5.20: Dust emissions***) – Any excess sand, stone and cement must be removed or reused from site on completion of construction period and disposed at a registered disposal facility; – Temporary fencing must be erected around batching plants in accordance with Section ***5.5: Fencing and gate installation***.						

5.20 Dust emissions

Impact management outcome: Dust prevention measures are applied to minimise the generation of dust.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Take all reasonable measures to minimise the generation of dust as a result of project development activities to the satisfaction of the ECO; – Removal of vegetation must be avoided until such time as soil stripping is required and similarly exposed surfaces must be re-vegetated or stabilised as soon as is practically possible; – Excavation, handling and transport of erodible materials must be avoided under high wind conditions or when a visible dust plume is present; – During high wind conditions, the ECO must evaluate the situation and make recommendations as to whether dust-damping measures are adequate, or whether working will cease altogether until the wind speed drops to an acceptable level; – Where possible, soil stockpiles must be located in sheltered areas where they are not exposed to the erosive effects of the wind; – Where erosion of stockpiles becomes a problem, erosion control measures must be implemented at the discretion of the ECO; – Vehicle speeds must not exceed 40 km/h along dust roads or 20 km/h when traversing unconsolidated and non-vegetated areas; – Straw stabilisation must be applied at a rate of one bale/10 m² and harrowed into the top 100 mm of top material, for all completed earthworks;						

– For significant areas of excavation or exposed ground, dust suppression measures must be used to minimise the spread of dust.						

5.21 Blasting

Impact management outcome: Impact to the environment is minimised through a safe blasting practice.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Any blasting activity must be conducted by a suitably licensed blasting contractor; and – Notification of surrounding landowners, emergency services site personnel of blasting activity 24 hours prior to such activity taking place on Site.						

5.22 Noise

Impact Management outcome: Prevent unnecessary noise to the environment by ensuring that noise from development activity is mitigated.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance

– The Contractor must keep noise level within acceptable limits, Restrict the use of sound amplification equipment for communication and emergency only; – All vehicles and machinery must be fitted with appropriate silencing technology and must be properly maintained; – Any complaints received by the Contractor regarding noise must be recorded and communicated. Where possible or applicable, provide transport to and from the site on a daily basis for construction workers; – Develop a Code of Conduct for the construction phase in terms of behaviour of construction staff. Operating hours as determined by the environmental authorisation are adhered to during the development phase. Where not defined, it must be ensured that development activities must still meet the impact management outcome related to noise management.						

5.23 Fire prevention

Impact management outcome: Prevention of uncontrollable fires.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance

– Designate smoking areas where the fire hazard could be regarded as insignificant; – Firefighting equipment must be available on all vehicles located on site; – The local Fire Protection Agency (FPA) must be informed of construction activities; – Contact numbers for the FPA and emergency services must be communicated in environmental awareness training and displayed at a central location on site; – Two way swop of contact details between ECO and FPA.						

5.24 Stockpiling and stockpile areas

Impact management outcome: Reduce erosion and sedimentation as a result of stockpiling.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– All material that is excavated during the project development phase (either during piling (if required) or earthworks) must be stored appropriately on site in order to minimise impacts to watercourses, watercourses and water bodies; – All stockpiled material must be maintained and kept clear of weeds and alien vegetation growth by undertaking regular weeding and control methods; – Topsoil stockpiles must not exceed 2 m in height;						

– During periods of strong winds and heavy rain, the stockpiles must be covered with appropriate material (e.g. cloth, tarpaulin etc.); – Where possible, sandbags (or similar) must be placed at the bases of the stockpiled material in order to prevent erosion of the material.						

5.25 Civil works

Impact management outcome: Impact to the environment minimised during civil works to create the substation terrace.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Where terracing is required, topsoil must be collected and retained for the purpose of re-use later to rehabilitate disturbed areas not covered by yard stone; – Areas to be rehabilitated include terrace embankments and areas outside the high voltage yards; – Where required, all sloped areas must be stabilised to ensure proper rehabilitation is effected and erosion is controlled; – These areas can be stabilised using design structures or vegetation as specified in the design to prevent erosion of embankments. The contract design specifications must be adhered to and implemented strictly; – Rehabilitation of the disturbed areas must be managed in accordance with ***Section 5.35: Landscaping and rehabilitation***;						

– All excess spoil generated during terracing activities must be disposed of in an appropriate manner and at a recognised landfill site; and – Spoil can however be used for landscaping purposes and must be covered with a layer of 150 mm topsoil for rehabilitation purposes.						

5.26 Excavation of foundation, cable trenching and drainage systems

Impact management outcome: No environmental degradation occurs as a result of excavation of foundation, cable trenching and drainage systems.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– All excess spoil generated during foundation excavation must be disposed of in an appropriate manner and at a licensed landfill site, if not used for backfilling purposes; – Spoil can however be used for landscaping purposes and must be covered with a layer of 150 mm topsoil for rehabilitation purposes; – Management of equipment for excavation purposes must be undertaken in accordance with ***Section 5.18: Workshop, equipment maintenance and storage***; and – Hazardous substances spills from equipment must be managed in accordance with ***Section 5.17: Hazardous substances***.						

5.27 Installation of foundations, cable trenching and drainage systems

Impact management outcome: No environmental degradation occurs during the installation of foundation, cable trenching and drainage system.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Batching of cement to be undertaken in accordance with **Section *5.19: Batching plants***; and – Residual solid waste must be disposed of in accordance with **Section *5.8: Solid waste and hazardous management***.						

5.28 Installation of equipment (circuit breakers, current Transformers, Isolators, Insulators, surge arresters, voltage transformers, earth switches)

Impact management outcome: No environmental degradation occurs as a result of installation of equipment.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Management of dust must be conducted in accordance with Section ***5. 20: Dust emissions***; – Management of equipment used for installation must be conducted in accordance with Section ***5.18: Workshop, equipment maintenance and storage***; – Management hazardous substances and any associated spills must be conducted in accordance with Section ***5.17: Hazardous substances***; and						

– Residual solid waste must be recycled or disposed of in accordance with ***Section 5.8: Solid waste and hazardous management***.						

5.29 Steelwork Assembly and Erection

Impact management outcome: No environmental degradation occurs as a result of steelwork assembly and erection.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– During assembly, care must be taken to ensure that no wasted/unused materials are left on site e.g. bolts and nuts – Emergency repairs due to breakages of equipment must be managed in accordance with ***Section 5. 18: Workshop, equipment maintenance and storage*** and ***Section 5.16: Emergency procedures***.						

5.30 Cabling and Stringing

Impact management outcome: No environmental degradation occurs as a result of stringing.

Impact Management Actions	**Implementation**	**Monitoring**

	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Residual solid waste (off cuts etc.) shall be recycled or disposed of in accordance with **Section 6.8: *Solid waste and hazardous Management***; – Management of equipment used for installation shall be conducted in accordance with **Section *5.18: Workshop, equipment maintenance and storage***; – Management hazardous substances and any associated spills shall be conducted in accordance with ***Section 5.17: Hazardous substances***.						

5.31 Testing and Commissioning (all equipment testing, earthing system, system integration)

Impact management outcome: No environmental degradation occurs as a result of Testing and Commissioning.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Residual solid waste must be recycled or disposed of in accordance with ***Section 5.8: Solid waste and hazardous management***.						

5.32 Socio-economic

Impact management outcome: enhanced socio-economic development.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Develop and implement communication strategies to facilitate public participation; – Develop and implement a collaborative and constructive approach to conflict resolution as part of the external stakeholder engagement process; – Sustain continuous communication and liaison with neighboring owners and residents – Create work and training opportunities for local stakeholders; and – Where feasible, no workers, with the exception of security personnel, must be permitted to stay over-night on the site. This would reduce the risk to local farmers.						

5.33 Temporary closure of site

Impact management outcome: Minimise the risk of environmental impact during periods of site closure greater than five days.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Bunds must be emptied (where applicable) and need to be undertaken in accordance with the impact management						

actions included in ***sections 5.17: Hazardous substances and 5.18: Workshop, equipment maintenance and storage***; – Hazardous storage areas must be well ventilated; – Fire extinguishers must be serviced and accessible. Service records to be filed and audited at last service; – Emergency and contact details displayed must be displayed; – Security personnel must be briefed and have the facilities to contact or be contacted by relevant management and emergency personnel; – Night hazards such as reflectors, lighting, traffic signage etc. must have been checked; – Fire hazards identified and the local authority must have been notified of any potential threats e.g. large brush stockpiles, fuels etc.; – Structures vulnerable to high winds must be secured; – Wind and dust mitigation must be implemented; – Cement and materials stores must have been secured; – Toilets must have been emptied and secured; – Refuse bins must have been emptied and secured; – Drip trays must have been emptied and secured.						

5.34 Dismantling of old equipment

Impact management outcome: Impact to the environment to be minimised during the dismantling, storage and disposal of old equipment commissioning.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance

– All old equipment removed during the project must be stored in such a way as to prevent pollution of the environment; – Oil containing equipment must be stored to prevent leaking or be stored on drip trays; – All scrap steel must be stacked neatly and any disused and broken insulators must be stored in containers; – Once material has been scrapped and the contract has been placed for removal, the disposal Contractor must ensure that any equipment containing pollution causing substances is dismantled and transported in such a way as to prevent spillage and pollution of the environment; – The Contractor must also be equipped to contain and clean up any pollution causing spills; and – Disposal of unusable material must be at a licensed waste disposal site.						

5.35 Landscaping and rehabilitation

Impact management outcome: Areas disturbed during the development phase are returned to a state that approximates the original condition.

Impact Management Actions	**Implementation**			**Monitoring**		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance

– All areas disturbed by construction activities must be subject to landscaping and rehabilitation; All spoil and waste must be disposed of to a registered waste site; – All slopes must be assessed for contouring, and to contour only when the need is identified in accordance with the Conservation of Agricultural Resources Act, No 43 of 1983 – All slopes must be assessed for terracing, and to terrace only when the need is identified in accordance with the Conservation of Agricultural Resources Act, No 43 of 1983; – Berms that have been created must have a slope of 1:4 and be replanted with indigenous species and grasses that approximates the original condition; – Where new access roads have crossed cultivated farmlands, that lands must be rehabilitated by ripping which must be agreed to by the holder of the EA and the landowners; – Rehabilitation of access roads outside of farmland; – Indigenous species must be used for with species and/grasses to where it compliments or approximates the original condition; – Stockpiled topsoil must be used for rehabilitation (refer to ***Section 5.24: Stockpiling and stockpiled areas***); – Stockpiled topsoil must be evenly spread so as to facilitate seeding and minimise loss of soil due to erosion; – Before placing topsoil, all visible weeds from the placement area and from the topsoil must be removed; – Subsoil must be ripped before topsoil is placed; – The rehabilitation must be timed so that rehabilitation can take place at the optimal time for vegetation establishment; – Where impacted through construction related activity, all sloped areas must be stabilised to ensure proper rehabilitation is effected and erosion is controlled;						

– Sloped areas stabilised using design structures or vegetation as specified in the design to prevent erosion of embankments. The contract design specifications must be adhered to and implemented strictly; – Spoil can be used for backfilling or landscaping as long as it is covered by a minimum of 150 mm of topsoil. – Where required, re-vegetation including hydro-seeding can be enhanced using a vegetation seed mixture as described below. A mixture of seed can be used provided the mixture is carefully selected to ensure the following: a) Annual and perennial plants are chosen; b) Pioneer species are included; c) Species chosen must be indigenous to the area with the seeds used coming from the area; d) Root systems must have a binding effect on the soil; e) The final product must not cause an ecological imbalance in the area						

6 ACCESS TO THE GENERIC EMPr

Once completed and signed, to allow the public access to the generic EMPr, the holder of the EA must make the EMPr available to the public in accordance with the requirements of Regulation 26(h) of the EIA Regulations.

PART B: SECTION 2

7 SITE SPECIFIC INFORMATION AND DECLARATION

7.1 Sub-section 1: contact details and description of the project

7.1.1 Details of the applicant: Upgrade Energy (Pty) Ltd

Name of applicant: Mr. Emil Unger

Tel No:

Fax No: 086 600 8622

Postal Address: PO. Box 1171, Umhlanga Rocks, 4320

Physical Address: 25 The Oval, Umhlali Country Club, Ballito 4390

7.1.2 Details and expertise of the EAP:

Name of applicant: SiVEST SA (Pty) Limited

Tel No: 031 581 1570

Fax No:

E-mail address: michellen@sivest.co.za

Expertise of the EAP (Curriculum Vitae included): yes

7.1.3 Project name: Proposed Expansion of the Leeumax Solar Photovoltaic (PV) Plant and Associated Infrastructure near Leeudoringstad in the North West Province

7.1.4 Description of the project:

The site area to be expanded is approximately 15 ha in extent. It is anticipated that the expanded Solar PV energy facility will include PV fields (arrays) comprising of multiple PV panels. In summary, the proposed SEF expansion development will include the following components:

- The proposed solar PV plant will include PV fields (arrays) comprising multiple PV modules;
- PV panels will be single axis tracking mounting, and the modules will be either crystalline silicon or thin film technology;
- Each PV module will be approximately 2274mm (≈2.3m) long and 1134mm (≈1.1m) wide and mounted on supporting structures above ground;
- The foundations will most likely be either concrete or rammed piles;
- Generation capacity of up to 35MWac, broken down as follows:
  - PV 1 - up to 10MWac (to be expanded by 0.1 MWac on existing footprint)
  - PV 2 - up to 10MWac (to be expanded by 0.1 MWac on existing footprint)
  - PV expansion area – new area, to be expanded by up to 15MWac

- One (1) new 33/132kV on-site substation (facility substation) occupying an area of up to approximately 0.2003ha (2 003m^2);
- One (1) guard house approximately 0.0876 ha (876m^2) in size;
- One (1) temporary building zone 0.2944 ha (2 944m^2);
- Site and internal access roads, up to 4m wide, will provide access to the PV arrays. Existing site roads will be used wherever possible, although new site roads will be constructed where necessary;
- Galvanized steel fencing with electrification approximately 2.1m in height;
- Existing boreholes will be used where possible. Water will potentially be stored in water storage tanks;

A summary of the project technical details is provided in the table below.

Table 2: Technical Detail Summary

Component	Description / Dimensions
Location of site (centre point)	Latitude: 27°12'24.03" S Longitude: 26°18'2.64" E
Expansion site area	Approximately 15 ha
Technology	• The proposed expanded solar PV plant will include PV fields (arrays) comprising multiple PV modules. • PV panel mountings. PV panels will be single axis tracking mounting, and the modules will be either crystalline silicon or thin film technology. • Each PV module will be approximately 2274mm (≈2.3 m) long and 1134 mm (≈1.1 m) wide and mounted on supporting structures above ground. At this stage it is anticipated that the structures will be mono-facial modules. The final design details will become available during the detailed design phase of the proposed development, prior to the start of construction. • The foundations will most likely be either concrete or rammed piles. The final foundation design will be determined at the detailed design phase of the proposed development.
SG codes	T0HP00000000004400037
Generation Capacity of Expanded Solar PV Plant	Maximum of up to ± 35MW ac o PV 1 - up to 10MWac (to be expanded by 0.1 MWac on existing footprint) o PV 2 - up to 10MWac (to be expanded by 0.1 MWac on existing footprint) o PV expansion area – new area, to be expanded by up to 15MWac
Capacity of Additional Switching Substation	More than 33 kV but less than 275 kV. Exact capacity of the proposed on-site switching substation will be determined and confirmed at a later stage.
Dimensions of PV Panels	• Width: up to ± 2274mm (≈2.3m)

Component	Description / Dimensions
	• Length: up to ± 1134mm (≈1.1m)
Additional On-site Switching Substation	• One (1) new on-site switching substation with a capacity of more than 33 but less than 275 kV. • Total footprint: up to ± 0.2003 ha (2 003 m^2). • To contain transformers for voltage, step up from medium voltage to high voltage. DC power from the PV modules will be converted into AC power in the inverters and the voltage will be stepped up to medium voltage in the inverter transformers.
Additional Guard House	One (1) permanent guard house of ± 0.0876ha (876 m^2).
Additional Temporary Building Zone	One (1) temporary building zone of ± 0.2944ha (2 944 m^2).
Area Occupied by Buildings	Up to ± 1.3807 ha (13 807 m^2)
Width of Existing Internal Gravel Roads	• Up to ± 4 m; • Existing internal gravel site roads will be used wherever possible. However, where required, new internal gravel roads may be constructed.
Length of existing internal roads (to be potentially upgraded)	Up to ± 1.57 km
Site Access	Access to the proposed development will be via an existing gravel road which connects to the tarred R502 road.
Proximity to grid connection	• Grid connection is to the 132/11kV Leeudoringstad Solar Plant Substation, which has been authorised as part of a separate BA process; and • The 132/11kV Leeudoringstad Solar Plant Substation is located within the proposed Leumax Solar PV Plant application site (namely Portion 37 of the Farm Leeuwbosch No. 44). • Medium voltage cabling (anticipated to be ± 0.8m x 0.6m wide at this stage) will link the various PV arrays to the switching substation, as well as the Leeudoringstad Solar Plant Substation. These cables will be laid underground, wherever technically feasible.
Height of fencing	• ± 2.1 m high • Fencing will surround the entire proposed solar PV plant.
Type of fencing	Galvanised steel with electrification on top.
Area covered by fencing	Up to approximately 18 ha

Component	Description / Dimensions
Boreholes and storage tanks	• At this stage it is anticipated that existing boreholes will be utilised; • Water will potentially be stored in temporary water storage tanks.

7.1.5 Project location:

The proposed development is located approximately 6 km north east of the town of Leeudoringstad in the Maquassi Hills Local Municipality, within the Dr Kenneth Kaunda District Municipality in the North West Province (Figure 1).

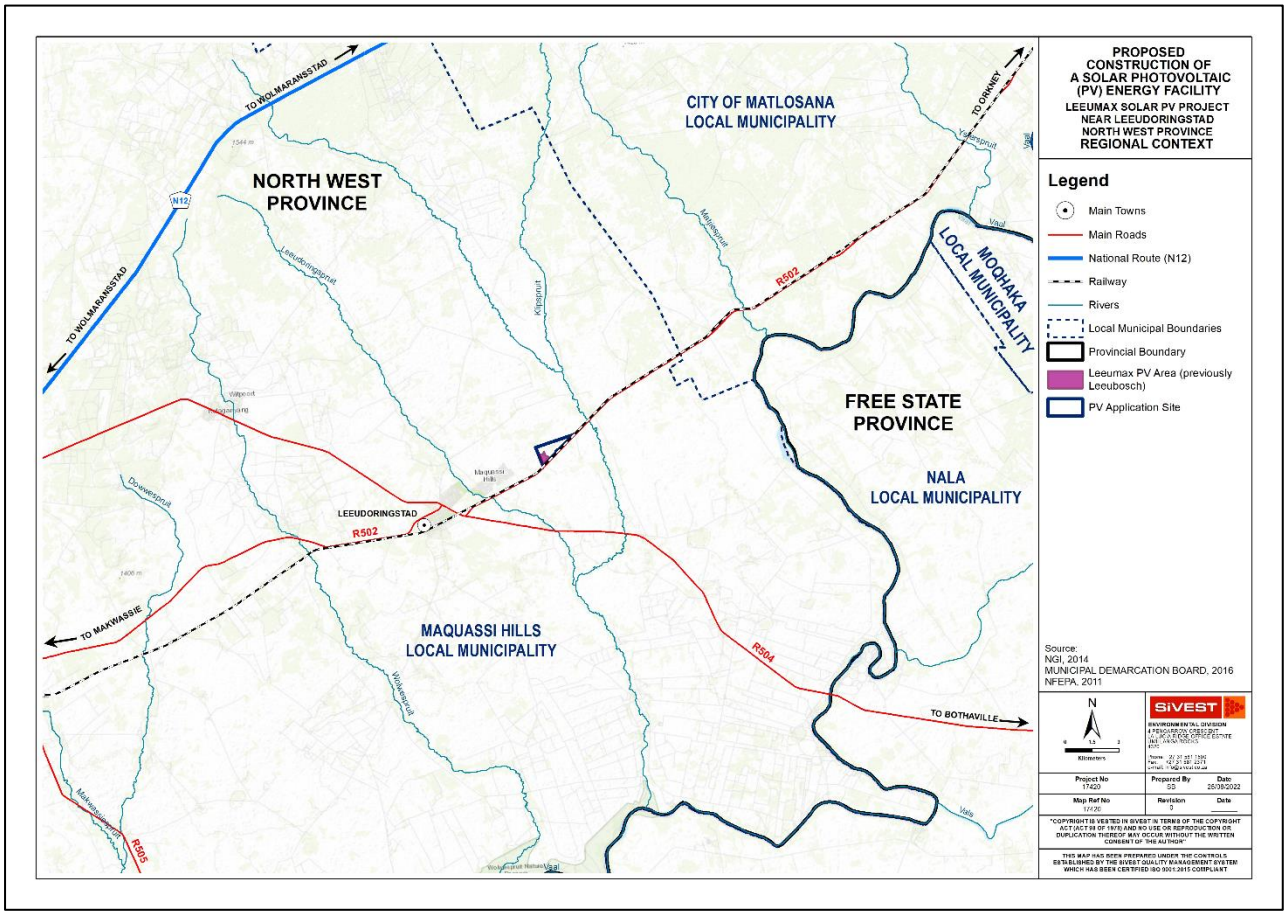


Figure 1: Regional Context

The coordinates for the site is as follows:

Table 3: SEF Coordinates – Application site

LEEUMAX SEF: APPLICATION SITE		
COORDINATES AT CORNER POINTS (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
1	27°12'18.76"S	26°17'51.68"E
2	27°12'18.87"S	26°17'57.62"E

3	27°12'14.32"S	26°18'1.71"E
4	27°12'20.43"S	26°18'3.57"E
5	27°12'22.00"S	26°18'8.17"E
6	27°12'24.45"S	26°18'9.71"E
7	27°12'34.83"S	26°17'58.96"E
COORDINATES AT CENTRE POINT (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
8	27°12'24.91"S	26°18'1.14"E

LEEUMAX SEF: SUBSTATION AND ASSOCIATED INFRASTRUCTURE LOCATION		
COORDINATES AT CENTRE POINTS (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
33kV Switching Station	27°12'15.08"S	26°18'22.83"E
Temporary Building Zone	27°12'15.19"S	26°18'3.43"E
Guard House	27°12'13.71"S	26°18'2.79"E
Substation (already approved)	27°12'14.18"S	26°18'25.58"E

7.2 Sub-section 2: Development footprint site map

This sub-section must include a map of the site sensitivity overlaid with the preliminary infrastructure layout. The sensitivity map must be prepared from the national web based environmental screening tool, when available for compulsory use at: https://screening.environment.gov.za/screeningtool. The sensitivity map shall identify the nature of each sensitive feature e.g. threatened plant species, archaeological site, etc. Sensitivity maps shall identify features both within the planned working area and any known sensitive features within 50 m from the development footprint.

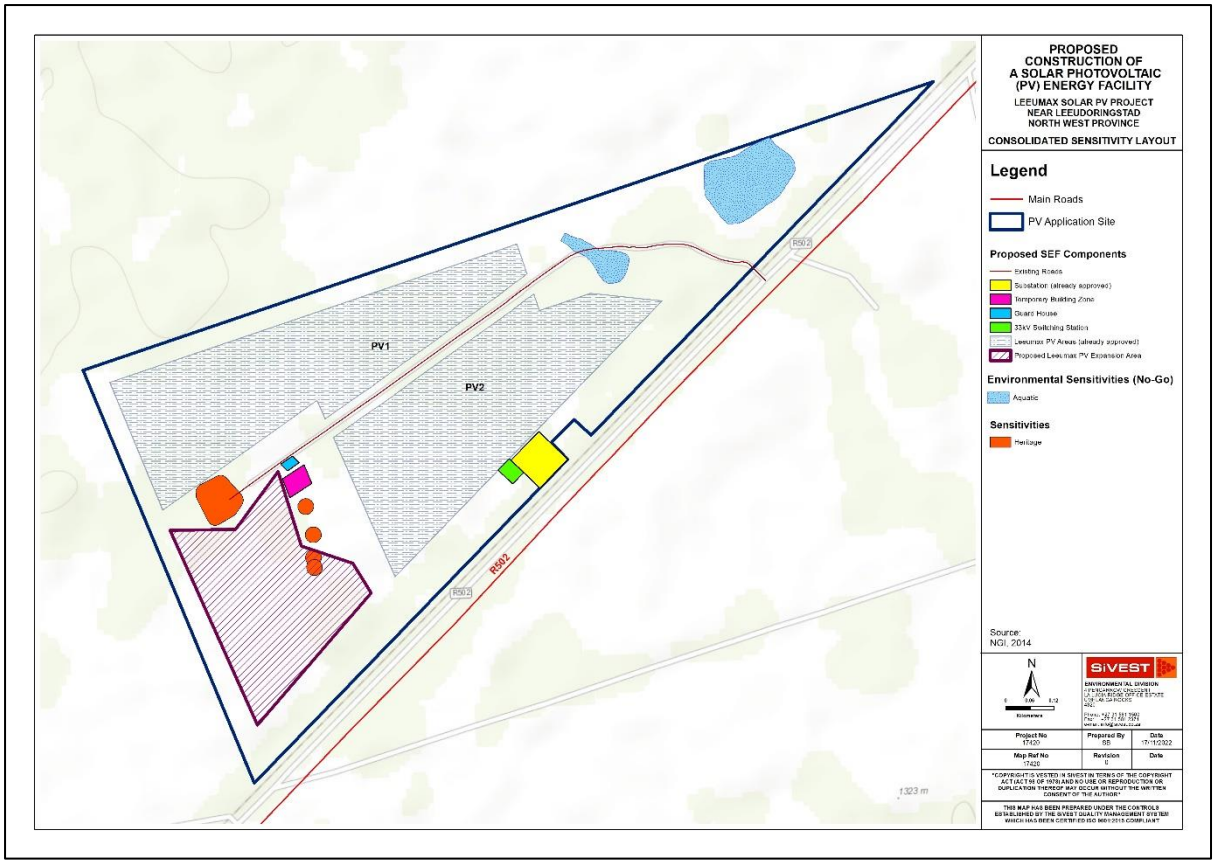


Figure 2: Environmental Sensitivity Overlay

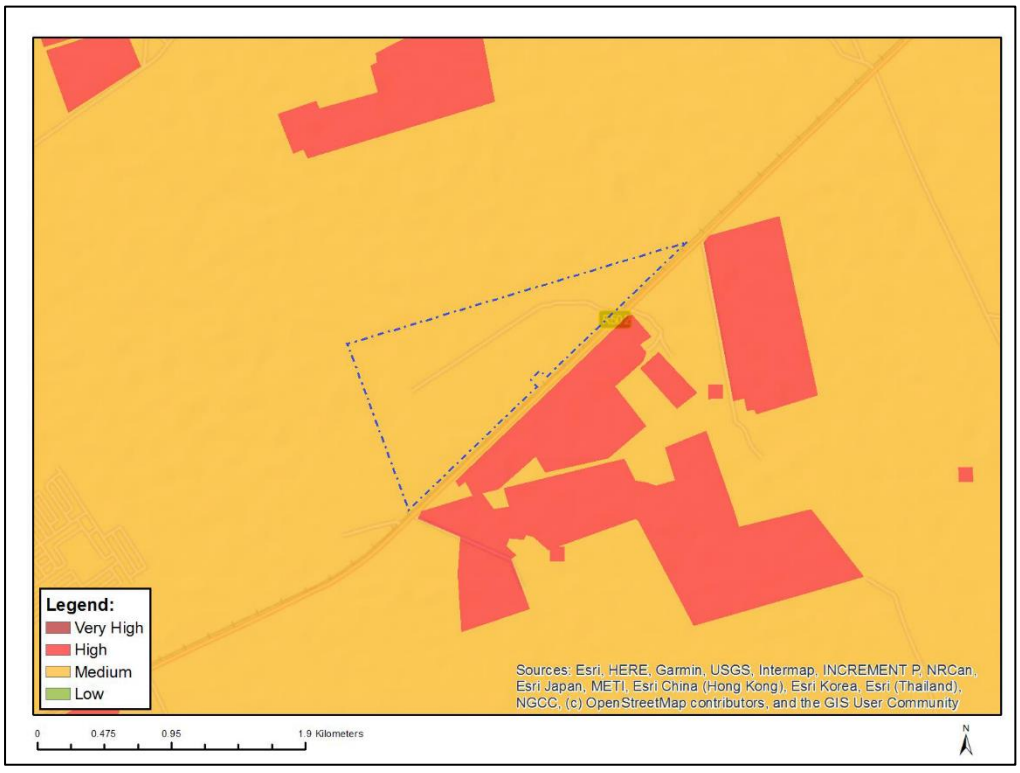


Figure 3: Map showing substation location in relation to the Agriculture Theme Sensitivity (DFFE Screening Tool)

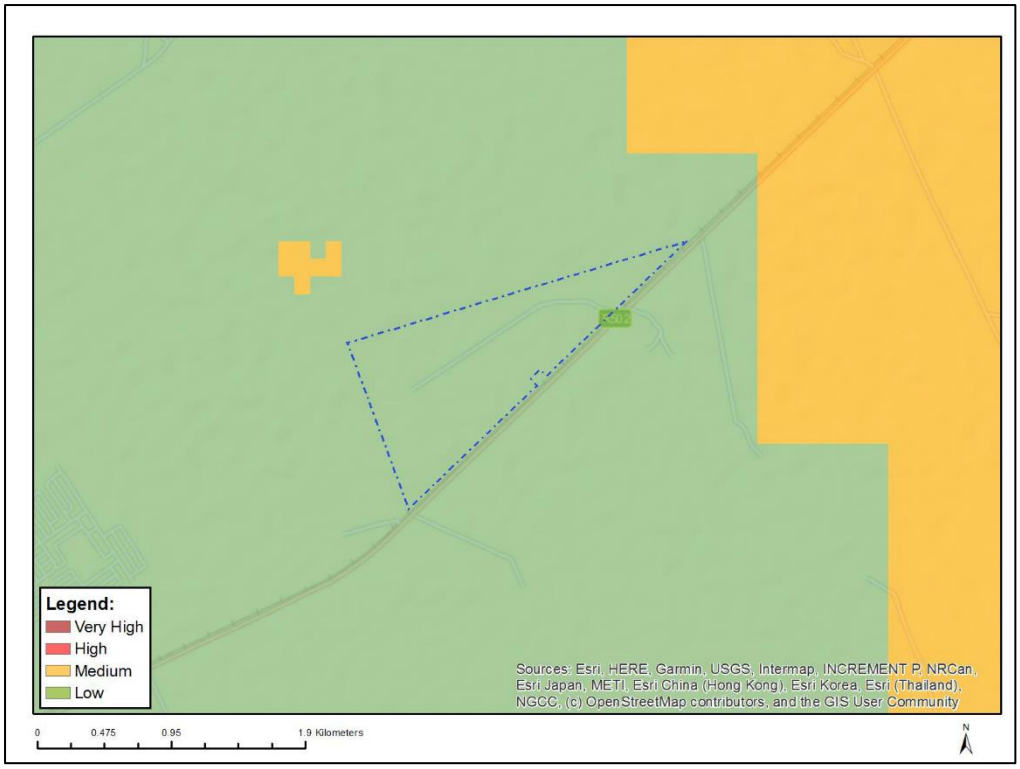


Figure 4: Map showing substation location in relation to the Animal Species Theme Sensitivity (DFFE Screening Tool)

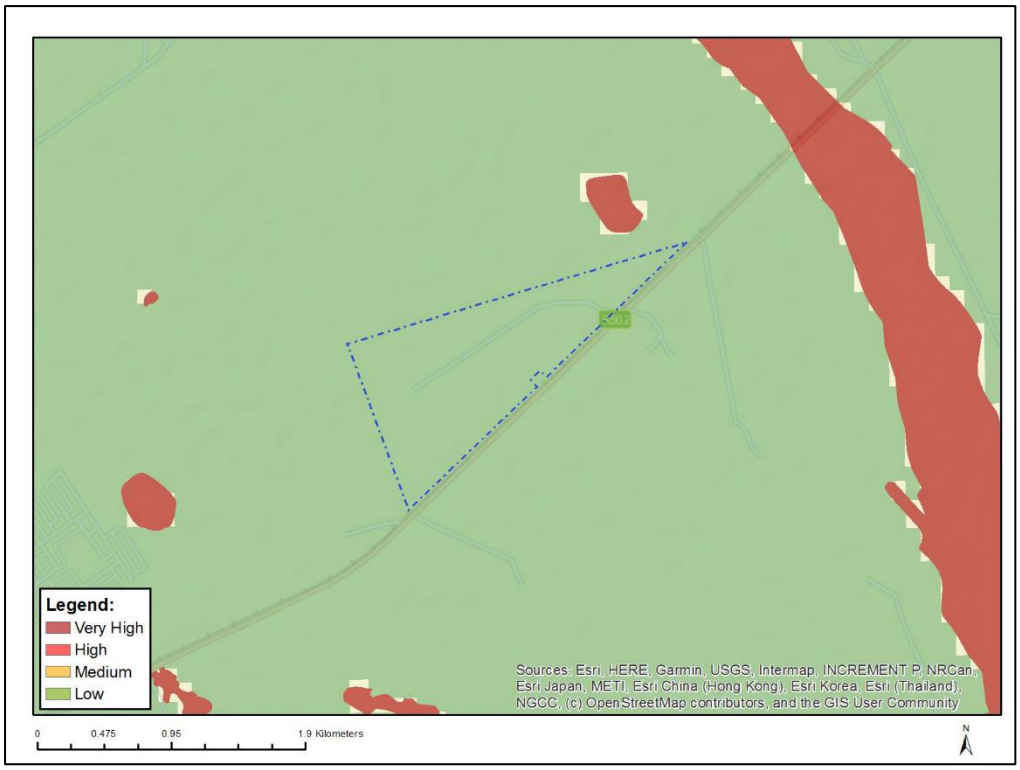


Figure 5: Map showing substation location in relation to the Aquatic Biodiversity Theme Sensitivity (DFFE Screening Tool)

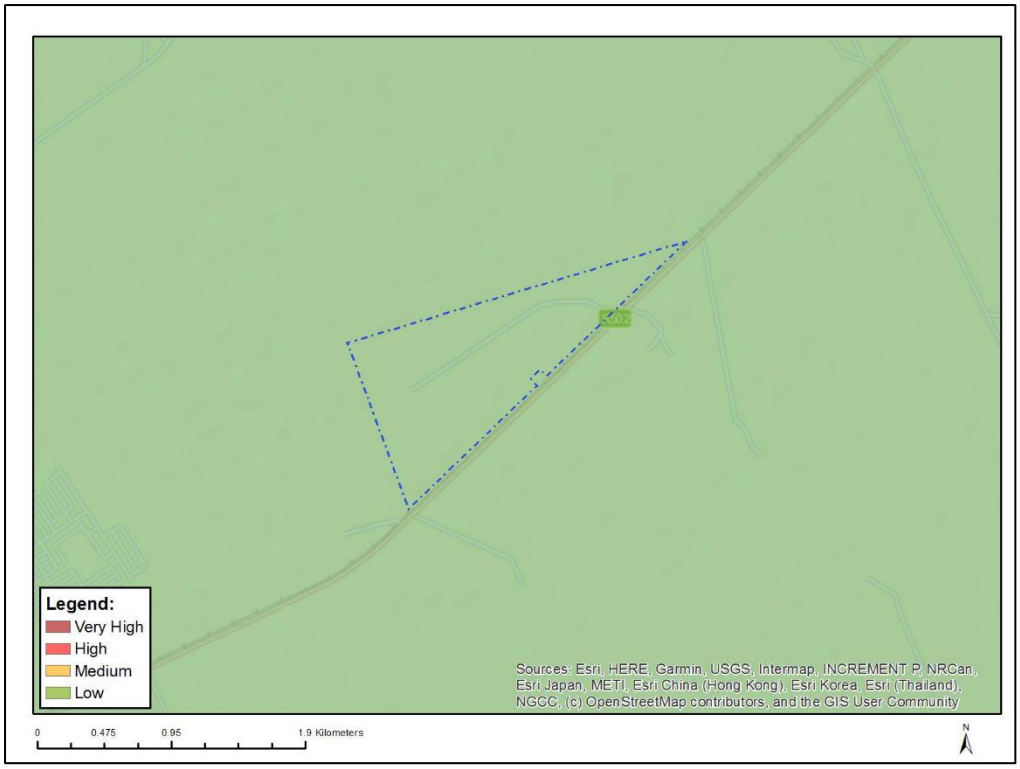


Figure 6: Map showing substation location in relation to the Archaeological and Cultural Heritage Theme Sensitivity (DFFE Screening Tool)

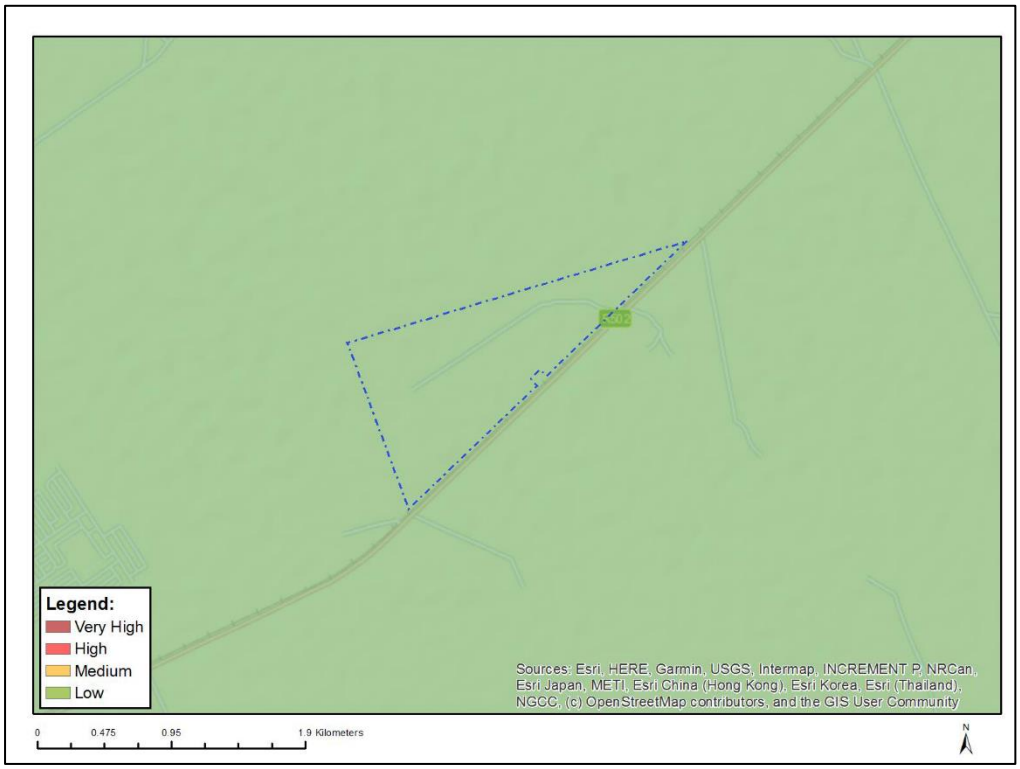


Figure 7: Map showing substation location in relation to the Civil Aviation Theme Sensitivity (DFFE Screening Tool)

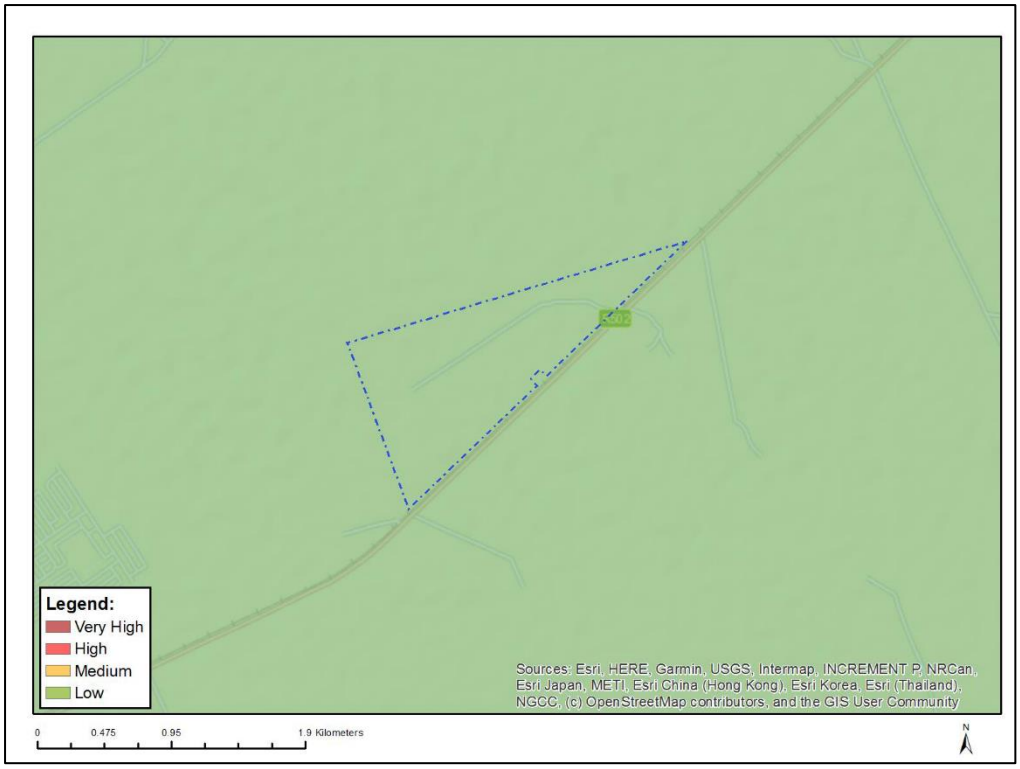


Figure 8: Map showing substation location in relation to the Defence Theme Sensitivity (DFFE Screening Tool)

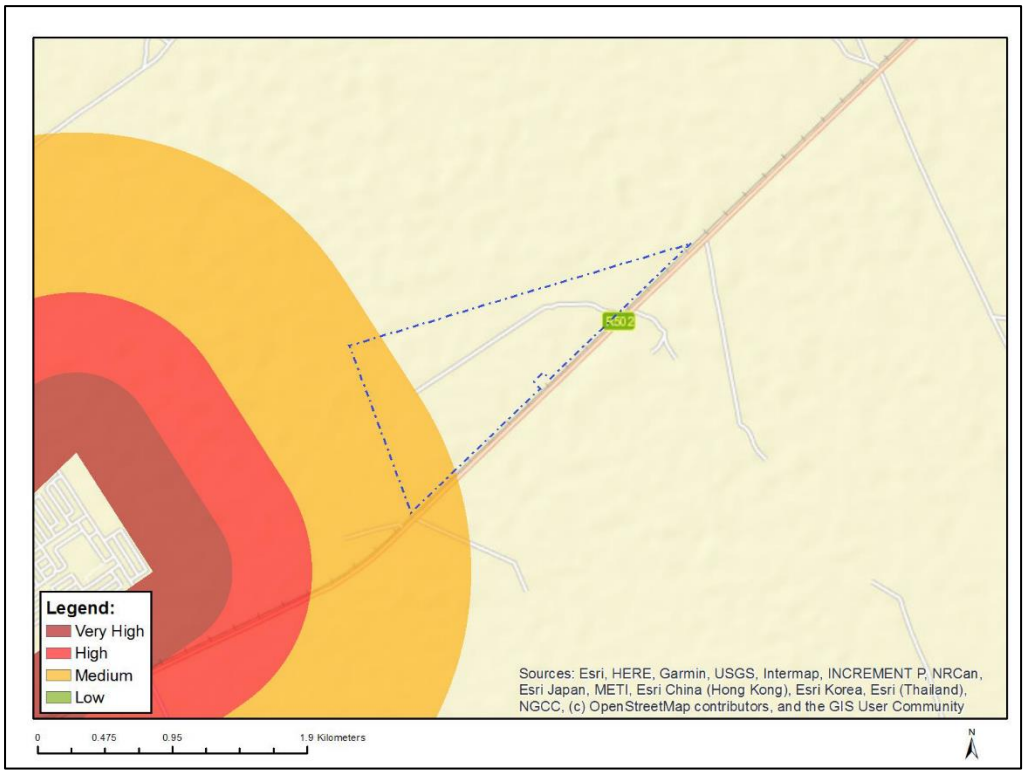


Figure 9: Map Showing relative Landscape (Solar) theme sensitivity

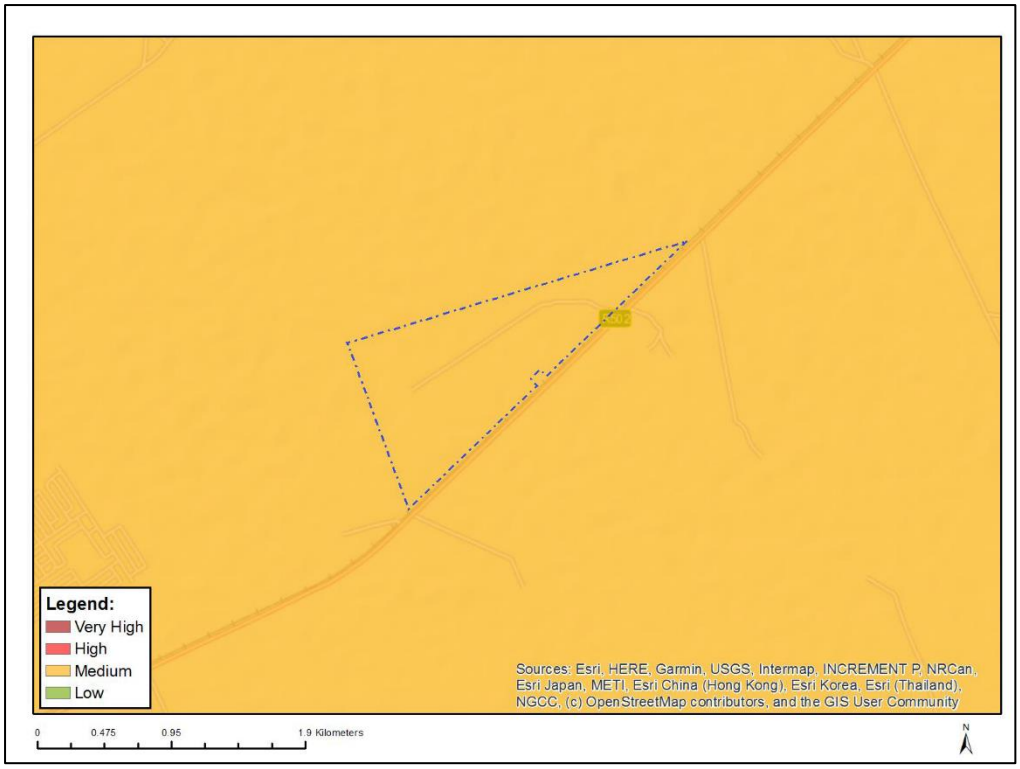


Figure 10: Map showing substation location in relation to the Palaeontology Theme Sensitivity (DFFE Screening Tool)

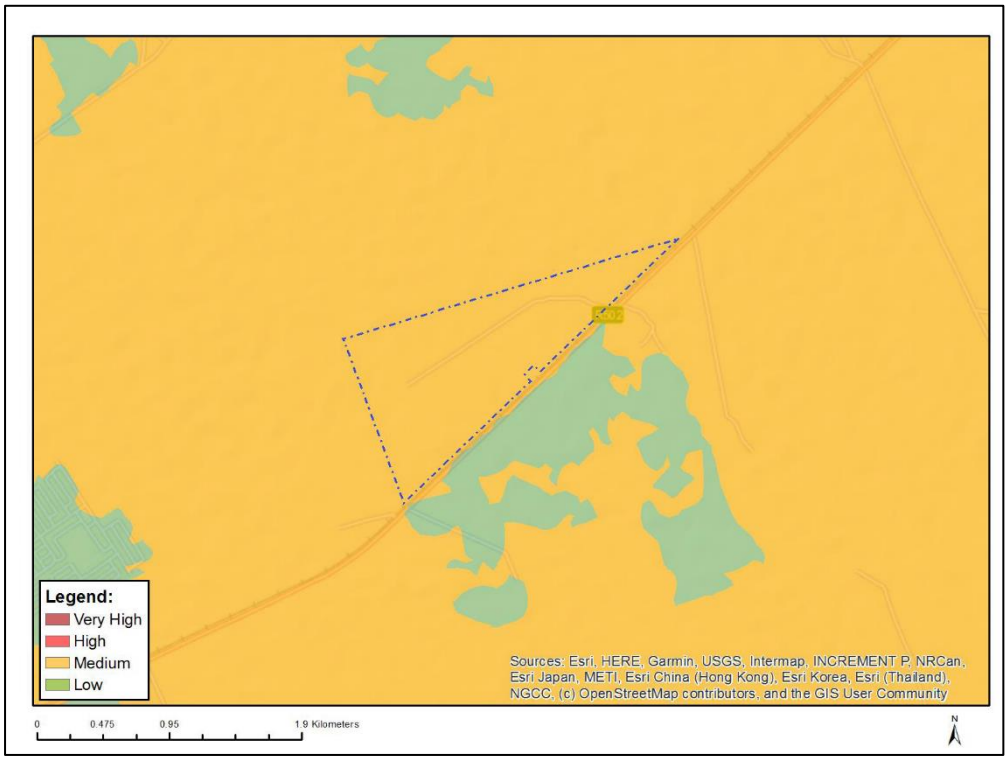


Figure 11: Map showing substation location in relation to the Plant Species Theme Sensitivity (DFFE Screening Tool)

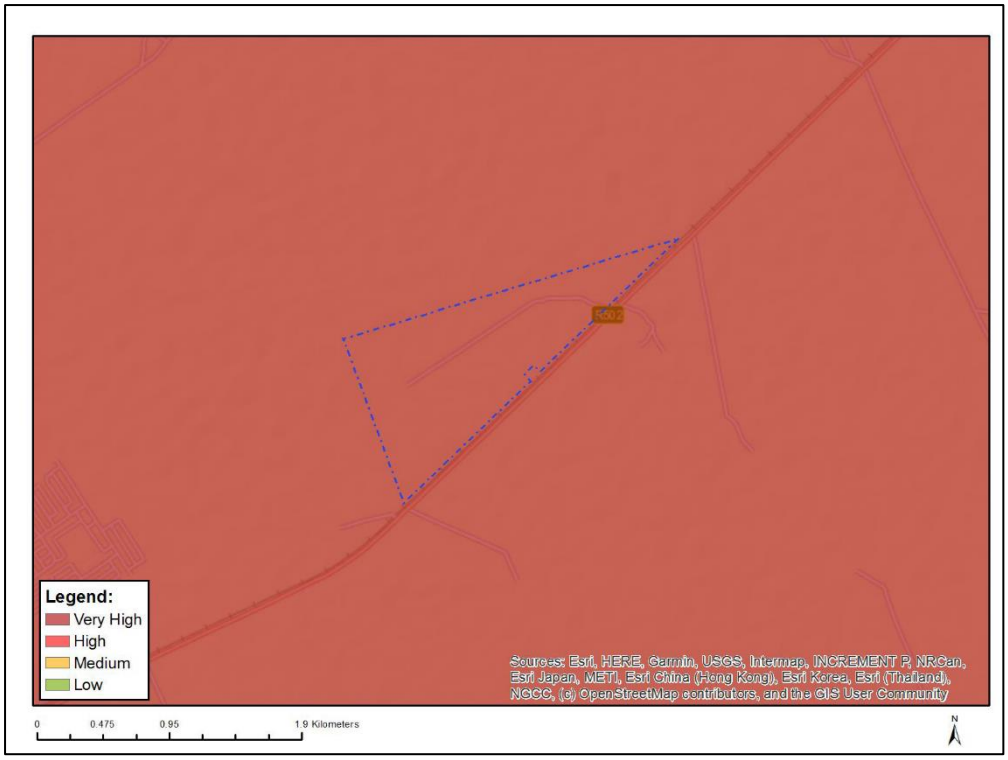


Figure 12: Map showing substation location in relation to the Terrestrial Biodiversity Theme Sensitivity (DFFE Screening Tool)

7.3 Sub-section 3: Declaration

The proponent/applicant or holder of the EA affirms that he/she will abide and comply with the prescribed impact management outcomes and impact management actions as stipulated in part B: section 1 of the generic EMPr and have the understanding that the impact management outcomes and impact management actions are legally binding. The proponent/applicant or holder of the EA affirms that he/she will provide written notice to the CA 14 day prior to the date on which the activity will commence of commencement of construction to facilitate compliance inspections.

Signature Proponent/applicant/ holder of EA Date:

7.4 Sub-section 4: amendments to site specific information (Part B; section 2)

Should the EA be transferred to a new holder, Part B: Section 2 must be completed by the new holder and submitted with the application for an amendment of the EA in terms of Regulations 29 or 31 of the EIA Regulations, whichever applies. The information submitted for an amendment to an environmental authorisation will be considered to be incomplete should a signed copy of Part B: Section 2 not be submitted. Once approved, Part B: Section 2 forms part of the EMPr for the development and the EMPr becomes legally binding to the new EA holder.

PART C

8 SITE SPECIFIC ENVIRONMENTAL ATTRIBUTES

If any specific environmental sensitivities/attributes are present on the site which require more specific impact management outcomes and actions, not included in the pre-approved generic EMPr template, to manage impacts, those impact management outcomes and impact management actions must be included in this section. These specific management controls must be referenced spatially, and must include impact management outcomes and impact management actions. The management controls including impact management outcomes and impact management actions must be presented in the format of the pre-approved generic EMPr template. This applies only to additional impact management outcomes and impact management actions that are necessary.

If Part C is applicable to the development as authorised in the EA, it is required to be submitted to the CA together with the BAR or EIAR, for consideration of, and decision on, the application for EA. The information in this section must be prepared by an EAP and the name and expertise of the EAP, including the curriculum vitae are to be included. Once approved, Part C forms part of the EMPr for the site and is legally binding.

This section will **not be required** should the site contain no specific environmental sensitivities or attributes.

The following specialist studies were undertaken as part of this project:

- Desktop Geotechnical Assessment
- Surface Water Impact Assessment
- Terrestrial Biodiversity Impact Assessment
- Agriculture and Soils Impact Assessment (desktop)
- Avifaunal Impact Assessment
- Social Impact Assessment (desktop)
- Heritage Impact Assessment
- Paleontological Impact Assessment
- Visual Impact Assessment
- Stormwater Management Plan

Only additional mitigation measures provided by the Specialists are included below.

8.1. Pre-construction

8.1.1. Socio-Economic

This section deals with the issues relative to Socio-economic during the pre-construction phase.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Socio-economic: Availability of sufficient local construction materials for the PV Plant	• Source unavailable materials from abroad (import)	Project developer	Holder of the EA	Clear communication channels. Compliance to all legislative requirements. Ensure the EMPr is adhered to.	Continuous

8.2. Construction

8.2.1. Heritage

This section deals with the issues relative to heritage during the construction phase.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Heritage: Site clearance and vegetation stripping	• Implement a chance finds procedures handle any heritage resources discovered during construction.	Construction Manager or Contractor	Monitoring of surface clearance relative to approved layout	Minimise landscape scarring	Ongoing basis
		ECO			Whenever on site (at least weekly)

8.2.2. Agriculture and Soils

This section deals with the issues relative to Agriculture and Soils during the construction phase.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Loss of agricultural land and	• Avoid any cultivated and especially irrigated areas, if possible.	• Project management • EPC • Engineer/Contractor	Undertake a periodic site inspection to record the occurrence of and re-vegetation progress of all areas that	That disturbance and existence of hard surfaces causes no erosion on or downstream of the site.	Ongoing basis
Soil erosion (wind or water) caused	• Avoid extensive vegetation removal; re-vegetate as soon as possible and maintain cover (irrigate if necessary)				

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
by surface disturbance			require re-vegetation.	That vegetation clearing does not pose a high erosion risk.	

8.2.3. Socio-Economic

This section deals with the issues relative to socio-economic during the construction phase.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Socio-economic: Increase in production of the national and local economies due to project capital expenditure.	Procure inputs from local and domestic suppliers Employ local contractors where possible	Holder of EA Contractor ECO	Clear communication channels. Compliance to all legislative requirements. Ensure the EMPr is adhered to.	Continuous
Socio-economic: The creation of new direct and indirect opportunities related to the construction	• Employ labour-intensive methods • Employ local residents and communities • Sub-contract to local construction companies • Utilise local suppliers	Holder of EA Contractor ECO	Clear communication channels.	Continuous

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
and operation of the proposed solar plant and facilities			Compliance to all legislative requirements. Ensure the EMPr is adhered to.	

8.2.4. Geotechnical

This section deals with the issues relative to geotechnical during the construction phase.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
Geotechnical: Displacement of natural earth material and overlying vegetation. • Increase in soil and wind erosion due to • clearing of vegetation. • Construction and earthmoving	• Identify protected areas prior to construction. • Construction of temporary berms and drainage channels to divert surface water. • Minimize earthworks and fills. • Use existing road network and access tracks. • Rehabilitation of affected areas (such as regrassing, mechanical stabilization). • Correct engineering design and construction of gravel roads and water crossings.	Holder of EA Contractor ECO	Clear communication channels. Compliance to all legislative requirements. Ensure the EMPr is adhered to.	Continuous

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
• vehicles may displace soil during operations. • Creation • of drainage paths along access tracks. • Potential oil • spillages from heavy plant. • Excessive dust.	• Correct construction methods for foundation installations. • Control stormwater flow • Dust suppression			

8.2.5. Aquatic/ Freshwater

This section deals with the issues relative to aquatic during the construction phase.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Aquatic: Loss of wetland areas through direct impact or indirect impacts of erosion or sedimentation).	During site clearing the vegetation and topsoil is removed, increasing the runoff and erosion potential of flowing water. to mitigate these impacts the following measures must be followed:	Holder of EA Contractor ECO	Construction monitoring and audit reports	Impacts avoided or managed. Ensure the conditions of the EA are adhered to.	Continuous

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	• Minimise the area of soil disturbance to reduce the impact of sedimentation into waterbodies. • Clearing and grading must occur only where necessary to build and provide access to structures and infrastructure. Clearing must be done immediately before construction, rather than leaving soils exposed for months or years. • Where possible, plants should be cut down to ground level instead of being removed completely to stabilise the soil during land-clearing operations. • The proposed limits of land disturbance must be physically marked off to ensure that only the land area required for the development is cleared. • When excavated areas are backfilled the surface must be level with the surrounding land surface, to minimise soil erosion from the areas when the excavation is complete.				

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	• The most efficient approach to control erosion is to minimise the area of land disturbed as well as the duration for which it is exposed. • Once surfaces have been exposed, they must immediately be protected from erosion, so limiting the source of the sediment. • During the excavation of pits, roads, construction sites etc. the removed topsoil must be stored and appropriately protected so that it does not wash into waterbodies, causing sedimentation and nutrient loading. This is then used to backfill the area so that it can be effectively rehabilitated. • Topsoil that is removed during excavation must NEVER be buried or rendered unusable in any way (such as mixing it with spoils or being compacted by machinery). • During excavation soil must be excavated one layer at a time and stored in separate stockpiles so they can be returned in their				

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	natural order when the area is backfilled. This improves soil functions and improves the template for plant growth. • To ensure that it reaches most people signs must be written in the languages of the area (NOT just English). This ensures that non-English speakers can understand and will hopefully cooperate in reducing water pollution by the measures indicated on the sign. • Within a construction site, vehicle access must be strictly controlled (i.e., there must be set parking, turning areas, set routes and no access to undisturbed areas.) This minimises soil disturbance and compaction and pollution from fluids leaking onto the ground as well as the disturbance of aquatic organisms.				
Aquatic: Hydrocarbon spills and compaction	• Areas (away from surface water bodies and outside of the riparian zone) must be designated for the	Holder of EA	Construction monitoring and audit reports	Impacts avoided or managed.	Continuous

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
within wetland zones. **Aquatic:** Sewerage spills within wetlands or drainage lines feeding wetlands **Aquatic:** Spills of stored hazardous material into wetlands or drainage lines feeding wetlands	storage of materials and mixing of materials (such as concrete or chemicals). This reduces contamination of water resources from these materials/ activities. • Portable toilets must be provided where work is being done and must be located a considerable distance away from water resources and riparian areas. • If soil contamination occurs (such as due to a spill) the soil must be removed from the site and disposed of appropriately. • Prevention of spills eliminates or minimizes the discharge of pollutants to water bodies. • Handle hazardous and non-hazardous materials, such as concrete, solvents, asphalt, sealants, and fuels, as infrequently as possible and observe all national and local regulations when using, handling, or disposing of these materials. • An effective response plan must be in place and personnel must be ready to mobilise in the event of a			Ensure the conditions of the EA are adhered to.	

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	spillage to reduce the environmental effects of an oil or chemical spill. • Spill control devices such as absorbent snakes and mats must be placed around chemical storage areas, and they can be used in an emergency to contain a spill. • Implement preventative maintenance system to ensure that work vehicles are maintained in an acceptable condition. This would involve routinely checking vehicles for leaks before construction begins; and not allowing vehicles with significant leaks to operate or be repaired within the construction site. Ideally, vehicle maintenance and washing occurs in garages and wash facilities, not on active construction sites. • Before an operation occurs near a waterbody, vehicles must be checked for leaks, to reduce soil and water contamination from vehicle fluids.				

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	• Old engine oil must NOT be thrown on the ground or down a stormwater drains but rather collected in containers and recycled. • Ensure that appropriate solid waste disposal facilities are provided, and adequate signage is provided for all solid, liquid, and hazardous waste types. These must contain waste products in a weatherproof manner and to prevent any airborne litter, access to scavengers or loss of food residues that may be washed into surface or ground waters. Collected waste needs to be disposed of at a registered landfill site/hazardous waste facility. • Re-fuelling areas for vehicles must be bunded and located away from water resources and sensitive environments to prevent any accidental spillage contaminating soil or seeping into groundwater aquifers. All servicing area run-off must be directed towards a fully				

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	contained collection sump for recovery and appropriate disposal. • There must be no standing water at a stockpile site, to reduce erosion as well as the contamination of the water by nutrients/ toxics. • Water resources must be well fenced and sign-posted, to keep machinery, people, and livestock away from the water body as well as vegetated areas to reduce the soil disturbance, soil compaction and vegetation destruction, which thus reduces the amount of erosion and habitat loss.				
Aquatic: The introduction of alien vegetation into disturbed areas disrupting natural wetland vegetation composition or alteration of water transpiration from soils.	• Alien and invasive vegetation have several detrimental effects on water quality, from nutrient enrichment to increased erosion and excessive water use, which is especially relevant in dry areas or in important catchments. Invasive species are highly likely to colonise disturbed areas, even after rehabilitation and follow-up clearing must be done until healthy vegetation returns to the site	Holder of EA Contractor ECO	Construction monitoring and audit reports	Impacts avoided or managed. Ensure the conditions of the EA are adhered to.	Continuous

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Aquatic: The change in flow dynamics to and through wetlands potentially altering wetland types or potentially causing erosion from increased surface runoff.	• Runoff from disturbed areas (such as landing/depot areas, extraction routes, gravel pits, temporary and unpaved roads) must be directed to silt traps (silt fences, sandbags, etc) to remove sediment and reduce the sedimentation of the water bodies. • Check dams are small, temporary dams constructed across a swale or channel. They can be constructed using gravel, rock, gabions, or straw bales. They are used to reduce the velocity of concentrated flow and, therefore, to reduce erosion in a swale or channel.				

8.2.6. Avifaunal

This section deals with the issues relative to avifaunal during the construction phase.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
Avifauna: Displacement of priority species due to disturbance associated with construction of the PV plant and associated infrastructure	• Construction activity should be restricted to the immediate footprint of the infrastructure • Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. • Measures to control noise and dust should be applied according to current best practice in the industry. • Maximum used should be made of existing access roads and the construction of new roads should be kept to a minimum.	Contractor and ECO	1. Implementation of the CEMPr. Oversee activities to ensure that the CEMPr is implemented and enforced via site audits and inspections. Report and record any non-compliance. 2. Ensure that construction personnel are made aware of the	Prevent unnecessary displacement of avifauna by ensuring that contractors are aware of the requirements of the Construction Environmental Management Programme (CEMPr.)	Monthly

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
			impacts relating to off-road driving. 3. Construction access roads must be demarcated clearly. Undertake site inspections to verify. 4. Monitor the implementation of noise control mechanisms via site inspections and record and report non-compliance. 5. Ensure that the construction area is		

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
			demarcated clearly and that construction personnel are made aware of these demarcations. Monitor via site inspections and report non-compliance.		

8.2.7. Terrestrial Biodiversity

This section deals with the issues relative to biodiversity during the construction phase.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
Loss, degradation or fragmentation of vegetation through direct clearing	• Use existing road infrastructure for access roads. • Avoid construction of infrastructure within sensitive habitats. Minimise vegetation clearing and disturbance to footprint areas only.	Holder of EA Contractor ECO	Construction monitoring and audit reports	Impacts avoided or managed. Ensure the conditions of the	Continuous

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
	• Compile a rehabilitation programme and rehabilitate disturbed areas. • Compile and implement Alien Invasive Management Plan. Limit access to sensitive areas during construction. • Undertake monitoring to evaluate whether further measures are required.			EA are adhered to.	

8.2.8. Visual

This section deals with the issues relative to visual during the construction phase.

IMPACT/ ASPECT	MITIGATION/MANAGEMENT ACTIONS	RESPONSIBILITY	METHODOLOGY	MITIGATION/ MANAGEMENT OBJECTIVES AND OUTCOMES	FREQUENCY
Visual: Large construction vehicles and equipment will alter the natural character of the study area and	• Carefully plan to mimimise the construction period and avoid construction delays. • Inform receptors within 500m of the site of the construction programme and schedules.	Project management and EPC	As defined by the rehabilitation specialist.	• The surrounding landscape remains rural and agricultural in landscape and land use • Dust generated on site as well as on the	• Commencement of construction

IMPACT/ ASPECT	MITIGATION/MANAGEMENT ACTIONS	RESPONSIBILITY	METHODOLOGY	MITIGATION/ MANAGEMENT OBJECTIVES AND OUTCOMES	FREQUENCY
expose visual receptors to impacts associated with construction. • Construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. • Dust emissions and dust plumes from increased traffic on the gravel roads	• Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. • Vegetation clearing should take place in a phased manner. • Where possible, re-vegetate all reinstated cable trenches with the same vegetation that existed prior to the cable being laid. • Establish erosion control measures on areas which will be exposed for long periods of time. This is to reduce the potential impact heavy rains may have on the bare soil. • Suitable buffers of intact natural vegetation should be provided along the perimeter of the development area.			access road to the site, is well managed and does not become a nuisance factor for the workers or the surrounding farmsteads.	

IMPACT/ ASPECT	MITIGATION/MANAGEMENT ACTIONS	RESPONSIBILITY	METHODOLOGY	MITIGATION/ MANAGEMENT OBJECTIVES AND OUTCOMES	FREQUENCY
serving the construction site may evoke negative sentiments from surrounding viewers. • Surface disturbance during construction would expose bare soil (scarring) which could visually contrast with the surrounding environment. • Temporary stockpiling of soil during	• Maintain a neat construction site by removing rubble and waste materials regularly. • Make use of existing gravel access roads where possible. • Limit the number of vehicles and trucks travelling to and from the construction site, where possible. • Ensure that dust suppression techniques are implemented: • on all access roads; • in all areas where vegetation clearing has taken place; • on all soil stockpiles. • Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.				

IMPACT/ ASPECT	MITIGATION/MANAGEMENT ACTIONS	RESPONSIBILITY	METHODOLOGY	MITIGATION/ MANAGEMENT OBJECTIVES AND OUTCOMES	FREQUENCY
construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.					

8.3. Operation

8.3.1. Socio-Economic

This section deals with the issues relative to socio-economic during the operation phase.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Socio-economic: The plant will increase the size of the local utility sector and stimulate economic production through multiplier effects.	• Procure goods and services required for the operation of the plant from the local economy.	Holder of the EA	Clear communication channels maintained	Continuous
Socio-economic: Creation of jobs to support the operation and maintenance of the plant	• Aim to fill all the positions with labour from the local community	Holder of the EA	Clear communication channels maintained	Continuous
Socio-economic: The generated electricity will improve the security of electricity in the local municipality and increase the government's	• No mitigation measures proposed	N/A	N/A	N/A

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
revenue and service delivery				

8.3.2. Geotechnical

This section deals with the issues relative to geotechnical during the operation phase.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
Geotechnical: Displacement of natural earth material. • Increase in soil erosion due to concentrated flow received off hardstand areas. • Potential oil spillages from maintenance vehicles. • Sedimentation of non-perennial features caused by soil erosion.	• Use of existing roads and tracks. • Rehabilitation of affected areas (such as erosion control mats). • Correct engineering design and construction of roads, water crossings and hardstand areas. • Vehicle repairs to be undertaken in designated areas • Design of and maintenance of stormwater system.	Holder of EA	Clear communication channels. Compliance to all legislative requirements. Ensure the EMPr is adhered to.	Continuous

8.3.3. Aquatic/ Freshwater

This section deals with the issues relative to aquatic freshwater during the operation phase.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Aquatic: The change in flow dynamics to and through wetlands potentially altering wetland types or potentially causing erosion from increased surface runoff.	• Runoff from disturbed areas (such as landing/depot areas, extraction routes, gravel pits, temporary and unpaved roads) must be directed to silt traps (silt fences, sandbags, etc) to remove sediment and reduce the sedimentation of the water bodies. • Check dams are small, temporary dams constructed across a swale or channel. They can be constructed using gravel, rock, gabions, or straw bales. They are used to reduce the velocity of concentrated flow and, therefore, to reduce erosion in a swale or channel.	Holder of EA	All staff members are aware of the EMPr. Ensure EMPr is adhered to.	Continuous
Aquatic: Hydrocarbon spills and compaction within wetland zones.	• Areas (away from surface water bodies and outside of the riparian zone) must be designated for the storage of materials and mixing of materials (such as concrete or chemicals). This reduces contamination of water resources from these materials/ activities. • Portable toilets must be provided where work is being done and must be located	Holder of EA	All staff members are aware of the EMPr. Ensure EMPr is adhered to.	Continuous

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	a considerable distance away from water resources and riparian areas. • If soil contamination occurs (such as due to a spill) the soil must be removed from the site and disposed of appropriately. • Prevention of spills eliminates or minimizes the discharge of pollutants to water bodies. • Handle hazardous and non-hazardous materials, such as concrete, solvents, asphalt, sealants, and fuels, as infrequently as possible and observe all national and local regulations when using, handling, or disposing of these materials. • An effective response plan must be in place and personnel must be ready to mobilise in the event of a spillage to reduce the environmental effects of an oil or chemical spill. • Spill control devices such as absorbent snakes and mats must be placed around chemical storage areas, and they can be used in an emergency to contain a spill. • Implement preventative maintenance system to ensure that work vehicles are maintained in an acceptable condition.			

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	This would involve routinely checking vehicles for leaks before construction begins; and not allowing vehicles with significant leaks to operate or be repaired within the construction site. Ideally, vehicle maintenance and washing occurs in garages and wash facilities, not on active construction sites. • Before an operation occurs near a waterbody, vehicles must be checked for leaks, to reduce soil and water contamination from vehicle fluids. • Old engine oil must NOT be thrown on the ground or down a stormwater drains but rather collected in containers and recycled. • Ensure that appropriate solid waste disposal facilities are provided, and adequate signage is provided for all solid, liquid, and hazardous waste types. These must contain waste products in a weatherproof manner and to prevent any airborne litter, access to scavengers or loss of food residues that may be washed into surface or ground waters. Collected waste needs to be disposed of			

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	at a registered landfill site/hazardous waste facility. • Re-fuelling areas for vehicles must be bunded and located away from water resources and sensitive environments to prevent any accidental spillage contaminating soil or seeping into groundwater aquifers. All servicing area run-off must be directed towards a fully contained collection sump for recovery and appropriate disposal. • There must be no standing water at a stockpile site, to reduce erosion as well as the contamination of the water by nutrients/ toxics. Water resources must be well fenced and sign-posted, to keep machinery, people, and livestock away from the water body as well as vegetated areas to reduce the soil disturbance, soil compaction and vegetation destruction, which thus reduces the amount of erosion and habitat loss.			
Aquatic: Loss of wetland areas through direct impact or indirect impacts of erosion or sedimentation.	During site clearing the vegetation and topsoil is removed, increasing the runoff and erosion potential of flowing water. to mitigate	Holder of EA	All staff members are aware of the EMPr.	Continuous

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	these impacts the following measures must be followed: • Minimise the area of soil disturbance to reduce the impact of sedimentation into waterbodies. • Clearing and grading must occur only where necessary to build and provide access to structures and infrastructure. Clearing must be done immediately before construction, rather than leaving soils exposed for months or years. • Where possible, plants should be cut down to ground level instead of being removed completely to stabilise the soil during land-clearing operations. • The proposed limits of land disturbance must be physically marked off to ensure that only the land area required for the development is cleared. • When excavated areas are backfilled the surface must be level with the surrounding land surface, to minimise soil erosion from the areas when the excavation is complete. • The most efficient approach to control erosion is to minimise the area of land		Ensure EMPr is adhered to.	

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	disturbed as well as the duration for which it is exposed. • Once surfaces have been exposed, they must immediately be protected from erosion, so limiting the source of the sediment. • During the excavation of pits, roads, construction sites etc. the removed topsoil must be stored and appropriately protected so that it does not wash into waterbodies, causing sedimentation and nutrient loading. This is then used to backfill the area so that it can be effectively rehabilitated. • Topsoil that is removed during excavation must NEVER be buried or rendered unusable in any way (such as mixing it with spoils or being compacted by machinery). • During excavation soil must be excavated one layer at a time and stored in separate stockpiles so they can be returned in their natural order when the area is backfilled. This improves soil functions and improves the template for plant growth.			

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	• To ensure that it reaches most people signs must be written in the languages of the area (NOT just English). This ensures that non-English speakers can understand and will hopefully cooperate in reducing water pollution by the measures indicated on the sign. • Within a construction site, vehicle access must be strictly controlled (i.e., there must be set parking, turning areas, set routes and no access to undisturbed areas.) This minimises soil disturbance and compaction and pollution from fluids leaking onto the ground as well as the disturbance of aquatic organisms.			

8.3.4. Avifaunal

This section deals with the issues relative to avifaunal during the operation phase.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Avifauna: Displacement of priority species due to habitat transformation associated with construction of the PV plant and associated infrastructure	• Construction activity should be restricted to the immediate footprint of the infrastructure. • Access to the remainder of the site should be strictly controlled to prevent unnecessary degradation of habitat. • Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum. • The mitigation measures proposed by the vegetation specialist must be strictly enforced.	1. Project Developer 2. Facility Environmental Manager 3. Project Developer and Facility Operational Manager	1. Appointment of rehabilitation specialist to develop HRP. 2. Site inspections to monitor progress of HRP. 3. Adaptive management to ensure HRP goals are met.	Prevent unnecessary displacement of avifauna by ensuring that the rehabilitation of transformed areas is implemented by an appropriately qualified rehabilitation specialist, according to the recommendations of the botanical specialist study.	1. Once-off 2. Once a year 3. As and when required
Avifauna: Entrapment of large-bodied birds in the double perimeter fence	• It is recommended that a single perimeter fence is used				

8.3.5. Terrestrial Biodiversity

This section deals with the issues relative to biodiversity during the operational phase.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
Establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors	• Compile and implement Alien Invasive Management Plan. Rehabilitate disturbed areas.	Holder of EA Operator	Operational monitoring and audit reports	Impacts avoided or managed. Ensure the conditions of the EA are adhered to.	Continuous

8.3.6. Agriculture and Soils

This section deals with the issues relative to Agriculture and Soils during the operation phase.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
Agriculture and Soils: Loss of agricultural land	Avoid any cultivated and especially irrigated areas, if possible.	Facility Environmental Manager	Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of	That existence of hard surfaces causes no erosion on or downstream of the site.	Ongoing basis
Agriculture and Soils: Soil erosion (wind or water)	Avoid extensive vegetation removal; re-vegetate as soon as possible and maintain cover (irrigate if necessary)				

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
caused by surface disturbance			the storm water run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring. Undertake a periodic site inspection to record the progress of all areas that require re-vegetation.	That denuded areas are re-vegetated to stabilise soil against erosion	

8.3.7. Visual

This section deals with the issues relative to visual during the operation phase.

IMPACT/ ASPECT	MITIGATION/MANAGEMENT ACTIONS	RESPONSIBILITY	METHODOLOGY	MITIGATION/MANAGEMENT OBJECTIVES AND OUTCOMES	FREQUENCY
Visual: • The PV arrays may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. • The proposed solar PV facility will alter the visual character of the surrounding area and expose potentially sensitive visual receptor	• Restrict vegetation clearance on the site to that which is required for the correct operation of the facility. • Ensure that the PV arrays are not located within 500m of any farmhouses in order to minimise visual impacts on these dwellings. • As far as possible, limit the number of maintenance vehicles which are allowed to access the site. • Ensure that dust suppression techniques are implemented on all gravel access roads. • Only clear vegetation on site and adjacent to the site which is	Project management and EPC	• Set up a clear management plan with clear accountability structures with set thresholds for triggering of mitigations. • A review of the security lights at night is undertaken by the EPC to check that undue light spillage is not taking place without loss of security.	• Dust generated on site as well as on the access road to the site, is well managed and does not become a nuisance factor for the workers or the surrounding farmsteads. • Lights contrast generated from the buildings as seen from the roads is low and does not attract the attention of the casual observer.	On completion of construction phase. On-going

IMPACT/ ASPECT	MITIGATION/MANAGEMENT ACTIONS	RESPONSIBILITY	METHODOLOGY	MITIGATION/MANAGEMENT OBJECTIVES AND OUTCOMES	FREQUENCY
locations to visual impacts. • Dust emissions and dust plumes from maintenance vehicles accessing the site via gravel roads may evoke negative sentiments from surrounding viewers. • The night time visual environment will be altered as a result of operational and security lighting at the proposed PV facility.	required to be cleared for the correct operation of the facility. • As far as possible, limit the amount of security and operational lighting present on site. • Light fittings for security at night should reflect the light toward the ground and prevent light spill. • If possible, light sources should be shielded by physical barriers (walls, vegetation, or the structure itself); • Lighting fixtures should make use of minimum lumen or wattage. • Mounting heights of lighting fixtures should be limited, or alternatively, foot-light or bollard level lights should be used.				

IMPACT/ ASPECT	MITIGATION/MANAGEMENT ACTIONS	RESPONSIBILITY	METHODOLOGY	MITIGATION/MANAGEMENT OBJECTIVES AND OUTCOMES	FREQUENCY
	• If economically and technically feasible, make use of motion detectors on security lighting. Care should be taken with the layout of the security lights to prevent motorists on the R502 from being blinded by lights.				

8.4. Decommissioning

8.4.1. Socio-Economic

This section deals with the issues relative to socio-economic during the decommissioning phase.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Socio-economic: Land demarcated for the solar PV plant will be sterilized and all current activities	Rehabilitation of land should take place at the end of the project's life to allow for the land to be used for commercial livestock farming after the project's closure.	Holder of EA /Contractor	Clear communication channels. Compliance to all legislative requirements.	Continuous

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
taking place on said land will be discontinued.			Ensure the EMPr is adhered to.	

8.4.2. Avifaunal

This section deals with the issues relative to avifaunal during the decommissioning phase.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Avifauna: Displacement of priority species due to disturbance associated with decommissioning of the PV plant and associated infrastructure	• De-commissioning activity should be restricted to the immediate footprint of the infrastructure. • Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. • Measures to control noise and dust should be applied according to current best practice in the industry. • Maximum used should be made of existing access roads and the construction of new roads should be kept to a minimum.	Holder of EA	Construction monitoring and audit reports	Impacts avoided or managed. Ensure the conditions of the EA are adhered to.	Continuous

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	• The mitigation measures proposed by the vegetation specialist must be strictly enforced				
Avifauna: Entrapment of large-bodied birds in the double perimeter fence	• It is recommended that a single perimeter fence is used	Holder of EA	Construction monitoring and audit reports	Impacts avoided or managed. Ensure the conditions of the EA are adhered to.	Continuous

8.4.3. Terrestrial Biodiversity

This section deals with the issues relative to biodiversity during the decommissioning phase.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
Loss and disturbance of natural vegetation due to the removal of infrastructure and need for working sites	• No additional clearing of vegetation should take place without a proper assessment of the environmental impacts and authorization from relevant authorities. • If any additional infrastructure needs to be constructed, for example overhead powerlines,	Holder of EA Contractor ECO	Construction monitoring and audit reports	Impacts avoided or managed. Ensure the conditions of the EA are adhered to.	Continuous

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
	communication cables, etc., then these must be located next to existing infrastructure, and clustered to avoid dispersed impacts. • No driving of vehicles off-road. Implement Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas. • Access to sensitive areas outside of development footprint should not be permitted during operation. • Surface runoff and erosion must be properly controlled and any issues addressed as quickly as possible				
Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors	• Implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control. • Undertake regular monitoring to detect alien invasions early so that they can be controlled. • Post-decommissioning monitoring should continue for an appropriate length of time to ensure that future problems are avoided. • Do NOT use any alien plants during any rehabilitation that may be required.	Holder of EA Contractor ECO	Construction monitoring and audit reports	Impacts avoided or managed. Ensure the conditions of the EA are adhered to.	Continuous

8.4.4. Agriculture and Soils

This section deals with the issues relative to agriculture and soils during the decommissioning phase.

IMPACT/ ASPECT	MITIGATION/MANAGEMENT ACTIONS	RESPONSIBILITY	METHODOLOGY	MITIGATION/MANAGEMENT OBJECTIVES AND OUTCOMES	FREQUENCY
Agriculture and Soils: Loss of agricultural land	• Avoid any cultivated and especially irrigated areas, if possible	Engineer /Contractor	• Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the storm water run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any	• That disturbance and existence of hard surfaces causes no erosion on or downstream of the site. • That vegetation clearing does not pose a high erosion risk.	Every 2 months during the decommissioning phase, and then every 6 months after completion of decommissioning, until final sign-off is achieved.
Agriculture and Soils: Soil erosion (wind or water) caused by surface disturbance	• Avoid extensive vegetation removal; re-vegetate as soon as possible and maintain cover (irrigate if necessary)				

			erosion occurring. • Undertake a periodic site inspection to record the occurrence of and re-vegetation progress of all areas that require re-vegetation.		

8.4.5. Visual

This section deals with the issues relative to visual during the decommissioning phase.

IMPACT/ ASPECT	MITIGATION/MANAGEMENT ACTIONS	RESPONSIBILITY	METHODOLOGY	MITIGATION/MANAGEMENT OBJECTIVES AND OUTCOMES	FREQUENCY
Visual: Vehicles and equipment required for decommissioning will alter the natural character of the study area and expose visual receptors to visual impacts.	• All infrastructure that is not required for post-decommissioning use should be removed. • Carefully plan to minimize the decommissioning period and avoid delays. • Maintain a neat decommissioning site by	Project management and EPC with inputs from rehabilitation specialist.	As defined by the rehabilitation specialist.	Soil sterilization does not take place and large degraded areas do not occur, with overall landscape integrity maintained.	Within 1 year of closure.

• Decommissioning activities may be perceived as an unwelcome visual intrusion. • Dust emissions and dust plumes from increased traffic on the gravel roads serving the decommissioning site may evoke negative sentiments from surrounding viewers. • Surface disturbance during decommissioning would expose bare soil (scarring) which could visually surrounding environment. • Temporary stockpiling of soil during decommissioning may alter the flat	removing rubble and waste materials regularly. • Ensure that dust suppression procedures are maintained on all gravel access roads throughout the decommissioning phase. • All cleared areas should be rehabilitated as soon as possible Rehabilitated areas should be monitored post-decommissioning and remedial actions implemented as required.				

landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.					

8.4.6. Geotechnical

This section deals with the issues relative to Geotechnical during the decommissioning phase.

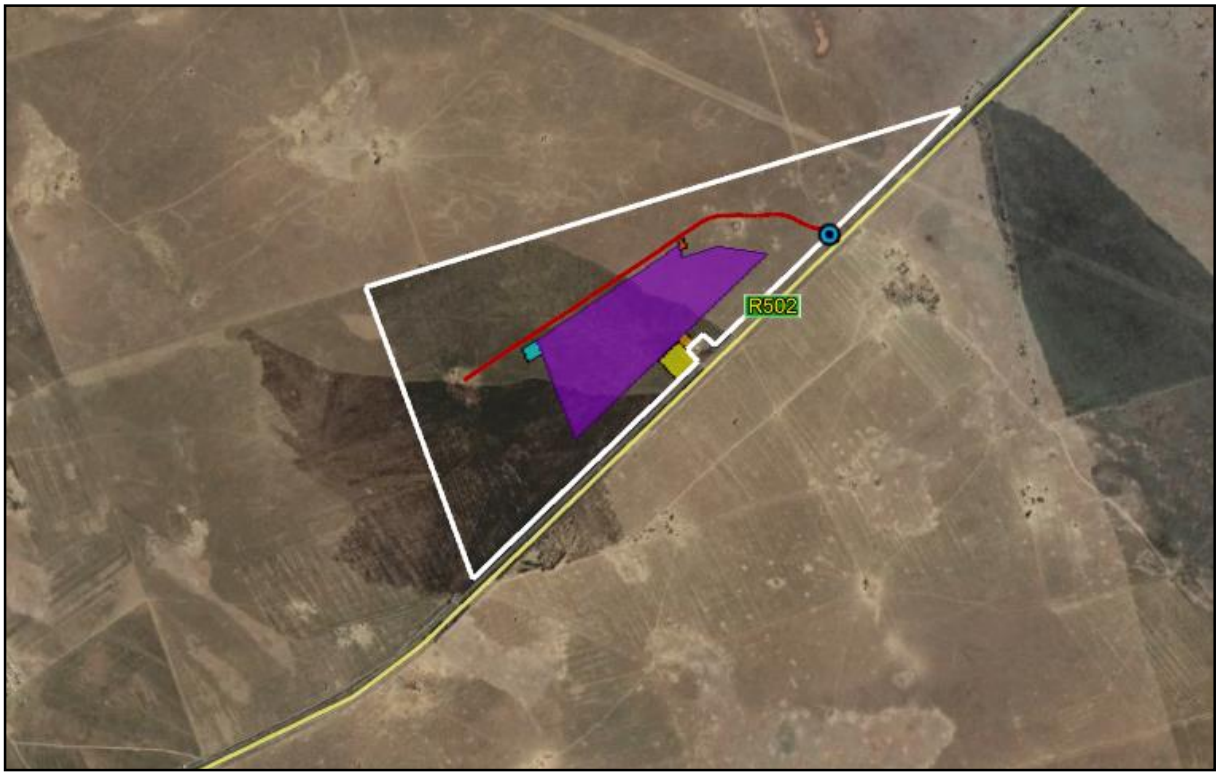
ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
Geotech: Decommissioning of the structure will disturb the geological environmental. 1) Increase in soil and wind erosion due to clearance of structures 2) Construction and earthmoving	• Use of existing roads and tracks. • Use of temporary berms and drainage channels to divert surface water during flooding. • Minimize earthworks and demolish footprints. • Use of existing roads and tracks. • Rehabilitation of affected areas (such as regrassing).	Holder of EA	Clear communication channels. Compliance to all legislative requirements. Ensure the EMPr is adhered to.	Continuous

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
vehicles will displace the soil. 3) Creation of drainage paths 4) Potential oil spillages from vehicles 5) Excessive sediments in non-perennial features	• Develop a chemical spill response plan. • Develop dust and demolitation fly supression plan. • Reinstate channelized drainage features.			

APPENDIX 1: METHOD STATEMENTS

To be prepared by the contractor prior to commencement of the activity. The method statements are **not required** to be submitted to the CA.

APPENDIX 2: STORMWATER MANAGEMENT PLAN

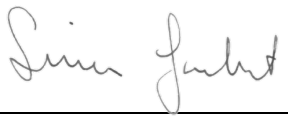


UPGRADE ENERGY (PTY) LTD

Leeuwbosch PV3 SWMP

Stormwater Management Plan

Issue Date: 17 November 2022
Revision No: 0
Project No: 17420
Document No: 17420-LEEUBOSCH_PV3-SWMP-NH-REV0

Date:	17 November 2022
Document Title:	17420 – Leeuwbosch PV3 SWMP
Revision Number	0
Author	Ntuthuko Hlanguza
Checked By:	Simon Joubert
Approved By:	Simon Joubert
Signature:	
Client:	Upgrade Energy (Pty) Ltd

Confidentiality Statement

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UPGRADE ENERGY (PTY) LTD

LEEUWBOSCH PV3 SWMP

1. INTRODUCTION & BACKGROUND

Upgrade Energy (Pty) Ltd propose to construct four 15MWac Photovoltaic (PV) facilities and associated infrastructure on Farm Wildebeestkuil 59 and Farm Leeuwbosch 44, approximately 6-8km east of Leeudoringstad in the North West Province. The proposed sites are located within the Maquassi Hills Local Municipality which falls within the Dr Kenneth Kaunda District Municipality.

SiVEST SA (Pty) Ltd (SiVEST) were appointed to undertake the Basic Assessment Process which requires various specialist studies. SiVEST's Civil Engineering Division was appointed as the specialist consultant to develop a conceptual stormwater management plan (SWMP) for each of the proposed sites.

This SWMP focuses on the Leeuwbosch PV3 site which is located on Farm Leeuwbosch 44 (Portion 37). This report serves to provide a broad guideline for the developers, owners and professional teams to manage the stormwater and comply with the necessary rules and regulations of the relevant authorities and should not be viewed as a detailed design report.

2. OBJECTIVES & SCOPE OF WORK

The main objective of the study is to develop a conceptual stormwater management plan for Site PV3. The scope of works comprises the following:

- Data collection;
- Liaison with the client;
- Site inspection to confirm topographical conditions;
- Hydrological assessment of the site;
- Development of conceptual drawings and design guidelines; and Compilation of the SWMP in the form of report.

3. DATA COLLECTION

The following data was collected and used to undertake this study:

- 5m contour data from Planet GIS;
- Technical project information and proposed development footprint from SiVEST Environmental;
- Climate information from South African Weather Services;
- Design Rainfall data (JC Smithers & RE Schulze);
- Aerial Imagery from Google Earth and ESRI online base maps.

4. PROJECT DESCRIPTION

It is anticipated that the proposed Solar PV energy facility will include PV fields (arrays) comprising of multiple PV panels. In summary, the proposed SEF development will include the following components:

- The proposed solar PV plant will include PV fields (arrays) comprising multiple PV modules;
- PV panels will be single axis tracking mounting, and the modules will be either crystalline silicon or thin film technology;
- Each PV module will be approximately 2274mm (≈2.3m) long and 1134mm (≈1.1m) wide and mounted on supporting structures above ground;
- The foundations will most likely be either concrete or rammed piles;
- Generation capacity of up to 15MWac;
- The dimension of the PV panels will be approximately 2.3 m wide by 1.1 m long;
- One (1) new 33/132kV on-site substation (facility substation) occupying an area of up to approximately 0.2003ha (2 003m^2);
- Site and internal access roads, up to 4m wide, will provide access to the PV arrays. Existing site roads will be used wherever possible, although new site roads will be constructed where necessary;
- One (1) guard house approximately 0.0876 ha (876m^2) in size;
- One (1) temporary building zone 0.2944 ha (2 944m^2);
- Galvanized steel fencing with electrification approximately 2.1m in height;
- Existing boreholes will be used where possible. Water will potentially be stored in water storage tanks;

The project locality and proposed layout are depicted in Figure 4-1 and Figure 4-2 below.

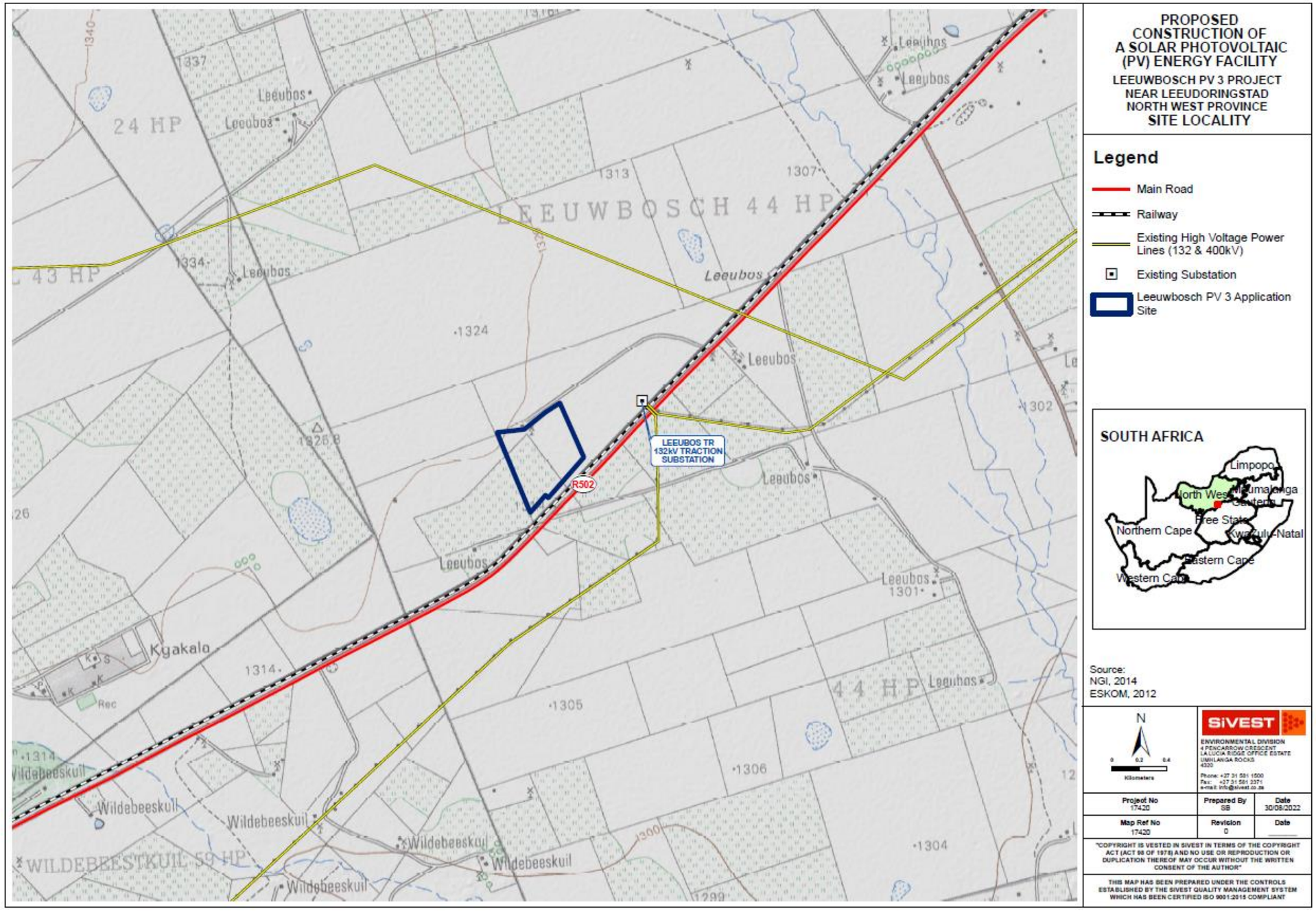


Figure 4-1: Site Locality

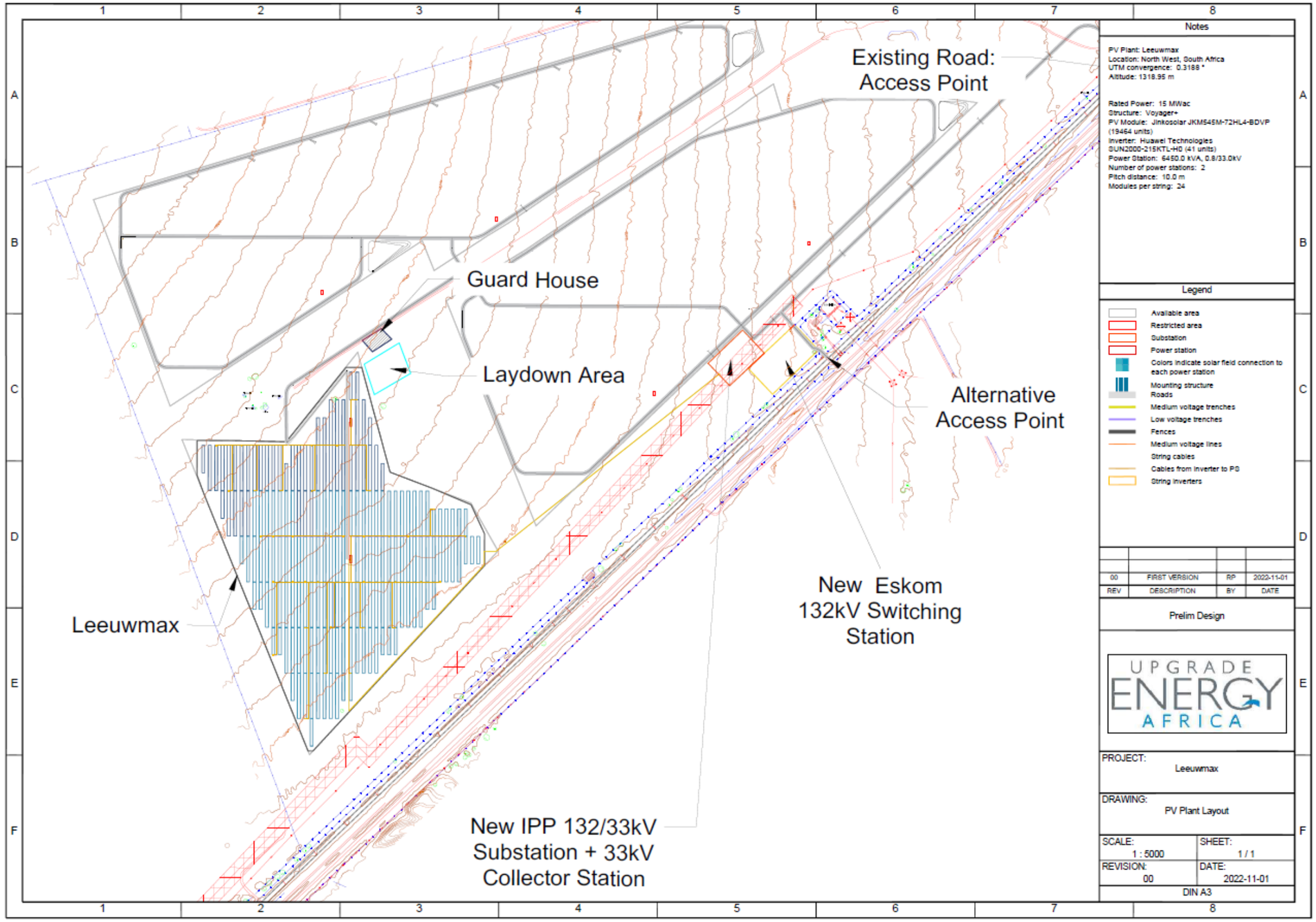


Figure 4-2: Leeuwbosch PV3 Site Layout

5. STORMWATER MANAGEMENT PHILOSOPHY

Development is a process of change or growth that usually involves the construction of buildings, roads and infrastructure which leads to a change in the hydraulic properties of an area. Permeable layers become less permeable or impermeable resulting in increased surface runoff and flood volumes. Conduits are constructed to drain runoff more efficiently resulting in shorter catchment response times and increased peak flows. Natural vegetation is often removed, reducing interception and transpiration and exposing soil to the impact of rain which may lead to increased erosion.

In order to lessen the negative impacts and enhance the positive impacts on the environment as a result of development, responsible management of stormwater is required. This can be achieved through the implementation of various mitigation measures in accordance with drainage requirements and guidelines as set out by the local authority.

Stormwater Management policies require that, for storms of similar recurrence intervals, the post-development runoff from an area may not exceed the runoff generated under the pre-development condition. The study area falls within The Maquassi Hills Local Municipality and, in the absence of site specific design guidelines, the stormwater drainage system should be designed in accordance with the criteria given in the "Red Book" [1] as well as the Drainage Manual[2]. This drainage system can be divided into minor and major stormwater systems.

The minor stormwater system comprises elements that aid in conveying stormwater runoff from within the development and road reserves to the major stormwater system. These elements include catch pits inlet structures, gutters, berms, canals, road verges, pipes and culverts.

The major stormwater system comprises elements of the minor system, road surfaces, natural low points, streams, rivers, wetlands, dams and flood attenuation structures necessary to control and drain stormwater or larger storms without damage and loss of life.

Stormwater runoff shall not be concentrated to an extent that would result in any damage to the downstream riverine ecology and/or built environment during storms with a recurrence interval exceeding 1:10 years and would result in only minor, repairable damage during storms with a recurrence interval exceeding 1:50 years.

To this end, the minor and major stormwater systems shall be designed to convey and withstand the 1:10 and 1:50 year flood events respectively. This is a guideline and the onus is on the design engineer to determine the risks associated with a storm with a specific recurrence interval. For areas where the risk of loss is unacceptably high, a higher recurrence interval and a higher level of service may need to be considered. For larger structures such as bridges and major culverts, the Department of Transport's specific requirements shall be considered.

Drainage systems must be maintained in a clean state, free of any rubbish, debris and matter likely to restrict the flow of stormwater or pose a pollution threat regulated by the departments of Water Affairs & Forestry, Environmental Affairs & Tourism and Health.

The Stormwater Management Philosophy for the development encourages the developer, the professional teams and contractors to do the following:

- Maintain adequate ground cover in all areas at all times to reduce the risk or erosion by wind, water and all forms of traffic;
- Prevent concentration of stormwater flow at any point where the ground is susceptible to erosion. Where unavoidable, adequate protection of the ground must be provided;

[1] *Guidelines for Human Settlement Planning and Design compiled by CSIR Building and Construction Technology*
[2] *Drainage Manual 6th Edition, Published by The South African National Roads Agency SOC Ltd, 2013*

- Reduce stormwater flows as much as possible by providing effective attenuation measures;
- Ensure that development does not increase the rate of stormwater flow above that which the natural ground can safely accommodate at any point;
- Ensure that all stormwater control works are constructed in a safe and aesthetic manner in keeping with the overall development;
- Prevent pollution of waterways and water features;
- Contain soil erosion by constructing protective works to trap sediment at appropriate locations. This applies particularly during construction; and
- Avoid situations where natural or artificial slopes may become saturated and unstable, both during and after the construction process.

The main stormwater management objectives and criteria that are considered to be relevant to the design and planning of stormwater drainage systems include:

- Minimising the threat of flooding;
- Minimising public inconvenience caused by frequent storms;
- Protecting the public and preventing the loss of life due to severe storms and/or malfunctioning drainage systems;
- Preventing erosion and siltation;
- Protection of receiving water bodies;
- Minimising costs;
- Sustainability of stormwater management systems; and
- Environmental and water pollution considerations.

6. HYDROLOGICAL ASSESSMENT

The methods described in the Drainage Manual were used to carry out hydrological assessments of the catchments and site.

6.1. CATCHMENT DESCRIPTION

The catchment is small (1.09 km²) and flat (<3%) and falls within the C25A quaternary catchment. It has the shape of a fairly proportioned polygon and has no evidence of clearly defined watercourses. Overland sheet flow occurs in a south-easterly direction through the site to meet the railway adjacent to the main road (R502). The catchment runoff eventually discharges into the Klipspruit.

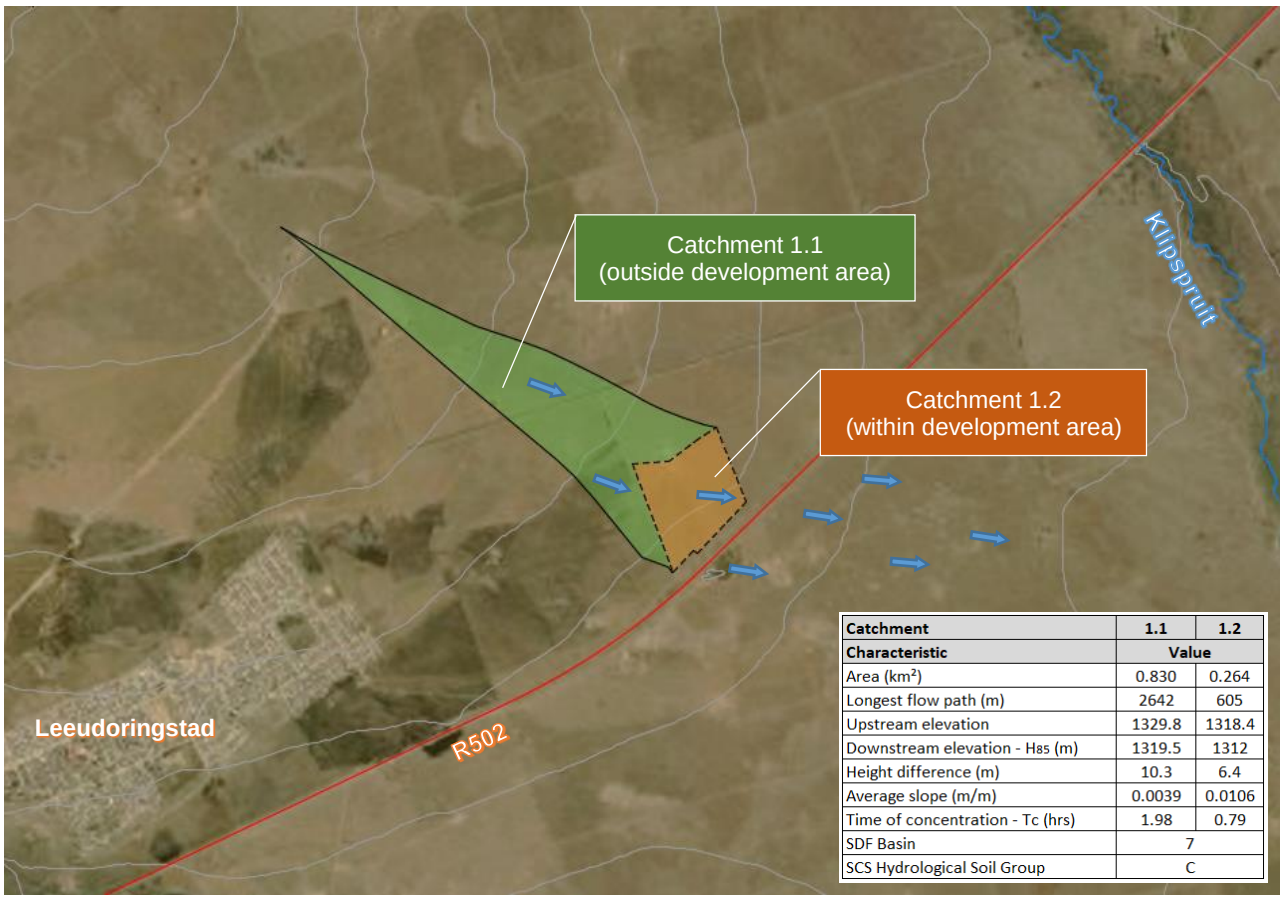
The landuse is predominantly rural grasslands. Soils were classed under the SCS hydrological soil group C, which have a moderately high stormflow potential (slow infiltration rates, shallow soil depths and restricted permeability).

The catchment was subdivided to separate the application site from the upper catchment. This would help determine the runoff entering and leaving the site which may be used in the design of mitigation measures if/where needed.

The site is located approximately 2.8 km away from the nearest river edge and will therefore not impact on or be impacted by a flood line.

6.2. CATCHMENT CHARACTERISTICS

The contributing catchments and their characteristics were determined using the existing 5m contours and aerial imagery. The catchment characteristics and delineations are illustrated in Figure 6-1 below.



Catchment	1.1	1.2
Characteristic	Value	
Area (km²)	0.830	0.264
Longest flow path (m)	2642	605
Upstream elevation	1329.8	1318.4
Downstream elevation - H85 (m)	1319.5	1312
Height difference (m)	10.3	6.4
Average slope (m/m)	0.0039	0.0106
Time of concentration - Tc (hrs)	1.98	0.79
SDF Basin	7	
SCS Hydrological Soil Group	C	

Figure 6-1: Catchments

6.3. CLIMATE

According to the Köppen-Geiger map updated by the CSIR to quantify the current South African climatic conditions, the site is given a BSk classification. This is indicative of a semi-arid climate, with cool, dry winters and warm to hot summers.

December and January are the hottest months of the year with an average temperature of approximately 30°C. June and July are the coldest months of the year with an average temperature of approximately 17°C.

The mean annual precipitation is approximately 550mm with most rainfall occurring during summer. The Design Rainfall Estimation[3] software was used to obtain the rainfall data (tabulated below) required for the runoff calculations.

[3] *Design Rainfall Estimation in South Africa Version 3 developed by MJ Gorven, JC Smithers and RE Schulze*

Table 6-1: Design Rainfall

Return Period		2yr	5yr	10yr	20yr	50yr	100yr	200yr
Duration		Rainfall Depth (mm)						
5	m	9.40	12.70	14.90	17.20	20.30	22.70	25.10
10	m	13.90	18.80	22.20	25.55	30.10	33.70	37.30
15	m	17.55	23.70	28.00	32.20	37.95	42.45	47.05
30	m	22.20	30.00	35.40	40.80	48.05	53.75	59.55
45	m	25.50	34.45	40.65	46.80	55.15	61.70	68.35
60	m	28.10	38.00	44.85	51.65	60.85	68.05	75.40
90	m	32.30	43.60	51.45	59.30	69.85	78.10	86.55
120	m	35.60	48.10	56.75	65.40	77.05	86.15	95.45
240	m	41.65	56.25	66.40	76.45	90.15	100.75	111.65
360	m	45.65	61.65	72.75	83.85	98.75	110.45	122.40
480	m	48.70	65.85	77.65	89.45	105.40	117.85	130.65
600	m	51.25	69.25	81.65	94.10	110.85	123.95	137.40
720	m	53.40	72.15	85.15	98.05	115.55	129.15	143.20
960	m	57.00	76.95	90.85	104.65	123.30	137.80	152.80
1200	m	59.95	80.95	95.55	110.05	129.70	145.00	160.70
1440	m	62.45	84.35	99.55	114.70	135.10	151.10	167.50
1	d	51.95	70.15	82.80	95.40	112.40	125.60	139.30
2	d	63.85	86.35	101.85	117.35	138.20	154.55	171.30
3	d	72.15	97.45	115.00	132.45	156.05	174.45	193.40
4	d	78.25	105.70	124.80	143.70	169.35	189.30	209.85
5	d	83.40	112.65	132.90	153.10	180.45	201.65	223.60
6	d	87.80	118.60	140.00	161.25	190.05	212.40	235.50
7	d	91.75	123.90	146.25	168.50	198.55	221.90	246.00

6.4. PEAK RUNOFF FLOWS

The runoff peak values were calculated using the widely-used Rational Method, which is considered appropriate for catchments less than 15km2. The Rational Method is based on a simplified representation of the law of conservation of mass and the hypothesis that the flow rate is directly proportional to the size of the contributing area and the rainfall intensity, with the latter a function of the return period. It is a method of estimating the runoff in a drainage basin at a specific point in time by means of the rational formula,

$$Q = \frac{CIA}{3.6},$$

where *C* is a runoff coefficient based on the type of surface,
I is the rainfall intensity in mm per hour, and
A is the area in km^2.

Three phases of the project were considered and assessed. These included the pre-development, construction and post-development scenarios.

6.4.1. Pre-Development

The pre-development catchment is considered predominantly flat (<3%), semi-permeable, and covered with grasslands and light bush.

The adopted pre-development peak flows are tabulated below with the detailed calculations included in Appendix A

Table 6-2: Adopted Pre-Development Peak Runoff Flows

Return Period	1:2	1:5	1:10	1:20	1:50	1:100
Catchment	**Peak Runoff (m^3/s)**					
1.1	1.03	1.48	1.86	2.27	2.82	3.31
1.2	0.36	0.53	0.68	0.88	1.28	1.72

Peak flows for sub-catchment 1.1 will remain the same for all phases since all development considered in this study fall entirely within sub-catchment 1.2. Sub-catchment 1.1 is therefore not included in the assessment of the construction phase and post-development phase. It is recommended that the runoff from sub-catchment 1.1 be controlled separately through the use of berms or similar measures in order not to compound the stormwater management requirements of sub-catchment 2 during and after construction.

6.4.2. Construction Phase

During construction the site will be highly susceptible to erosion and other stormwater-related impacts. Activities such as site clearance, topsoil removal, excavation and compaction of soils due to plant and vehicular traffic all contribute towards reducing infiltration and permeability and increasing stormwater runoff. The construction site will be deemed highly impermeable during this phase.

The adopted peak flows for the construction phase are tabulated below with the detailed calculations included in Appendix A

Table 6-3: Adopted Construction Phase Peak Runoff Flows

Return Period	1:2	1:5	1:10	1:20	1:50	1:100
Catchment	**Peak Runoff (m^3/s)**					
1.2	1.20	1.64	1.94	2.25	2.67	3.00

6.4.3. Post-Development

The proposed layout as well as research on similar facilities were used to make reasonable assumptions regarding the design of the PV facility. The final detailed design will influence the layout and arrangement of the PV arrays and therefore its footprint. It is understood that the 15MW solar PV Facility will occupy approximately 18 Ha. The estimated portion of land each component will typically occupy is summarised below.

Table 6-4: Typical Landuse Proportions for PV Facility

Component	% of footprint	Area (Ha)	% of Farm (125Ha)
Total Facility Area	100%	18	14.4%
PV Arrays	90%	16.2	13.0%
Buildings Substations Transformers	5%	0.9	0.7%
Internal and Access Roads	5%	0.9	0.7%

The actual runoff distribution patterns can only be determined once the final layout of the PV facility and associated infrastructure is available.

Whilst the PV panels are impervious and occupy the majority of the site area, they will not significantly impact on the runoff volume. They will be mounted on a structure (typically a modular frame or vertical poles) which will keep them elevated above and off the ground. The structure will either be pile driven or require concrete strip footings depending on the soil conditions. The impact of these mounting structures on the effective pervious area is deemed to be negligible. The critical factor therefore is the ultimate finished condition of the ground surface underneath the PV panels. Two finished-ground options are considered: re-vegetation to the original state; and bare ground or hardstand.

Option 1: Re-vegetation

Re-vegetating the ground is the ideal option from a stormwater management perspective as it significantly reduces the impact of the development on stormwater runoff. However, it cannot be guaranteed that pre-development vegetation can re-establish itself under the shading of PV panels, therefore the input of a vegetation specialist would be required. Furthermore, an appropriate maintenance regime would be required since overgrowth might hinder the performance of the panels and undergrowth might negate the envisaged runoff mitigation.

Option 2: Bare Ground or Hard Stand

It is common for solar PV facilities to maintain bare ground under the panels through soil poisoning, or to construct hard-stands under the panels. This simplifies the maintenance of the ground surface and avoids the operational hazard of overgrown vegetation. This option, however, results in higher stormwater runoff.

Notwithstanding the finished-ground options discussed above, other hardened (impervious) areas amount to 2.6 Ha (see Table 5-4), which is just over 10% of the facility.

The adopted peak flows for the post-development phase are tabulated below with the detailed calculations included in Appendix A.

Table 6-5: Adopted Post-Development Peak Runoff Flows

Return Period	1:2	1:5	1:10	1:20	1:50	1:100
Catchment	**Peak Runoff (m^3/s)**					
1.2 – Option 1	0.70	0.95	1.12	1.29	1.52	1.70
1.2 – Option 2	1.65	2.24	2.64	3.04	3.59	4.00

6.4.4. Attenuation

For attenuation of stormwater runoff to pre-development flows, the required attenuation volume for each phase is estimated using approximate hydrographs of the corresponding phase storm and the pre-development storm, as depicted in Figure X.

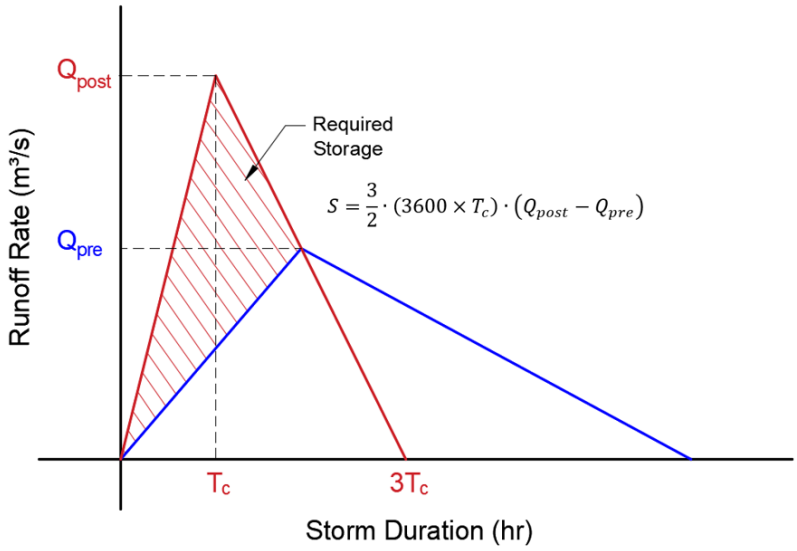


Figure 6-2: Required attenuation volume

A summary of the adopted peak flows for each phase together with the estimated attenuation volumes are tabulated below. These values are subject to refinement at the detail design stage.

Table 5-6: Attenuation volumes

Aspect	Tc	1:2	1:5	1:10	1:20	1:50
Pre-development flow (m³/s)	0.79	0.53	0.77	0.97	1.18	1.47
Construction phase flow (m³/s)	0.47	1.20	1.64	1.94	2.25	2.67
Post-development Opt 1 flow (m³/s)	0.47	0.70	0.95	1.12	1.29	1.52
Post-development Opt 2 flow (m³/s)	0.79	1.65	2.24	2.64	3.04	3.59
Development storage (m³)		1 705	2 205	2 487	2 737	3 069
Post-development Option 1 storage (m³)		717	764	660	481	239
Post-development Option 2 storage (m³)		2 851	3 730	4 257	4 744	5 396

7. STORMWATER MANGEMENT POLICY

The following rules are to be observed by the owner, developer, professional team, contractors and sub-contractors:

- Development designs must include measures for attenuating the concentration of and, increase in stormwater runoff. The post-development peak flows are to be attenuated back to pre-development conditions;
- Before the commencement of any construction activities, a plan must be agreed upon which details the measures to be implemented to control and prevent erosion during and after construction;
- On-site stormwater control systems, such as swales, berms and attenuation ponds are to be constructed before any other construction commences. These systems are to be monitored and appropriately adjusted as construction progresses to ensure complete stormwater, erosion and pollution control at all times;
- All embankments to be formed must be adequately stabilized;
- Stormwater must not be allowed to pond in close proximity to building foundations;
- An approved landscaping and re-vegetation plan must be implemented immediately after building works have reached a stage where newly established ground cover is not at risk from the construction works;
- No work is to commence without an approved Stormwater Control Plan (SCP). The SCP must describe what stormwater control measures are to be implemented before, during and after construction. Plans must indicate all persons responsible for the design and on-site monitoring during each stage of the implementation of the control measures;
- The SCP must show that all the provisions, regulations and guidelines contained in this document have been considered;
- In the event of a failure to adequately implement the approved SCP, the contractor shall be responsible for making good all consequential damage at his own cost. The developer is therefore advised to ensure that all members of the professional team and contractors are competent to undertake the development work and are adequately insured;
- The management of stormwater run-off during construction will be controlled by the Environmental Management Plan (EMP) as produced by the Environmental Control Officer (ECO). All construction activities within the development must comply with the EMP. This document is supplementary to the EMP and the control measures set out herein are not to be considered all-encompassing as the contractor will also have to adapt his control measures to the varying onsite conditions;
- All elements of the minor stormwater system shall be designed to safely accommodate and convey the 1:10 year storm event to the major stormwater system elements, which will be designed to accommodate the 1:50 year storm event. Exceptions to these capacities are to be made by the design engineer after assessing the risks;
- Attenuation/Detention facilities will be located at appropriately selected sites based on geotechnical, environmental and topographical conditions, including wetland conservation;
- Where conditions permit, open ditches, drains and channels will be used instead of pipes. On steeper slopes, where high flow velocities are anticipated, appropriate linings for all channels must be provided to withstand erosion. Such linings will vary from vegetated earthen to stone pitching and reinforced concrete;
- Flow velocities must be reduced wherever possible to reduce the erosion potential in channels, natural ground and points of flow concentration (typically at outlets);
- Silt, trash and oil traps must be strategically provided to ensure water quality is not compromised and to prevent blockages in the drainage systems;
- Areas within the proposed development that bound on stormwater attenuation areas, near road crossings, watercourse confluences and water features might be subject to flooding. In these situations, all development should take place above the outfall levels with an appropriate freeboard allowance;

- For areas flowing into the development area, potential future development in these sub-catchments should be considered and any stormwater attenuation requirements should be identified. Likewise, consideration must be given to the stormwater flowing out of the development which may impact on the downstream areas and watercourses. Appropriate measures must be taken to ensure any upstream development does not result in an increased flood damage risk downstream; and
- All natural and unlined channels should be inspected for adequate binding of soil by sustainable ground cover. Stone pitching should be used to reinforce channel inverts on steep slopes. Existing wetlands and stormwater attenuation areas should be protected from encroachment by the development.

8. GUIDELINES FOR OWNERS AND DEVELOPERS

The buildings/structures within the development will be required to control stormwater runoff in accordance with the stormwater management philosophy and policies of the local authority / municipality. The following guidelines are intended to assist in the design of the major and minor stormwater systems infrastructure, and to ensure that the objectives of this SWMP are met during the planning, design, construction and operational phases of all developments.

8.1. BUILDINGS

Any building will inevitably result in some degree of flow concentration, or deflection of flow around the building. The developer/owner shall ensure that all stormwater flow paths are protected against erosion. Discharge from the site must be attenuated back to the pre-development state.

Any inlet to a piped system shall be fitted with a screen, or grating to prevent debris and refuse from entering the stormwater system. This must be installed immediately on installation of the infrastructure.

No building works, earthworks, walls or fences may obstruct or encroach on a watercourse inside or outside the site without approved plans that do not compromise the objectives of the Stormwater Management Plan.

8.2. ROOF DRAINAGE

Building designs must ensure that rainfall runoff from roofing and other areas, not subjected to excessive pollution, be efficiently captured for re-use where possible for on-site irrigation and non-potable water uses.

Where storage for re-use and where ground conditions permit, rainwater runoff should be connected to detention areas to maximize groundwater recharge. These detention areas must be designed to contain at least the first hour of a minor storm's runoff without before overflowing.

8.3. PARKING AND PAVED AREAS

Parking or paved areas should be designed to attenuate stormwater runoff to an acceptable degree by allowing ponding or infiltration. Stormwater from such areas must be discharged in a controlled manner either as overland sheet flow or to larger attenuation facilities.

8.4. ROADS

Roads should be designed and graded to avoid concentration of flow along and off the road. Where flow concentration is unavoidable, measures to incorporate the road into the major stormwater system should be taken, with the provision of attenuation storage facilities at suitable points.

Culverts must be designed to ensure that the capacity of the culvert does not exceed the pre-development stormwater flow at that point and attenuation storage should be provided on the upstream side of the road crossing.

Outlet and culvert discharge points into the natural watercourse must be designed to dissipate flow energy and any unlined downstream channel must be adequately protected against soil erosion.

8.5. SUBSURFACE DISPOSAL OF STORMWATER

Any construction providing for the subsurface disposal of stormwater should be designed to ensure that such disposal does not cause slope instability, or areas of concentrated saturation or inundation. Infiltration structures should be integrated into the terrain so as to be unobtrusive and in keeping with the natural surroundings.

8.6. CHANNELS

Channels may be constructed to convey stormwater directly to a natural watercourse where deemed necessary and unavoidable. The channels must be suitably lined to prevent erosion and scour and provide maximum possible energy dissipation of the flow. Such linings will vary from vegetated earthen to stone pitching and reinforced concrete.

8.7. ENERGY DISSIPATION

Measures should be taken to dissipate flow energy wherever concentrated stormwater flow is discharged down an embankment or erodible slope.

8.8. OPEN TRENCHES

Open trenches should not be left open and unprotected for extended periods and should be progressively backfilled as construction proceeds. Excavated material to be used as backfill must be placed close to the trench on the upstream side to avoid loose material from washing away.

8.9. STOCKPILES

Material is to be stockpiled away from drainage paths. Loose material such as stone, sand or gravel must be covered or kept damp to minimise dust. Temporary silt screens are to be positioned immediately downstream of stockpiles to intercept loose material which may be washed away.

8.10. PHOTOVOLTAIC PANELS

Orientation of panels shall be considered with respect to drainage pattern, flow concentration, drainage area and velocity. Rows perpendicular to the contours may result in higher runoff concentrations, therefore the configuration should be designed and constructed such that the runoff remains as sheet flow across the entire site.

The panels shall be designed and constructed in such a manner as to allow vegetative growth and maintenance beneath and between panels. If the lowest vertical clearance of the panels above the ground is greater than 3m, non-vegetative control measures will be required to prevent/control erosion and scour along the drip line or otherwise provide energy dissipation from the water running off the panels.

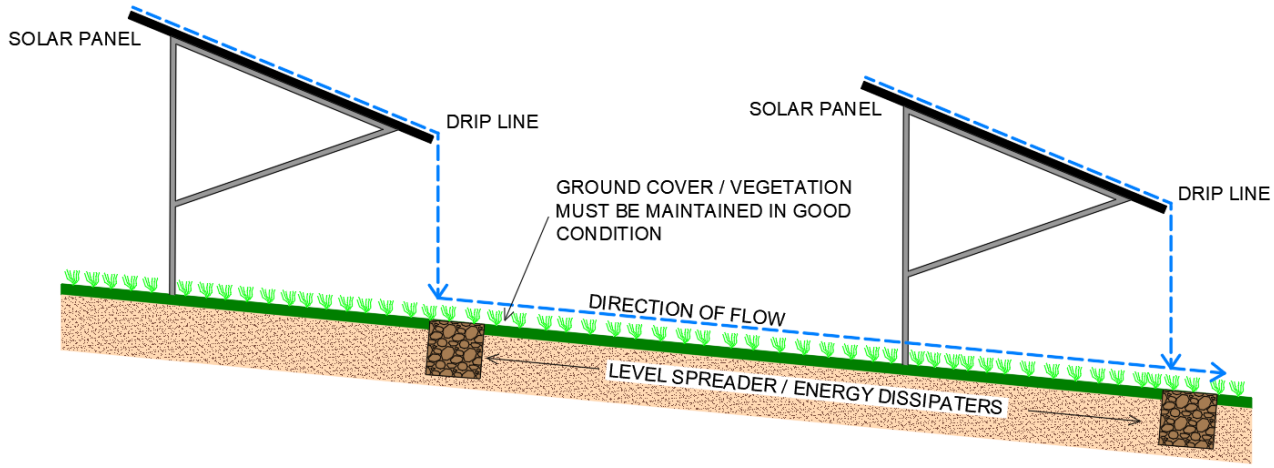


Figure 8-1: Stormwater control of PV panel runoff

8.11. STORMWATER POLLUTION CONTROL

The stormwater systems should be free from any materials that could have a detrimental effect on the fauna, flora and aquatic life in the water systems.

Sites which generate “dirty” (Grey or Black) water must have measures in place that separates the clean and “dirty” water. Depending on the nature of the “dirty” water, this must either be discharged into the wastewater system or contained on site for treatment or packaging before being re-used or disposed of. It is important that the wastewater system does not flood and overflow into the stormwater systems and designers must ensure there is sufficient capacity for the wastewater system to receive this “dirty” water.

Any site that is required to store substances that could be regarded as hazardous in terms of water pollution must take measures to ensure spillages of such substances can be adequately contained and prevent contamination of the water resources within the development area.

9. COMPLIANCE WITH STORMWATER MANGEMENT POLICY

This document should be read in conjunction with the EMP. The developer, owner and professional team, shall be responsible for ensuring that the requirements and conditions as set out in the EMP are to be adhered to.

The developer, owner and the professional team shall be responsible for the performance of all stormwater control measures implemented on the site and the impact such works may have on downstream or

neighbouring properties. Approval of any plan or document shall not be construed as absolving the developer, owner, and professional teams of this responsibility.

10. CONCLUSIONS & RECOMMENDATIONS

The following may be concluded:

- The hydrological assessment (Section 5) reveals that the proposed development/infrastructure will have a moderate impact on the stormwater quality and quantities post-development (operational phase). This impact can be successfully mitigated on site through re-vegetation and/or attenuation.
- The highest impact will occur during the construction phase and it is important that these impacts are strictly managed under the advisement of the guidelines set out in this document.
- The need for formal stormwater interventions can be minimised if the development is designed to maintain the existing drainage patterns. Overland flow via poorly-defined drainage paths will be the primary form of conveyance.
- A detailed stormwater management plan describing and illustrating the proposed stormwater and erosion control measures must be prepared by the Civil Engineers during the detailed design phase.

It is recommended that:

- The proposed development be approved in respect of its stormwater impacts;
- The policy described in Section 6 be implemented;
- The guidelines described in Section 7 be incorporated into the detailed design of the development.

Annexure A:

Calculations

Pre-Development Runoff Calculations

Catchment 1.1

Return Period	Tc (hrs)	Rainfall (mm)	Intensity (mm/hr)	A (Km^2)	C	Q (m^3/s)
1:2yr	1.98	35.6	18.0	2.47	0.35	3.31
1:5yr	1.98	48.1	20.1	2.47	0.35	4.47
1:10yr	1.98	56.8	21.96	2.47	0.35	5.27
1:20yr	1.98	65.4	25.27	2.47	0.35	6.07
1:50yr	1.98	77.1	29.82	2.47	0.35	7.16
1:100yr	1.98	86.1	33.31	2.47	0.35	8.00

Catchment 1.2

Return Period	Tc (hrs)	Rainfall (mm)	Intensity (mm/hr)	A (Km^2)	C	Q (m^3/s)
1:2yr	1.39	31.3	22.52	1.26	0.35	2.76
1:5yr	1.39	42.3	30.43	1.26	0.35	3.73
1:10yr	1.39	49.9	35.90	1.26	0.35	4.40
1:20yr	1.39	57.5	41.37	1.26	0.35	5.07
1:50yr	1.39	67.8	48.78	1.26	0.35	5.98
1:100yr	1.39	75.8	54.53	1.26	0.35	6.68

Construction Phase Runoff Calculations

Catchment 1.1

Return Period	Tc (hrs)	Rainfall (mm)	Intensity (mm/hr)	A (Km^2)	C	Q (m^3/s)
1:2yr	2.75	37.9	13.78	2.47	0.35	3.31
1:5yr	2.75	51.2	18.62	2.47	0.35	4.47
1:10yr	2.75	60.4	21.96	2.47	0.35	5.27
1:20yr	2.75	69.5	25.27	2.47	0.35	6.07
1:50yr	2.75	82	29.82	2.47	0.35	7.16
1:100yr	2.75	91.6	33.31	2.47	0.35	8.00

Catchment 1.2

Return Period	Tc (hrs)	Rainfall (mm)	Intensity (mm/hr)	A (Km^2)	C	Q (m^3/s)
1:2yr	1.39	31.3	22.52	1.26	0.48	3.78
1:5yr	1.39	42.3	30.43	1.26	0.48	5.11
1:10yr	1.39	49.9	35.90	1.26	0.48	6.03
1:20yr	1.39	57.5	41.37	1.26	0.48	6.95
1:50yr	1.39	67.8	48.78	1.26	0.48	8.19
1:100yr	1.39	75.8	54.53	1.26	0.48	9.16

Catchment 1 (Combined Catchment)

Return Period	Tc (hrs)	Rainfall (mm)	Intensity (mm/hr)	A (Km^2)	C	Q (m^3/s)
1:2yr	3.07	38.8	12.64	3.73	0.39	5.11
1:5yr	3.07	52.5	17.10	3.73	0.39	6.91
1:10yr	3.07	62	20.20	3.73	0.39	8.16
1:20yr	3.07	71.3	23.22	3.73	0.39	9.38
1:50yr	3.07	84	27.36	3.73	0.39	11.06
1:100yr	3.07	93.9	30.59	3.73	0.39	12.36

Post-Development Runoff Calculations

Catchment 1.1

Return Period	Tc (hrs)	Rainfall (mm)	Intensity (mm/hr)	A (Km^2)	C	Q (m^3/s)
1:2yr	2.75	37.9	13.78	2.47	0.35	3.31
1:5yr	2.75	51.2	18.62	2.47	0.35	4.47
1:10yr	2.75	60.4	21.96	2.47	0.35	5.27
1:20yr	2.75	69.5	25.27	2.47	0.35	6.07
1:50yr	2.75	82	29.82	2.47	0.35	7.16
1:100yr	2.75	91.6	33.31	2.47	0.35	8.00

Catchment 1.2

Return Period	Tc (hrs)	Rainfall (mm)	Intensity (mm/hr)	A (Km^2)	C	Q (m^3/s)
1:2yr	1.39	31.3	22.52	1.26	0.35	2.76
1:5yr	1.39	42.3	30.43	1.26	0.35	3.73
1:10yr	1.39	49.9	35.90	1.26	0.35	4.40
1:20yr	1.39	57.5	41.37	1.26	0.35	5.07
1:50yr	1.39	67.8	48.78	1.26	0.35	5.98
1:100yr	1.39	75.8	54.53	1.26	0.35	6.68

Catchment 1 (Combined Catchment)

Return Period	Tc (hrs)	Rainfall (mm)	Intensity (mm/hr)	A (Km^2)	C	Q (m^3/s)
1:2yr	3.07	38.8	12.64	3.73	0.35	4.58
1:5yr	3.07	52.5	17.10	3.73	0.35	6.20
1:10yr	3.07	62	20.20	3.73	0.35	7.32
1:20yr	3.07	71.3	23.22	3.73	0.35	8.42
1:50yr	3.07	84	27.36	3.73	0.35	9.92
1:100yr	3.07	93.9	30.59	3.73	0.35	11.09

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