

# KWANA PV FACILITY, NORTHERN CAPE PROVINCE

Environmental Management Programme for the  
132kV switching station and a 132/33kV on-site  
collector substation associated with the Kwana PV  
facility

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savannah  
environmental

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

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**environmental affairs**

Department:  
Environmental Affairs  
REPUBLIC OF SOUTH AFRICA

**TABLE OF CONTENTS**

- INTRODUCTION ..... 1
  - 1. Background ..... 1
  - 2. Purpose ..... 1
  - 3. Objective ..... 1
  - 4. Scope..... 1
  - 5. Structure of this document..... 2
  - 6. Completion of part B: section 1: the pre-approved generic EMPr template..... 4
  - 7. Amendments of the impact management outcomes and impact management actions ..... 4
  - 8. Documents to be submitted as part of part B: section 2 site specific information and declaration ..... 5
    - (a) Amendments to Part B: Section 2 – site specific information and declaration ..... 5
- PART A – GENERAL INFORMATION..... 2
  - 1. DEFINITIONS ..... 2
  - 2. ACRONYMS and ABBREVIATIONS ..... 3
  - 3. ROLES AND RESPONSIBILITIES FOR ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) IMPLEMENTATION ..... 4
  - 4. ENVIRONMENTAL DOCUMENTATION REPORTING AND COMPLIANCE ..... 10
    - 4.1 Document control/Filing system ..... 10
    - 4.2 Documentation to be available ..... 10
    - 4.3 Weekly Environmental Checklist..... 10
    - 4.4 Environmental site meetings ..... 11
    - 4.5 Required Method Statements ..... 11
    - 4.6 Environmental Incident Log (Diary) ..... 12
    - 4.7 Non-compliance ..... 12
    - 4.8 Corrective action records ..... 13
    - 4.9 Photographic record ..... 13
    - 4.10 Complaints register ..... 14
    - 4.11 Claims for damages..... 14
    - 4.12 Interactions with affected parties ..... 14
    - 4.13 Environmental audits ..... 15
    - 4.14 Final environmental audits ..... 15
- PART B: SECTION 1: Pre-approved generic EMPr template ..... 16
  - 5. IMPACT MANAGEMENT OUTCOMES AND IMPACT MANAGEMENT ACTIONS ..... 16
    - 5.1 Environmental awareness training ..... 17
    - 5.2 Site Establishment development ..... 20

5.3	Access restricted areas .....	22
5.4	Access roads.....	23
5.5	Fencing and Gate installation .....	26
5.6	Water Supply Management .....	31
5.7	Storm and waste water management.....	32
5.8	Solid and hazardous waste management .....	34
5.9	Protection of watercourses and estuaries.....	37
5.10	Vegetation clearing.....	40
5.11	Protection of fauna .....	45
5.12	Protection of heritage resources .....	49
5.13	Safety of the public .....	50
5.14	Sanitation .....	52
5.15	Prevention of disease .....	54
5.16	Emergency procedures.....	57
5.17	Hazardous substances .....	59
5.18	Workshop, equipment maintenance and storage .....	66
5.19	Batching plants.....	68
5.20	Dust emissions .....	71
5.21	Blasting.....	74
5.22	Noise .....	75
5.23	Fire prevention .....	76
5.24	Stockpiling and stockpile areas.....	78
5.25	Civil works .....	80
5.26	Excavation of foundation, cable trenching and drainage systems.....	82
5.27	Installation of foundations, cable trenching and drainage systems .....	84
5.28	Installation of equipment (circuit breakers, current Transformers, Isolators, Insulators, surge arresters, voltage transformers, earth switches) .....	85
5.30	Cabling and Stringing .....	88
5.31	Testing and Commissioning (all equipment testing, earthing system, system integration) .....	90
5.32	Socio-economic .....	90
5.33	Temporary closure of site .....	93
5.34	Dismantling of old equipment .....	96
5.35	Landscaping and rehabilitation .....	98
6	ACCESS TO THE GENERIC EMPr .....	102
PART B: SECTION 2 .....		103
7	SITE SPECIFIC INFORMATION AND DECLARATION.....	103

7.1	Sub-section 1: contact details and description of the project .....	103
7.2	Sub-section 2: Development footprint site map .....	106
7.3	Sub-section 3: Declaration .....	123
7.4	Sub-section 4: amendments to site specific information (Part B; section 2) .....	123
PART C	.....	124
8	SITE SPECIFIC ENVIRONMENTAL ATTRIBUTES .....	124
CONSTRUCTION AND DECOMMISSIONING OUTCOMES AND ACTIONS	.....	125
7.1	<i>Ecology (Fauna and Flora)</i> .....	125
7.2	<i>Aquatic Ecology</i> .....	134
7.3	<i>Avifauna</i> .....	139
7.4	<i>Land Use, Soils and Agricultural Potential</i> .....	140
7.5	<i>Heritage</i> .....	142
7.6	<i>Visual</i> .....	144
7.7	<i>Socio-Economic</i> .....	151
OPERATIONAL PHASE OUTCOMES AND ACTIONS	.....	160
7.8	<i>Ecology (Fauna and Flora)</i> .....	161
7.9	<i>Aquatic Ecology</i> .....	166
7.10	<i>Avifauna</i> .....	170
7.11	<i>Socio-Economic</i> .....	172
APPENDIX 1: METHOD STATEMENTS	.....	173
APPENDIX 2: CV OF THE EAP	.....	174
APPENDIX 3: REHABILITATION MANAGEMENT PLAN	.....	175
APPENDIX 4: ALIEN VEGETATION MANAGEMENT PLAN	.....	176

**List of tables**

Table 1: <i>Guide to roles and responsibilities for implementation of an EMPr</i> .....	4
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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 <b>not legally binding</b>	Definitions, acronyms, roles & responsibilities and documentation and reporting.
B	1	Pre-approved generic EMPr template	<p>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.</p> <p>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.</p> <p>Where an impact management outcome is not relevant, the words "not applicable" can be inserted in the template under the "responsible persons" column.</p> <p>Once completed and signed, the template represents the EMPr for the activity approved by the CA and is legally binding. The template <b>is not required</b> to be submitted to the CA as once the generic EMPr is gazetted for implementation, it has been approved by the CA.</p> <p>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.</p>
	2	Site specific information	Contains preliminary infrastructure layout and a declaration that the applicant/holder of the EA

Part	Section	Heading	Content
			<p>will comply with the pre-approved generic EMPr template contained in <u>Part B: Section 1</u>, and understands that the impact management outcomes and impact management actions are <b>legally binding</b>. 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 <u>Part C</u>.</p> <p>This section <b>must be</b> 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 <u>Part B: section 2</u> not be submitted. Once approved, this Section forms part of the EMPr for the development and is legally binding.</p>
C		Site specific sensitivities/ attributes	<p>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 (<u>Part B: section 1</u>)</p> <p>This section will not be required should the site contain no specific environmental sensitivities or attributes. However, if <u>Part C</u> is applicable to the site, it <b>is required</b> 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</p>



Part	Section	Heading	Content
			<p>approved, Part C forms part of the EMPr for the site and is legally binding.</p> <p>This section applies only <b>to additional</b> 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 <u>Part B: section 1</u>.</p>
		Appendix 1	<p>Contains the method statements to be prepared prior to commencement of the activity. The method statements are <b>not required</b> to be submitted to the competent authority.</p>

## 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

<b>CA</b>	Competent Authority
<b>cEO</b>	Contractors Environmental Officer
<b>dEO</b>	Developer Environmental Officer
<b>DPM</b>	Developer Project Manager
<b>DSS</b>	Developer Site Supervisor
<b>EAR</b>	Environmental Audit Report
<b>ECA</b>	Environmental Conservation Act No. 73 of 1989
<b>ECO</b>	Environmental Control Officer
<b>EA</b>	Environmental Authorisation
<b>EIA</b>	Environmental Impact Assessment
<b>ERAP</b>	Emergency Response Action Plan
<b>EMPr</b>	Environmental Management Programme Report
<b>EAP</b>	Environmental Assessment Practitioner
<b>FPA</b>	Fire Protection Agency
<b>HCS</b>	Hazardous chemical Substance
<b>NEMA</b>	National Environmental Management Act, 1998 (Act No. 107 of 1998)
<b>NEMBA</b>	National Environmental Management: Biodiversity Act ,2004 (Act No. 10 of 2004)
<b>NEMWA</b>	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
<b>MSDS</b>	Material Safety Data Sheet
<b>RI&amp;AP's</b>	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)	<p><u>Role</u></p> <p>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.</p> <p><u>Responsibilities</u></p> <ul style="list-style-type: none"> <li>- Be fully conversant with the conditions of the EA;</li> <li>- Ensure that all stipulations within the EMPr are communicated and adhered to by the Developer and its Contractor(s);</li> <li>- Issuing of site instructions to the Contractor for corrective actions required;</li> <li>- 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</li> <li>- Ensure that periodic environmental performance audits are undertaken on the project implementation.</li> </ul>

Responsible Person(s)	Role and Responsibilities
Developer Site Supervisor (DSS)	<p><u>Role</u> 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.</p> <p><u>Responsibilities</u></p> <ul style="list-style-type: none"> <li>- Ensure that all contractors identify a contractor's Environmental Officer (cEO);</li> <li>- Must be fully conversant with the conditions of the EA. Oversees site works, liaison with Contractor, DPM and ECO;</li> <li>- Must ensure that all landowners have the relevant contact details of the site staff, ECO and cEO;</li> <li>- Issuing of site instructions to the Contractor for corrective actions required;</li> <li>- Will issue all non-compliances to contractors; and</li> <li>- Ratify the Monthly Environmental Report.</li> </ul>
Environmental Control Officer (ECO)	<p><u>Role</u> 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.</p> <p>The ECO provides feedback to the DSS and Project Manager, who in turn reports back to the Contractor and potential and Registered Interested &amp; Affected Parties' (RI&amp;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</p>

Responsible Person(s)	Role and Responsibilities
	<p>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.</p> <p><u>Responsibilities</u></p> <p>The responsibilities of the ECO will include the following:</p> <ul style="list-style-type: none"> <li>- Be aware of the findings and conclusions of all EA related to the development;</li> <li>- Be familiar with the recommendations and mitigation measures of this EMPr;</li> <li>- Be conversant with relevant environmental legislation, policies and procedures, and ensure compliance with them;</li> <li>- 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;</li> <li>- Educate the construction team about the management measures contained in the EMPr and environmental licenses;</li> <li>- Compilation and administration of an environmental monitoring plan to ensure that the environmental management measures are implemented and are effective;</li> <li>- Monitoring the performance of the Contractors and ensuring compliance with the EMPr and associated Method Statements;</li> <li>- 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;</li> <li>- Liaison between the DPM, Contractors, authorities and other lead stakeholders on all environmental concerns;</li> <li>- Compile a regular environmental audit report highlighting any non-compliance issues as well as satisfactory or exceptional compliance with the EMPr;</li> <li>- Validating the regular site inspection reports, which are to be prepared by the contractor Environmental Officer (cEO);</li> <li>- Checking the cEO's record of environmental incidents (spills, impacts, legal transgressions etc.) as well as corrective and preventive actions taken;</li> <li>- Checking the cEO's public complaints register in which all complaints are recorded, as well as action taken;</li> </ul>

Responsible Person(s)	Role and Responsibilities
	<ul style="list-style-type: none"> <li>- Assisting in the resolution of conflicts;</li> <li>- Facilitate training for all personnel on the site – this may range from carrying out the training, to reviewing the training programmes of the Contractor;</li> <li>- 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;</li> <li>- Maintenance, update and review of the EMPr;</li> <li>- Communication of all modifications to the EMPr to the relevant stakeholders.</li> </ul>
<p>developer Environmental Officer (dEO)</p>	<p><u>Role</u></p> <p>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.</p> <p><u>Responsibilities</u></p> <ul style="list-style-type: none"> <li>- Be fully conversant with the EMPr;</li> <li>- Be familiar with the recommendations and mitigation measures of this EMPr, and implement these measures;</li> <li>- Ensure that all stipulations within the EMPr are communicated and adhered to by the Employees, Contractor(s) ;</li> <li>- Confine the development site to the demarcated area;</li> <li>- Conduct environmental internal audits with regards to EMPr and authorisation compliance (on cEO);</li> <li>- Assist the contractors in addressing environmental challenges on site;</li> <li>- Assist in incident management:</li> <li>- Reporting environmental incidents to developer and ensuring that corrective action is taken, and lessons learnt shared;</li> <li>- Assist the contractor in investigating environmental incidents and compile investigation reports;</li> <li>- Follow-up on pre-warnings, defects, non-conformance reports;</li> </ul>



Responsible Person(s)	Role and Responsibilities
	<ul style="list-style-type: none"> <li>- Measure and communicate environmental performance to the Contractor;</li> <li>- Conduct environmental awareness training on site together with ECO and cEO;</li> <li>- Ensure that the necessary legal permits and / or licenses are in place and up to date;</li> <li>- Acting as Developer's Environmental Representative on site and work together with the ECO and contractor;</li> </ul>
Contractor	<p><u>Role</u></p> <p>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.</p> <p><u>Responsibilities</u></p> <ul style="list-style-type: none"> <li>- project delivery and quality control for the development services as per appointment;</li> <li>- 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;</li> <li>- 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;</li> <li>- attend on site meeting(s) prior to the commencement of activities to confirm the procedure and designated activity zones;</li> <li>- 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.</li> </ul>

Responsible Person(s)	Role and Responsibilities
contractor Environmental Officer (cEO)	<p><u>Role</u></p> <p>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:</p> <p><u>Responsibilities</u></p> <ul style="list-style-type: none"> <li>- Be on site throughout the duration of the project and be dedicated to the project;</li> <li>- Ensure all their staff are aware of the environmental requirements, conditions and constraints with respect to all of their activities on site;</li> <li>- Implementing the environmental conditions, guidelines and requirements as stipulated within the EA, EMPr and Method Statements;</li> <li>- Attend the Environmental Site Meeting;</li> <li>- Undertaking corrective actions where non-compliances are registered within the stipulated timeframes;</li> <li>- Report back formally on the completion of corrective actions;</li> <li>- Assist the ECO in maintaining all the site documentation;</li> <li>- Prepare the site inspection reports and corrective action reports for submission to the ECO;</li> <li>- Assist the ECO with the preparing of the monthly report; and</li> <li>- Where more than one Contractor is undertaking work on site, each company appointed as a Contractor will appoint a cEO representing that company.</li> </ul>

## 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 contractor 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;	ECO / cEO / dEO	Hold environmental awareness training workshops	Pre-construction Construction and Operations	ECO dEO	Monthly and as and when required	Attendance register and training minutes / notes for the record
– The Contractor must allow for sufficient sessions to train all personnel with no more than 20 personnel attending each course;	Contractor	Scheduling of sufficient sessions through consultation with the ECO / cEO / dEO	Pre-construction Construction	ECO dEO	Monthly and as and when required	Attendance register and training minutes / notes for the record
– Refresher environmental awareness training is available as and when required;	cEO / dEO in consultation with the ECO	Hold refresher environmental awareness training workshops	During the construction phase	ECO dEO	Monthly and as and when required	Attendance register and training minutes / notes for the record
– 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;	cEO / dEO	Hold training workshops and ensure that the EA and EMPr is readily available	During the construction phase	ECO dEO	Monthly and as and when required	Attendance register and training minutes / notes for the record

<ul style="list-style-type: none"> <li>- The Contractor must erect and maintain information posters at key locations on site, and the posters must include the following information as a minimum: <ul style="list-style-type: none"> <li>a) Safety notifications; and</li> <li>b) No littering.</li> </ul> </li> </ul>	Contractor	Develop and place appropriate posters at key locations	Pre-construction Construction	ECO dEO cEO	Monthly	Photographic record
<ul style="list-style-type: none"> <li>- Environmental awareness training must include as a minimum the following: <ul style="list-style-type: none"> <li>a) Description of significant environmental impacts, actual or potential, related to their work activities;</li> <li>b) Mitigation measures to be implemented when carrying out specific activities;</li> <li>c) Emergency preparedness and response procedures;</li> <li>d) Emergency procedures;</li> <li>e) Procedures to be followed when working near or within sensitive areas;</li> <li>f) Wastewater management procedures;</li> <li>g) Water usage and conservation;</li> <li>h) Solid waste management procedures;</li> <li>i) Sanitation procedures;</li> <li>j) Fire prevention; and</li> <li>k) Disease prevention.</li> </ul> </li> </ul>	cEO / dEO in consultation with the ECO	Develop environmental awareness training material which covers the minimum requirements	Pre-construction Construction	ECO dEO	Prior to the commencement of the environmental awareness training	Environmental awareness training material requirements checklist
<ul style="list-style-type: none"> <li>- A record of all environmental awareness training courses undertaken as part of the EMPr must be available;</li> </ul>	ECO / cEO / dEO	Filing system including all proof of training (i.e. attendance register and training minutes / notes for the record)	During the construction phase	ECO dEO	Monthly	Completed and up to date filing system with proof of training
<ul style="list-style-type: none"> <li>- Educate workers on the dangers of open and/or unattended fires;</li> </ul>	cEO / dEO in consultation with the ECO	Develop environmental awareness training	Pre-construction Construction	ECO dEO	Prior to the commencement of the	Environmental awareness training

		material which covers the dangers of open and/or unattended fire			environmental awareness training	material requirements checklist
- A staff attendance register of all staff to have received environmental awareness training must be available.	ECO / cEO / dEO	Filing system including all proof of training (i.e. attendance register)	During the construction phase	ECO dEO	Monthly	Completed and up to date filing system inclusive of all attendance registers
- Course material must be available and presented in appropriate languages that all staff can understand.	ECO / cEO / dEO	Develop environmental awareness training material in the required languages. Training material must be readily available to all staff	During the construction phase	ECO dEO	Monthly	Environmental awareness training material requirements checklist and the training register which must indicate the language of the training

## 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
<ul style="list-style-type: none"> <li>- 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;</li> </ul>	Contractor	Development of an appropriate method statement	Pre-construction	ECO dEO	Once, prior to construction	Availability of the method statement which complies with the minimum requirements listed
<ul style="list-style-type: none"> <li>- 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;</li> </ul>	DPM	Place construction camps outside of sensitive areas identified in the Basic Assessment Report	Pre-construction Construction	ECO dEO	Once, prior to construction	Availability of a layout and sensitivity map indicating avoidance of sensitive areas
<ul style="list-style-type: none"> <li>- Sites must be located where possible on previously disturbed areas;</li> </ul>	DPM	Place site outside of sensitive areas and within previously disturbed areas	Pre-construction	ECO dEO	Once, prior to construction	Availability of a layout and sensitivity map indicating

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		identified in the BA Report				avoidance of sensitive areas and placement within disturbed areas
– The camp must be fenced in accordance with <b>Section 5.5: Fencing and gate installation</b> ; and	DPM	Design and implementation of fencing as per the requirements of Section 5.5 of this EMPr	Pre-construction & Construction	ECO dEO	Once, prior to construction and once during the construction of the fencing	The camp is fenced in accordance with Section 5.5 of this EMPr
– The use of existing accommodation for contractor staff, where possible, is encouraged.	Not applicable – the development of new accommodation is not proposed. Employees will be accommodated in the nearby towns such as Kroonstad and transported to and from site daily.					

### 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;	dEO / cEO in consultation with the ECO	Spatially demarcate access restricted areas informed by the BA Report	Pre-construction	ECO	Once, prior to construction	Access restricted areas are identified and provided in a spatial format
– 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	dEO / cEO in consultation with the ECO	Erect appropriate temporary barriers around access restricted areas	At the commencement and for the duration of the construction phase	ECO	Monthly	Access restricted areas are closed-off through temporary barriers and barriers are maintained to a sufficient standard
– Unauthorised access and development related activity inside access restricted areas is prohibited.	Contractor / dEO / cEO	Erect appropriate temporary barriers around access restricted areas and provide clear signage of restricted status	During the construction phase	ECO	Monthly, and as and when required	Photographic evidence and notes of compliance that no unauthorised access or

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
						activities has taken place within the access restricted areas

#### 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;	DPM Contractor	Develop access agreements with the affected landowners. Ensure that agreements are approved and signed	Pre-construction	dEO ECO	Once, prior to construction	Availability of approved and signed negotiations
– 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	Contractor	Undertake maintenance activities on private roads used for construction as	During the construction phase	cEO / ECO	Weekly	Photographic record of the pre-construction condition



Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		degradation takes place				and degradation of roads, and records of the implementation and effectiveness of maintenance activities
- All contractors must be made aware of all these access routes.	dEO / cEO	Develop a map illustrating all access routes associated with the project and present and provide the map to all contractors	Pre-construction Construction	ECO	Once, prior to construction	Access routes map readily available
- Any access route deviation from that in the written agreement must be closed and re-vegetated immediately, at the contractor's expense;	Contractor	All access routes developed that are not in-line with the access route agreements must be closed and rehabilitated to the pre-disturbance state	Construction and Rehabilitation	cEO ECO	Bi-weekly (every two weeks)	Photographic record of the closure of access roads and re-vegetation
- Maximum use of both existing servitudes and existing roads must be made to minimize further disturbance through the development of new roads;	Contractor (and Eskom maintenance)	Existing access routes to be used must be specified	Construction and operation	cEO Operation and	Weekly	Implementation of the

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
	staff where relevant to operation)	and the development of new roads must be avoided as far as possible		maintenance team		approved layout
– In circumstances where private roads must be used, the condition of the said roads must be recorded in accordance with <b>section 4.9: photographic record</b> ; prior to use and the condition thereof agreed by the landowner, the DPM, and the contractor;	dEO / cEO	Record the conditions of private roads to be used (prior to use) as per the requirements of section 4.9 and agree on the required condition of the roads with the landowner, DPM and contractor	During the construction phase	ECO	Prior to the use of private roads	Photographic record and proof of the road conditions agreed upon with the relevant parties
– Access roads in flattish areas must follow fence lines and tree belts to avoid fragmentation of vegetated areas or croplands	DPM and Contractor	Design access roads to follow fence lines and avoid vegetated areas	Pre-construction	ECO	Once during the design and once prior to construction	Implementation of the approved layout
– Access roads must only be developed on pre-planned and approved roads.	Contractor	Construction of access roads only on pre-planned and approved access roads	During the construction phase	ECO once during the design dEO	Once during the design and weekly during the construction	Implementation of the approved layout

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
					n of access 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;	Contractor	Identify and inform all relevant staff of the existing gates to be used	Pre-construction & Construction	dEO	Monthly	Existing gates are utilised on a frequent basis and only limited new access gates are developed
– Existing and new gates to be recorded and documented in accordance with <b>section 4.9: photographic record;</b>	ECO	Existing and new gates will be recorded and documented as per the requirements of section 4.9	During the construction phase	ECO	Once, when the construction of all new gates have been completed	Photographic record of the existing and new gates as per the requirements of section 4.9

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– All gates must be fitted with locks and be kept locked at all times during the development phase, unless otherwise agreed with the landowner;	Contractor	Ensure all relevant gates are fitted with locks and are always locked	Construction and Operation	ECO monthly, Operation and maintenance team and cEO	Bi-weekly (every second week)	All gates are locked and no complaints from landowners are received in this regard
– 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;	dEO	Install new gates where required with the approval of the affected landowner	During the construction phase	ECO	Once, prior to construction and during the construction phase, as and when required	New gates are installed where required
– 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;	Contractor	Install gates in a manner so that there is a gap of no more than 100mm between the bottom of the gate and the ground	During the construction phase	cEO	Once, during the erection of the gates during the construction phase	New gates installed as per the requirement
– Where gates are installed in jackal proof fencing, a suitable reinforced concrete sill must be provided beneath the gate;	Contractor	Implement a reinforced concrete sill beneath gates installed for jackal proofing	During the construction phase	cEO	Once, during the erection of the gates during the construction phase	New gates installed as per the requirement

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
- Original tension must be maintained in the fence wires;	Contractor	Maintain original tension of fences through required activities	During the construction phase	ECO	Monthly	No tension reduction on fence wires
- All gates installed in electrified fencing must be re-electrified;	Contractor	Electrify gates installed in electrified fencing	During the construction phase	ECO	Once, during the erection of the gates during the construction phase	Gates installed in electrified fencing is electrified
- All demarcation fencing and barriers must be maintained in good working order for the duration of the development activities;	Contractor	Undertake maintenance activities on fences and barriers	During the construction phase	ECO	Monthly	Photographic record of maintained fences and barriers
- Fencing must be erected around the camp, batching plants, hazardous storage areas, and all designated access restricted areas, where applicable;	Contractor	Fence construction camps, batching plants, hazardous storage areas and access restricted areas. Avoid sensitive flora	During the construction phase	ECO	Once during the erection of fencing	Photographic record of fences erected
- Any temporary fencing to restrict the movement of livestock must only be erected with the permission of the land owner.	dEO/ cEO Contractor	Obtain written approval from the relevant landowner where temporary fencing is required to	During the construction phase	ECO	To be monitored as temporary fencing is required	Written approval to be provided by the dEO

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		restrict livestock movement				
– All fencing must be developed of high quality material bearing the SABS mark;	Contractor	Make use of high quality materials approved by SABS	During the construction phase	cEO	To be monitored as fencing is erected during the construction phase	Use of high quality materials for fencing approved by SABS
– The use of razor wire as fencing must be avoided;	Contractor	Razor wire must not be sourced or used for the erection of fencing	During the construction phase	ECO	To be monitored as fencing is erected during the construction phase	Fences erected do not make use of razor wire
– 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;	DSS and Contractor	Ensure fenced areas are locked as required through the implementation of a formalised process. Appoint a security company	During the construction phase	cEO	Weekly and as and when required	Fences are locked and no complaints from landowners are received. A security company is appointed
– On completion of the development phase all temporary fences are to be removed;	Contractor	Removal of all temporary fences	At the end of the Construction Phase	ECO dEO	Once, following the completion	No temporary fences associated

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
					of the construction phase	with the project is present following the completion of the construction phase
<ul style="list-style-type: none"> <li>- The contractor must ensure that all fence uprights are appropriately removed, ensuring that no uprights are cut at ground level but rather removed completely.</li> </ul>	Contractor	Appropriate removal of all fence uprights	At the end of the Construction Phase	ECO dEO	Once, following the completion of the construction phase	No fence uprights associated with the project is present following the completion of the construction phase

## 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
<ul style="list-style-type: none"> <li>- 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;</li> </ul>	DPM and Contractor	Obtaining relevant registrations from DWS and installation of water meters	Pre-construction	cEO	To be monitored with the installation of water meters and daily during construction and operation	Use of high quality water meters
<ul style="list-style-type: none"> <li>- The Contractor must ensure the following:               <ul style="list-style-type: none"> <li>a. The vehicle abstracting water from a river does not enter or cross it and does not operate from within the river;</li> <li>b. No damage occurs to the river bed or banks and that the abstraction of water does not entail stream diversion activities; and</li> <li>c. All reasonable measures to limit pollution or sedimentation of the downstream watercourse are implemented.</li> </ul> </li> </ul>	Not applicable – No abstraction from a river proposed.					



Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> <li>- Ensure water conservation is being practiced by:               <ul style="list-style-type: none"> <li>a. Minimising water use during cleaning of equipment;</li> <li>b. Undertaking regular audits of water systems; and</li> <li>c. Including a discussion on water usage and conservation during environmental awareness training.</li> <li>d. The use of grey water is encouraged.</li> </ul> </li> </ul>	Contractor / dEO / cEO in consultation with the ECO	Implement the required water conservation measures throughout on-site construction processes	During the construction phase	ECO	Monthly, and as and when required	Successful implementation of water conservation

### 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
<ul style="list-style-type: none"> <li>- 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;</li> </ul>	Contractor	Implement measures for the control and management of runoff	During the construction phase	cEO	Weekly	No mismanagement of runoff or contaminated water due to the temporary concrete batching plant

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<p>– 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;</p>	Contractor and cEO	Obtain approved absorbent material and make use of licensed waste disposal facilities for disposal of oil	During the Construction Phase	ECO	Monthly	Availability of approved absorbent material at the construction site and proof of disposal of oil at licensed disposal facilities
<p>– 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;</p>	DPM in consultation with the ECO	Consultation between the DPM and the ECO to determine if water can be discharged directly into water bodies (where present). The necessary water quality testing must be undertaken prior to discharge	During the construction phase	ECO	As and when the need arises to discharge natural stormwater runoff and clean water	Proof of consultation between the DPM and ECO and the outcomes thereof to be provided. Proof of water quality testing and the results thereof.
<p>– 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.</p>	DPM in consultation with the ECO	Consultation between the DPM and the ECO to determine if water can be released following settling.	During the construction phase	ECO	As and when the need arises to discharge settled water	Proof of consultation between the DPM and ECO and the outcomes

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance thereof to be provided.

### 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;	Contractor	Develop and implement a waste management plan	During the construction phase	ECO	Monthly	Implementation of the waste management plan and proof of waste management through proof of responsible disposal
– Sufficient, covered waste collection bins (scavenger and weatherproof) must be provided;	Contractor	Provision of appropriate waste collection bins	During the construction phase	cEO	Weekly	Appropriate waste collection

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		strategically placed throughout the site				bins are available throughout the site
– A suitably positioned and clearly demarcated waste collection site must be identified and provided;	DPM and Contractor	Identify an appropriate location for the waste collection site which must be clearly demarcated through signage and temporary fencing	Design and Construction Phase	ECO	Once, prior to the commencement of construction	A waste collection site is appropriately placed and demarcated
– The waste collection site must be maintained in a clean and orderly manner;	Contractor	Regular collection of waste and maintenance of the area must be undertaken as per the waste requirements for the project during construction	During the Construction Phase	cEO	Weekly	The waste collection site is maintained and clean
– Waste must be segregated into separate bins and clearly marked for each waste type for recycling and safe disposal;	Contractor	Provide separate and marked bins for the different waste types associated with the construction phase	During the Construction Phase	cEO	Weekly	Separate waste bins are available on site and waste generated is separated

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
						into the relevant bins
– Staff must be trained in waste segregation;	cEO / dEO in consultation with the ECO	Include waste segregation as part of the environmental awareness training material.	Pre-construction Construction	ECO	Monthly, and as and when required	Environmental awareness training material requirements checklist
– Bins must be emptied regularly;	Contractor	Bins must be emptied before reaching total capacity and on a regular basis as required for the project	During the construction phase	ECO	Monthly	No mismanagement of bins.
– General waste produced onsite must be disposed of at registered waste disposal sites/ recycling company;	Contractor	Disposal of general waste at licensed waste disposal facilities must be undertaken as per the waste management plan	During the construction phase	ECO	Monthly	Disposal certificates of disposal at licensed facilities to be provided
– Hazardous waste must be disposed of at a registered waste disposal site;	Contractor	Disposal of hazardous waste at licensed waste disposal facilities must be undertaken as per the waste	During the construction phase	ECO	Monthly	Disposal certificates of disposal at licensed facilities to be provided

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		management plan				
– Certificates of safe disposal for general, hazardous and recycled waste must be maintained.	Contractor	Obtain certificates for safe disposal of waste	During the construction phase	ECO	Monthly	Disposal certificates of disposal at licensed facilities to be provided and filed as part of the filing system

### 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;	Contractor	Contractor to undertake activities which can cause spills of pollutants outside of watercourses	During the construction phase	cEO	Weekly	No incidents reported of spillage of pollutants into watercourses

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
- In the event of a spill, prompt action must be taken to clear the polluted or affected areas;	Contractor and cEO	Develop a management plan or process for implementation should a spill take place	During the construction phase	cEO	Weekly	Feedback must be provided by the contractor in terms of how the spill was handled and photographic evidence of the feedback must be provided and kept on record
- Where possible, no development equipment must traverse any seasonal or permanent wetland	cEO and Contractor	Ensure layout has been informed by the environmental sensitivities as determined by the basic assessment and specialist studies	Construction Phase	ECO	Once off review that the layout used is the approved one	Confirm no development equipment traverses any seasonal or permanent wetland as per the authorised layout by reviewing the as-built designs (once-off

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance (confirmation)
– No return flow into the estuaries must be allowed and no disturbance of the Estuarine functional Zone should occur;	Not applicable – no estuaries are located within the study area.					
– Development of permanent watercourse or estuary crossing must only be undertaken where no alternative access to tower position is available;	cEO, Contractor	Ensure that permanent crossings (access roads) are provided for access to the substations if no alternative crossing is available.	During the construction phase	cEO	Weekly	Ensure that permanent crossings are developed if there is no alternative.
– There must not be any impact on the long term morphological dynamics of watercourses or estuaries;	DPM, cEO	Develop a management plan or process for implementation should a spill take place within a watercourse and ensure continuous monitoring	During the construction and operation phase	ECO, dEO	For all phases of the project life cycle (i.e. construction, operation, decommissioning)	No incidents reported of spillage of pollutants into watercourses
– Existing crossing points must be favored over the creation of new crossings (including temporary access)	DPM, cEO	Develop a management plan or process for implementation should a spill take place within a	During the pre-construction and construction phase	ECO, dEO	During the construction phase of the project.	Existing crossing points utilised as opposed to new ones created and



Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		watercourse and ensure continuous monitoring				no incidents reported of spillage of pollutants into watercourses
<p>– When working in or near any watercourse or estuary, the following environmental controls and consideration must be taken:</p> <p>a) Water levels during the period of construction; No altering of the bed, banks, course or characteristics of a watercourse</p> <p>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;</p> <p>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</p> <p>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.</p>	Contractor	Activities undertaken near watercourses must be in-line with and consider the specified environmental controls	During the construction phase	ECO	Monthly, and as and when required	No degradation of the watercourses and no incidents of destruction reported

## 5.10 Vegetation clearing

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**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
<b>General:</b>						
– Indigenous vegetation which does not interfere with the development must be left undisturbed;	cEO and contractor	Demarcate areas of indigenous vegetation to be avoided before clearance is undertaken	Construction and operation (i.e. for maintenance purposes)	ECO monthly, Operation and maintenance team weekly	Weekly, and as and when required	No unnecessary clearance of indigenous vegetation is undertaken
– Protected or endangered species may occur on or near the development site. Special care should be taken not to damage such species;	Contractor	Demarcate areas containing protected or endangered species to be avoided by construction activities	During the Construction Phase	ECO monthly and Operation and maintenance team weekly	Weekly, and as and when required	No clearance of protected or endangered species other than those permitted to be removed
– 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;	Relevant specialist in consultation with the Contractor	Develop and implement a Plant Search and Rescue Plan	Pre-construction & Construction	cEO	Weekly, and as and when required	Implementation of the Plant Search and Rescue Plan and photographic evidence and notes of the implementation of the plan

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– 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;	DPM	Undertake the permitting process in order to obtain the relevant permits for the removal of protected species. Permits must be kept on file	Pre-construction	ECO	Once, prior to the commencement of the construction phase and removal of the protected species	CA permits on file
– 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;	ECO	Ensure that the audit report indicates all species rescued and replanted and provides feedback in terms of compliance with the conditions of permits for replanting	During the Construction Phase and following the completion of the Construction Phase	ECO	Once off or as and when required	ECO confirmed rescued and replanted programme implemented correctly.
– Trees felled due to construction must be documented and form part of the Environmental Audit Report;	ECO	Ensure that the audit report documents the details of trees felled	During the Construction Phase and following the completion of the Construction Phase	ECO	Once, prior to the commencement of the construction phase and removal of the	CA permits on file

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
					protected species	
– Rivers and watercourses must be kept clear of felled trees, vegetation cuttings and debris;	Contractor	Felled trees, vegetation cuttings and debris must be disposed of at a licensed waste disposal facility	During the Construction Phase	ECO	Monthly	No felled trees, vegetation cuttings and debris are dumped in inappropriate locations and disposal certificates are available as proof of responsible disposal
– 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;	DPM and Contractor	A suitably qualified pest control operator must be appointed	Construction and Operation	ECO	As and when the use of herbicides is required	Only registered pest control operators must be appointed and proof of their registration must be provided
– A daily register must be kept of all relevant details of herbicide usage;	DPM and Contractor	A suitably qualified pest control operator must be appointed	Construction and Operation	ECO	As and when the use of	Only registered pest control operators

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
					herbicides is required	must be appointed and proof of their registration must be provided
- No herbicides must be used in estuaries	Not applicable - no estuaries are present within the study area					
- All protected species and sensitive vegetation not removed must be clearly marked and such areas fenced off in accordance to <b>Section 5.3: Access restricted areas.</b>	Contractor in consultation with the cEO	Spatially demarcate protected species and sensitive vegetation and implement appropriate fencing where required as per section 5.3	During the construction phase	ECO	Once, during the undertaking of the demarcation of the areas and the erection of the fencing	Demarcation and fencing is undertaken in-line with the requirements of section 5.3
- Alien invasive vegetation must be removed and disposed of at a licensed waste management facility.	Contractor	Undertake removal of alien invasive vegetation in accordance with the relevant guideline and ensure the vegetation is disposed of at a	Construction and Operation	ECO Operation and maintenance team	Monthly, and as and when required	Proof must be provided that alien invasive vegetation has been cleared in accordance to the relevant guideline and

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		licensed waste disposal facility				that the vegetation was disposed of at a licensed waste disposal 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;	dEO / cEO Contractor	Develop a procedure for dealing with livestock within the affected properties	Pre-construction and during the construction phase	ECO	Once, prior to the commencement of construction and as and when required during the construction phase	Written consent provided by the landowner and proof of representation of the landowner during interference

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– The breeding sites of raptors and other wild birds species must be taken into consideration during the planning of the development programme;	dEO / cEO in consultation with the Contractor	Ensure that the planning and development programme considers breeding sites for wild bird species	Pre-construction & Construction	ECO	Once, prior to the commencement of construction and as and when required	The planning and development programme includes the consideration of breeding sites for wild bird species
– 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;	dEO / cEO in consultation with the Contractor	Avoid breeding sites and ensure that special care is taken in the presence of nestlings and fledglings	During the Construction Phase Operation Phase	ECO monthly, cEO and Operation and maintenance team weekly	Weekly, and as an when required during the construction . Monthly, and as and when required during operation	Photographic record of intact breeding sites
– Special recommendations of the avian specialist must be adhered to at all times to prevent unnecessary disturbance of birds;	dEO / cEO in consultation with the Contractor	All mitigation measures recommended by the avifauna specialist must be implemented	During the Construction Phase Operation Phase	ECO Operation and maintenance team	Monthly during construction and monthly during operation	Photographic record of compliance and successful implementation of the recommended measures

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
- 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;	dEO / cEO in consultation with the Contractor	All site staff must be informed of this requirement during the Environmental Awareness Training and the consequences of not adhering to the requirement. These areas must be demarcated as Access Restricted Areas	During the Construction Phase	ECO	Monthly, and as and when required	No instances of poaching is reported
- No deliberate or intentional killing of fauna is allowed;	dEO / cEO in consultation with the Contractor	All site staff must be informed of this requirement during the Environmental Awareness Training and the consequences of not adhering to the requirement. These areas must be demarcated as Access Restricted Areas	During the Construction Phase	ECO	Monthly, and as and when required	No instances of deliberate or intentional killing is reported
- In areas where snakes are abundant, snake deterrents to be deployed on the pylons to prevent snakes climbing	dEO / cEO in consultation	Implement and maintain snake deterrents on	During the Construction Phase	ECO Operation and	Once, during the construction	Photographic record of the implementati



Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
up, being electrocuted and causing power outages; and	with the Contractor	pylons in areas where snakes are abundant	Operation Phase	maintenance team	of the pylons and as and when required. Monthly during operation	on and maintenance of snake deterrents
- 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.	DPM in consultation with the dEO	Undertake a permitting process to obtain the required permits	Pre-construction	ECO	Once, prior to the commencement of construction and as and when required	Permits for removal and/relocation must be kept on file and be readily available

## 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 <b>Section 5.3: Access restricted areas</b> ;	DPM and a suitably qualified specialist  dEO / cEO in consultation with the Contractor and ECO	Spatially identify and demarcate areas of heritage significance as per the Heritage Impact Assessment and the Heritage Walk-through Report and as per the requirements of section 5.3	Pre-construction	ECO	Once, prior to the commencement of construction	Proof of avoidance of sensitive heritage features through details of avoidance and photographic records
– Carry out general monitoring of excavations for potential fossils, artefacts and material of heritage importance;	dEO (in consultation with specialists if/as required).	Ensure construction staff are adequately informed (via environmental awareness training) to carry out monitoring of excavations for fossils, artefacts and important heritage material	During the Construction Phase	ECO	Monthly, or as required	Environmental awareness training includes measures relating to monitoring for chance finds

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> <li>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.</li> </ul>	dEO / cEO in consultation with the Contractor and ECO	Develop and implement procedures for situations where human remains, archaeological, palaeontological or historical material are uncovered	During the Construction Phase	ECO	As and when required	Proof of work ceased and the required procedures followed in cases where material is discovered.

### 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
<ul style="list-style-type: none"> <li>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.;</li> </ul>	cEO in consultation with the Contractor	Develop an Emergency Preparedness, Response and Fire Management Plan specific to the project	Pre-construction Construction	cEO	Once, prior to the commencement of construction and weekly during the	Compliance with the Emergency Preparedness, Response and Fire Management Plan

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
					construction phase	
– All unattended open excavations must be adequately fenced or demarcated;	Contractor	Ensure that all excavations undertaken is fenced and demarcated within a reasonable timeframe and in instances where excavations will be open for long-periods of time	During the Construction Phase	cEO	Weekly	Excavations are fenced where required and photographic proof can be provided
– Adequate protective measures must be implemented to prevent unauthorised access to and climbing of partly constructed towers and protective scaffolding;	Contractor	All staff must be easily identifiable and the climbing of towers and scaffolding must only be undertaken by authorised personnel as managed by the Contractor	During the construction phase	ECO	Monthly, and as and when required	No incidents of unauthorised climbing is reported
– Ensure structures vulnerable to high winds are secured;	Contractor	Ensure that sufficient stabilisation measures are implemented to	During the construction phase	cEO	Weekly, and as and when required	No incidents of unstable structures due to high

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		secure structures vulnerable to high winds				winds is reported
– Maintain an incidents and complaints register in which all incidents or complaints involving the public are logged.	cEO	Compile and regularly update as incidents and complaints are submitted from the public and indicate the actions taken to resolve the complaint	During the construction phase	ECO	Monthly, and as and when required	The incidents and complaints register is complete and provides all the required details

#### 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;	Contractor	Mobile chemical toilets must be placed appropriately and in areas that avoid	During the Construction Phase	cEO	Weekly	Mobile toilets are installed and avoid environmental sensitivities

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		environmental sensitivities				
<ul style="list-style-type: none"> <li>- 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;</li> </ul>	Contractor in consultation with the cEO	All site staff must be informed of this requirement during the Environmental Awareness Training and the consequences of not adhering to the requirement.	Pe-construction & Construction	ECO	Monthly, and as and when required	No evidence of non-compliance identified
<ul style="list-style-type: none"> <li>- Where mobile chemical toilets are required, the following must be ensured: <ul style="list-style-type: none"> <li>a) Toilets are located no closer than 100 m to any watercourse or water body;</li> <li>b) Toilets are secured to the ground to prevent them from toppling due to wind or any other cause;</li> <li>c) No spillage occurs when the toilets are cleaned or emptied and the contents are managed in accordance with the EMPr;</li> <li>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;</li> <li>e) Toilets are emptied before long weekends and workers holidays, and must be locked after working hours;</li> <li>f) Toilets are serviced regularly and the ECO must inspect toilets to ensure compliance to health standards;</li> </ul> </li> </ul>	Contractor in consultation with the cEO	The installation of the toilets by the Contractor must be as per the listed requirements	During the Construction Phase	cEO	Weekly	No evidence of non-compliance identified

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– A copy of the waste disposal certificates must be maintained.	Contractor	Certificates obtained from the licensed waste disposal facility with the emptying of the toilets must be kept on file	During the Construction Phase	ECO	Monthly, and as and when required	Certificates for waste disposal from the licensed waste disposal facility available on site

### 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;	Contractor	Only environmentally-friendly pest control must be used, when required	During the Construction Phase	ECO	As and when pest control is required for the project	Contractor to provide proof of pest control used being environmentally-friendly
– Ensure that the workforce is sensitised to the effects of sexually transmitted diseases, especially HIV AIDS;	CEO / Contractor in	The effects of sexually transmitted	Pre-construction & Construction	ECO	Once, prior to the commence	Environmental awareness training

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
	consultation with the ECO	diseases and HIV/AIDS must be covered in the Environmental Awareness Training			ment of construction and monthly during construction	material requirements checklist
– The Contractor must ensure that information posters on AIDS are displayed in the Contractor Camp area;	Contractor	Develop and place information posters on HIV/AIDS	During the Construction Phase	cEO	Weekly	Photographic evidence of poster placement
– Information and education relating to sexually transmitted diseases to be made available to both construction workers and local community, where applicable;	cEO / Contractor in consultation with the ECO	Information and education of sexually transmitted diseases must be covered in the Environmental Awareness Training.	Pre-construction & Construction	ECO	Monthly	Environmental awareness training material requirements checklist
– Free condoms must be made available to all staff on site at central points;	Contractor	Placement of free condoms in mobile toilets and at the construction camps	During the Construction Phase	ECO	Monthly	Proof of placement of free condoms by the contractor to be provided
– Medical support must be made available;	dEO / cEO in consultation with the Contractor	Ensure that designated personnel with first aid training are	Construction and Operations	ECO	Monthly	Check the availability of first aid trained



Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		available on site and that first aid kits to provide medical support is readily available				personnel and medical kits (including if these are complete in terms of supplies)
- Provide access to Voluntary HIV Testing and Counselling Services.	Contractor	Compile a HIV testing schedule and provide counselling services where required	During the Construction Phase	ECO	Quarterly, and as and when required	Voluntary testing schedules and proof of counselling (where undertaken)

### 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;	Contractor	Develop an Emergency Preparedness, Response and Fire Management Plan specific to the project	Pre-construction	ECO	Once, prior to the commencement of construction	Emergency Preparedness, Response and Fire Management Plan compiled
– The Emergency Plan must deal with accidents, potential spillages and fires in line with relevant legislation;	Contractor	Develop an Emergency Preparedness, Response and Fire Management Plan specific to the project which covers accidents, potential spillages and fires	Pre-construction	ECO	Once, prior to the commencement of construction	Emergency Preparedness, Response and Fire Management Plan includes required specifications
– All staff must be made aware of emergency procedures as part of environmental awareness training;	CEO / dEO in consultation with the ECO	Develop environmental awareness training material which covers the relevant	Pre-construction	ECO	Prior to the commencement of the environmental	Environmental awareness training material requirements checklist

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		emergency procedures			awareness training	
- The relevant local authority must be made aware of a fire as soon as it starts;	Contractor in consultation with the ECO	Develop and include a procedure in the Emergency Preparedness, Response and Fire Management Plan for the event of a fire and the procedure to be followed for informing the local authority	Construction	ECO	As and when a fire occurs	The local authority was informed as per the relevant procedure set out in the Emergency Preparedness, Response and Fire Management Plan
- In the event of emergency necessary mitigation measures to contain the spill or leak must be implemented (see <b>Hazardous Substances section 5.17</b> ).	Contractor	Implement the required mitigation measures in the event of a spill or leak as per the requirements of Section 5.17.	Construction and Operations	ECO	As and when a spill or leak occurs	The mitigation measures included under Section 5.17 have been adhered to

### 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;	CEO in consultation with the Contractor	Develop a strategy of how hazardous substances can be and should be minimised	Pre-construction & Construction	ECO	Once, prior to the commencement of construction and monthly during the construction phase	Contractor to provide evidence of substances used for proof of compliance
- All hazardous substances must be stored in suitable containers as defined in the Method Statement;	Contractor	Develop a Method Statement for the storage of hazardous substances in suitable containers	Pre-construction & Construction	ECO	Once, prior to the commencement of construction and monthly during the construction phase	Photographic proof that hazardous substances are stored in suitable containers as per the requirements of the relevant Method Statements

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Containers must be clearly marked to indicate contents, quantities and safety requirements;	Contractor	Where hazardous waste is stored these must be clearly marked indicating the required details of the contents	During the Construction Phase	ECO	Monthly	Photographic proof that containers are marked as per the requirements
– All storage areas must be bunded. The bunded area must be of sufficient capacity to contain a spill / leak from the stored containers;	Contractor	Ensure that storage areas are sufficiently bunded which are of sufficient capacity to contain a spill / leak from the stored containers	During the Construction Phase	ECO	Monthly during the Construction Phase	Photographic proof that storage areas are bunded and proof that the bund areas are of sufficient capacity to contain a spill / leak from the stored containers
– Bunded areas to be suitably lined with a SABS approved liner;	Contractor	Ensure that bunded storage areas are suitably lined	During the Construction Phase	ECO	Once, during the Construction Phase	Photographic proof that bunded storage areas are suitably lined
– An Alphabetical Hazardous Chemical Substance (HCS) control sheet must be drawn up and kept up to date on a continuous basis;	cEO / Contractor	Compile and update an Alphabetical Hazardous Chemical	During the Construction Phase	ECO	Monthly, and as and when required	Complete and up to date control sheet provided by

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		Substance (HCS) control sheet specific to the project				the Contractor
– All hazardous chemicals that will be used on site must have Material Safety Data Sheets (MSDS);	cEO / Contractor	Keep a record of all hazardous chemicals and the respective MSDS	During the Construction Phase	ECO	Monthly, and as and when required	Record of hazardous chemicals and the respective MSDS
– All employees working with HCS must be trained in the safe use of the substance and according to the safety data sheet;	cEO / Contractor	Provide training for personnel working with HCS	Pre-construction	ECO	Once, prior to the commencement of construction and as and when required	Record of training provided to personnel working with HCS
– 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;	cEO / Contractor	Develop environmental awareness training material which covers the relevant impacts and safety measures.  Provide appropriate training and personal	Pre-construction & Construction	ECO	Prior to the commencement of the environmental awareness training and monthly during the construction phase for personal	Environmental awareness training material requirements checklist and all relevant personnel have undergone appropriate training and have access

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		protective equipment for the relevant personnel handling hazardous substances and materials			protective equipment	to personal protective equipment
– The Contractor must ensure that diesel and other liquid fuel, oil and hydraulic fluid is stored in appropriate storage tanks or in bowzers;	Contractor	Appropriate storage facilities must be constructed or obtained for the storing of diesel, other liquid fuel, oil and hydraulic fluid	During the Construction Phase	ECO	Monthly, and as and when required	Storage tanks for the project are appropriate and no incidents are reported in this regard
– The tanks/ bowzers 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/ bowzers (110% statutory requirement plus an allowance for rainfall);	Contractor	Appropriate storage facilities must be constructed or obtained for tanks as per the requirements listed	During the Construction Phase	ECO	Monthly, and as and when required	Storage areas for the tanks/ bowzers for the project are appropriate and no incidents are reported in this regard
– The floor of the bund must be sloped, draining to an oil separator;	Contractor	Appropriate storage facilities must be constructed as per	During the Construction Phase	ECO	Once, during construction	Bunded storage areas are constructed according to

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		the requirements listed				the requirements
– 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;	Contractor	Appropriately constructed refuelling facility must be developed as per the requirements. Drip trays must be provided for use	During the Construction Phase	ECO cEO	Monthly Weekly	Soils at the refuelling facility are protected as required and drip trays are provided and used
– All empty externally dirty drums must be stored on a drip tray or within a bunded area;	Contractor	Ensure that empty dirty drums are stored appropriately as per the requirements	During the Construction Phase	ECO cEO	Monthly Weekly	Drip trays or bunded areas are used for the storage of dirty drums
– No unauthorised access into the hazardous substances storage areas must be permitted;	Contractor	Ensure through the implementation of procedures that no unauthorised access is undertaken into the storage areas	During the Construction Phase	ECO	Monthly	Proof of the implementation of the relevant procedure must be provided by the contractor
– No smoking must be allowed within the vicinity of the hazardous storage areas;	Contractor	Inform all employees of the requirement and develop and place relevant	During the Construction Phase	ECO cEO	Monthly Weekly	Photographic record of the signage placed must be provided



Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		signage in the relevant areas				
– Adequate fire-fighting equipment must be made available at all hazardous storage areas;	Contractor	Hazardous storage areas must be fitted with adequate fire-fighting equipment	During the Construction Phase	ECO	Monthly	Adequate fire-fighting equipment is available and has been serviced
– 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;	Contractor	Provide a mobile refuelling unit as well as suitable ground protection, where required	During the Construction Phase	ECO	Monthly, and as and when required	A mobile refuelling unit and suitable ground protection is available for use
– 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;	Contractor	Provide an appropriate spill kit for the project for the use of hazardous substances	During the Construction Phase	ECO	Monthly, and as and when required	Appropriate spill kits are available for use
– The responsible operator must have the required training to make use of the spill kit in emergency situations;	cEO and Contractor	Provide training on the use of spill kits to the relevant employees	Pre-construction	ECO	Once, prior to the commencement of construction	Proof of training to be provided by the contractor
– An appropriate number of spill kits must be available and must be located in all areas where activities are being undertaken;	cEO and Contractor	Provide an appropriate number of spill kits in relevant areas	During the Construction Phase	ECO	Monthly	Proof of appropriate number of spill kits in

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
						appropriate areas to be provided by the contractor
<p>– 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 <b>Section 5.7</b> for procedures concerning <b>storm and waste water management</b> and <b>5.8</b> for <b>solid and hazardous waste management</b>.</p>	cEO and Contractor	Storage and disposal of contaminated soil must be in accordance with the National Environmental Management: Waste Act and sections 5.7 and 5.8 of this EMPr	During the Construction Phase	ECO	Monthly, and as and when required	<p>Proof of storage and disposal in terms of the National Environmental Management: Waste Act must be provided.</p> <p>Certificates of disposal at licensed waste disposal facilities must be provided</p>

### 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;	Contractor	Demarcate specific areas for the maintenance of vehicles and equipment	During the Construction Phase	ECO	Monthly	A dedicated area for the maintenance of vehicles and machinery is used.
– 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;	Contractor	Ensure that a drip tray is available for any emergency repairs required	During the Construction Phase	ECO	Monthly	Contractor to provide evidence of drip tray use for emergency repairs
– Leaking equipment must be repaired immediately or be removed from site to facilitate repair;	Contractor	Ensure that where leaking equipment is identified it is repaired immediately or removed from site for repairs	During the Construction Phase	ECO	Monthly	Contractor to provide details of equipment repaired or removed from site
– Workshop areas must be monitored for oil and fuel spills;	cEO	Undertake regular inspections of the workshop areas for oil and fuel spills	During the Construction Phase	ECO	Monthly	Register of inspection

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		and keep an updated register of inspection on site				
– Appropriately sized spill kit kept onsite relevant to the scale of the activity taking place must be available;	Contractor	Provide an appropriate spill kit for the project	During the Construction Phase	ECO	Monthly, and as and when required	Appropriate spill kits are available for use
– 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;	Contractor	Ensure that the workshop area is sufficiently bunded in accordance with the required specification	During the Construction Phase	ECO	Once, during the Construction Phase and as and when required	Workshop area is bunded in accordance with the required specification
– Water drainage from the workshop must be contained and managed in accordance <b>Section 5.7: Storm and waste water management.</b>	Contractor	Ensure that water drainage from workshop area is managed as per the requirements of section 5.7	During the Construction Phase	ECO	Monthly	Workshop drainage is managed in accordance with the requirements

## 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;	Contractor	Provide impermeable surface for the mixing of concrete	During the Construction Phase	cEO	Weekly	No concrete mixing is undertaken on open ground
– Batching plants areas must be fitted with a containment facility for the collection of cement laden water.	Contractor	Implement measures for the control and management of cement laden water	During the construction phase	cEO	Weekly	No mismanagement of laden water due to the temporary concrete batching plant
– Dirty water from the batching plant must be contained to prevent soil and groundwater contamination	Contractor	Implement measures for the control and management of dirty water to prevent soil and groundwater contamination	During the construction phase	cEO	Weekly	No mismanagement of dirty water due to the temporary concrete batching plant and no/minimal soil and

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
						groundwater contamination
– Bagged cement must be stored in an appropriate facility and at least 10 m away from any water courses, gullies and drains;	Contractor	Demarcate and provide a storage area for bagged cement in-line with the listed requirements	During the Construction Phase	cEO	Weekly	Photographic proof of bagged cement stored within the demarcated area
– A washout facility must be provided for washing of concrete associated equipment. Water used for washing must be restricted;	Contractor	Provide a washout facility for the washing of associated equipment. Enforce limitations on water use for washing of equipment	During the Construction Phase	cEO	Weekly	No cement laden water is released into the environment. Only minimal water is used for washing
– Hardened concrete from the washout facility or concrete mixer can either be reused or disposed of at an appropriate licensed disposal facility;	Contractor	Make use of hardened concrete where possible or dispose of concrete in a suitable manner	During the Construction Phase	ECO	Monthly	Certificates of disposal of concrete at licensed waste disposal facility
– Empty cement bags must be secured with adequate binding material if these will be temporarily stored on site;	Contractor	Bind empty cement bags and temporarily store it	During the Construction Phase	ECO	Monthly	Proof of binding of empty cement bags

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		in an appropriate area on site				and storage in an appropriate area on site to be provided by the Contractor
– Sand and aggregates containing cement must be kept damp to prevent the generation of dust (Refer to <b>Section 5.20: Dust emissions</b> )	Contractor	Ensure that sand and aggregates are kept damp or otherwise protected from dust generation	During the Construction Phase	ECO	Monthly	Proof of damping (or alternative dust suppression) of sand and aggregates must be provided by the Contractor
– 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;	Contractor	Ensure that all excess sand, stone and cement is removed or reused	At the completion of the Construction Phase	ECO	Once, with the completion of construction	Certificates for the disposal of sand, stone and cement at licensed waste disposal facilities or proof of reuse must be provided

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Temporary fencing must be erected around batching plants in accordance with <b>Section 5.5: Fencing and gate installation.</b>	Contractor	Erect Temporary fencing	During the construction phase	cEO	Weekly	Temporary fencing around batching plants

## 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;	Contractor	Apply appropriate dust suppressant	During the Construction Phase	cEO	Weekly	Contractor to provide proof of use of appropriate dust suppressants
– 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;	Contractor	Proper planning for vegetation removal must be undertaken as well as for the	During the Construction Phase and Rehabilitation	cEO	Weekly	Plan for implementation must be provided by the Contractor



Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		associated rehabilitation				
– Excavation, handling and transport of erodible materials must be avoided under high wind conditions or when a visible dust plume is present;	Contractor	Ensure that specific limitations are placed on the transport and handling of erodible materials during high wind conditions or when a visible dust plume is present	During the Construction Phase	cEO	Bi-weekly (every second week)	No complaints submitted in this regard
– 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;	ECO	ECO to provide adequate recommendations	During the Construction Phase	Not Applicable		
– Where possible, soil stockpiles must be located in sheltered areas where they are not exposed to the erosive effects of the wind;	Contractor	Place soil stockpiles in areas less affected by wind	During the Construction Phase	cEO and ECO	Bi-weekly (every second week) Monthly	Soil stockpiles are not exposed to wind and have not been eroded
– Where erosion of stockpiles becomes a problem, erosion control measures must be implemented at the discretion of the ECO;	Contractor in consultation with the ECO	Contractor to implement erosion control measures as recommended and agreed with the ECO	During the Construction Phase	cEO	Weekly, until erosion is no longer a problem	Recommendations made by the ECO have been implemented

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
						by the Contractor
- Vehicle speeds must not exceed 40 km/h along dust roads or 20 km/h when traversing unconsolidated and non-vegetated areas;	cEO / dEO / contractor	Inform all drivers of speed limits and place appropriate signage along the relevant roads	During the Construction Phase Operation Phase	ECO Operation and Maintenance team	Monthly	No complaints from community members are submitted
- Straw stabilisation must be applied at a rate of one bale/10 m <sup>2</sup> and harrowed into the top 100 mm of top material, for all completed earthworks;	Contractor	Ensure that straw stabilisation is undertaken as per the listed requirements	During the Construction Phase	ECO	Monthly	Photographic record of all straw stabilisation undertaken
- For significant areas of excavation or exposed ground, dust suppression measures must be used to minimise the spread of dust.	Contractor	Appropriate dust suppressant measures are implemented	During the Construction Phase	cEO	Weekly	Photographic record of measures being implemented and the results thereof

### 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	Not Applicable – no blasting proposed.					
- Notification of surrounding landowners, emergency services site personnel of blasting activity 24 hours prior to such activity taking place on Site.	Not Applicable – no blasting proposed.					

## 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;	Contractor	Ensure that noise limits do not exceed acceptable limits and avoid the use of amplification communication	During the Construction Phase	ECO	Monthly, and as and when required	No complaints registered in this regard. No amplification equipment is used.
– All vehicles and machinery must be fitted with appropriate silencing technology and must be properly maintained;	Contractor	Provide and implement silencing technology	During the Construction Phase	ECO	Monthly, and as and when required	No complaints registered in this regard. Silencing technology is utilised.
– 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;	cEO	Update complaints register. Provide daily transport to and from site for employees	During the Construction Phase	ECO	Monthly, and as and when required	Complaints register provided by the cEO and proof of transportation services provided

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– 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.	cEO and Contractor in consultation with the ECO	Compile a Code of Conduct for staff. Appropriate operating hours must be identified for the project.	Pre-construction and Construction	ECO	Once, prior to the commencement of construction	No complaints registered in this regard.

### 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;	cEO / Contractor	Identify and demarcate through signage designated smoking areas	Pre-construction & Construction	ECO	Monthly	Photographic record of designated smoking area
– Firefighting equipment must be available on all vehicles located on site;	cEO / dEO in consultation with the Contractor	Provide all vehicles with firefighting equipment	Construction	ECO	Monthly	All vehicles are fitted with firefighting equipment and the details

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
						thereof are provided by the cEO
– The local Fire Protection Agency (FPA) must be informed of construction activities;	cEO in consultation with the ECO	Undertake formal consultation to inform the local FPA of the associated construction activities	Pre-construction	ECO	Once, during the commencement of the Construction Phase	Proof of consultation with the FPA
– Contact numbers for the FPA and emergency services must be communicated in environmental awareness training and displayed at a central location on site;	dEO / cEO / Contractor in consultation with the ECO	Develop environmental awareness training material which covers the contact numbers for the FPA and emergency services.  Place the contact numbers for the FPA and emergency services at a visible and central location	Pre-construction & Construction	ECO	Prior to the commencement of the environmental awareness training and once during the construction phase	Environmental awareness training material requirements checklist and photographic record of contact numbers on display
– Two way swop of contact details between ECO and FPA.	ECO	Consultation between the ECO and FPA in order to	Pre-construction	Not Applicable		

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		exchange contact details				

#### 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;	Contractor	Identify and demarcate an appropriate location for the storage of excavated materials	Pre-construction & Construction	ECO	Monthly	Excavated material is not stored within sensitive environmental areas
– All stockpiled material must be maintained and kept clear of weeds and alien vegetation growth by undertaking regular weeding and control methods;	Contractor	Implement appropriate and sufficient maintenance on	During the Construction Phase	cEO ECO	Bi-weekly (every second month)	Stockpiled material is maintained sufficiently and is clear of

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		stockpiled material regularly			Monthly	weeds and alien vegetation
- Topsoil stockpiles must not exceed 2 m in height;	Contractor	Enforce limitations for the height of topsoil stockpiles	During the Construction Phase	cEO ECO	Bi-weekly (every second month) Monthly	Topsoil stockpiles do not exceed 2m in height
- During periods of strong winds and heavy rain, the stockpiles must be covered with appropriate material (e.g. cloth, tarpaulin etc.);	Contractor	Appropriate material must be provided in order to cover stockpiles when required	During the Construction Phase	ECO	Monthly	Contractor to provide proof of availability of appropriate material to cover stockpiles when required
- Where possible, sandbags (or similar) must be placed at the bases of the stockpiled material in order to prevent erosion of the material.	Contractor	Sandbags must be provided in order to prevent erosion of stockpiled materials	During the Construction Phase	ECO	Monthly	Contractor to provide proof of availability of sandbags to prevent erosion of stockpiled materials



## 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;	Contractor	Collection and safe storage of topsoil for later use in rehabilitation phase	During the Construction Phase	ECO	Monthly	Visual inspection of topsoil stockpiles for later use
– Areas to be rehabilitated include terrace embankments and areas outside the high voltage yards;	Contractor	Regard areas that do not house infrastructure as requiring rehabilitation and apply rehabilitation measures to these regions	During the Construction Phase, where the area is no longer going to be utilised	ECO	Monthly	Visual inspection of rehabilitation implementation to ensure these areas are being rehabilitated
– Where required, all sloped areas must be stabilised to ensure proper rehabilitation is effected and erosion is controlled;	Contractor	If required stabilise soil using recognised methods to ensure proper rehabilitation and erosion control	Duration of the construction phase	ECO	Monthly	Visual inspection of stabilised soil regions and descriptions of staff of stabilisation method used

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– 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;	Contractor	If required stabilise soil using recognised methods to ensure proper rehabilitation and erosion control	Duration of the construction phase	ECO	Monthly	Visual inspection of stabilised soil regions and descriptions of staff of stabilisation method used
– Rehabilitation of the disturbed areas must be managed in accordance with <b>Section 5.35: Landscaping and rehabilitation</b> ;	Contractor	Review and ensure that all rehabilitation measures are implemented in accordance with the requirements of Section 5.35	Duration of the construction phase	ECO	Monthly	Visual inspection of rehabilitation conducted and the degree of conformance with the requirements set out in Section 35.5 of this report
– All excess spoil generated during terracing activities must be disposed of in an appropriate manner and at a recognised landfill site; and	Contractor	Dispose of all excess spoil using appropriate means and at recognised landfill sites. Keep written registers of the disposal conducted	Duration of the construction phase	ECO	Monthly	Evidence of disposal slips as applicable kept in the site environmental file

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Spoil can however be used for landscaping purposes and must be covered with a layer of 150 mm topsoil for rehabilitation purposes.	Contractor	Where spoil is utilised for landscaping purposes implement a 150mm topsoil layer on top following shaping and compaction to promote rehabilitation	Duration of the construction phase	ECO	Monthly	Spoil material used in landscaping is suitably covered with a later of topsoil at least 150mm deep

#### 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;	Contractor	Use a licensed waste disposal facility for the disposal of excess spoil	During the Construction Phase	ECO	Monthly	Certificates obtained for the disposal of excess spoil at a licensed waste

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
						disposal facility
– Spoil can however be used for landscaping purposes and must be covered with a layer of 150 mm topsoil for rehabilitation purposes;	Contractor	Spoil used for landscaping must be applied as per the listed requirements	Construction and Rehabilitation	ECO	Monthly	Photographic record of spoil used for landscaping purposes as well as feedback from the contractor
– Management of equipment for excavation purposes must be undertaken in accordance with <b>Section 5.18: Workshop, equipment maintenance and storage</b> ; and	Contractor	Undertake the management of equipment for excavation as per the requirements of section 5.18	During the Construction Phase	ECO	Monthly	Management of equipment is undertaken in line with the requirements of section 5.18
– Hazardous substances spills from equipment must be managed in accordance with <b>Section 5.17: Hazardous substances</b> .	Contractor	Undertake the management of hazardous substances spills from equipment as per the requirements of section 5.17	During the Construction Phase	ECO	Monthly	Management of hazardous substances spills from equipment is undertaken in line with the requirements

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
						of section 5.17

### 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 <b>Section 5.19: Batching plants</b> ; and	Contractor	Ensure correct batching of cement	During the construction phase	cEO	Weekly	Measures in place to ensure the batching of cement is done in accordance with Section 5.19: Batching plants
– Residual solid waste must be disposed of in accordance with <b>Section 5.8: Solid waste and hazardous management</b> .	Contractor	Undertake the disposal of residual solid waste as per the requirements of section 5.8	During the Construction Phase	ECO	Monthly	The disposal of residual solid waste is undertaken in line with section 5.8.

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

**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 <b>Section 5. 20: Dust emissions;</b>	Contractor	Review and implement dust management actions in accordance with the requirement of Section 5.20 of this report	During the Construction Phase	ECO	Monthly	Dust management actions observed to be in accordance with the requirement of Section 5.20 of this report

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Management of equipment used for installation must be conducted in accordance with <b>Section 5.18: Workshop, equipment maintenance and storage;</b>	Contractor	Review and implement equipment management actions in accordance with the requirement of Section 5.18 of this report	During the Construction Phase	ECO	Monthly	Equipment management actions observed to be in accordance with the requirement of Section 18 of this report
– Management hazardous substances and any associated spills must be conducted in accordance with <b>Section 5.17: Hazardous substances;</b> and	Contractor	Review and implement hazardous substances and any associated spills in accordance with the requirement of Section 5.17 of this report	During the Construction Phase	ECO	Monthly	Hazardous substances and any associated spills management actions observed to be in accordance with the requirement of Section 5.17 of this report
– Residual solid waste must be recycled or disposed of in accordance with <b>Section 5.8: Solid waste and hazardous management.</b>	Contractor	Review and dispose/recycle residual solid waste in accordance with	During the Construction Phase	ECO	Monthly	Dispose/recycle residual solid waste observed to be in

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		the requirement of Section 5.8 of this report				accordance with the requirement of Section 5.8 of this report

### 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	Contractor	Conduct an inspection of the site once assembly is complete to remove all stray bolts or unused materials that may be left on site	Duration of the construction phase	ECO	Monthly	Evidence of leftover waste/unused materials on site following closure of assembly
– Emergency repairs due to breakages of equipment must be managed in accordance with <b>Section 5.18: Workshop, equipment maintenance and storage</b> and <b>Section 5.16: Emergency procedures.</b>	Contractor	Review and conduct all emergency repairs in accordance with	Duration of the construction phase	ECO	Monthly	Evidence of emergency repairs carried out



Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		Sections 5.18 and 5.16 of this report				having been conducted in accordance with Sections 5.18 and 5.16 of this report

### 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 <b>Section 6.8: Solid waste and hazardous Management;</b>	Contractor	Undertake recycling or disposal of solid waste as per the requirements of section 6.8	During the Construction Phase	ECO	Monthly	Undertake recycling or disposal of solid waste as per the requirements of section 6.8

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Management of equipment used for installation shall be conducted in accordance with <b>Section 5.18: Workshop, equipment maintenance and storage;</b>	Contractor	Undertake the management of equipment as per the requirements of section 5.18	During the Construction Phase	ECO	Monthly	Management of equipment is undertaken in line with the requirements of section 5.18
– Management hazardous substances and any associated spills shall be conducted in accordance with <b>Section 5.17: Hazardous substances.</b>	Contractor	Undertake the management of hazardous substances as per the requirements of section 5.17	During the Construction Phase	ECO	Monthly	Management of hazardous substances is undertaken in line with the requirements of section 5.17

### 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 <b>Section 5.8: Solid waste and hazardous management.</b>	Contractor	Undertake recycling or disposal of solid waste as per the requirements of section 5.8	During the Construction Phase	ECO	Monthly	Undertake recycling or disposal of solid waste as per the requirements of section 5.8

### 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;	dEO / cEO	Identify and implement appropriate strategies for communication with the	Pre-construction & Construction	ECO	Once, prior to the commencement of construction and	Communication is undertaken as per the identified strategies

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		communities through consideration of the community needs			monthly during the construction	and no complaints are submitted regarding communication
– Develop and implement a collaborative and constructive approach to conflict resolution as part of the external stakeholder engagement process;	Contractor	Development and implement a Grievance Mechanism which considers the community needs and provides procedures for conflict resolution	Pre-construction & Construction	ECO	Once, prior to the commencement of construction and monthly during the construction phase	Conflict resolution is undertaken in line with the requirements of the Grievance Mechanism. No complaints on conflict resolution is submitted by the community
– Sustain continuous communication and liaison with neighboring owners and residents	Contractor	Development and implement and Grievance Mechanism provides procedures for communication / liaison with neighbouring	Pre-construction & Construction	ECO	Once, prior to the commencement of construction and monthly during the construction phase	Communication / liaison with neighbouring landowners and residents are undertaken in line with the requirements

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		landowners and residents				of the Grievance Mechanism. No complaints on communication with neighbouring landowners and residents are submitted
- Create work and training opportunities for local stakeholders; and	Contractor	Develop and implement a "locals first" policy for the provision of employment opportunities	Pre-construction & Construction	ECO	Once, prior to the commencement of construction and monthly during the construction phase	The "locals first" policy is considered in terms of the employment and training opportunities
- 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.	Not applicable –no on-site housing is envisaged with daily commute to and from site expected of construction staff.					

### 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 <b>sections 5.17: Hazardous substances</b> and <b>5.18: Workshop, equipment maintenance and storage</b> ;	Contractor	Regular emptying of the bunds must be undertaken. This must be undertaken as per the requirements listed in sections 5.17 and 5.18	During the Construction Phase	ECO	Prior to site closure for more than 05 days	Bunds are emptied as per the requirements listed under sections 5.17 and 5.18
– Hazardous storage areas must be well ventilated;	Contractor	Install appropriate ventilation in all hazardous storage areas	During the construction phase	ECO	Prior to site closure for more than 05 days	Effective ventilation is installed in hazardous storage areas
– Fire extinguishers must be serviced and accessible. Service records to be filed and audited at last service;	Contractor / cEO	Ensure fire extinguishers are serviced, as required and are easily accessible with appropriate signage indicating location. Ensure service records and kept up to date and filed	During the Construction Phase	ECO	Prior to site closure for more than 05 days	Signage placed indicating location of fire extinguishers and service records

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
- Emergency and contact details displayed must be displayed;	Contractor / cEO	Place emergency and contact details which are readily available and easily accessible	During the Construction Phase	ECO	Prior to site closure for more than 05 days	Photographic proof of contact details on display
- Security personnel must be briefed and have the facilities to contact or be contacted by relevant management and emergency personnel;	Contractor in consultation with the ECO	Hold a workshop with all security personnel to provide a brief of the project and security requirements. Provide facilities in order to contact management and emergency personnel	Pre-construction & construction	ECO	Prior to site closure for more than 05 days	Proof of the workshop held must be kept on file by the contractor.
- Night hazards such as reflectors, lighting, traffic signage etc. must have been checked;	Contractor	Regular checks of night hazards must be undertaken	During the Construction Phase	ECO	Prior to site closure for more than 05 days	Proof of checks of night hazards must be provided by the contractor
- Fire hazards identified and the local authority must have been notified of any potential threats e.g. large brush stockpiles, fuels etc.;	cEO / Contractor in consultation with the ECO	Identify any potential fire hazards and notify the relevant local authority	During the Construction Phase	ECO	Prior to site closure for more than 05 days	Proof of notification of the fire hazards to the local authority

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
						must be provided by the Contractor
– Structures vulnerable to high winds must be secured;	Contractor	Ensure structures vulnerable to wind are secure prior to site closure	During the Construction Phase	ECO	Prior to site closure for more than 05 days	Structures vulnerable to wind are secured prior to site closure
– Wind and dust mitigation must be implemented;	Contractor	Implement wind and dust mitigation prior to site closure	During the Construction Phase	ECO	Prior to site closure for more than 05 days	Wind and dust mitigation is implemented prior to site closure
– Cement and materials stores must have been secured;	Contractor	Ensure cement and material stores are secured prior to site closure	During the Construction Phase	ECO	Prior to site closure for more than 05 days	Cement and material stores are secured prior to site closure
– Toilets must have been emptied and secured;	Contractor	Ensure toilets are emptied and secured prior to site closure	During the Construction Phase	ECO	Prior to site closure for more than 05 days	Toilets are emptied and secured prior to site closure
– Refuse bins must have been emptied and secured;	Contractor	Ensure refuse bins are emptied and secured prior to site closure	During the Construction Phase	ECO	Prior to site closure for more than 05 days	Refuse bins are emptied and secured prior to site closure



Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
- Drip trays must have been emptied and secured.	Contractor	Ensure drip trays are emptied and secured prior to site closure	During the Construction Phase	ECO	Prior to site closure for more than 05 days	Drip trays are emptied and secured prior to site closure

### 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	Contractor	Ensure old equipment is secured and where required, stored in contained areas where no spillage or pollution may result	During the Construction Phase	ECO	Monthly	Drip trays are emptied and secured prior to site closure
- Oil containing equipment must be stored to prevent leaking or be stored on drip trays;	Contractor	Ensure old equipment is secured and	During the Construction Phase	ECO	Monthly	Drip trays are emptied and

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		where required, stored in contained areas where no spillage or pollution may result				secured prior to site closure
– All scrap steel must be stacked neatly and any disused and broken insulators must be stored in containers;	Contractor	Store defunct insulators in containers and scrap steel in one single place, neatly secured	During the Construction Phase	ECO	Monthly	Where needed, insulators observed to be stored in containers and scrap stored neatly as determined by the ECO
– 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;	Contractor , cEO	Ensure dismantling and packaging of scrapped material is transported in such a way as to prevent spillage and pollution of the environment;	During the Construction Phase	ECO	Monthly	Where needed, insulators observed to be stored in containers and scrap stored neatly as determined by the ECO
– The Contractor must also be equipped to contain and clean up any pollution causing spills; and	cEO and Contractor	Provide training on the use of spill kits	During the Construction Phase	ECO	Monthly	Proof of training to be provided by

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		to the relevant employees				the contractor
– Disposal of unusable material must be at a licensed waste disposal site.	cEO and Contractor	Ensure a registered waste disposal site is utilised and keep disposal slips and record in the site environmental file	During the Construction Phase	ECO	Monthly	Visual inspection of disposal record documentation and registration of the waste disposal site utilised.

### 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;	Contractor	Develop and implement a rehabilitation plan for the	Pre-construction & Rehabilitation	cEO	Weekly	Rehabilitation of the disturbed areas is undertaken

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		rehabilitation of all disturbed areas.  Dispose of all spoil and waste at a licensed waste disposal facility				as per the rehabilitation plan. All certificates of waste disposal at licensed facilities are available.
- 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	Contractor in consultation with the ECO	Assess all slopes and determine whether contouring is required	Rehabilitation	cEO	Weekly	All slopes are assessed and contoured as required
- 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;	Contractor in consultation with the ECO	Assess all slopes and determine whether terracing is required	Rehabilitation	cEO	Weekly	All slopes are assessed and terraced as required
- 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;	Contractor	Ensure all berms have a slope of 1:4 and is replanted with indigenous species and grasses	Rehabilitation	cEO	Weekly	All berms have a slope of 1:4 and is replanted with indigenous species and grasses
- 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;	Not applicable					
- Rehabilitation of access roads outside of farmland;	Not applicable					

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Indigenous species must be used for with species and/grasses to where it compliments or approximates the original condition;	Contractor	Make use of indigenous species for rehabilitation	Rehabilitation	cEO	Weekly	Indigenous species are used for rehabilitation
– Stockpiled topsoil must be used for rehabilitation (refer to <b>Section 5.24: Stockpiling and stockpiled areas</b> );	Contractor	Ensure stockpiled topsoil is used as per the requirements listed under section 5.24	Rehabilitation	cEO	Weekly	Stockpiled topsoil is used as per the requirements listed under section 5.24
– Stockpiled topsoil must be evenly spread so as to facilitate seeding and minimise loss of soil due to erosion;	Contractor	Ensure that topsoil is spread evenly	Rehabilitation	cEO	Weekly	Topsoil is spread evenly
– Before placing topsoil, all visible weeds from the placement area and from the topsoil must be removed;	Contractor	Remove all visible weeds from placement area and topsoil before spreading the topsoil	Rehabilitation	cEO	Weekly	No weeds are visible in the placement area or the topsoil
– Subsoil must be ripped before topsoil is placed;	Contractor	Undertake the ripping of subsoil prior to the spreading of topsoil	Rehabilitation	cEO	Weekly	Subsoil is ripped before topsoil is placed
– The rehabilitation must be timed so that rehabilitation can take place at the optimal time for vegetation establishment;	Contractor	Plan the timeframe for rehabilitation in order to undertake vegetation planting during the optimal time for	Rehabilitation	ECO	At the start of rehabilitation to confirm correct timeframe	Rehabilitation is undertaken during the optimal time

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		vegetation establishment				
– Where impacted through construction related activity, all sloped areas must be stabilised to ensure proper rehabilitation is effected and erosion is controlled;	Contractor	All disturbed slope areas must be stabilised	Rehabilitation	cEO	Weekly	Disturbed slopes are stabilised sufficiently
– 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;	Contractor	Stabilise slopes as per the design specifications	Pre-construction & Rehabilitation	cEO	Weekly	Slopes are stabilised as per the design specifications
– Spoil can be used for backfilling or landscaping as long as it is covered by a minimum of 150 mm of topsoil.	Contractor	Spoil used for landscaping must be applied as per the listed requirements	Rehabilitation	cEO	Weekly	Photographic record of spoil used for landscaping purposes as well as feedback from the contractor
– 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;	Contractor in consultation with a suitably qualified specialist	Make use of a suitable vegetation seed mixture should enhancement be required	Rehabilitation	ECO	As and when required	Use of a suitable vegetation seed mixture if required

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

<b>Applicant Name</b>	<b>Great Karoo Renewable Energy (Pty) Ltd</b>
<b>Contact Person</b>	Romaya Dorasamy & Tobias Hobbach
<b>Physical Address</b>	53 Carlisle Street, Paarden Eiland, Cape Town, 7405
<b>Postal Address</b>	53 Carlisle Street, Paarden Eiland, Cape Town, 7405
<b>Telephone</b>	N/A
<b>Fax</b>	N/A
<b>Cell</b>	N/A
<b>Email Address</b>	tobias@greatkaroo.energy romaya@greatkarro.energy

##### 7.1.2 Details and expertise of the EAP:

<b>EAP Name</b>	<b>Jo-Anne Thomas</b>
<b>EAP Qualifications</b>	M.Sc. (Botany)
<b>Professional Affiliation/Registration</b>	South African Council for Scientific Natural Professions (SACNASP): Certified Natural Scientist – Pr.Sci.Nat. (Membership No.: 117178)
<b>Physical Address</b>	South African Council for Natural Scientific Professions (SACNASP) – registration number: registration number 400024/00  Environmental Assessment Practitioners Association of South Africa (EAPASA) – registration number: 2019/726
<b>Telephone</b>	011 656 3237
<b>Fax</b>	086 684 0547
<b>Cell</b>	082 775 5628
<b>Email Address</b>	joanne@savannahsa.com

**7.1.3 Project name:** Kwana PV facility, Northern Cape Province

**7.1.4 Description of the project:**



Great Karoo Renewable Energy (Pty) Ltd is proposing the development of a commercial solar PV and associated infrastructure on a site located approximately 35km south-west of Richmond and 80km south-east of Victoria West, within the Ubuntu Local Municipality and the Pixley Ka Seme District Municipality in the Northern Cape Province. The facility will have a contracted capacity of up to 100MW and will be known as the Kwana PV facility. The project is planned as part of a larger cluster of renewable energy projects, which includes two (2) additional 100MW PV facilities (known as the Nku Solar PV and Moriri Solar PV), two (2) 140MW Wind Energy Facility (known as the Angora Wind Farm and the Merino Wind Farm), as well as grid connection infrastructure connecting the renewable energy facilities to the existing Eskom Gamma Substation. These projects are proposed by separate Specialist Purpose Vehicles (SPVs)<sup>1</sup>, and are assessed through separate Environmental Impact Assessment (EIA) processes.

A technically feasible project site<sup>2</sup>, with an extent of ~29 909ha has been identified by Great Karoo Renewable Energy (Pty) Ltd as a technically suitable area for the development of the Kwana PV development. A development area<sup>3</sup> of ~999ha has been identified within the project site by the proponent for the development. The development area consists of two (2) affected properties, which include:

- » Portion 1 of Farm Rondavel 85
- » Portion 0 of Farm Rondavel 85

During the Scoping Phase, the full extent of the development area was considered by the specialist assessments, with the aim of determining the suitability from an environmental and social perspective and identifying areas that should be avoided in development planning. Based on the specialist assessments undertaken during the Scoping Phase, areas of environmental sensitivity were identified within the development area. In order to avoid these areas of potential sensitivity and to ensure that potential detrimental environmental impacts are minimised as far as possible, the developer identified a suitable development footprint<sup>4</sup> (~205ha in extent) within the larger development area where the solar panels and other associated infrastructure for the Kwana PV facility is planned to be constructed. Since the development area assessed during the Scoping Phase is larger than the area required for the development footprint, it provides the opportunity for the optimal placement of the infrastructure, ensuring avoidance of major identified environmental sensitivities.

Infrastructure associated with the Kwana PV will include:

- » Solar PV array comprising PV modules and mounting structures.
- » Inverters and transformers.
- » Cabling between the panels.
- » 33/132kV onsite facility substation.
- » Cabling from the onsite substation to the collector substation (either underground or overhead).
- » Electrical and auxiliary equipment required at the collector substation that serves the solar energy facility, including switchyard/bay, control building, fences, etc.
- » Battery Energy Storage System (BESS).

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<sup>1</sup> The development of the various projects under separate SPVs is in accordance with the DMRE's requirements under the REIPPPP.

<sup>2</sup> The project site is the area with an extent of 29 909ha, within which the Kwana PV development footprint will be located.

<sup>3</sup> The development area is that identified area (located within the project site) where the Kwana PV facility is planned to be located. This area has been selected as a practicable option for the facility, considering technical preference and constraints. The development area is ~999ha in extent.

<sup>4</sup> The development footprint, which is ~205ha in extent, is the defined area (located within the development area) where the solar panels and other associated infrastructure for the Kwana PV facility is planned to be constructed. This is the actual footprint of the facility, and the area which would be disturbed.

- » Site offices and maintenance buildings, including workshop areas for maintenance and storage.
- » Laydown areas.
- » Access roads and internal distribution roads.

The Kwana PV facility is proposed in response to the identified objectives of the national and provincial government and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to bid the Kwana PV facility under the Department of Mineral Resources and Energy's (DMRE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme or a similar programme, with the aim of evacuating the generated power into the national grid. This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP), with the Kwana PV facility set to inject up to 100MW into the national grid.

From a regional perspective, the area within the Northern Cape identified for the project is considered favourable for the development of a commercial solar PV by virtue of prevailing climatic conditions, relief, the extent of the affected properties, the availability of a direct grid connection (i.e., a point of connection of the national grid) and the availability of land on which the development can take place.

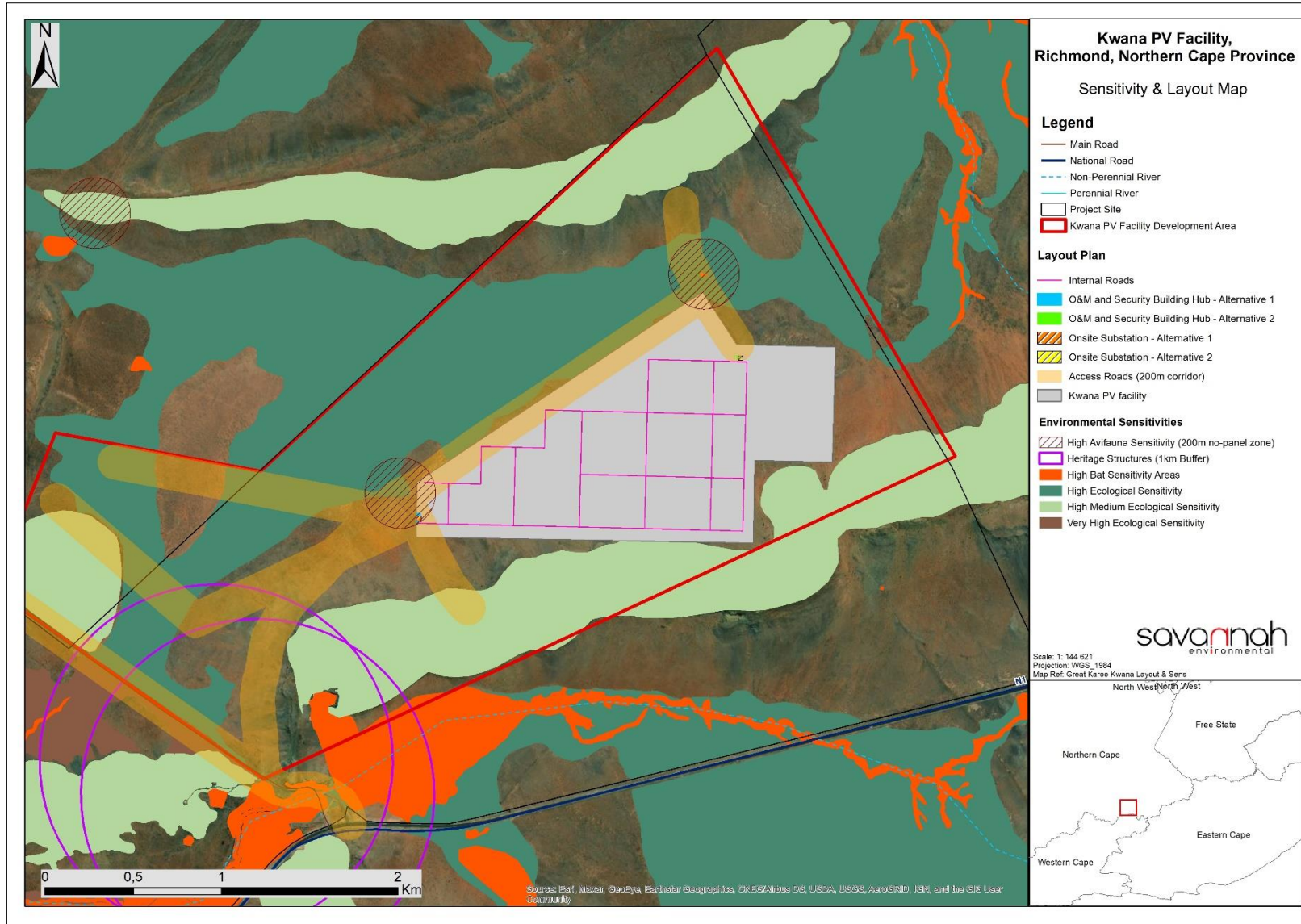
## 7.2 Sub-section 2: Development footprint site map

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.zg/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.

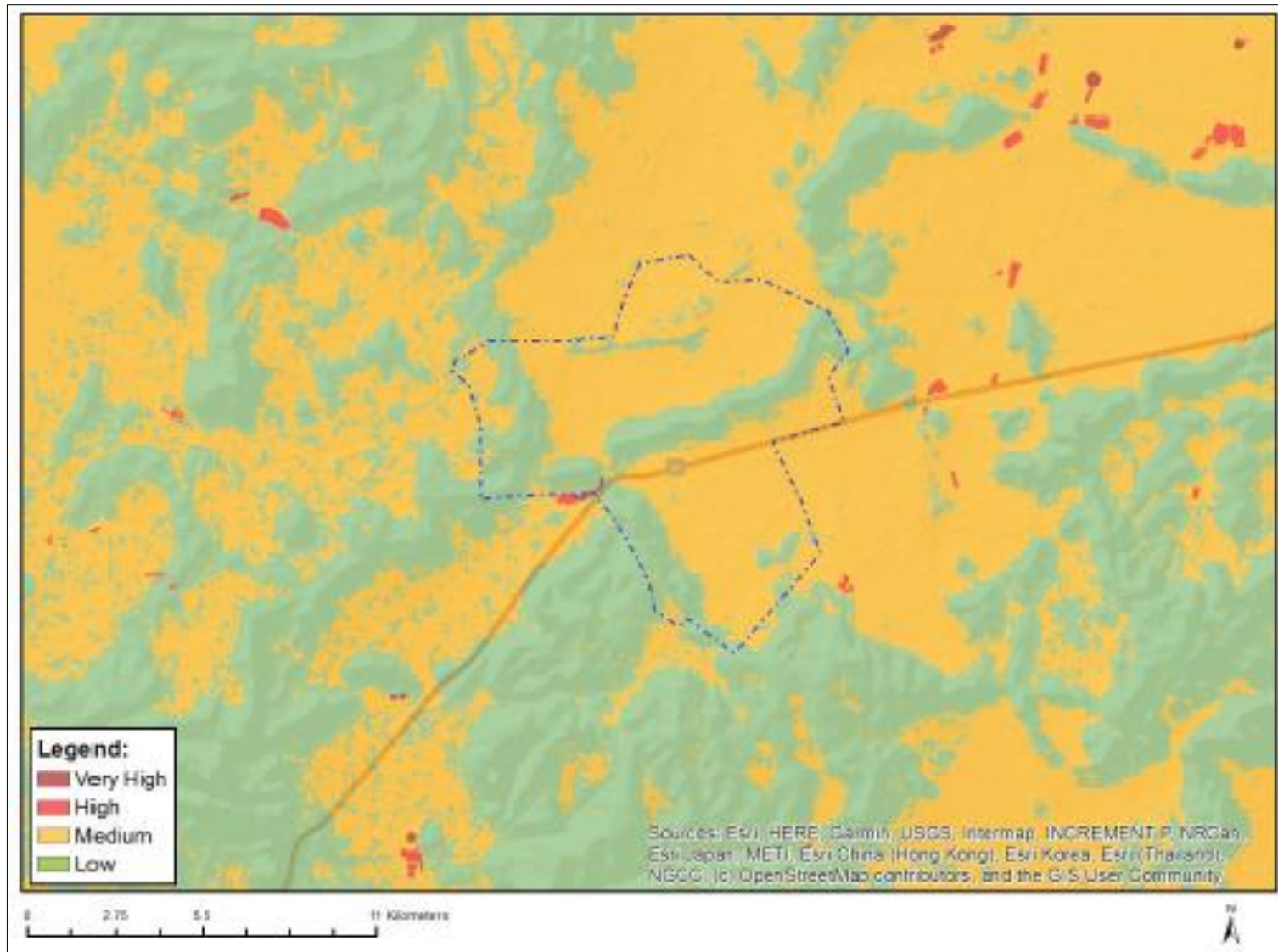
**The national web-based environmental screening tool was utilised for this project and the Kwana PV development sensitivity maps can be seen in Figures 2 to 16. The site-specific environmental sensitivity map included in the EIA Report is included as Figure 1.**

### **Site sensitivity**

A combined sensitivity map for the grid connection corridor is provided below. This has been compiled based on the specialist sensitivities determined from their respective studies, and therefore aims to represent the entirety of the site and the combined sensitivities.

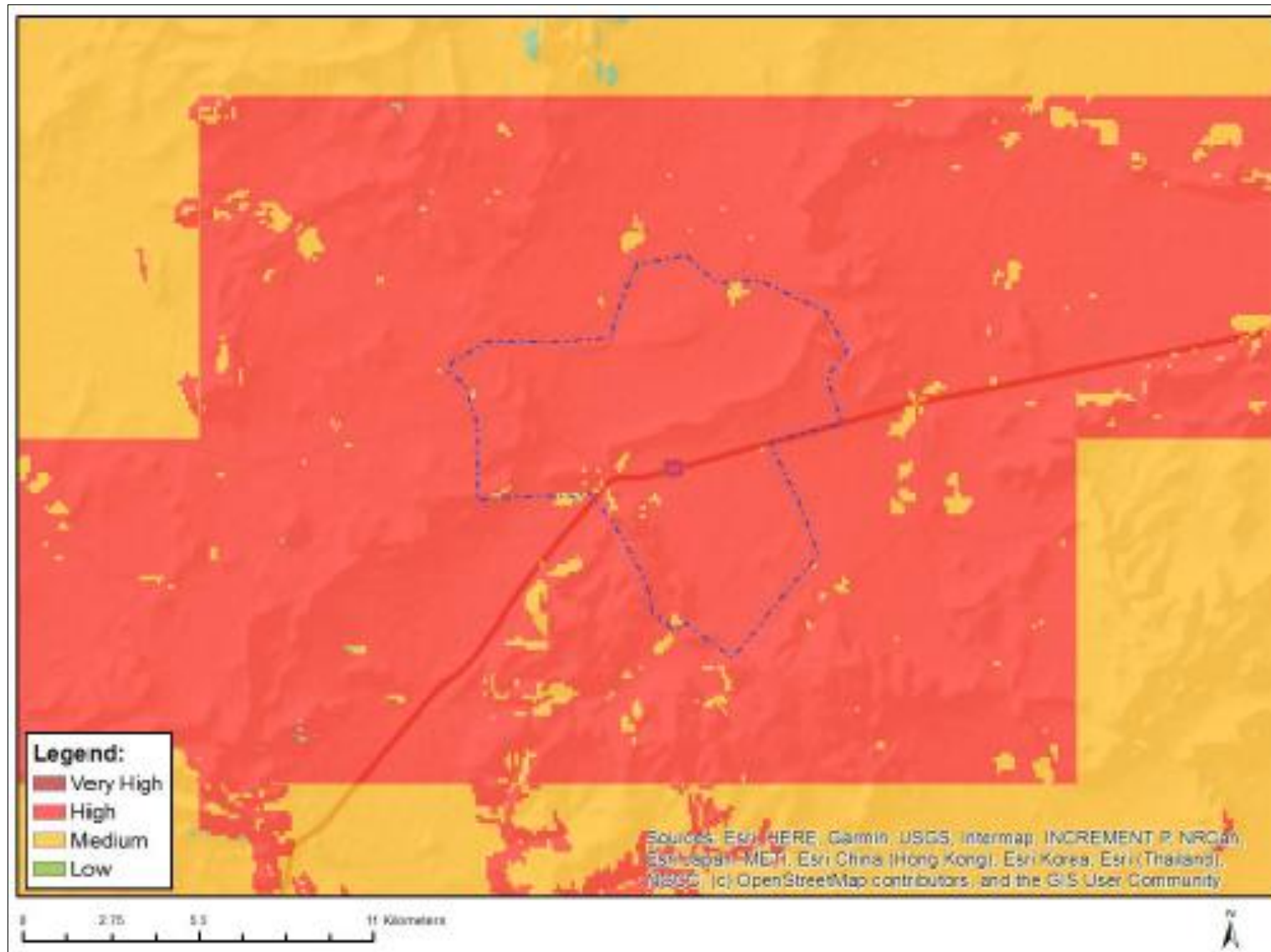


**Figure 1:** Environmental sensitivity and development footprint map of the Kwana PV facility

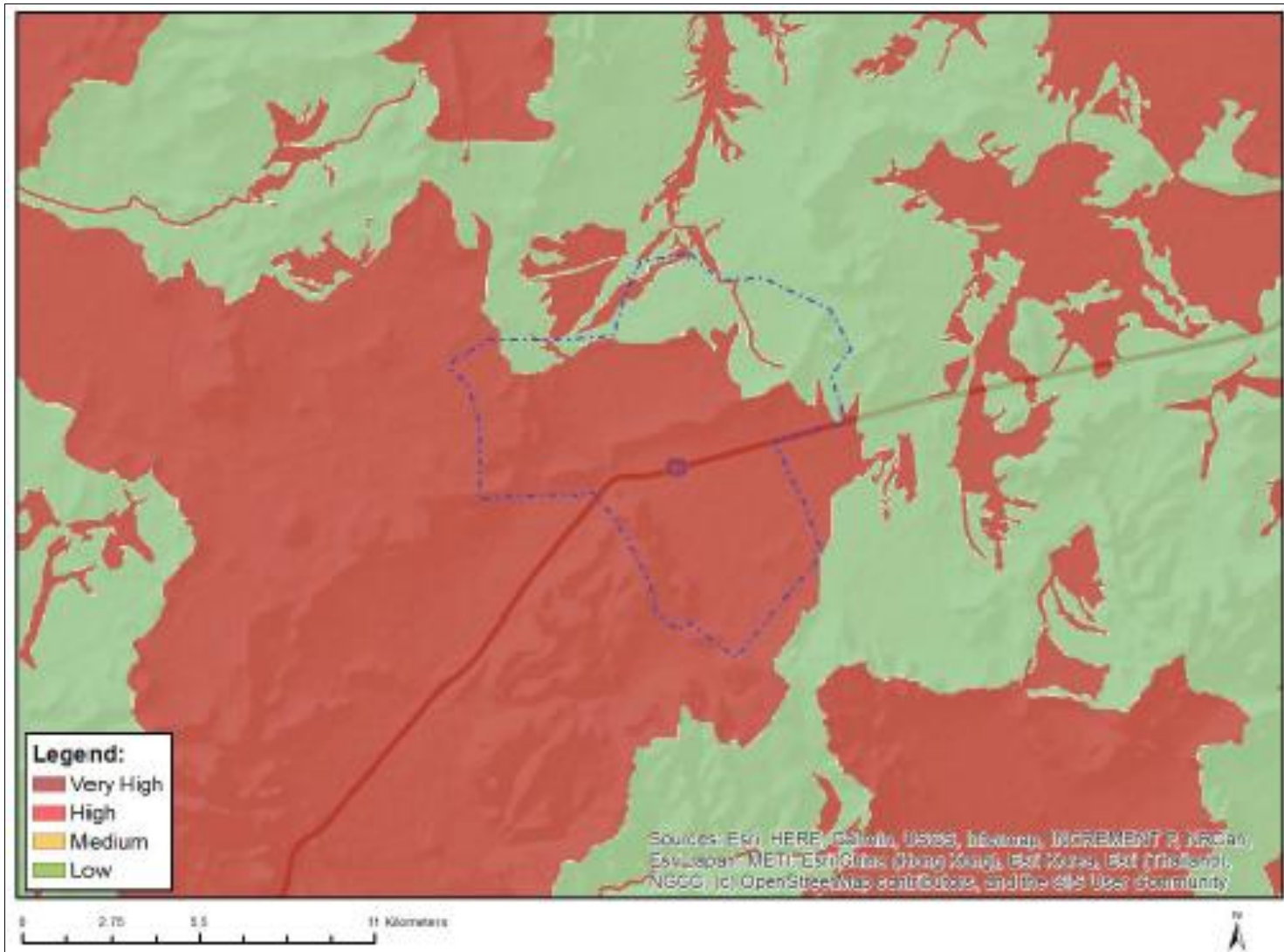


**Figure 2:** Map of relative agriculture theme sensitivity

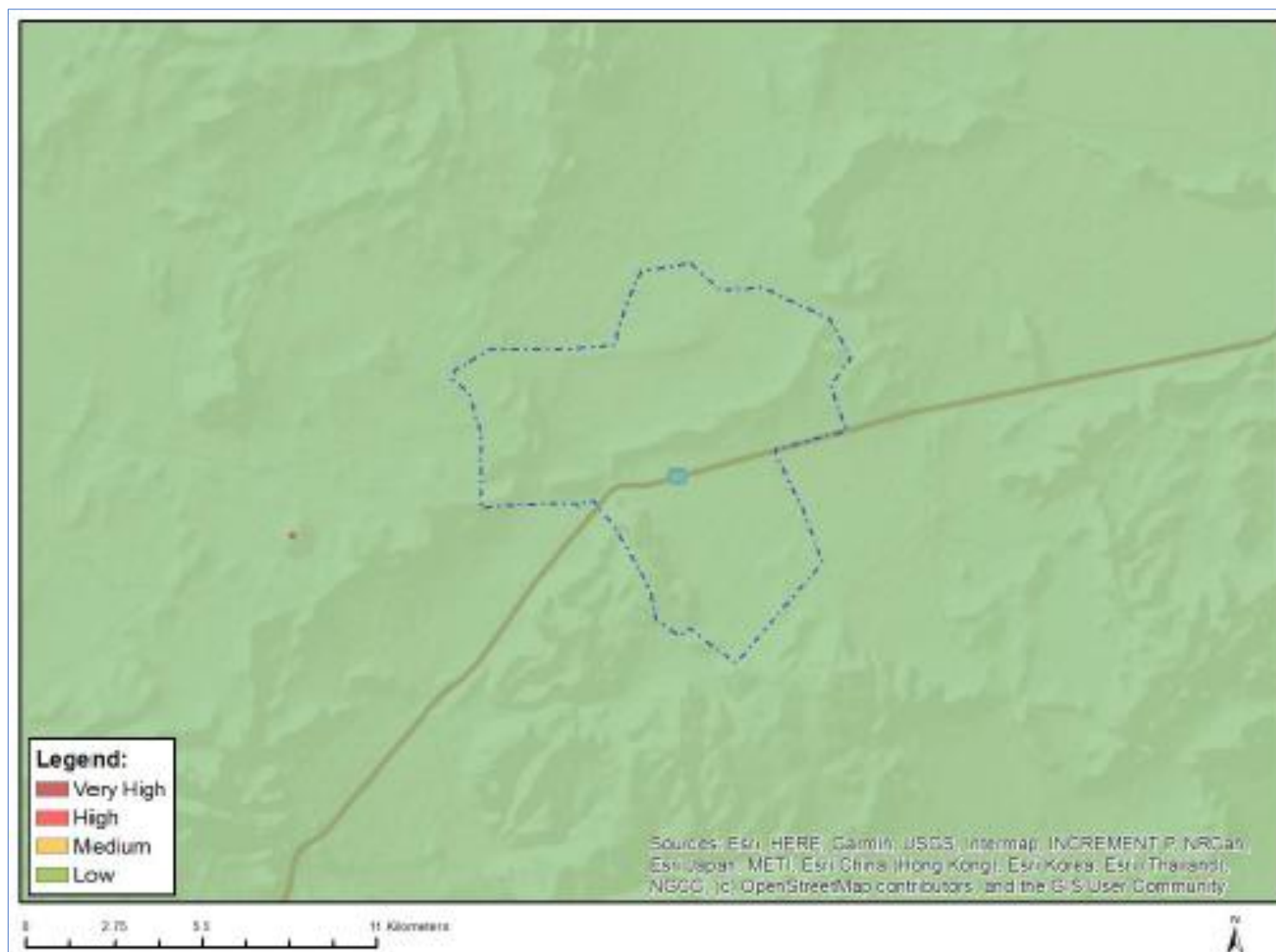




**Figure 3:** Map of relative animal species theme sensitivity

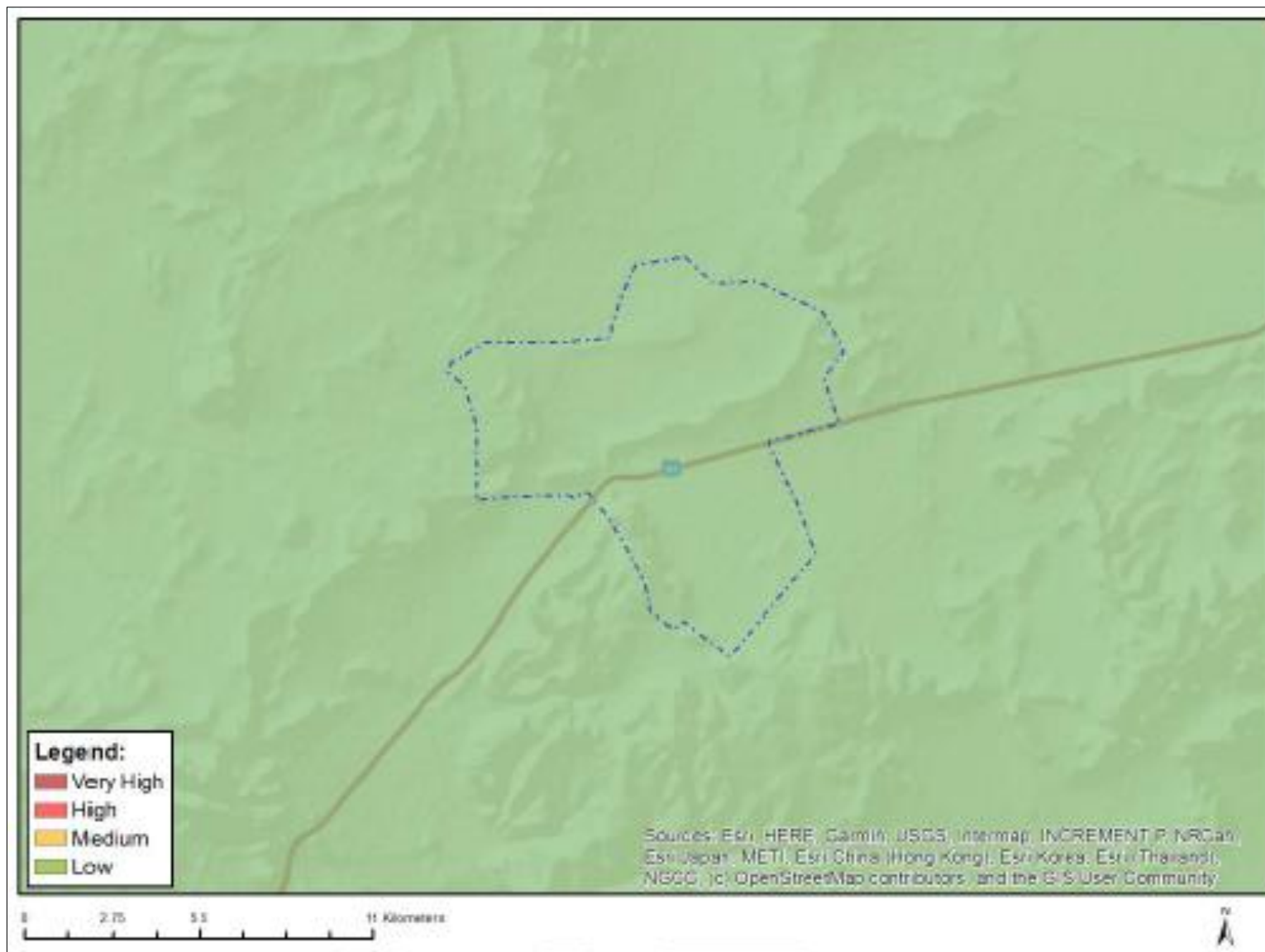


**Figure 4:** Map of relative aquatic biodiversity theme sensitivity

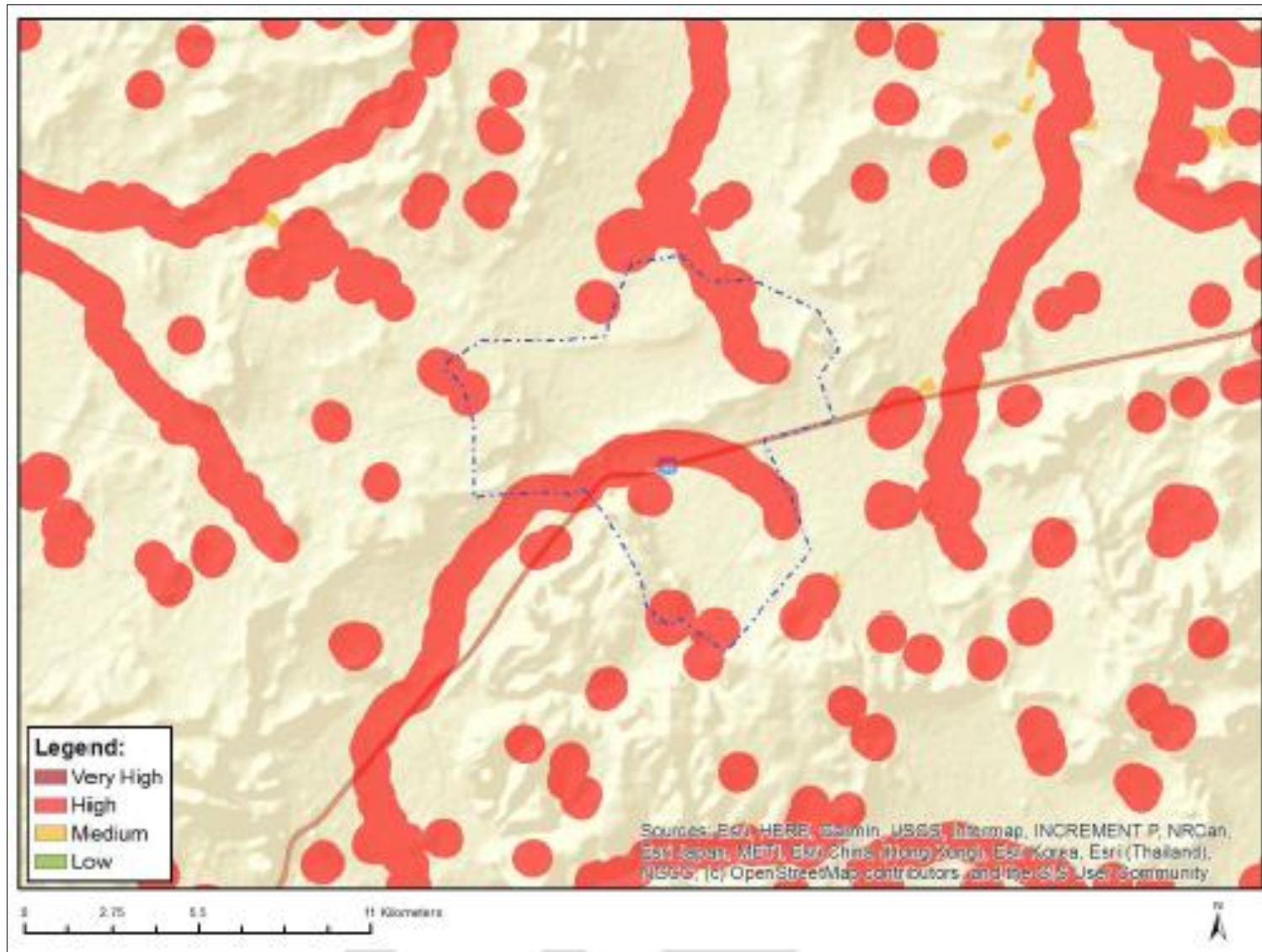


**Figure 5:** Map of relative archaeological and cultural heritage theme sensitivity.

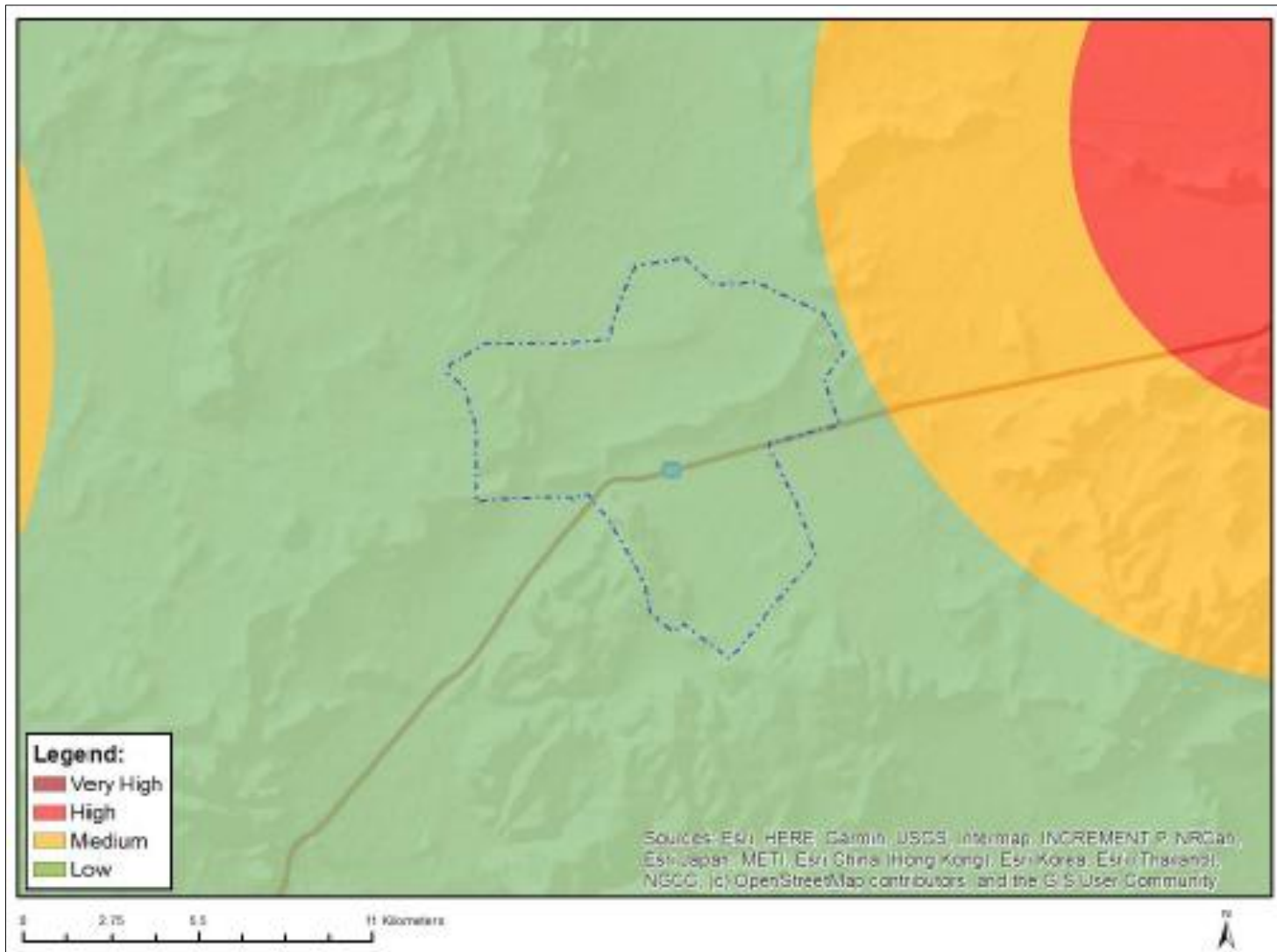




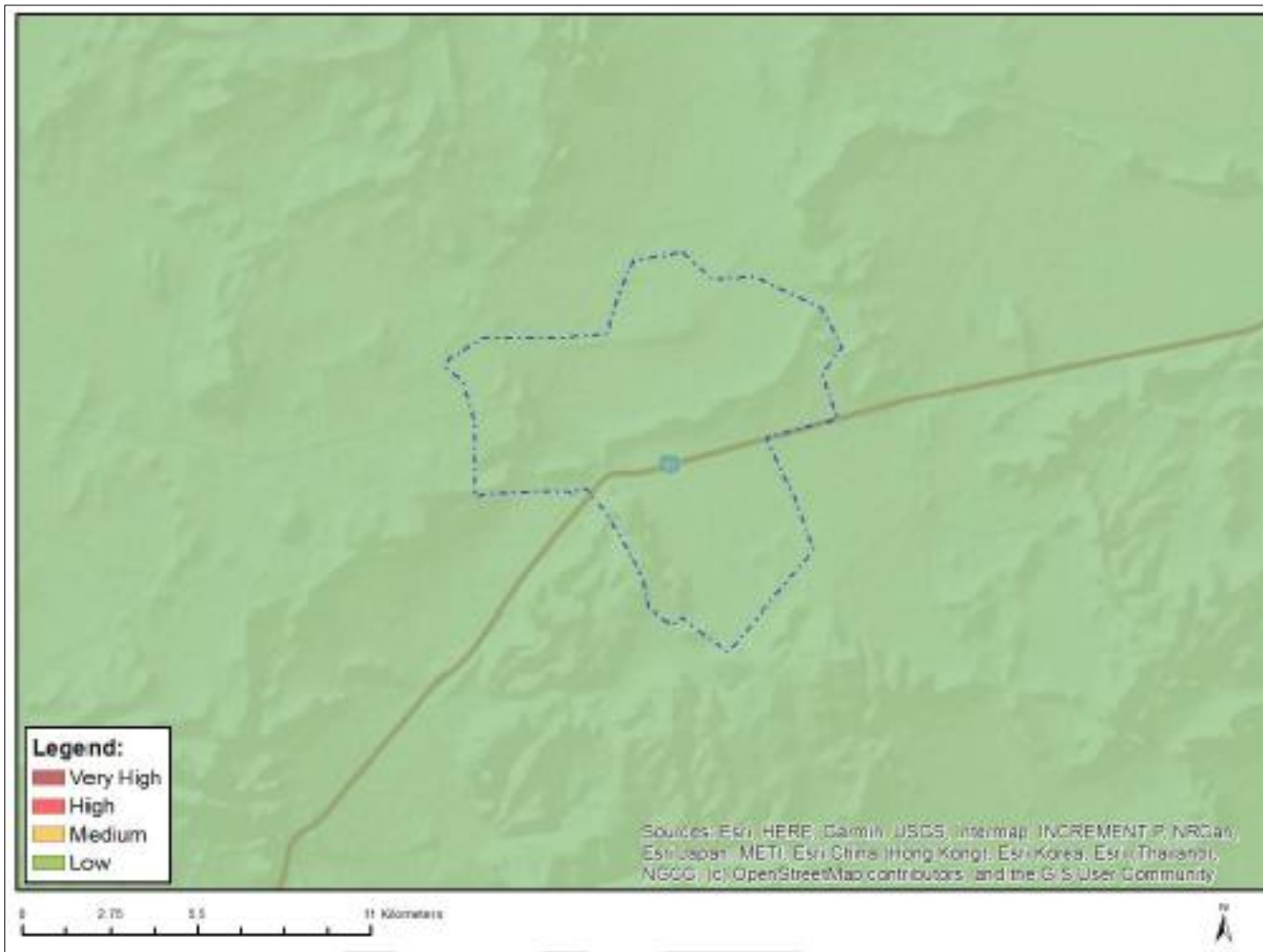
**Figure 6:** Map of relative avian theme sensitivity



**Figure 7:** Map of relative bat theme sensitivity

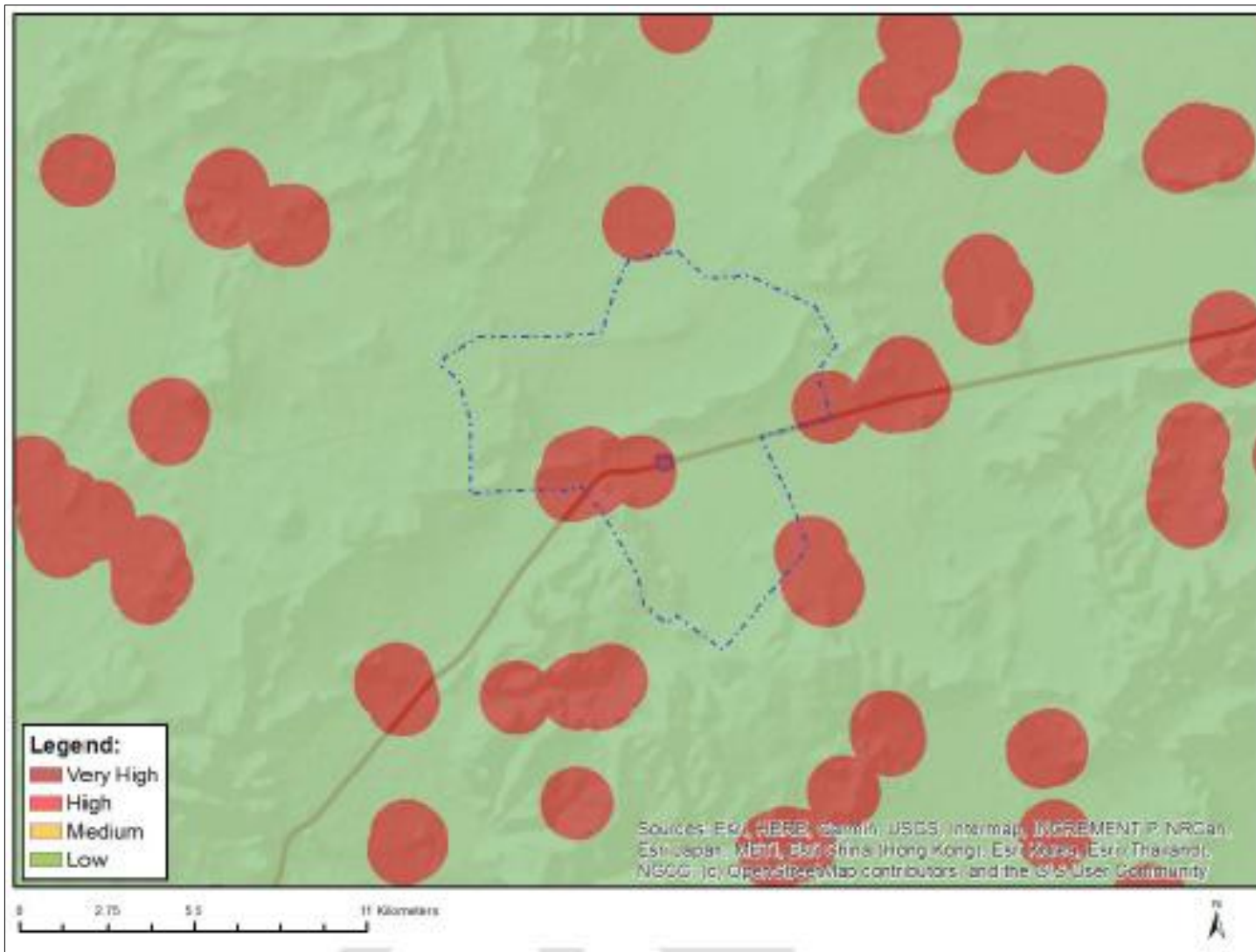


**Figure 8:** Map of relative civil aviation theme sensitivity

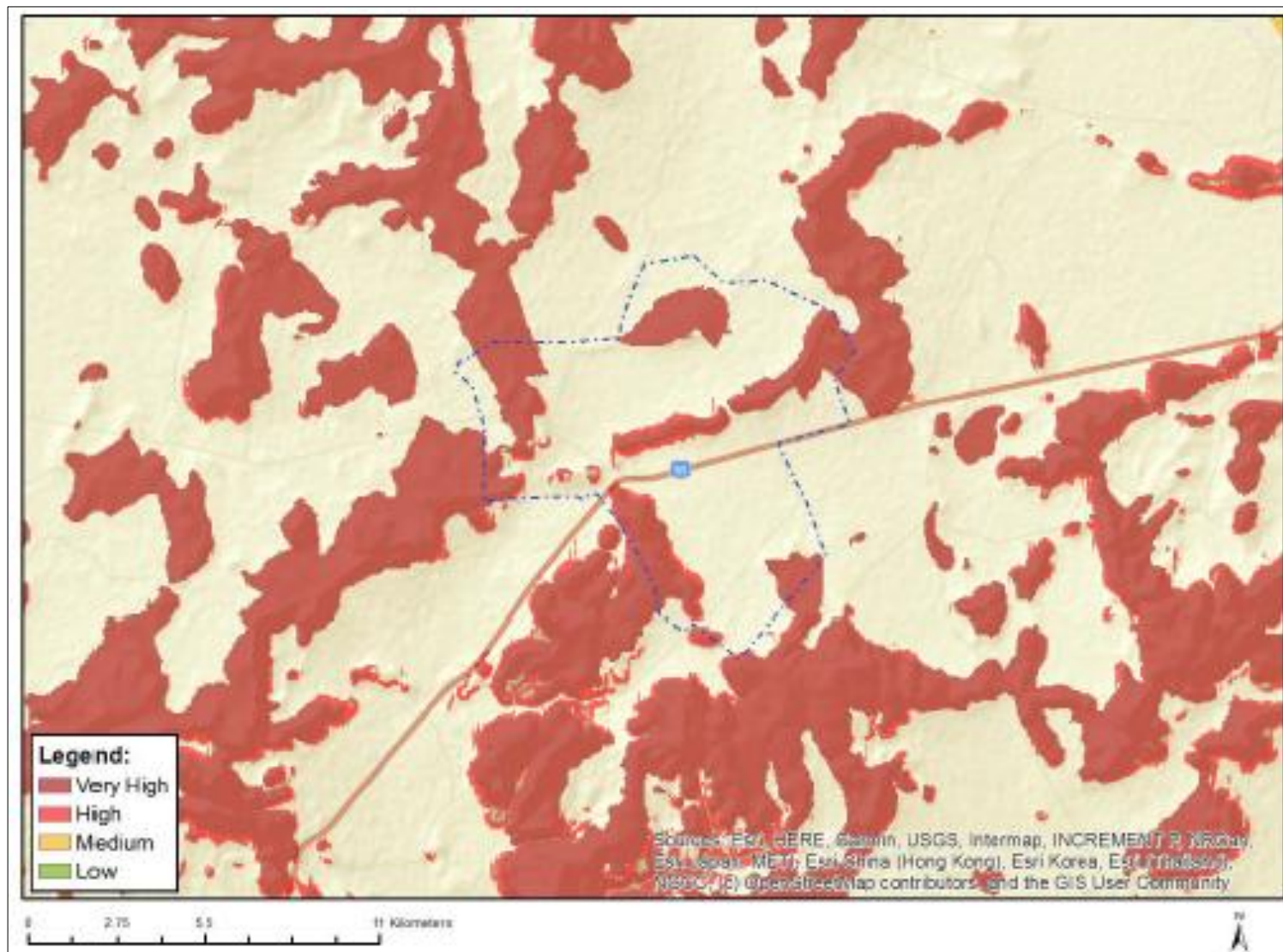


**Figure 9:** Map of relative defence theme sensitivity

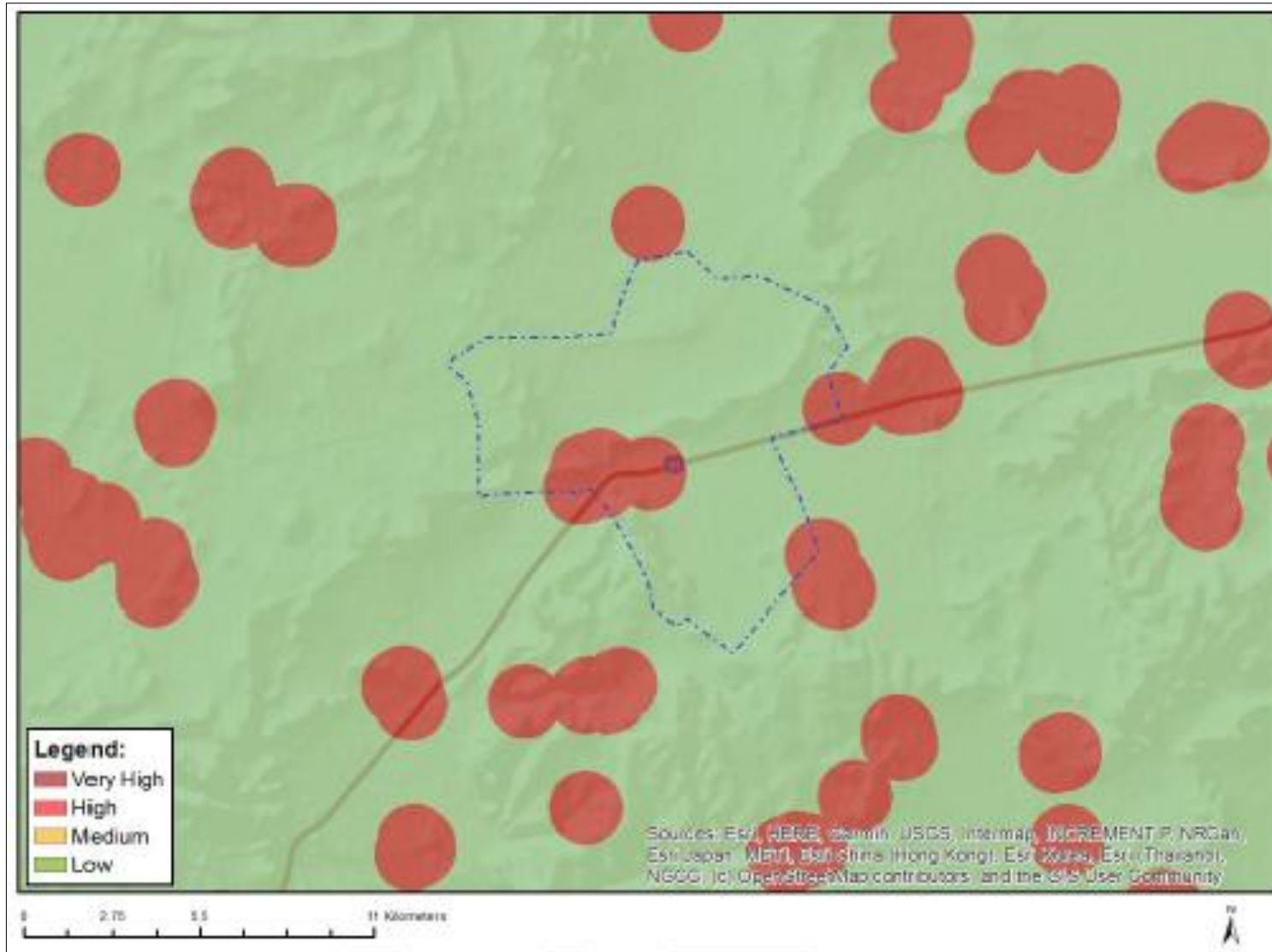




**Figure 10:** Map of relative flicker theme sensitivity

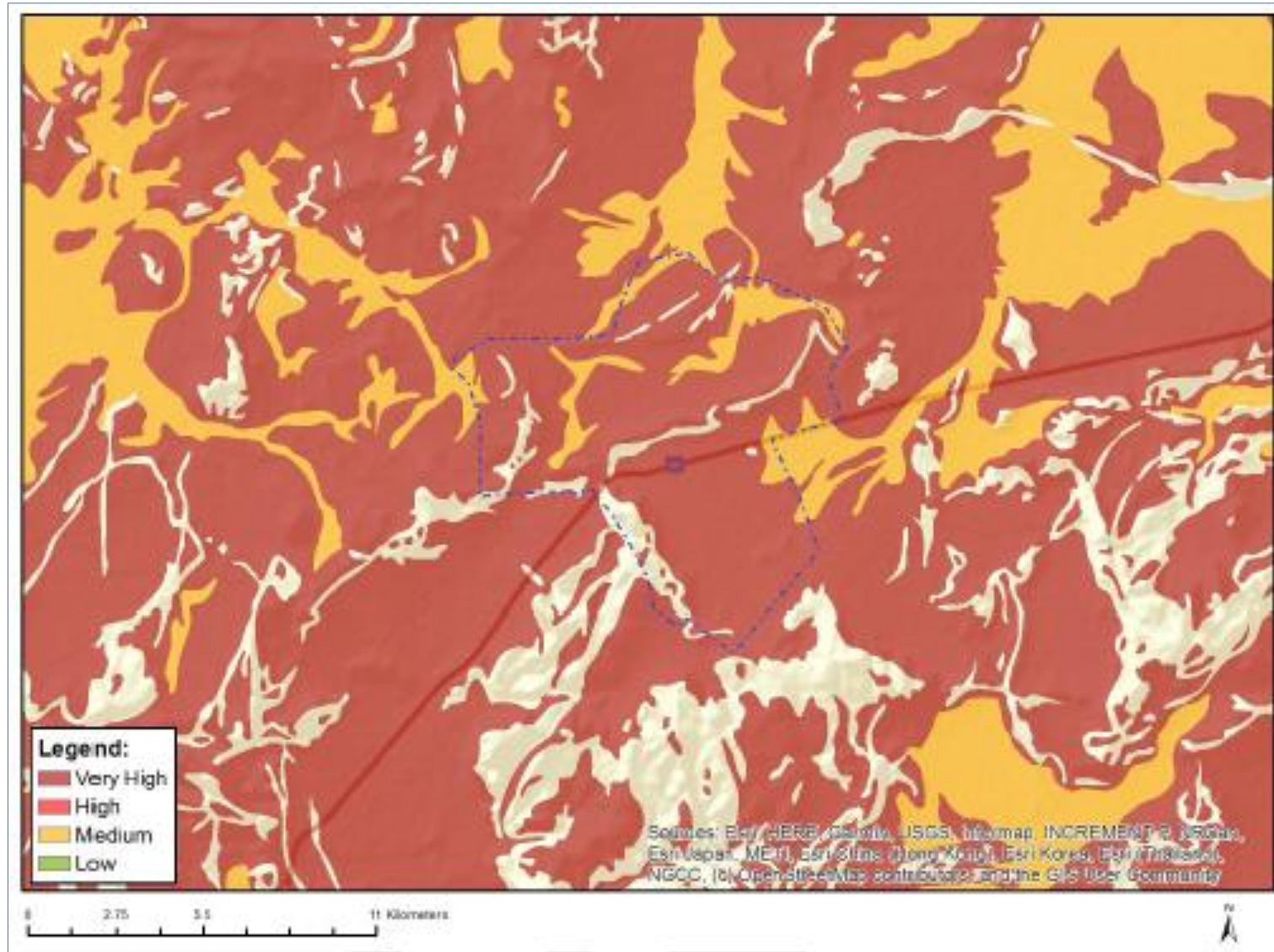


**Figure 11:** Map of relative landscape theme sensitivity



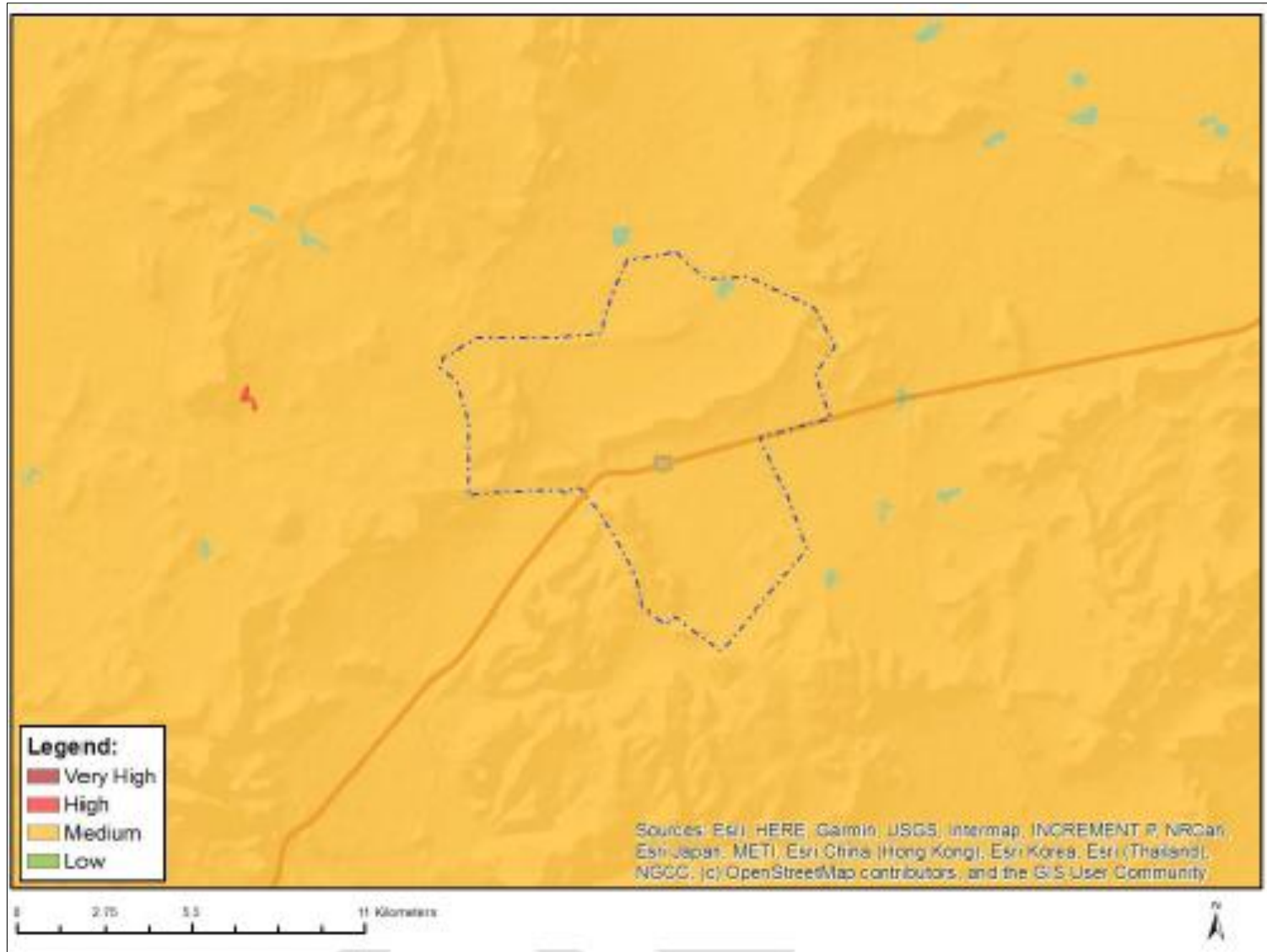
**Figure 12:** Map of relative noise theme sensitivity



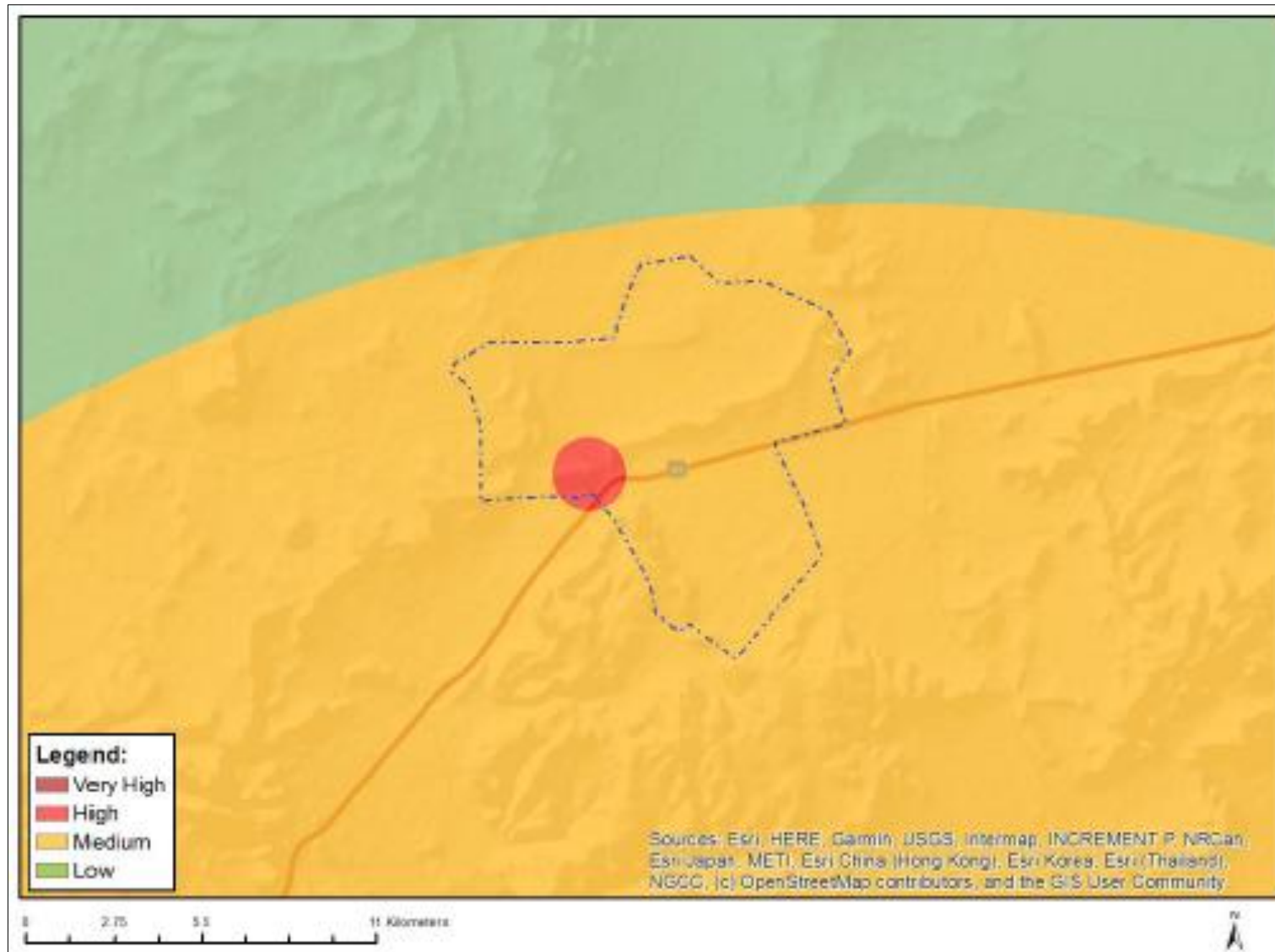


**Figure 13:** Map of relative palaeontological theme sensitivity





**Figure 14:** Map of relative plant species theme sensitivity



**Figure 15:** Map of relative RFI theme sensitivity



### 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 or commencement of construction to facilitate compliance inspections.

Signature Proponent/applicant/ holder of EA

Date:

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**This declaration will be signed by the proponent/applicant/holder of the EA once the contractor is appointed and has provided inputs to this Generic EMPr as per the requirements of this template.**

**The contractor would be required to develop the following site-specific plans in accordance with the specialist recommendation contained in Section C of this EMPr:**

- » **Alien Invasive Plant Management Plan**
- » **Plant Rescue Plan**
- » **Storm Water Management Plan**
- » **Rehabilitation Plan**

### 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.

## **CONSTRUCTION AND DECOMMISSIONING OUTCOMES AND ACTIONS**

### **7.1 Ecology (Fauna and Flora)**

**Impact management outcome:** Direct loss and/or fragmentation of indigenous natural vegetation is minimised

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
– Restrict impact to development footprint only and limit disturbance creeping into surrounding areas.	Contractor	Place a barricade around the development footprint to indicate that no disturbance is allowed beyond that point	During the construction phase	ECO	Monthly	No evidence of disturbance beyond the development footprint
– As far as possible, locate infrastructure within areas that have been previously disturbed or in areas with lower sensitivity scores. Avoid sensitive features and habitats when locating infrastructure.	Design Engineer and Contractor	Develop a facility layout that avoids areas of high sensitivity  Provide layout to the contractor and demarcate areas of high sensitivity	Prior to construction and during the construction phase	ECO	Monthly	Infrastructure avoids areas of high sensitivity
– Compile a Rehabilitation Plan.	Contractor, cEO	Make contractor aware of the requirement for a rehabilitation plan for the site	During the construction phase	ECO	Monthly	Rehabilitation Plan available on request

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
– Compile an Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas.	Contractor, CEO	Make contractor aware of the requirement for an alien plant management plan for the site	During the construction phase	ECO	Monthly	Alien Plant Management Plan available on request
– Footprints of infrastructure, laydown areas, construction sites, roads and substation sites should be clearly demarcated.	Contractor	Make contractor aware of the requirement to demarcate the infrastructure footprint	During the construction phase	ECO	Monthly	Barricade evident around infrastructure footprints
– No additional clearing of vegetation should take place without a proper assessment of the environmental impacts and authorization from relevant authorities, unless for maintenance purposes, in which case all reasonable steps should be taken to limit damage to natural areas	Contractor	Place a barricade around the development footprint to indicate that no disturbance is allowed beyond that point	During the construction phase	ECO	Monthly	No vegetation clearing observed beyond the barricaded development footprint
– Limit clearing of natural habitat designated as sensitive, especially rocky outcrops, cliffs and riparian habitats, where possible.	Contractor, CEO	Install signage at locations of sensitive features that states that no disturbance is allowed	During the construction phase	ECO	Monthly	No clearing of natural habitat designated as sensitive is observed on site
– No driving of vehicles off-road outside of construction areas. Personnel and vehicles should be restricted to access / internal roads and no off-road driving should occur.	Contractor	Install signage stating that no driving of vehicle off-road outside of construction areas is permitted and	Duration of construction phase	ECO	Monthly	No evidence of vehicles driving in the veld outside the demarcated roads

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
		also include this in toolbox talks and induction training material				
– Access to sensitive areas should be limited during construction.	cEO and Contractor	Include topic the avoidance of sensitive features in toolbox talks	Duration of construction phase	ECO	Monthly	Avoidance of sensitive areas included in toolbox talks

**Impact management outcome:** Impact on the integrity of Critical Biodiversity Areas is avoided

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
– Locate linear infrastructure outside boundaries of CBA1 areas, except where these are located entirely within existing disturbance and/or transformation.	Design Engineer, Contractor	Design facility layout such that it avoids CBA1 areas  Include topic of the avoidance of CBA1 areas by in linear infrastructure in toolbox talks	Prior to construction and during the construction phase	ECO	Monthly	Linear infrastructure avoids CBA1 areas



**Impact management outcome:** Loss of individual species of conservation concern due to clearing is minimised

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
– Undertake a detailed walk-through survey of footprint areas that are within habitats where SCC are likely to occur during a favourable season to locate any individuals of protected plants, as well as for any populations of threatened plant species. This survey must cover the footprint of all approved infrastructure, including internal access roads (final infrastructure layout). The best season is early to late Summer, but dependent on recent rainfall and vegetation growth.	Developer, Specialist	Appoint specialist prior to construction to undertake a detailed walk-through survey of the footprint areas	Prior to construction	ECO	Once at the commencement of construction	Walk-through report produced and kept on file during construction
– Where significant populations of SCC are found, shift infrastructure to avoid direct impacts.	Design Engineer	Use the results of the detailed walk-through survey to design the facility layout and ensure that the layout avoids areas of significant populations of species of conservation concern	Prior to construction	ECO	Monthly	No infrastructure established in areas where significant populations of species of conservation concern are found
– Compile a Plant Rescue Plan to be approved by the appropriate authorities.	Specialist, Developer	Appoint specialist to compile a detailed plant rescue plan	Prior to construction	ECO	Monthly	Plan rescue plan available on request

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
– Obtain the necessary permits for specimens or protected plant species that will be lost due to construction of the project.	Specialist	Appoint specialist to apply for the necessary permits	Prior to construction	ECO	Monthly	Necessary permits are available on file at the site
– For any plants that are transplanted, annual monitoring should take place to assess survival. This should be undertaken for a period of three years after translocation and be undertaken by a qualified botanist. The monitoring programme must be designed prior to translocation of plants and should include control sites (areas not disturbed by the project) to evaluate mortality relative to wild populations.	cEO, Contractor	Prepare plan for the monitoring of transplanted plants	Prior to construction	ECO	As and when required	Plan for the monitoring of transplanted plants available upon request and results of monitoring are available on site
– No collecting or poaching of any plant species must be permitted on site. Report any illegal collection to conservation authorities.	cEO, Contractor	Requirement for induction of all staff prior to entry, in particular about the collection of plant species	During the construction phase	ECO	Monthly	No evidence of collection of plant species, and induction roster of all staff completed, maintained and available on site
– Loss of protected species of conservation concern must be report to the conservation authorities.	cEO, Contractor	Include this condition within the contractor's pack and within the site induction material	During the construction phase	ECO	Monthly	Condition include in the site induction material and contractor's pack
– Personnel must be educated about protection status of species, including distinguishing features, to be able to identify protected species.	cEO	Prepare induction material that includes information on the protection	During the construction phase	ECO	Monthly	Protection status of species, including distinguishing

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
		status of species, including distinguishing features				features included in induction material
– Implement strict access control for the site.	DSS, dEO	Demarcate the project site and place a security guard and register at the main gate	Duration of the project	ECO	Monthly	Security guard placed on site and no reports of unauthorised entry

**Impact management outcome:** Establishment and spread of declared weeds and alien invader plants is minimised

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
– Undertake regular monitoring to detect alien invasions early so that they can be controlled.	Contractor, cEO	Prepare alien management plan for implementation for the duration of the construction phase	During the construction phase	ECO	Monthly	Alien Plant Management Plan available on request

**Impact management outcome:** Runoff and erosion are reduced

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
– Compile and implement a stormwater management plan.	Contractor, cEO	Make contractor aware of the requirement for a stormwater management plan for the site	During the construction phase	ECO	Monthly	Alien Plant Management Plan available on request
– Speed limits should be set for all roads on site, as well as access roads to the site. These limits should not exceed 40 km/h, but may be set lower, depending on local circumstances. Strict enforcement of speed limits should occur – install speed control measures, such as speed humps, if necessary.	Contractor, cEO	Install speed signature throughout site, include speed limit into induction and ensure all staff entering site is aware of the requirement to implement speed limits. Institute verbal and written warnings for violations and appropriate fines for repeat contraventions. Written log of fines and warning issued kept on site	During the construction phase	ECO	Monthly	Minimal instances of speeding as observed on site during audits and as evidenced in the written log of warnings and fines issued for contraventions

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
– Maintain adequate buffer zones around hydrological features so that these do not become degraded from runoff and erosion	Design Engineer and Contractor	Ensure layout has been informed by the environmental sensitivities as determined by the environmental impact assessment and specialist studies	Prior to construction and during construction	ECO	Once off review that the layout used is the approved one, and monthly thereafter	Hydrological features clearly demarcated  No evidence of construction activities taking place within the 'no-go' areas during audit

**Impact management outcome:** Minimal to no impacts to fauna species

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
– Pre-construction walk-through, undertaken in the correct season, in front of construction must be undertaken to move any individual animals, such as tortoises, prior to construction.	Developer, Specialist	Appoint specialist prior to construction to undertake a detailed walk-through survey of the footprint areas	Prior to construction	ECO	Once at the commencement of construction	Walk-through report produced and kept on file during construction
– No dogs or other pets should be allowed on site, except those confined to landowners' dwellings.	Contractor, cEO	Include topic on 'no dogs allowed on site' in toolbox talks	Duration of construction phase	ECO	Monthly	Topic on 'no dogs allowed on site' included in toolbox talks

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
– Personnel on site should undergo environmental induction training, including the need to abide by speed limits, the increased risk of collisions with wild animals on roads in rural areas.	cEO, Contractor	Include topic on speed limits and collision with wild animals in induction material	During the construction phase	ECO	Monthly	Topic on speed limits and collision with wild animals included in induction material
– Proper waste management must be implemented, ensuring no toxic or dangerous substances are accessible to wildlife. This should also apply to stockpiles of new and used materials to ensure that they do not become a hazard.	Contractor	Compile a waste management plan for implementation during the construction phase	During the construction phase	ECO	Monthly	Waste management plan available on site and waste is being managed in accordance with the plan
– No collecting, hunting or poaching of any animal species should take place. Report any mortality of protected species to conservation authorities.	cEO	Requirement for induction of all staff prior to entry, in particular about the collection, hunting or harvesting of and animals	Duration of the project	ECO	Monthly	No evidence of fauna mortality, and induction roster of all staff completed, maintained and available on site
– Appropriate lighting should be installed to minimize impacts on nocturnal animals, as per visual specialist assessment.	Developer, Contractor	Include lighting specifications in the contractor's pack	Prior to construction and during construction	ECO	Monthly	Lighting specifications include in contractor's pack  Appropriate lighting utilised on site

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
- Construction activities should not be undertaken at night.	Developer, Contractor	Include working hours in contractor's pack	Prior to construction and during construction	ECO	Monthly	No evidence of construction activities being undertaken at night

## 7.2 Aquatic Ecology

**Impact management outcome:** Watercourse disturbance/loss is reduced

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
- Avoid direct impacts to water resources and their associated buffer width (as recommended). This avoidance is not required from watercourse crossings (i.e. roads, pipelines, cables etc), but the number and size of the crossings must be kept to a minimum. Only essential services and equipment are permitted within the crossings and associated buffer during the construction phase.	cEO, Contractor	Demarcate the delineated water resources	Duration of the construction phase	ECO	Monthly	Delineated water resources are appropriately demarcated and no direct impact to these resources is observed

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Prioritise construction of the crossings during the dry season period.	Contractor	Construction programme should include the construction of crossings during the dry season	During the construction phase	ECO	Monthly	Construction of crossings planned for the dry season as per the construction programme
– When clearing vegetation, allow for some vegetation cover as opposed to bare areas.	Contractor	Compile method statement for the clearing of vegetation	During the construction phase	ECO	Monthly	Method statement for the clearing of vegetation available on site
– Use the shapefiles provided within the EIA process defining the watercourses within the site to signpost the edge of the watercourses closest to site. Place the sign 22m from the edge (this is the buffer zone). Label these areas as environmentally sensitive areas, keep out.	Design Engineer, Contractor	Layout design should consider the watercourses identified as part of the EIA process and the delineated water courses and their buffers should be demarcated	Prior to and during the construction phase	ECO	Monthly	Layout avoids water courses and their buffers and delineated water resources are appropriately demarcated
– All activities (including driving) must adhere to the respective buffer areas.	Contractor	Toolbox talks should include topic on the avoidance of water courses and their buffer areas	During the construction phase	ECO	Monthly	Toolbox talks include topic on the avoidance of water resources and their buffer areas



Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– All alien vegetation within the site should be managed in terms of the Regulation GNR.1048 of 25 May 1984 (as amended) issued in terms of the CARA and IAP regulations.	Contractor, cEO	Prepare an alien plant management plan for implementation during the construction phase	Prior to construction	ECO	Monthly	Alien plant management plan available on site
– Landscape and re-vegetate all denuded areas as soon as possible.	Contractor, cEO	Prepare a rehabilitation plan for the site	Prior to construction	ECO	Monthly	Rehabilitation plan available on site

**Impact management outcome:** Minimised impacts on surface water quality and runoff, erosion and sedimentation are reduced

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– The contractors used for the construction should have spill kits available onsite prior to construction to ensure that any fuel, oil or hazardous substance spills are cleaned-up and discarded correctly	Developer	Make contractors aware of the requirement for a spill kit on site	Construction phase	ECO	Monthly	Visual observation of spills kits

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– All chemicals and toxicants to be used for the construction must be stored in a bunded area.	Contractor	Ensure that storage areas are impermeable and are sufficiently bunded, and have sumps and roofing	During the Construction Phase	ECO	Monthly	Photographic proof that storage areas are impermeable, and have bunds, sumps and roofing
– All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site at designed areas.	Contractor, cEO	Make contractors aware of the requirement for regular inspection of their machinery and equipment	Prior to construction and during construction	ECO	Monthly	Inspection checklists available on request
– Adequate sanitary facilities and ablutions on the servitude must be provided for all personnel throughout the project area. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation).	Contractor	Ablution facilities must be provided and must be placed appropriately and in areas which avoid environmental sensitivities	During the Construction Phase	ECO	Weekly	Ablution facilities are installed and avoid environmental sensitivities
– All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as	cEO and Contractor	Prepare induction material which includes	Pre-construction and Construction	ECO	Monthly	Register of attendance available on request

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping".		environmental awareness				
– During construction activities, all rubble generated must be kept in a skip (or similar) and the removed from the site to a licensed facility.	Contractor, CEO	Develop and implement a waste management plan for the site.	Pre-construction and Construction	ECO	Monthly	Waste managed in accordance with the waste management plan for the site.
– All removed soil and material stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds.	Contractor	Prepare a method statement for the handling of soil	During the construction phase	ECO	Monthly	Method statement available on file at the site
– No dumping of material on site may take place.	Contractor	Toolbox talks must include topics on the handling of waste material	During the construction phase	ECO	Monthly	No dumping of material observed on site  Register of attendance of toolbox talks on the handling of waste material available on site
– All waste generated on site during construction must be adequately managed. Separation and recycling of different waste materials should be supported.	Contractor, CEO	Develop and implement a waste management plan for the site.	Pre-construction and Construction	ECO	Monthly	Waste managed in accordance with the waste management plan for the site.

### 7.3 Avifauna

**Impact management outcome:** Displacement of priority species due to disturbance during the construction phase is reduced

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Construction activity should be restricted to the immediate footprint of the infrastructure as far as possible, and in particular to the proposed road network.	cEO, Contractor	Visual inspection of the construction activities to observe whether they remain within the defined footprint area	Duration of construction phase	ECO	Monthly	No evidence of construction activity outside the immediate footprint of the infrastructure
– Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species.	cEO, Contractor	Demarcate sensitive areas to restrict access to these areas	Duration of construction phase	ECO	Monthly	Sensitive areas appropriately demarcated and fenced off for the duration of the construction phase
– Removal of vegetation must be restricted to a minimum and must be rehabilitated to its former state where possible after construction.	Contractor	Compile method statement for the clearing of vegetation and rehabilitation plan for the site	During the construction phase	ECO	Monthly	Method statement for the clearing of vegetation and a rehabilitation plan area available on site
– Construction of new roads should only be considered if existing roads cannot be upgraded.	Contractor, cEO	Visual inspection of the construction activities and if	Duration of construction phase	ECO	Monthly	No evidence of several new access roads on site

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		the use of existing access roads over the construction of new roads is favoured				
– Vehicle and pedestrian access to the site should be controlled and restricted as much as possible to prevent unnecessary disturbance of priority species.	cEO, Contractor	Demarcate sensitive areas to restrict access to these areas	Duration of construction phase	ECO	Monthly	Sensitive areas appropriately demarcated and fenced off for the duration of the construction phase

#### 7.4 Land Use, Soils and Agricultural Potential

**Impact management outcome:** Minimise loss of land capability

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Prevent any spills from occurring. Machines must be parked within hard park areas and must be checked daily for fluid leaks.	Contractor  cEO	Vehicle and equipment storage areas must have hard surfaces and must be appropriately bundled.	During the construction phase	ECO	Monthly	Vehicle and equipment storage areas have hard surfaces and are appropriately bundled.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
						No spills recorded in the site incident register.
– Proper invasive plant control must be undertaken quarterly.	Contractor cEO	Ensure that invasive plant control is undertaken on an ongoing basis (at least quarterly).	During the construction phase	ECO	As and where required	Photographic proof of invasive plant control being undertaken on site.
– All excess soil (soil that are stripped and stockpiled to make way for foundations) must be stored, continuously managed / maintained to be used for rehabilitation of eroded areas.	Contractor cEO	Development a procedure for the removal, handling, and storage of soil and ensure implementation of this procedure during the construction phase.	During the construction phase	ECO	Monthly	Copy of procedure for the removal, handling, and storage of soil provided during the review.  Visual observation of appropriate soil storage and handling practices on site.
– Rip all compacted areas outside of the developed areas that have been compacted.	Contractor cEO	Ensure that ripping is undertaken on all compacted areas outside of the development areas.	Following completion of the construction phase.	ECO	Monthly	Visual observation of ripping being undertaken on compacted areas outside the development areas.
– Ripping must be done by means of a commercial ripper that has at least two rows of tines.	Contractor Developer	Utilise a commercial ripper with at least two	During the construction phase	ECO	As and when required	Ripping undertaken using a commercial ripper with at least two rows of tines.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		rows of tines for ripping purposes.				
– Ripping must take place between 1 and 3 days after seeding and following a rainfall event (seeding must therefore be carried out directly after a rainfall event).	Contractor cEO	Ensure that ripping is undertaken between 1 and 3 days after seeding and following a rainfall event.	During the construction phase	ECO	As and when required	Visual observation of ripping being undertaken between 1 and 3 days after seeding and following a rainfall event.

## 7.5 Heritage

**Impact management outcome:** Impacts on archaeological and palaeontological heritage resources are reduced

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– A no-go development buffer of 1km must be implemented around Sites GK037, GK038 and GK074.	Contractor	Ensure that the heritage resource (GK037, GK038 and GK074) is demarcated  Project design and layout avoids heritage resources	Prior to construction and for the duration of the construction phase	ECO	Once off review that the layout used is the approved one, and monthly thereafter	Construction undertaken in accordance with approved layout  Construction activities avoid heritage resources
– A no-go development buffer of 50m must be implemented around site GK048.	Contractor	Ensure that the heritage resource	Prior to construction and for the duration	ECO	Once off review that the layout used is	Construction undertaken in

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		(GK048) is demarcated  Project design and layout avoids heritage resources	of the construction phase		the approved one, and monthly thereafter	accordance with approved layout  Construction activities avoid heritage resources
– Should any significant archaeological resources be uncovered during the course of the construction phase, work must cease in the area of the find and SAHRA must be contacted regarding an appropriate way forward.	Contractor, cEO, Specialist (if required)	If any evidence of unrecorded archaeological resources or possible burials is observed during the course of construction activities, all work must cease immediately within the vicinity of the find and the find be reported to the SAHRA.	Duration of Construction Phase	ECO, cEO	Ongoing (cEO), Monthly (ECO)	Evidence of communication with SAHRA where any evidence of unrecorded archaeological resources or possible burials is found
– The Chance Fossil Finds Procedure must be implemented for the duration of construction activities:	Developer, Contractor	The chance fossil finds procedure must be include in the contractor's pack	During the construction phase	ECO	Monthly	Chance fossil finds procedure is included in the contractor's pack and evidence of implementation of the procedure is observed



## 7.6 Visual

**Impact management outcome:** Visual impact of construction activities on sensitive visual receptors, and the potential impact on the sense of place is reduced.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> <li>Retain and maintain natural vegetation immediately adjacent to the development footprint.</li> </ul>	Project proponent/ design consultant  Contractor  cEO	Visual inspection of the layout to ensure that vegetation immediately adjacent to the development footprint will not be disturbed  Ensure that natural vegetation immediately adjacent to the development footprint/servitude is retained and maintained.	Prior to construction and during construction	ECO	Ongoing throughout construction	Onsite evidence that natural vegetation immediately adjacent to the development footprint/servitude is retained and maintained.
<ul style="list-style-type: none"> <li>Consult adjacent landowners (if present) in order to inform them of the development and to identify any (valid) visual impact concerns.</li> </ul>	Developer	Consultation between the developer and adjacent landowners.	During construction	ECO	As and when required	Proof of consultation with adjacent landowners

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<p>– Ensure that vegetation is not unnecessarily removed during the construction phase.</p>	<p>Contractor  cEO</p>	<p>Visual inspection of the project site to ensure that no unnecessary vegetation clearance is being undertaken.</p> <p>Include this mitigation in the contractor's environmental awareness training.</p>	<p>During construction</p>	<p>ECO</p>	<p>Daily, during the vegetation clearance phase and monthly thereafter</p>	<p>Onsite evidence that not unnecessary vegetation clearance is being undertaken.</p>
<p>– Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e., in already disturbed areas) wherever possible.</p>	<p>Project proponent/ design consultant  Contractor  cEO</p>	<p>Ensure that temporary construction infrastructure in the final layout is placed within already disturbed areas, where possible.</p> <p>Ensure that temporary construction infrastructure is established within already disturbed areas, where possible, during the</p>	<p>Prior to construction and during construction</p>	<p>ECO</p>	<p>Once-off review of the final layout prior to construction and as and when required during the construction phase</p>	<p>Photographic proof that temporary construction infrastructure is placed in already disturbed areas, where possible.</p> <p>Final layout shows placement of temporary construction infrastructure within already disturbed areas.</p>

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		construction phase.				
– Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	Contractor	Demarcate construction site to restrict movement within the construction site and immediate area. Inform the contractors, through inclusion of this condition in the environmental awareness training and contractor's packs, that movement should be restricted to existing access roads.	Duration of the construction phase	ECO	Monthly	Reduced duration of the construction phase. Copy of construction programme provided during audit
– Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.	Contractor	Waste to be appropriately stored in designated areas.  Disposal of waste at licensed waste disposal facilities must be undertaken as per	Duration of the construction phase	ECO	Monthly	Appropriate storage of waste in designated areas.  Disposal certificates of disposal at licensed facilities to be provided

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		the waste management plan				
– Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).	Contractor	Apply appropriate dust suppression techniques.	Duration of the construction phase	ECO	Weekly	Contractor to provide proof of use of appropriate dust suppression technique. Photographic evidence that dust suppression is being undertaken on site
– Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts.	Developer Contractor cEO	Ensure that working hours are clearly communicated to construction workers and that the working hours are restricted to daylight hours and are adhered to.	Duration of the construction phase	ECO	Daily	Limited construction activities taking place at night.
– Rehabilitate all disturbed areas immediately after the completion of construction works.	Contractor cEO	Ensure that disturbed areas are rehabilitated immediately after completion of construction works	Following completion of construction	ECO	As and when required	Visual observation that disturbed areas are rehabilitated immediately after the

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
		and that this is communicated to the contractor.  Develop and implement a rehabilitation plan for the site.				completion of construction works.
– Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.	Contractor	Ensure that disturbed areas are rehabilitated. Rehabilitation to be undertaken in consultation with an ecologist.	At the end of the Construction Phase	ECO dEO	Weekly, after the completion of the construction phase	All disturbed areas are sufficiently rehabilitated, and rehabilitation is undertaken in consultation with a qualified ecologist.

**Impact management outcome:** Visual impact of lighting at night on sensitive visual receptors is reduced.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Shield the sources of light by physical barriers (walls, vegetation, or the structure itself).	Contractor cEO	Ensure that contractors are made aware of this management	Prior to construction and during	ECO dEO	As and when required	Light sources are shielded by physical barriers

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
	Design engineer/consultant	action and that light sources are shielded by physical barriers.	construction and operations			such as walls, vegetation etc.
– Limit mounting heights of lighting fixtures, or alternatively use footlights or bollard level lights.	Contractor cEO Design engineer/consultant	Ensure that contractors are made aware of this management action and that mounting heights for light fixtures are kept to a minimum.	Prior to construction and during construction and operations	ECO dEO	As and when required	Mounting heights of lighting fixtures are kept to a minimum.
– Make use of minimum lumen or wattage in fixtures.	Contractor cEO Design engineer/consultant	Ensure that contractors are made aware of this management action and that the contractor makes use of minimum lumen or wattage in lighting fixtures.	Prior to construction and during construction and operations	ECO dEO	As and when required	Minimum use of lumen or wattage in lighting fixtures is observed
– Make use of down-lighters or shielded fixtures.	Contractor cEO Design engineer/consultant	Ensure that contractors are made aware of this management action and that the contractor makes use of down-lighters or shielded fixtures.	Prior to construction and during construction and operations	ECO dEO	As and when required	Visual observation of down-lighters or shielded fixtures being utilised.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
<ul style="list-style-type: none"> <li>– Make use of Low-Pressure Sodium lighting or other types of low impact lighting.</li> </ul>	Contractor  cEO  Design engineer/consultant	Ensure that contractors are made aware of this management action and that low-pressure sodium lighting or other types of low impact lighting is used.	Prior to construction and during construction and operations	ECO  dEO	As and when required	Visual observation of low-pressure sodium lighting or other types of low impact lighting being utilised
<ul style="list-style-type: none"> <li>– Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.</li> </ul>	Contractor  cEO  Design engineer/consultant	Ensure that contractors are made aware of this management action and that motion detectors are used on security lighting.	Prior to construction and during construction and operations	ECO  dEO	As and when required	Visual observation of motion detectors being utilised on security lighting.

## 7.7 Socio-Economic

**Impact management outcome:** Enhanced socio-economic development and reduction in potential negative social impacts.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Where reasonable and practical, the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.	Developer	Develop and implement a "locals first" policy for the provision of employment opportunities	Prior to construction	ECO	Once, prior to the commencement of construction and monthly during the construction phase	The "locals first" policy is considered in terms of the employment and training opportunities
– Where feasible, efforts should be made to employ local contractors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria.	Developer	Develop and implement a "locals first" policy for the provision of employment opportunities that states that first preference will be given to contractors that are compliant with BBBEE criteria	Prior to construction	ECO	Once, prior to the commencement of construction and monthly during the	The "locals first" policy is considered in terms of the employment and gives first preference to contractors that are compliant with BBBEE criteria
– Before the construction phase commences the proponent should meet with representatives from the MLM to establish the existence of a skills database for the area. If such a database exists it should be made	Developer	Identify and implement appropriate strategies for communication	Prior to construction	ECO	Once, prior to the commencement of construction and monthly	Communication is undertaken as per the identified strategies and



available to the contractors appointed for the construction phase.		with representatives from the MLM			during the construction	evidence of the meeting with the MLM (meeting minutes) is provided during the audit
– The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project.	Developer	Identify and implement appropriate strategies to communicate the availability of job opportunities to interested and affected parties and ensure that all interested and affected parties are aware of the job opportunities associated with the project	Prior to construction	ECO	Once, prior to the commencement of construction and monthly during the construction	Evidence indicating that interested and affected parties were informed of the job opportunities is provided during the audit
– Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.	Developer	Develop and implement a "locals first" policy for the provision of employment opportunities	Pre-construction & Construction	ECO	Once, prior to the commencement of construction and monthly during the construction phase	The "locals first" policy is considered in terms of the employment and training opportunities
– The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.	Developer	Develop and implement a "locals first" policy for the provision of employment opportunities and	Pre-construction & Construction	ECO	Once, prior to the commencement of construction and monthly during the	The "locals first" policy, which promotes gender equality and women empowerment is

		ensure that the policy promotes gender equality and women empowerment			construction phase	considered in terms of the employment
– The proponent should liaise with the ULM with regards the establishment of a database of local companies, specifically BBEE companies, which qualify as potential service providers (e.g., construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work.	Developer	Establish communication channels with the ULM	Pre-construction & Construction	ECO	Once, prior to the commencement of construction and monthly during the construction phase	Documentary evidence indicating liaison between the developer and the ULM
– Where possible, the proponent should assist local BBEE companies to complete and submit the required tender forms and associated information.	Developer	Develop and implement a programme for the provision of assistance in completing and submitting tender forms	Prior to construction	Not Applicable		
– The ULM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.	Developer	Establish communication channels with the ULM	Pre-construction & Construction	ECO	Once, prior to the commencement of construction and monthly during the construction phase	Documentary evidence indicating liaison between the developer and the ULM
– Where possible, the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories.	Developer	Develop and implement a "locals first" policy for the provision of	Pre-construction & Construction	ECO	Once, prior to the commencement of construction and monthly during the	The "locals first" policy is considered in terms of the employment

		employment opportunities			construction phase	
- Ongoing consultation with stakeholders must be undertaken throughout the construction phase.	Developer	Establish communication channels with stakeholders and implement a grievance mechanism	During the construction phase	ECO	Monthly	Documentary evidence indicating liaison between the developer and stakeholders
- The proponent and the contractor(s) should develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation.	Developer, in consultation with the Monitoring Forum	Develop and implement code of conduct for the construction phase	Prior to construction and during the construction phase	ECO	Monthly	Code of conduct evident during audit
- The proponent and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase.	cEO / Contractor in consultation with the ECO	The effects of sexually transmitted diseases and HIV/AIDS must be covered in the Environmental Awareness Training	Pre-construction & Construction	ECO	Once, prior to the commencement of construction and monthly during construction	Environmental awareness training material requirements checklist
- The construction area should be fenced off before construction commences and no workers should be permitted to leave the fenced off area.	Contractor	Ensure that the construction area is fenced off	Prior to construction and during the construction phase	ECO	Weekly	Construction area is fenced off and photographic proof can be provided
- The contractor should provide transport for workers to and from the site on a daily basis. This will enable the contractor to effectively manage and monitor the movement of construction workers on and off the site.	cEO	Provide daily transport to and from site for employees	During the Construction Phase	ECO	Monthly, and as and when required	Proof of transportation services provided

- The contractor must ensure that all construction workers from outside the area are transported back to their place of residence within 2 days for their contract coming to an end.	cEO	Provide transport from site to employees within 2 days of their contract coming to an end	Towards the end of the construction phase	ECO	As and when required, towards the end of the construction phase	Proof of transportation services provided
- It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.	Not Applicable - no on-site housing is envisaged with daily commute to and from site expected of construction staff.					
- The proponent should implement a policy that no employment will be available at the gate.	Developer	Develop and implement a policy that no employment will be available at the gate	Pre-construction & Construction	ECO	Once, prior to the commencement of construction and monthly during the construction	Policy considered in terms of employment
- The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences.	DPM Contractor	Develop agreements for compensation for the damage of farm property etc. with the affected landowners. Ensure that agreements are approved and signed	Pre-construction	dEO ECO	Once, prior to construction	Availability of approved and signed agreements
- Traffic movement and construction related activities should be contained within clearly designated areas.	Contractor, cEO	Ensure that traffic and activities are contained within designated areas	During the construction phase	ECO	Weekly	Traffic and activities are contained within designated areas
- Strict traffic speed limits must be enforced on the farm.	cEO / dEO / Contractor	Inform all drivers of speed limits and place appropriate	During the construction and operation phase	ECO Operation and	Monthly	No complaints regarding speeding on site are received

		signage along the relevant roads		Maintenance team		
- All farm gates must be closed after passing through.	DSS and Contractor	Ensure farm gates are closed after passing through as required through the implementation of a formalised process	During the construction phase	cEO	Weekly and as and when required	Farm gates are closed after passing through and no complaints from landowners are received.
- Contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site. This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties.	cEO	Provide daily transport to and from site for employees	During the construction phase	ECO	Monthly, and as and when required	Proof of transportation services provided during audit
- The proponent should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors' and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below).	DPM Contractor	Develop agreements with the contractors regarding their liability for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. Ensure that agreements are approved and signed	Pre-construction	dEO ECO	Once, prior to construction	Availability of approved and signed agreement
- The Environmental Management Plan (EMP) must outline procedures for managing and storing waste on	cEO	Ensure that the EMP contains measures for managing and	Pre-construction and during the	dEO, ECO, cEO	Once, at the onset of the construction	Measures for managing and storing waste

site, specifically plastic waste that poses a threat to livestock if ingested.		storing waste on site	construction and operation phase		phase, and again on the onset of the operation phase	included in the EMP and the implementation thereof observed during audit
– Contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.	cEO and Contractor in consultation with the ECO	Compile a Code of Conduct for staff. Ensure that the conditions of the Code of Conduct are communicated staff at the outset of construction	Pre-construction	ECO	Once, prior to the commencement of construction	No complaints registered in this regard
– Contractors appointed by the proponent must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation.	Developer	Compile a Code of Conduct for staff. Ensure that any dismissals are done in accordance with South African labour legislation	During the construction phase	ECO	As and when necessary	No complaints from dismissed staff  Code of Conduct observed during audit
– No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.	Developer	The contractor's pack must indicate that no construction staff will be allowed to sleep on site	Construction phase	ECO	Monthly	No evidence of construction staff sleeping on site is observed during the audit
– Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas.	ECO / cEO / dEO	Hold environmental awareness training workshops. Training material should include the fact that open fires for cooking or heating	Pre-construction construction and operations	ECO dEO	Monthly and as and when required	Attendance register and training minutes / notes for the record

		are prohibited, in designated areas				
- Smoking on site should be confined to designated areas.		Erect signage indicating designated smoking areas, and ensure that smoking is only confined to these areas	Construction and operations	ECO dEO cEO	Monthly, and as and when required	Photographic evidence of signage indicating designated smoking areas
- Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are effectively managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy winter months.	dEO / cEO / Contractor	Ensure that construction related activities that pose a potential fire risk, such as welding, are effectively managed and are confined to areas where the risk of fires has been reduced  Develop environmental awareness training material which covers conditions under which work should not be undertaken to reduce the risk of fires	Pre-construction, construction and operations	ECO	Prior to the commencement of the environmental awareness training, once during the construction phase and once during the operation phase	No fire outbreaks occurred  Environmental awareness training material observed

- Contractor should provide adequate fire-fighting equipment on-site, including a fire fighting vehicle.	Contractor	The site must be fitted with adequate fire-fighting equipment	During the Construction Phase	ECO	Monthly	Adequate fire-fighting equipment is available and has been serviced
- Contractor to provide fire-fighting training to selected construction staff.	cEO and Contractor	Provide training on the use of fire-fighting equipment to the relevant employees	Pre-construction	ECO	Once, prior to the commencement of construction	Proof of training to be provided by the contractor
- As per the conditions of the Code of Conduct, in the event of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire-fighting costs borne by farmers and local authorities.	DPM Contractor	Develop agreements with the contractors regarding their liability for damage as a result of fires caused by construction workers and or construction activities. Ensure that agreements are approved and signed	Pre-construction	dEO ECO	Once, prior to construction	Availability of approved and signed agreement
- The movement of heavy vehicles associated with the construction phase should be timed to avoid times of the week, such as weekends, when the volume of traffic travelling along the R34 may be higher.	Contractor	Ensure that movement of heavy vehicles is managed accordingly	During construction	ECO, dEO	Monthly	No complaints regarding traffic caused by the construction activities received
- Dust suppression measures must be implemented on un-surfaced roads, such as wetting on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.	Contractor	Appropriate dust suppression measures are implemented	During the construction phase	cEO, ECO	Weekly	Photographic record of measures being implemented



						and the results thereof
<ul style="list-style-type: none"> <li>- All vehicles must be road-worthy, and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.</li> </ul>	cEO / dEO / Contractor	<p>Regular inspection of vehicles</p> <p>Inform all drivers of speed limits and place appropriate signage along the relevant roads</p>	During construction and operations	ECO Operation and Maintenance team	Monthly	<p>No complaints from community members are submitted</p> <p>Vehicle inspection checklists available</p>
<ul style="list-style-type: none"> <li>- The footprint associated with the construction related activities (access roads, construction platforms, workshop etc.) should be minimised.</li> </ul>	cEO, Contractor	Visual inspection of clearing activities to determine if any unnecessary land clearing is being undertaken	Duration of construction phase	ECO	Monthly	No evidence of unnecessary land clearing observed during audit
<ul style="list-style-type: none"> <li>- An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase.</li> </ul>	Developer	Ensure that an ECO is appointed prior to the commencement of construction activities	Pre-construction	cEO	Once, prior to construction	Appointment letter provided for review

## **OPERATIONAL PHASE OUTCOMES AND ACTIONS**

## 7.8 Ecology (Fauna and Flora)

**Impact management outcome:** Direct loss and/or fragmentation of indigenous natural vegetation is minimised

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
– Restrict impact to development footprint only and limit disturbance creeping into surrounding areas.	Operator	Place a barricade around the development footprint to indicate that no disturbance is allowed beyond that point	During the operational phase	dEO	Monthly	No evidence of disturbance beyond the development footprint
– Protect sensitive features and habitats during operation activities.	Design Engineer and Operator	Develop a facility layout that avoids areas of high sensitivity  Provide layout to the operator and demarcate areas of high sensitivity	Prior to and during the operational phase	dEO	Monthly	Infrastructure avoids areas of high sensitivity
– Compile a rehabilitation plan	Operator, cEO	Make operator aware of the requirement for a rehabilitation plan for the site	During the operational phase	dEO	Monthly	Rehabilitation Plan available on request
– Implement Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas.	Operator, cEO	Make operator aware of the requirement for an alien plant management plan for the site	During the operational phase	dEO	Monthly	Alien Plant Management Plan available on request

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
– No additional clearing of vegetation should take place during the operation phase without a proper assessment of the environmental impacts and authorization from relevant authorities, unless for maintenance purposes, in which case all reasonable steps should be taken to limit damage to natural areas	Operator	Place a barricade around the development footprint to indicate that no disturbance is allowed beyond that point	During the operational phase	dEO	Monthly	No vegetation clearing observed beyond the barricaded development footprint

**Impact management outcome:** Establishment and spread of declared weeds and alien invader plants is minimised

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
– Undertake regular monitoring to detect alien invasions early so that they can be controlled.	Operator	Prepare alien management plan for implementation for the duration of the operational phase	During the operational phase	dEO	Monthly	Alien Plant Management Plan available on request

**Impact management outcome:** Runoff and erosion are reduced

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
– Compile and implement a stormwater management plan.	Operator	Make operator aware of the requirement for a stormwater management plan for the site	During the operational phase	dEO	Monthly	Stormwater Management Plan available on request
– Speed limits should be set for all roads on site, as well as access roads to the site. These limits should not exceed 40 km/h, but may be set lower, depending on local circumstances. Strict enforcement of speed limits should occur – install speed control measures, such as speed humps, if necessary.	Operator	Install speed signature throughout site, include speed limit into induction and ensure all staff entering site is aware of the requirement to implement speed limits. Institute verbal and written warnings for violations and appropriate fines for repeat contraventions. Written log of fines and warning issued kept on site	During the operational phase	dEO	Monthly	Minimal instances of speeding as observed on site during audits and as evidenced in the written log of warnings and fines issued for contraventions

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
– Maintain adequate buffer zones around hydrological features so that these do not become degraded from runoff and erosion	Design Engineer and Operator	Ensure layout has been informed by the environmental sensitivities as determined by the environmental impact assessment and specialist studies	Prior to and during the operational phase	dEO	Once off review that the layout used is the approved one, and monthly thereafter	Hydrological features clearly demarcated  No evidence of construction activities taking place within the 'no-go' areas during audit

**Impact management outcome:** Minimal to no impacts to fauna species

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
– No dogs or other pets should be allowed on site, except those confined to landowners' dwellings.	Operator, cEO	Include topic on 'no dogs allowed on site' in induction training material	During the operational phase	dEO	Monthly	Topic on 'no dogs allowed on site' included in induction training material
– Personnel on site should undergo environmental induction training, including the need to abide by speed limits, the increased risk of collisions with wild animals on roads in rural areas.	cEO, Operator	Include topic on speed limits and collision with wild animals in induction material	During the operational phase	dEO	Monthly	Topic on speed limits and collision with wild animals included in

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Timeframe	Evidence of compliance
						induction material
<ul style="list-style-type: none"> <li>– Proper waste management must be implemented, ensuring no toxic or dangerous substances are accessible to wildlife. This should also apply to stockpiles of new and used materials to ensure that they do not become a hazard.</li> </ul>	Operator	Compile a waste management plan for implementation during the operational phase	During the operational phase	dEO	Monthly	Waste management plan available on site and waste is being managed in accordance with the plan
<ul style="list-style-type: none"> <li>– No collecting, hunting or poaching of any animal species should take place. Report any mortality of protected species to conservation authorities.</li> </ul>	cEO, Operator	Requirement for induction of all staff prior to entry, in particular about the collection, hunting or harvesting of and animals	Duration of the project	dEO	Monthly	No evidence of fauna mortality, and induction roster of all staff completed, maintained and available on site

## 7.9 Aquatic Ecology

**Impact management outcome:** Minimise erosion and sedimentation

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Design and implement an effective stormwater management plan.	Operator	Make operator aware of the requirement for a stormwater management plan for the site	During the operational phase	dEO	Monthly	Stormwater Management Plan available on request
– Promote water infiltration into the landscape. A covering of soil and grass (regularly cut and maintained) around infrastructure is ideal for infiltration. If not feasible, then gravel is preferable over concrete or paving.	Developer, Operator	Ensure the operator is made aware that water infiltration must be promoted through covering of soil and grass around infrastructure	During the operational phase	dEO	Monthly	Evidence of soil and grass around infrastructure to promote infiltration is observed on site
– Release only clean water into the environment.	Operator	Compile and implement a stormwater management plan for the site	During the operational phase	dEO	Monthly	Stormwater management plan available on request  No evidence of dirty water being release into the environment

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Stormwater leaving the site should not be concentrated in a single exit drain but spread across multiple drains around the site, each fitted with energy dissipaters (e.g. slabs of concrete with rocks cemented in).	Operator	Compile and implement a stormwater management plan for the site	During the operational phase	dEO	Monthly	Stormwater management plan available on request
– Regularly clear drains.	Operator	Compile programme indicating the frequency of drain cleaning	During the operational phase	dEO	Monthly	Drains a free of debris

**Impact management outcome:** Minimised impacts on surface water quality and runoff, erosion and sedimentation are reduced

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– The contractors used for the construction should have spill kits available onsite prior to construction to ensure that any fuel, oil or hazardous substance spills are cleaned-up and discarded correctly	Developer	Make operator aware of the requirement for a spill kit on site	During the operational phase	dEO	Monthly	Visual observation of spills kits



Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– All chemicals and toxicants to be used for the construction must be stored in a bunded area.	Operator	Ensure that storage areas are impermeable and are sufficiently bunded, and have sumps and roofing	During the operational phase	dEO	Monthly	Photographic proof that storage areas are impermeable, and have bunds, sumps and roofing
– All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site at designed areas.	Operator, cEO	Make contractors aware of the requirement for regular inspection of their machinery and equipment	Prior to and during the operational phase	dEO	Monthly	Inspection checklists available on request
– Adequate sanitary facilities and ablutions on the servitude must be provided for all personnel throughout the project area. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation).	Operator	Ablution facilities must be provided and must be placed appropriately and in areas which avoid environmental sensitivities	During the operational phase	dEO	Weekly	Ablution facilities are installed and avoid environmental sensitivities
– All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as	cEO and Operator	Prepare induction material which includes	During the operational phase	dEO	Monthly	Register of attendance available on request

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping".		environmental awareness				
– All waste generated on site during construction must be adequately managed. Separation and recycling of different waste materials should be supported.	Operator, cEO	Develop and implement a waste management plan for the site.	During the operational phase	dEO	Monthly	Waste managed in accordance with the waste management plan for the site.

### 7.10 Avifauna

**Impact management outcome:** Displacement of priority species due to habitat loss during the operation activities of the substation is reduced.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Once operational, vehicle and pedestrian access to the site should be controlled and restricted to prevent unnecessary destruction of vegetation.	cEO, Operator	Demarcate sensitive areas to restrict access to these areas	During the operational phase	dEO	Monthly	Sensitive areas appropriately demarcated and fenced off for the duration of the construction phase
– The mitigation measures proposed by the vegetation specialist, including rehabilitation, must be strictly implemented.	Specialist	Include mitigation measures proposed by the vegetation specialist in the project EMPr	Prior to the commencement of the project	dEO	Monthly	Mitigation measures proposed by the vegetation specialist included in the project EMPr and implemented on site

**Impact management outcome:** Minimisation of the likelihood of collisions during the operational phase.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Develop and implement a carcass search programme for birds during the first two years of operation, in line with the South African monitoring guidelines (Jenkins <i>et al.</i> 2015).	Specialist  Operator	Develop a carcass search programme for implementation during operation.	During the operation phase	dEO	Quarterly	Evidence of implementation of the carcass search programme.  Minimal to no carcasses observed on site during audit.

**Impact management outcome:** Mortality due to electrocution in substation yard is reduced.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– With regards to the infrastructure within the substation yard, the hardware is too complex to warrant any mitigation for electrocution at this stage. It is rather recommended that if any impacts are recorded once operational, site-specific mitigation be applied reactively and in consultation with a qualified avifauna specialist.	Developer	Consult with an avifauna specialist determine ways to mitigate impacts on avifauna.	During the operational phase	dEO	Annually	Proof of consultation with avifauna specialist.

## 7.11 Socio-Economic

**Impact management outcome:** Enhanced socio-economic development and reduction in potential negative social impacts.

Impact Management Actions	Implementation			Monitoring		
	Responsible person	Method of implementation	Timeframe for implementation	Responsible person	Frequency	Evidence of compliance
– Implement a skills development and training programme aimed at maximising the number of employment opportunities for local community members.	Developer	Develop and implement a "locals first" policy for the provision of employment and training opportunities	During the operation phase	dEO	Once prior to the commencement of operation and monthly during the operation phase	The "locals first" policy is considered in terms of the employment and training opportunities
– Maximise opportunities for local content, procurement, and community shareholding.	Developer	Develop and implement a "locals first" policy in the procurement process	During the operation phase	dEO	Once prior to the commencement of operation and monthly during the operation phase	The "locals first" policy is considered in terms of procuring goods and services
– The proponent should liaise with the ULM to identify projects that can be supported by SED contributions.	Developer	Establish communication channels with the ULM	During the operational phase	dEO	Once, prior to the commencement of operation and monthly during the operational phase	Documentary evidence indicating liaison between the developer and the ULM

## **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: CV OF THE EAP

## CURRICULUM VITAE OF JO-ANNE THOMAS

<b>Profession:</b>	Environmental Management and Compliance Consultant; Environmental Assessment Practitioner
<b>Specialisation:</b>	Environmental Management; Strategic environmental advice; Environmental compliance advice & monitoring; Environmental Impact Assessments; Policy, strategy & guideline formulation; Project Management; General Ecology
<b>Work experience:</b>	Twenty four (24) years in the environmental field

### VOCATIONAL EXPERIENCE

Provide technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, Environmental Impact Assessment studies, environmental auditing and monitoring, environmental permitting, public participation, Environmental Management Plans and Programmes, environmental policy, strategy and guideline formulation, and integrated environmental management. Key focus on integration of the specialist environmental studies and findings into larger engineering-based projects, strategic assessment, and providing practical and achievable environmental management solutions and mitigation measures. Responsibilities for environmental studies include project management (including client and authority liaison and management of specialist teams); review and manipulation of data; identification and assessment of potential negative environmental impacts and benefits; review of specialist studies; and the identification of mitigation measures. Compilation of the reports for environmental studies is in accordance with all relevant environmental legislation.

Undertaking of numerous environmental management studies has resulted in a good working knowledge of environmental legislation and policy requirements. Recent projects have been undertaken for both the public- and private-sector, including compliance advice and monitoring, electricity generation and transmission projects, various types of linear developments (such as National Road, local roads and power lines), waste management projects (landfills), mining rights and permits, policy, strategy and guideline development, as well as general environmental planning, development and management.

### SKILLS BASE AND CORE COMPETENCIES

- Project management for a range of projects
- Identification and assessment of potential negative environmental impacts and benefits through the review and manipulation of data and specialist studies
- Identification of practical and achievable mitigation and management measures and the development of appropriate management plans
- Compilation of environmental reports in accordance with relevant environmental legislative requirements
- External and peer review of environmental reports & compliance advice and monitoring
- Formulation of environmental policies, strategies and guidelines
- Strategic and regional assessments; pre-feasibility & site selection
- Public participation processes for a variety of projects
- Strategic environmental advice to a wide variety of clients both in the public and private sectors
- Working knowledge of environmental planning processes, policies, regulatory frameworks and legislation



## EDUCATION AND PROFESSIONAL STATUS

### Degrees:

- B.Sc Earth Sciences, University of the Witwatersrand, Johannesburg (1993)
- B.Sc Honours in Botany, University of the Witwatersrand, Johannesburg (1994)
- M.Sc in Botany, University of the Witwatersrand, Johannesburg (1996)

### Short Courses:

- Environmental Impact Assessment, Potchefstroom University (1998)
- Environmental Law, Morgan University (2001)
- Environmental Legislation, IMBEWU (2017)
- Mining Legislation, Cameron Cross & Associates (2013)
- Environmental and Social Risk Management (ESRM), International Finance Corporation (2018)

### Professional Society Affiliations:

- Registered EAP with the Environmental Assessment Practitioners Association of South Africa (EAPASA) (2019/726)
- Registered with the South African Council for Natural Scientific Professions as a Professional Natural Scientist: Environmental Scientist (400024/00)
- Registered with the International Association for Impact Assessment South Africa (IAIASa): 5601
- Member of the South African Wind Energy Association (SAWEA)

## EMPLOYMENT

Date	Company	Roles and Responsibilities
January 2006 - Current:	Savannah Environmental (Pty) Ltd	Director Project manager Independent specialist environmental consultant, Environmental Assessment Practitioner (EAP) and advisor.
1997 – 2005:	Bohlweki Environmental (Pty) Ltd	Senior Environmental Scientist at. Environmental Management and Project Management
January – July 1997:	Sutherland High School, Pretoria	Junior Science Teacher

## PROJECT EXPERIENCE

Project experience includes large infrastructure projects, including electricity generation and transmission, wastewater treatment facilities, mining and prospecting activities, property development, and national roads, as well as strategy and guidelines development.

## RENEWABLE POWER GENERATION PROJECTS: PHOTOVOLTAIC SOLAR ENERGY FACILITIES

### Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Christiana PV 2 SEF, North West	Solar Reserve South Africa	Project Manager & EAP
De Aar PV facility, Northern Cape	iNca Energy	Project Manager & EAP
Everest SEF near Hennenman, Free State	FRV Energy South Africa	Project Manager & EAP
Graafwater PV SEF, Western Cape	iNca Energy	Project Manager & EAP
Grootkop SEF near Allanridge, Free State	FRV Energy South Africa	Project Manager & EAP
Hertzogville PV 2 SEF with 2 phases, Free State	SunCorp / Solar Reserve	Project Manager & EAP

Project Name & Location	Client Name	Role
Karoshhoek CPV facility on site 2 as part of the larger Karoshhoek Solar Valley Development East of Upington, Northern Cape	FG Emvelo	Project Manager & EAP
Kgabalatsane SEF North-East for Brits, North West	Built Environment African Energy Services	Project Manager & EAP
Kleinbegin PV SEF West of Groblershoop, Northern Cape	MedEnergy Global	Project Manager & EAP
Lethabo Power Station PV Installation, Free State	Eskom Holdings SoC Limited	Project Manager & EAP
Majuba Power Station PV Installation, Mpumalanga	Eskom Holdings SoC Limited	Project Manager & EAP
Merapi PV SEF Phase 1 – 4 South-East of Excelsior, Free State	SolaireDirect Southern Africa	Project Manager & EAP
Sannaspos Solar Park, Free State	SolaireDirect Southern Africa	Project Manager & EAP
Ofir-Zx PV Plant near Keimoes, Northern Cape	S28 Degrees Energy	Project Manager & EAP
Oryx SEF near Virginia, Free State	FRV Energy South Africa	Project Manager & EAP
Project Blue SEF North of Kleinsee, Northern Cape	WWK Development	Project Manager & EAP
S-Kol PV Plant near Keimoes, Northern Cape	S28 Degrees Energy	Project Manager & EAP
Sonnenberg PV Plant near Keimoes, Northern Cape	S28 Degrees Energy	Project Manager & EAP
Tutuka Power Station PV Installation, Mpumalanga	Eskom Transmission	Project Manager & EAP
Two PV sites within the Northern Cape	MedEnergy Global	Project Manager & EAP
Two PV sites within the Western & Northern Cape	iNca Energy	Project Manager & EAP
Upington PV SEF, Northern Cape	MedEnergy Global	Project Manager & EAP
Vredendal PV facility, Western Cape	iNca Energy	Project Manager & EAP
Waterberg PV plant, Limpopo	Thupela Energy	Project Manager & EAP
Watershed Phase I & II SEF near Litchtenburg, North West	FRV Energy South Africa	Project Manager & EAP
Alldays PV & CPV SEF Phase 1, Limpopo	BioTherm Energy	Project Manager & EAP
Hyperion PV Solar Development 1, 2, 3, 4, 5 & 6, Northern Cape	Building Energy	Project Manager & EAP
Vrede & Rondavel PV, Free State	Mainstream Renewable Energy Developments	Project Manager & EAP

#### Basic Assessments

Project Name & Location	Client Name	Role
Aberdeen PV SEF, Eastern Cape	BioTherm Energy	Project Manager & EAP
Christiana PV 1 SEF on Hartebeestpan Farm, North-West	Solar Reserve South Africa	Project Manager & EAP
Heuningspruit PV1 & PV 2 facilities near Koppies, Free State	Sun Mechanics	Project Manager & EAP
Kakamas PV Facility, Northern Cape	iNca Energy	Project Manager & EAP
Kakamas II PV Facility, Northern Cape	iNca Energy	Project Manager & EAP
Machadodorp 1 PV SEF, Mpumalanga	Solar To Benefit Africa	Project Manager & EAP
PV site within the Northern Cape	iNca Energy	Project Manager & EAP
PV sites within 4 ACSA airports within South Africa, National	Airports Company South Africa (ACSA)	Project Manager & EAP
RustMo1 PV Plant near Buffelspoort, North West	Momentous Energy	Project Manager & EAP
RustMo2 PV Plant near Buffelspoort, North West	Momentous Energy	Project Manager & EAP
RustMo3 PV Plant near Buffelspoort, North West	Momentous Energy	Project Manager & EAP
RustMo4 PV Plant near Buffelspoort, North West	Momentous Energy	Project Manager & EAP

Project Name & Location	Client Name	Role
Sannaspos PV SEF Phase 2 near Bloemfontein, Free State	SolaireDirect Southern Africa	Project Manager & EAP
Solar Park Expansion within the Rooiwal Power Station, Gauteng	AFRKO Energy	Project Manager & EAP
Steynsrus SEF, Free State	SunCorp	Project Manager & EAP
Sirius Solar PV Project Three and Sirius Solar PV Project Four (BA in terms of REDZ regulations), Northern Cape	SOLA Future Energy	Project Manager & EAP
Northam PV, Limpopo Province	Northam Platinum	Project Manager & EAP
Kolkies PV Suite (x 6 projects) and Sadawa PV Suite (x 4 projects), Western Cape	Mainstream Renewable Energy Developments	Project Manager & EAP

### Screening Studies

Project Name & Location	Client Name	Role
Allemans Fontein SEF near Noupoot, Northern Cape	Fusion Energy	Project Manager & EAP
Amandel SEF near Thabazimbi, Limpopo	iNca Energy	Project Manager & EAP
Arola/Doomplaat SEF near Ventersdorp, North West	FRV & iNca Energy	Project Manager & EAP
Bloemfontein Airport PV Installation, Free State	The Power Company	Project Manager & EAP
Brakspuit SEF near Klerksorp, North West	FRV & iNca Energy	Project Manager & EAP
Carolus Poort SEF near Noupoot, Northern Cape	Fusion Energy	Project Manager & EAP
Damfontein SEF near Noupoot, Northern Cape	Fusion Energy	Project Manager & EAP
Everest SEF near Welkom, Free State	FRV & iNca Energy	Project Manager & EAP
Gillmer SEF near Noupoot, Northern Cape	Fusion Energy	Project Manager & EAP
Grootkop SEF near Allansridge, Free State	FRV & iNca Energy	Project Manager & EAP
Heuningspruit PV1 & PV 2 near Koppies, Free State	Cronimat	Project Manager & EAP
Kimberley Airport PV Installation, Northern Cape	The Power Company	Project Manager & EAP
Kolonnade Mall Rooftop PV Installation in Tshwane, Gauteng	Momentous Energy	Project Manager & EAP
Loskop SEF near Groblersdal, Limpopo	S&P Power Unit	Project Manager & EAP
Marble SEF near Marble Hall, Limpopo	S&P Power Unit	Project Manager & EAP
Morgenson PV1 SEF South-West of Windsorton, Northern Cape	Solar Reserve South Africa	Project Manager & EAP
OR Tambo Airport PV Installation, Gauteng	The Power Company	Project Manager & EAP
Oryx SEF near Virginia, Free State	FRV & iNca Energy	Project Manager & EAP
Rhino SEF near Vaalwater, Limpopo	S&P Power Unit	Project Manager & EAP
Rustmo2 PV Plant near Buffelspoort, North West	Momentous Energy	Project Manager & EAP
Spitskop SEF near Northam, Limpopo	FRV & iNca Energy	Project Manager & EAP
Steynsrus PV, Free State	Suncorp	Project Manager & EAP
Tabor SEF near Polokwane, Limpopo	FRV & iNca Energy	Project Manager & EAP
Upington Airport PV Installation, Northern Cape	The Power Company	Project Manager & EAP
Valeria SEF near Hartebeestpoort Dam, North West	Solar to Benefit Africa	Project Manager & EAP
Watershed SEF near Lichtenburg, North West	FRV & iNca Energy	Project Manager & EAP
Witkop SEF near Polokwane, Limpopo	FRV & iNca Energy	Project Manager & EAP
Woodmead Retail Park Rooftop PV Installation, Gauteng	Momentous Energy	Project Manager & EAP

### Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO and bi-monthly auditing for the construction of the Adams Solar PV Project Two South of Hotazel,	Enel Green Power	Project Manager

Project Name & Location	Client Name	Role
Northern Cape		
ECO for the construction of the Kathu PV Facility, Northern Cape	REISA	Project Manager
ECO and bi-monthly auditing for the construction of the Pulida PV Facility, Free State	Enel Green Power	Project Manager
ECO for the construction of the RustMo1 SEF, North West	Momentous Energy	Project Manager
ECO for the construction of the Sishen SEF, Northern Cape	Windfall 59 Properties	Project Manager
ECO for the construction of the Upington Airport PV Facility, Northern Cape	Sublary Trading	Project Manager
Quarterly compliance monitoring of compliance with all environmental licenses for the operation activities at the Kathu PV facility, Northern Cape	REISA	Project Manager
ECO for the construction of the Konkoonsies II PV SEF and associated infrastructure, Northern Cape	BioTherm Energy	Project Manager
ECO for the construction of the Aggeneys PV SEF and associated infrastructure, Northern Cape	BioTherm Energy	Project Manager

#### Compliance Advice and ESAP Reporting

Project Name & Location	Client Name	Role
Aggeneys Solar Farm, Northern Cape	BioTherm Energy	Environmental Advisor
Airies II PV Facility SW of Kenhardt, Northern Cape	BioTherm Energy	Environmental Advisor
Kalahari SEF Phase II in Kathu, Northern Cape	Engle	Environmental Advisor
Kathu PV Facility, Northern Cape	Building Energy	Environmental Advisor
Kenhardt PV Facility, Northern Cape	BioTherm Energy	Environmental Advisor
Kleinbegin PV SEF West of Groblershoop, Northern Cape	MedEnergy	Environmental Advisor
Konkoonsies II SEF near Pofadder, Northern Cape	BioTherm Energy	Environmental Advisor
Konkoonsies Solar Farm, Northern Cape	BioTherm Energy	Environmental Advisor
Lephalale SEF, Limpopo	Exxaro	Environmental Advisor
Pixley ka Seme PV Park, South-East of De Aar, Northern Cape	African Clean Energy Developments (ACED)	Environmental Advisor
RustMo1 PV Plant near Buffelspoort, North West	Momentous Energy	Environmental Advisor
Scuitdrift 1 SEF & Scuitdrift 2 SEF, Limpopo	Building Energy	Environmental Advisor
Sirius PV Plants, Northern Cape	Aurora Power Solutions	Environmental Advisor
Upington Airport PV Power Project, Northern Cape	Sublary Trading	Environmental Advisor
Upington SEF, Northern Cape	Abengoa Solar	Environmental Advisor
Ofir-ZX PV SEF near Keimoes, Northern Cape	Network S28 Energy	Environmental Advisor
Environmental Permitting for the Steynsrus PV1 & PV2 SEF's, Northern Cape	Cronimet Power Solutions	Environmental Advisor
Environmental Permitting for the Heuningspruit PV SEF, Northern Cape	Cronimet Power Solutions	Environmental Advisor

#### Due Diligence Reporting

Project Name & Location	Client Name	Role
5 PV SEF projects in Lephalale, Limpopo	iNca Energy	Environmental Advisor
Prieska PV Plant, Northern Cape	SunEdison Energy India	Environmental Advisor
Sirius Phase One PV Facility near Upington, Northern Cape	Aurora Power Solutions	Environmental Advisor

**Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Biodiversity Permit & WULA for the Aggeneys SEF near Aggeneys, Northern Cape	BioTherm Energy	Project Manager & EAP
Biodiversity Permit for the Konkoonises II SEF near Pofadder, Northern Cape	BioTherm Energy	Project Manager & EAP
Biodiversity Permitting for the Lephallale SEF, Limpopo	Exxaro Resources	Project Manager & EAP
Environmental Permitting for the Kleinbegin PV SEF West of Groblershoop, Northern Cape	MedEnergy	Project Manager & EAP
Environmental Permitting for the Upington SEF, Northern Cape	Abengoa Solar	Project Manager & EAP
Environmental Permitting for the Kathu PV Facility, Northern Cape	Building Energy	Project Manager & EAP
Environmental Permitting for the Konkoonsies Solar Farm, Northern Cape	BioTherm Energy	Project Manager & EAP
Environmental Permitting for the Lephallale SEF, Limpopo	Exxaro Resources	Project Manager & EAP
Environmental Permitting for the Scuitdrift 1 SEF & Scuitdrift 2 SEF, Limpopo	Building Energy	Project Manager & EAP
Environmental Permitting for the Sirius PV Plant, Northern Cape	Aurora Power Solutions	Project Manager & EAP
Environmental Permitting for the Steynsrus PV1 & PV2 SEF's, Northern Cape	Cronimet Power Solutions	Project Manager & EAP
Environmental Permitting for the Heuningspruit PV SEF, Northern Cape	Cronimet Power Solutions	Project Manager & EAP
Permits for the Kleinbegin and UAP PV Plants, Northern Cape	MedEnergy Global	Project Manager & EAP
S53 Application for Arriesfontein Solar Park Phase 1 – 3 near Danielskuil, Northern Cape	Solar Reserve / SunCorp	Project Manager & EAP
S53 Application for Hertzogville PV1 & PV 2 SEFs, Free State	Solar Reserve / SunCorp	Project Manager & EAP
S53 Application for the Bloemfontein Airport PV Facility, Free State	Sublunary Trading	Project Manager & EAP
S53 Application for the Kimberley Airport PV Facility, Northern Cape	Sublunary Trading	Project Manager & EAP
S53 Application for the Project Blue SEF, Northern Cape	WWK Developments	Project Manager & EAP
S53 Application for the Upington Airport PV Facility, Free State	Sublunary Trading	Project Manager & EAP
WULA for the Kalahari SEF Phase II in Kathu, Northern Cape	Engie	Project Manager & EAP

**RENEWABLE POWER GENERATION PROJECTS: CONCENTRATED SOLAR FACILITIES (CSP)**

**Environmental Impact Assessments and Environmental Management Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Ilanga CSP 2, 3, 4, 5, 7 & 9 Facilities near Upington, Northern Cape	Emvelo Holdings	Project Manager & EAP
Ilanga CSP near Upington, Northern Cape	Ilangethu Energy	Project Manager & EAP

Project Name & Location	Client Name	Role
Ilanga Tower 1 Facility near Upington, Northern Cape	Emvelo Holdings	Project Manager & EAP
Karoshhoek CPVPD 1-4 facilities on site 2 as part of the larger Karoshhoek Solar Valley Development East of Upington, Northern Cape	FG Emvelo	Project Manager & EAP
Karoshhoek CSP facilities on sites 1.4; 4 & 5 as part of the larger Karoshhoek Solar Valley Development East of Upington, Northern Cape	FG Emvelo	Project Manager & EAP
Karoshhoek Linear Fresnel 1 Facility on site 1.1 as part of the larger Karoshhoek Solar Valley Development East of Upington, Northern Cape	FG Emvelo	Project Manager & EAP

#### Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the construction of the !Khi CSP Facility, Northern Cape	Abengoa Solar	Project Manager
ECO for the construction of the Ilanga CSP 1 Facility near Upington, Northern Cape	Karoshhoek Solar One	Project Manager
ECO for the construction of the folar Park, Northern Cape	Kathu Solar	Project Manager
ECO for the construction of the KaXu! CSP Facility, Northern Cape	Abengoa Solar	Project Manager
Internal audit of compliance with the conditions of the IWUL issued to the Karoshhoek Solar One CSP Facility, Northern Cape	Karoshhoek Solar One	Project Manager

#### Screening Studies

Project Name & Location	Client Name	Role
Upington CSP (Tower) Plant near Kanoneiland, Northern Cape	iNca Energy and FRV	Project Manager & EAP

#### Compliance Advice and ESAP reporting

Project Name & Location	Client Name	Role
Ilanga CSP Facility near Upington, Northern Cape	Ilangethu Energy	Environmental Advisor
Ilangalethu CSP 2, Northern Cape	FG Emvelo	Environmental Advisor
Kathu CSP Facility, Northern Cape	GDF Suez	Environmental Advisor
Lephalale SEF, Limpopo	Cennergi	Environmental Advisor
Solis I CSP Facility, Northern Cape	Brightsource	Environmental Advisor

#### Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
Environmental Permitting for the Ilanga CSP Facility near Upington, Northern Cape	Ilangethu Energy	Project Manager & EAP
Environmental Permitting for the Kathu CSP, Northern Cape	GDF Suez	Project Manager & EAP
WULA for the Solis I CSP Facility, Northern Cape	Brightsource	Project Manager & EAP

## **RENEWABLE POWER GENERATION PROJECTS: WIND ENERGY FACILITIES**

### **Environmental Impact Assessments and Environmental Management Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Sere WEF, Western Cape	Eskom Holdings SoC Limited	EAP
Aberdeen WEF, Eastern Cape	Eskom Holdings SoC Limited	Project Manager & EAP
Amakhala Emoyeni WEF, Eastern Cape	Windlab Developments	Project Manager & EAP
EXXARO West Coast WEF, Western Cape	EXXARO Resources	Project Manager & EAP
Goereesoe Wind Farm near Swellendam, Western Cape	iNca Energy	Project Manager & EAP
Hartneest WEF, Western Cape	Juwi Renewable Energies	Project Manager & EAP
Hopefield WEF, Western Cape	Umoya Energy	EAP
Kleinsee WEF, Northern Cape	Eskom Holdings SoC Limited	Project Manager & EAP
Klipheuwel/Dassiesfontein WEF within the Overberg area, Western Cape	BioTherm Energy	Project Manager & EAP
Moorreesburg WEF, Western Cape	iNca Energy	Project Manager & EAP
Oyster Bay WEF, Eastern Cape	Renewable Energy Resources Southern Africa	Project Manager & EAP
Project Blue WEF, Northern Cape	Windy World	Project Manager & EAP
Rhebokfontein WEF, Western Cape	Moyeng Energy	Project Manager & EAP
Spitskop East WEF near Riebeeck East, Eastern Cape	Renewable Energy Resources Southern Africa	Project Manager & EAP
Suurplaat WEF, Western Cape	Moyeng Energy	Project Manager & EAP
Swellendam WEF, Western Cape	IE Swellendam	Project Manager & EAP
Tsitsikamma WEF, Eastern Cape	Exxarro	Project Manager & EAP
West Coast One WEF, Western Cape	Moyeng Energy	Project Manager & EAP

### **Basic Assessments**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Amakhala Emoyeni Wind Monitoring Masts, Eastern Cape	Windlab Developments	Project Manager & EAP
Beaufort West Wind Monitoring Masts, Western Cape	Umoya Energy	Project Manager & EAP
Hopefield Community Wind Farm near Hopefield, Western Cape	Umoya Energy	Project Manager & EAP
Koekenaap Wind Monitoring Masts, Western Cape	EXXARO Resources	Project Manager & EAP
Koingnaas WEF, Northern Cape	Just Palm Tree Power	Project Manager & EAP
Laingsburg Area Wind Monitoring Masts, Western Cape	Umoya Energy	Project Manager & EAP
Overberg Area Wind Monitoring Masts, Western Cape	BioTherm Energy	Project Manager & EAP
Oyster Bay Wind Monitoring Masts, Eastern Cape	Renewable Energy Systems Southern Africa (RES)	Project Manager & EAP
Wind Garden & Fronteer WEFs, Eastern Cape	Wind Relc	Project Manager & EAP

### **Screening Studies**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Albertinia WEF, Western Cape	BioTherm Energy	Project Manager & EAP
Koingnaas WEF, Northern Cape	Just Pal Tree Power	Project Manager & EAP
Napier Region WEF Developments, Western Cape	BioTherm Energy	Project Manager & EAP
Tsitsikamma WEF, Eastern Cape	Exxarro Resources	Project Manager & EAP



Project Name & Location	Client Name	Role
Various WEFs within an identified area in the Overberg area, Western Cape	BioTherm Energy	Project Manager & EAP
Various WEFs within an identified area on the West Coast, Western Cape	Investec Bank Limited	Project Manager & EAP
Various WEFs within an identified area on the West Coast, Western Cape	Eskom Holdings Limited	Project Manager & EAP
Various WEFs within the Western Cape	Western Cape Department of Environmental Affairs and Development Planning	Project Manager & EAP
Velddrift WEF, Western Cape	VentuSA Energy	Project Manager & EAP
Wind 1000 Project	Thabo Consulting on behalf of Eskom Holdings	Project Manager & EAP
Wittekleibosch, Snylip & Doriskraal WEFs, Eastern Cape	Exxarro Resources	Project Manager & EAP

#### Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the construction of the West Coast One WEF, Western Cape	Aurora Wind Power	Project Manager
ECO for the construction of the Gouda WEF, Western Cape	Blue Falcon	Project Manager
EO for the Dassiesklip Wind Energy Facility, Western Cape	Group 5	Project Manager
Quarterly compliance monitoring of compliance with all environmental licenses for the operation activities at the Gouda Wind Energy facility near Gouda, Western Cape	Blue Falcon	Project Manager
Annual auditing of compliance with all environmental licenses for the operation activities at the West Coast One Wind Energy facility near Vredenburg, Western Cape	Aurora Wind Power	Project Manager
External environmental and social audit for the Amakhala Wind Farm, Eastern Cape	Cennergi	Project Manager
External environmental and social audit for the Tsitsikamma Wind Farm, Eastern Cape	Cennergi	Project Manager
ECO for the construction of the Excelsior Wind Farm and associated infrastructure, Northern Cape	BioTherm Energy	Project Manager
External compliance audit of the Dassiesklip Wind Energy Facility, Western Cape	BioTherm Energy	Project Manager

#### Compliance Advice

Project Name & Location	Client Name	Role
Amakhala Phase 1 WEF, Eastern Cape	Cennergi	Environmental Advisor
Dassiesfontein WEF within the Overberg area, Western Cape	BioTherm Energy	Environmental Advisor
Excelsior Wind Farm, Western Cape	BioTherm Energy	Environmental Advisor
Great Karoo Wind Farm, Northern Cape	African Clean Energy Developments (ACED)	Environmental Advisor
Hopefield Community WEF, Western Cape	African Clean Energy Developments (ACED)	Environmental Advisor



Rheboksfontein WEF, Western Cape	Moyeng Energy	Environmental Advisor
Tiqua WEF, Western Cape	Cennergi	Environmental Advisor
Tsitsikamma WEF, Eastern Cape	Cennergi	Environmental Advisor
West Coast One WEF, Western Cape	Moyeng Energy	Environmental Advisor

#### **Due Diligence Reporting**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Witteberg WEF, Western Cape	EDPR Renewables	Environmental Advisor
IPD Vredenburg WEF within the Saldanha Bay area, Western Cape	IL&FS Energy Development Company	Environmental Advisor

#### **Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Biodiversity Permitting for the Power Line between the Tsitsikamma Community WEF & the Diep River Substation, Eastern Cape	Cennergi	Project Manager & EAP
Biodiversity Permitting for the West Coast One WEF, Western Cape	Aurora Wind Power	Project Manager & EAP
Environmental Permitting for the Excelsior WEF, Western Cape	BioTherm Energy	Project Manager & EAP
Plant Permits & WULA for the Tsitsikamma Community WEF, Eastern Cape	Cennergi	Project Manager & EAP
S24G and WULA for the Rectification for the commencement of unlawful activities on Ruimsig AH in Honeydew, Gauteng	Hossam Soror	Project Manager & EAP
S24G Application for the Rheboksfontein WEF, Western Cape	Ormonde - Theo Basson	Project Manager & EAP
S53 Application & WULA for Suurplaat and Gemini WEFs, Northern Cape	Engie	Project Manager & EAP
S53 Application for the Hopefield Community Wind Farm near Hopefield, Western Cape	Umoya Energy	Project Manager & EAP
S53 Application for the Project Blue WEF, Northern Cape	WWK Developments	Project Manager & EAP
S53 for the Oyster Bay WEF, Eastern Cape	RES	Project Manager & EAP
WULA for the Great Karoo Wind Farm, Northern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP

#### **CONVENTIONAL POWER GENERATION PROJECTS (COAL)**

##### **Environmental Impact Assessments and Environmental Management Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Mutsho Power Station near Makhado, Limpopo	Mutsho Consortium	Project Manager & EAP
Coal-fired Power Station near Ogies, Mpumalanga	Ruukki SA	Project Manager & EAP
Thabametsi IPP Coal-fired Power Station, near Lephalale, Limpopo	Axia	Project Manager & EAP
Transalloys Coal-fired Power Station, Mpumalanga	Transalloys	Project Manager & EAP
Tshivasho IPP Coal-fired Power Station (with WML), near Lephalale, Limpopo	Cennergi	Project Manager & EAP
Umbani Coal-fired Power Station, near Kriel, Mpumalanga	ISS Global Mining	Project Manager & EAP

Project Name & Location	Client Name	Role
Waterberg IPP Coal-Fired Power Station near Lephallale, Limpopo	Exxaro Resources	Project Manager & EAP

#### Basic Assessments

Project Name & Location	Client Name	Role
Coal Stockyard on Medupi Ash Dump Site, Limpopo	Eskom Holdings	Project Manager & EAP
Biomass Co-Firing Demonstration Facility at Arnot Power Station East of Middleburg, Mpumlanaga	Eskom Holdings	Project Manager & EAP

#### Screening Studies

Project Name & Location	Client Name	Role
Baseload Power Station near Lephallale, Limpopo	Cennergi	Project Manager & EAP
Coal-Fired Power Plant near Delmas, Mpumalanga	Exxaro Resources	Project Manager & EAP
Makhado Power Station, Limpopo	Mutsho Consortium, Limpopo	Project Manager & EAP

#### Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the Camden Power Station, Mpumalanga	Eskom Holdings	Project Manager

#### Compliance Advice

Project Name & Location	Client Name	Role
Thabametsi IPP Coal-fired Power Station, near Lephallale, Limpopo	Axia	Environmental Advisor

#### Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
Permit application for the Thabametsi Bulk Water Pipeline, near Lephallale, Limpopo	Axia	Project Manager & EAP
S53 & WULA for the Waterberg IPP Coal-Fired Power Station near Lephallale, Limpopo	Exxaro Resources	Project Manager & EAP
S53 Application for the Tshivasho Coal-fired Power Station near Lephallale, Limpopo	Cennergi	Project Manager & EAP

#### CONVENTIONAL POWER GENERATION PROJECTS (GAS)

##### Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Ankerlig OCGT to CCGT Conversion project & 400 kV transmission power line between Ankerlig and the Omega Substation, Western Cape	Eskom Holdings SoC Limited	Project Manager & EAP
Gourikwa OCGT to CCGT Conversion project & 400kV transmission power line between Gourikwa & Proteus Substation, Western Cape	Eskom Holdings SoC Limited	Project Manager & EAP
Richards Bay Gas to Power Combined Cycle Power Station, KwaZulu-Natal	Eskom Holdings SoC Limited	Project Manager & EAP
Richards Bay Gas to Power Plant, KwaZulu-Natal	Richards Bay Gas Power 2	Project Manager & EAP
Decommissioning & Recommissioning of 3 Gas Turbine Units at Acacia Power Station & 1 Gas Turbine Unit at Port Rex Power Station to the existing	Eskom Holdings	Project Manager & EAP

Project Name & Location	Client Name	Role
Ankerlig Power Station in Atlantis Industria, Western Cape		
320MW gas-to-power station in Richards Bay, KwaZulu-Natal	Phinda Power Projects	Project Manager & EAP

#### Screening Studies

Project Name & Location	Client Name	Role
Fatal Flaw Analysis for 3 area identified for the establishment of a 500MW CCGT Power Station	Globeleq Advisors Limited	Project Manager & EAP
Richards Bay Gas to Power Combined Cycle Power Station, KwaZulu-Natal	Eskom Holdings SoC Limited	Project Manager & EAP

#### GRID INFRASTRUCTURE PROJECTS

##### Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Aggeneis-Oranjemond Transmission Line & Substation Upgrade, Northern Cape	Eskom Transmission	Project Manager & EAP
Ankerlig-Omega Transmission Power Lines, Western Cape	Eskom Transmission	Project Manager & EAP
Karoshhoek Grid Integration project as part of the Karoshhoek Solar Valley Development East of Upington, Northern Cape	FG Emvelo	Project Manager & EAP
Koeberg-Omega Transmission Power Lines,, Western Cape	Eskom Transmission	Project Manager & EAP
Koeberg-Stikland Transmission Power Lines, Western Cape	Eskom Transmission	Project Manager & EAP
Kyalami Strengthening Project, Gauteng	Eskom Transmission	Project Manager & EAP
Mokopane Integration Project, Limpopo	Eskom Transmission	Project Manager & EAP
Saldanha Bay Strengthening Project, Western Cape	Eskom Transmission	Project Manager & EAP
Steelpoort Integration Project, Limpopo	Eskom Transmission	Project Manager & EAP
Transmission Lines from the Koeberg-2 Nuclear Power Station site, Western Cape	Eskom Transmission	Project Manager & EAP
Tshwane Strengthening Project, Phase 1, Gauteng	Eskom Transmission	Project Manager & EAP
Main Transmission Substation (MTS) associated with the Choje Wind Farm cluster, Eastern Cape	Wind Relic	Project Manager & EAP

#### Basic Assessments

Project Name & Location	Client Name	Role
Dassenberg-Koeberg Power Line Deviation from the Koeberg to the Ankerlig Power Station, Western Cape	Eskom Holdings	Project Manager & EAP
Golden Valley II WEF Power Line & Substation near Cookhouse, Eastern Cape	BioTherm Energy	Project Manager & EAP
Golden Valley WEF Power Line near Cookhouse, Eastern Cape	BioTherm Energy	Project Manager & EAP
Karoshhoek Grid Integration project as part of the Karoshhoek Solar Valley Development East of Upington, Northern Cape	FG Emvelo	Project Manager & EAP

Project Name & Location	Client Name	Role
Konkoonsies II PV SEF Power Line to the Paulputs Substation near Pofadder, Northern Cape	BioTherm Energy	Project Manager & EAP
Perdekraal West WEF Powerline to the Eskom Kappa Substation, Western Cape	BioTherm Energy	Project Manager & EAP
Rheboksfontein WEF Powerline to the Aurora Substation, Western Cape	Moyeng Energy	Project Manager & EAP
Soetwater Switching Station near Sutherland, Northern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
Solis Power I Power Line & Switchyard Station near Upington, Northern Cape	Brightsource	Project Manager & EAP
Stormwater Canal System for the Ilanga CSP near Upington, Northern Cape	Karoshhoek Solar One	Project Manager & EAP
Tsitsikamma Community WEF Powerline to the Diep River Substation, Eastern Cape	Eskom Holdings	Project Manager & EAP
Two 132kV Chickadee Lines to the new Zonnebloem Switching Station, Mpumalanga	Eskom Holdings	Project Manager & EAP
Electrical Grid Infrastructure for the Kolkies and Sadawa PV clusters, Western Cape	Mainstream Renewable Energy Developments	Project Manager & EAP
Sadawa Collector substation, Western Cape	Mainstream Renewable Energy Developments	Project Manager & EAP
Electrical Grid Infrastructure for the Vrede and Rondavel PV facilities, Free State	Mainstream Renewable Energy Developments	Project Manager & EAP

#### Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO for the construction of the Ferrum-Mookodi Transmission Line, Northern Cape and North West	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Gamma-Kappa Section A Transmission Line, Western Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Gamma-Kappa Section B Transmission Line, Western Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Hydra IPP Integration project, Northern Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Kappa-Sterrekus Section C Transmission Line, Western Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
EO for the construction of the Namaqualand Strengthening project in Port Nolloth, Western Cape	Trans-Africa Projects on behalf of Eskom	Project Manager
ECO for the construction of the Neptune Substation Soil Erosion Mitigation Project, Eastern Cape	Eskom	Project Manager
ECO for the construction of the Ilanga-Gordonia 132kV power line, Northern Cape	Karoshhoek Solar One	Project Manager

#### Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
Environmental Permitting and WULA for the Rockdale B Substation & Loop in Power Lines,	Eskom Holdings	Project Manager & EAP
Environmental Permitting and WULA for the Steelpoort Integration project, Limpopo	Eskom Holdings	Project Manager & EAP
Environmental Permitting for Solis CSP near Upington, Northern Cape	Brightsource	Project Manager & EAP

## **MINING SECTOR PROJECTS**

### **Environmental Impact Assessments and Environmental Management Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Elitheni Coal Mine near Indwe, Eastern Cape	Elitheni Coal	Project Manager & EAP
Groot Letaba River Development Project Borrow Pits	Iiso	Project Manager & EAP
Grootegeluk Coal Mine for coal transportation infrastructure between the mine and Medupi Power Station (EMPr amendment), Limpopo	Eskom Holdings	Project Manager & EAP
Waterberg Coal Mine (EMPr amendment), Limpopo	Sesoko Resources	Project Manager & EAP
Aluminium Plant WML & AEL, Gauteng	GfE-MIR Alloys & Minerals	Project Manager & EAP

### **Basic Assessments**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Rare Earth Separation Plant in Vredendal, Western Cape	Rareco	Project Manager & EAP
Decommissioning and Demolition of Kilns 5 & 6 at the Slurry Plant, Kwa-Zulu Natal	PPC	Project Manager & EAP

### **Environmental Compliance, Auditing and ECO**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
ECO for the construction of the Duhva Mine Water Recovery Project, Mpumalanga	Eskom Holdings SoC Limited	Project Manager
External compliance audit of Palesa Coal Mine's Integrated Water Use License (IWUL), near KwaMhlanga, Mpumalanga	HCI Coal	Project Manager
External compliance audit of Palesa Coal Mine's Waste Management License (WML) and EMP, near KwaMhlanga, Mpumalanga	HCI Coal	Project Manager
External compliance audit of Mbali Coal Mine's Integrated Water Use License (IWUL), near Ogies, Mpumalanga	HCI Coal	Project Manager
Independent External Compliance Audit of Water Use License (WUL) for the Tronox Namakwa Sands (TNS) Mining Operations (Brand se Baai), Western Cape	Tronox Namakwa Sands	Project Manager
Independent External Compliance Audit of Water Use License (WUL) for the Tronox Namakwa Sands (TNS) Mineral Separation Plant (MSP), Western Cape	Tronox Namakwa Sands	Project Manager
Independent External Compliance Audit of Water Use License (WUL) for the Tronox Namakwa Sands (TNS) Smelter Operations (Saldanha), Western Cape	Tronox Namakwa Sands	Project Manager
Compliance Auditing of the Waste Management Licence for the PetroSA Landfill Site at the GTL Refinery, Western Cape	PetroSA	Project Manager

### **Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Waste Licence Application for the Rare Earth Separation Plant in Vredendal, Western Cape	Rareco	Project Manager & EAP

WULA for the Expansion of the Landfill site at Exxaro's Namakwa Sands Mineral Separation Plant, Western Cape	Exxaro Resources	Project Manager & EAP
S24G & WML for an Aluminium Plant, Gauteng	GfE-MIR Alloys & Minerals	Project Manager & EAP

### **INFRASTRUCTURE DEVELOPMENT PROJECTS (BRIDGES, PIPELINES, ROADS, WATER RESOURCES, STORAGE, ETC)**

#### **Environmental Impact Assessments and Environmental Management Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Bridge across the Ngotwane River, on the border of South Africa and Botswana	Eskom Holdings	Project Manager & EAP
Chemical Storage Tanks, Metallurgical Plant Upgrade & Backfill Plant upgrade at South Deep Gold Mine, near Westonia, Gauteng	Goldfields	Project Manager & EAP
Expansion of the existing Welgedacht Water Care Works, Gauteng	ERWAT	Project Manager & EAP
Golden Valley WEF Access Road near Cookhouse, Eastern Cape	BioTherm Energy	Project Manager & EAP
Great Fish River Wind Farm Access Roads and Watercourse Crossings near Cookhouse, Eastern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
Ilanga CSP Facility Watercourse Crossings near Upington, Northern Cape	Karoshhoek Solar one	Project Manager & EAP
Modification of the existing Hartebeestfontein Water Care Works, Gauteng	ERWAT	Project Manager & EAP
N10 Road Realignment for the Ilanga CSP Facility, East of Upington, Northern Cape	SANRAL	Project Manager & EAP
Nxuba (Bedford) Wind Farm Watercourse Crossings near Cookhouse, Eastern Cape	African Clean Energy Developments (ACED)	Project Manager & EAP
Pollution Control Dams at the Medupi Power Station Ash Dump & Coal Stockyard, Limpopo	Eskom	Project Manager & EAP
Qoboshane borrow pits (EMPr only), Eastern Cape	Emalahleni Local Municipality	Project Manager & EAP
Tsitsikamma Community WEF Watercourse Crossings, Eastern Cape	Cennergi	Project Manager & EAP
Clayville Central Steam Plant, Gauteng	Bellmall Energy	Project Manager & EAP
Msenge Emoyeni Wind Farm Watercourse Crossings and Roads, Eastern Cape	Windlab	Project Manager & EAP

#### **Basic Assessments**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Harmony Gold WWTW at Doornkop Mine, Gauteng	Harmony Doornkop Plant	Project Manager & EAP
Ofir-ZX Watercourse Crossing for the Solar PV Facility, near Keimoes, Northern Cape	Networx S28 Energy	Project Manager & EAP
Qoboshane bridge & access roads, Eastern Cape	Emalahleni Local Municipality	Project Manager & EAP
Relocation of the Assay Laboratory near Carletonville, Gauteng	Sibanye Gold	Project Manager & EAP
Richards Bay Harbour Staging Area, KwaZulu-Natal	Eskom Holdings	Project Manager & EAP
S-Kol Watercourse Crossing for the Solar PV Facility, East of Keimoes, Northern Cape	Networx S28 Energy	Project Manager & EAP
Sonnenberg Watercourse Crossing for the Solar PV Facility, West Keimoes, Northern Cape	Networx S28 Energy	Project Manager & EAP

Project Name & Location	Client Name	Role
Kruisvallei Hydroelectric Power Generation Scheme, Free State	Building Energy	Project Manager & EAP
Masetjaba Water Reservoir, Pump Station and Bulk Supply Pipeline near Nigel, Gauteng	Naidu Consulting Engineers	Project Manager & EAP
Access Road for the Dwarsug Wind Farm, Northern Cape Province	South Africa Mainsteam Renewable Power	Project Manager & EAP

#### Screening Studies

Project Name & Location	Client Name	Role
Roodepoort Open Space Optimisation Programme (OSOP) Precinct, Gauteng	TIMAC Engineering Projects	Project Manager & EAP
Vegetable Oil Plant and Associated Pipeline, Kwa-Zulu Natal	Wilmar Oils and Fats Africa	Project Manager & EAP

#### Environmental Compliance, Auditing and ECO

Project Name & Location	Client Name	Role
ECO and bi-monthly auditing for the construction of the Olifants River Water Resources Development Project (ORWRDP) Phase 2A: De Hoop Dam, R555 realignment and housing infrastructure	Department of Water and Sanitation	Project Manager Auditor
ECO for the Rehabilitation of the Blaaupan & Storm Water Channel, Gauteng	Airports Company of South Africa (ACSA)	Project Manager
Due Diligence reporting for the Better Fuel Pyrolysis Facility, Gauteng	Better Fuels	Project Manager
ECO for the Construction of the Water Pipeline from Kendal Power Station to Kendal Pump Station, Mpumalanga	Transnet	Project Manager
ECO for the Replacement of Low-Level Bridge, Demolition and Removal of Artificial Pong, and Reinforcement the Banks of the Crocodile River at the Construction at Walter Sisulu National Botanical Gardens, Gauteng Province	South African National Biodiversity Institute (SANBI)	Project Manager
External Compliance Audit of the Air Emission Licence (AEL) for a depot in Bloemfontein, Free State Province and in Tzaneen, Mpumalanga Province	PetroSA	Project Manager

#### Environmental Permitting, S53, Water Use Licence (WUL), Waste Management Licence (WML) & Other Applications

Project Name & Location	Client Name	Role
WULA for the Izubulo Private Nature Reserve, Limpopo	Kjell Bismeyer, Jann Bader, Laurence Saad	Project Manager & EAP
WULA for the Masodini Private Game Lode, Limpopo	Masodini Private Game Lodge	Environmental Advisor
WULA for the Ezulwini Private Nature Reserve, Limpopo	Ezulwini Investments	Project Manager & EAP
WULA for the Masodini Private Game Lode, Limpopo	Masodini Private Game Lodge	Project Manager & EAP
WULA for the N10 Realignment at the Ilanga SEF, Northern Cape	Karoshhoek Solar One	Project Manager & EAP
WULA for the Kruisvallei Hydroelectric Power Generation Scheme, Free State	Building Energy	Project Manager & EAP



Project Name & Location	Client Name	Role
S24G and WULA for the Illegal construction of structures within a watercourse on EFF 24 Ruimsig Agricultural Holdings, Gauteng	Sorrer Language Services	Project Manager & EAP

## **HOUSING AND URBAN PROJECTS**

### **Basic Assessments**

Project Name & Location	Client Name	Role
Postmasburg Housing Development, Northern Cape	Transnet	Project Manager & EAP

### **Compliance Advice and reporting**

Project Name & Location	Client Name	Role
Kampi ya Thude at the Olifants West Game Reserve, Limpopo	Nick Elliot	Environmental Advisor
External Compliance Audit of WUL for the Johannesburg Country Club, Gauteng	Johannesburg Country Club	Project Manager

### **Environmental Compliance, Auditing and ECO**

Project Name & Location	Client Name	Role
Due Diligence Audit for the Due Diligence Audit Report, Gauteng	Delta BEC (on behalf of Johannesburg Development Agency (JDA))	Project Manager

## **ENVIRONMENTAL MANAGEMENT TOOLS**

Project Name & Location	Client Name	Role
Development of the 3rd Edition Environmental Implementation Plan (EIP)	Gauteng Department of Agriculture and Rural Development (GDARD)	Project Manager & EAP
Development of Provincial Guidelines on 4x4 routes, Western Cape	Western Cape Department of Environmental Affairs and Development Planning	EAP
Compilation of Construction and Operation EMP for the Braamhoek Transmission Integration Project, Kwazulu-Natal	Eskom Holdings	Project Manager & EAP
Compilation of EMP for the Wholesale Trade of Petroleum Products, Gauteng	Munaca Technologies	Project Manager & EAP
Operational Environmental Management Programme (OEMP) for Medupi Power Station, Limpopo	Eskom Holdings	Project Manager & EAP
Operational Environmental Management Programme (OEMP) for the Dube TradePort Site Wide Precinct	Dube TradePort Corporation	Project Manager & EAP
Operational Environmental Management Programme (OEMP) for the Kusile Power Station, Mpumalanga	Eskom Holdings	Project Manager & EAP
Review of Basic Assessment Process for the Wittekleibosch Wind Monitoring Mast, Eastern Cape	Exxaro Resources	Project Manager & EAP
Revision of the EMP for the Sirius Solar PV	Aurora Power Solutions	Project Manager & EAP



<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
State of the Environment (SoE) for Emalahleni Local Municipality, Mpumalanga	Simo Consulting on behalf of Emalahleni Local Municipality	Project Manager & EAP
Aspects and Impacts Register for Salberg Concrete Products operations	Salberg Concrete Products	EAP
First State of Waste Report for South Africa	Golder on behalf of the Department of Environmental Affairs	Project Manager & EAP
Responsibilities Matrix and Gap Analysis for the Kruisvallei Hydroelectric Power Generation Scheme, Free State Province	Building Energy	Project Manager
Responsibilities Matrix and Gap Analysis for the Roggeveld Wind Farm, Northern & Western Cape Provinces	Building Energy	Project Manager

### **PROJECTS OUTSIDE OF SOUTH AFRICA**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Advisory Services for the Zizabona Transmission Project, Zambia, Zimbabwe, Botswana & Namibia	PHD Capital	Advisor
EIA for the Semonkong WEF, Lesotho	MOSCET	Project Manager & EAP
EMP for the Kuvaninga Energia Gas Fired Power Project, Mozambique	ADC (Pty) Ltd	Project Manager & EAP
Environmental Screening Report for the SEF near Thabana Morena, Lesotho	Building Energy	EAP
EPBs for the Kawambwa, Mansa, Mwense and Nchelenge SEFs in Luapula Province, Zambia	Building Energy	Project Manager & EAP
ESG Due Diligence for the Hilton Garden Inn Development in Windhoek, Namibia	Vatange Capital	Project Manager
Mandahill Mall Rooftop PV SEF EPB, Lusaka, Zambia	Building Energy	Project Manager & EAP
Monthly ECO for the PV Power Plant for the Mocuba Power Station	Scatec	Project Manager

## CURRICULUM VITAE OF RENDANI RASIVHETSHELE

**Profession :** Environmental Assessment Practitioner

**Specialisation:** Environmental Impacts Assessments, Report writing

**Work Experience:** 4 years' experience in Environmental Field

### VOCATIONAL EXPERIENCE

Professional execution of consulting services for various projects in the environmental management field, specialising in Environmental Impact Assessments studies, environmental permitting, public participation process, compilation of environmental management plans and programmes. Responsibilities include report writing, project management and coordination, environmental planning, stakeholder engagements, site inspections, reviews of specialist studies and identifications of potential negative environmental impacts and benefits,

### SKILLS BASE AND CORE COMPETENCIES

- Interpretation of environmental regulations and compilation of Environmental Impact Assessments reports and associated environmental management programmes in accordance with the relevant environmental legislative requirements.
- Project management for a variety of projects
- Public participation process for a variety of projects
- Environmental planning

### EDUCATION AND PROFESSIONAL STATUS

#### Degrees:

- B.Sc. (Hons) Environmental Management (2020), University of South Africa (UNISA)
- Bachelor of Environmental Science (2016), University of Venda (UNIVEN)

#### Short Courses:

- Introduction to SAMTRAC (2020) - NOSA
- Introduction to EIA Report Writing (2020) - IAIAsa

#### Professional Society Affiliations:

- Environmental Assessment Practitioners Association of South Africa – Reg. EAP(EAPASA)- Reg No. 2019/1729
- International Association for Impact Assessment South Africa – Full Member – Reg No. 6534
- South African Council for natural Scientific Professionals – Candidate Natural Scientist: Environmental Scientist – Reg No. 116712

**EMPLOYMENT**

<b>Date</b>	<b>Company</b>	<b>Roles and Responsibilities</b>
<b>May 2021 - Current:</b>	Savannah Environmental (Pty) Ltd	<i>Environmental Assessment Practitioner</i>  <u>Tasks included:</u> Compilation of Environmental Impact Assessment (EIA) reports, Basic Assessment (BA) reports and Environmental Management Programmes (EMPr), environmental Screening reports, co-ordination of public participation process, Project management, Client liaison, Process EIA and amendments applications.
<b>March 2021 – April 2021</b>	JB Enviro Services (Pty) Ltd	<i>Environmental Control Officer</i>  <u>Task included:</u> Maintaining the Environmental Management System to align with ISO14001 Standard, Conducting site visits and compiling site reports.
<b>August 2018 – May 2020</b>	LEAP Enviro (Imbrilinx cc)	<i>Environmental Assessment Practitioner</i>  <u>Tasks included:</u> Compilation of Environmental Impact Assessment (EIA) reports, Basic Assessment (BA) reports and Environmental Management Programmes (EMPr), environmental Screening reports, co-ordination of public participation process, Project management, Client and specialist liaison, Process EIA and amendments applications.
<b>April 2016- July 2018</b>	Mott Macdonald SA (Pty) Ltd	<i>Assistant Environmental Consultant</i>  <u>Tasks included:</u> Assisting with public participation processes, environmental assessments, basic mapping, and field work.

**PROJECT EXPERIENCE**

Experience in conducting Environmental Impacts Assessments, public participation, and Environmental Management Programme, for residential developments, commercial developments, industrial upgrades, bulk services, and renewable energy projects (solar and wind). Responsibilities includes overall compilation of the report, specialists engagements, reviewing specialists reports and incorporating specialist studies into the Environmental Impact Assessment report and its associated Environmental Management Programme.

## **INFRASTRUCTURE DEVELOPMENT PROJECTS (PIPELINES, WATER RESOURCES, INDUSTRIAL)**

### **Basic Assessments and Environmental Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Diepsloot Klevebank, Sewer upgrade, Gauteng	Johannesburg water	Project Manager & EAP
Olivedale retirement village, dam rehabilitation, Gauteng	Olivedale Retirement Village	Project Manager & EAP

## **HOUSING AND URBAN PROJECTS**

### **Environmental Impact Assessments and Environmental Management Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Helderwyk Integrated Residential Project, Gauteng	Purple Moss 19(Pty) Ltd	EAP
Reigerpark Extension 10 mixed use Development, Gauteng	Living Africa 2 (Pty) Ltd	EAP
Dersley Springs, Gauteng	Royal Albertos Properties	EAP
Alliance Extension 4 & 5, Gauteng	New Canada Developments	EAP

### **Basic Assessments and Environmental Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Botesdal Commercial Development, Gauteng	Open Energy Innovations	Project Manager & EAP
Dark City/Poortjie Residential Development, Gauteng	City of Johannesburg	Project Manager & EAP
Matsamo Mall, Mpumalanga	Moolman Group	Project Manager & EAP
Clayville Extension 45 Mixed use development, Gauteng	Valuemax Midrand	EAP
Queenswood Extension 14, township establishment, Gauteng	Skilpadriff Ontwikkeling	EAP

## **RENEWABLE ENERGY PROJECTS**

### **Basic Assessments**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Redding Wind Energy Facility, Eastern Cape	Redding (Pty) Ltd	EAP
Aeolus Wind Energy Facility, Eastern Cape	Aeolus (Pty) Ltd	EAP
Woodhouse Grid Connection, North West	Genesis Eco Energy Developments	EAP

### **Part 2 amendments**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Perdekraal West Wind Energy Facility, Western Cape	Biotherm	EAP
Poortjies Wind Energy Facility, Northern Cape	Mainstream	EAP
Loperberg Wind Energy Facility, Eastern Cape	Loperberg Wind Farm	EAP
Malabar Wind Energy Facility, Eastern Cape	Malabar Wind Farm	EAP
Spreeukloof Wind Energy Facility, Eastern Cape	Spreeukloof Wind Farm	EAP

### **Part 1 amendments**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Woodhouse Solar 1 PV, North West	Genesis Woodhouse Solar 1	EAP

Woodhouse Solar 2 PV, North West	Genesis Woodhouse Solar 2	EAP
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## **OTHER PROJECTS**

### **Basic Assessments**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Thokoza Park, Gauteng	City of Ekurhuleni municipality	EAP
Macsteel, Industrial upgrade, Gauteng	The insulation Company	EAP



## CURRICULUM VITAE OF NICOLENE VENTER

<b>Profession :</b>	Public Participation and Social Consultant
<b>Specialisation:</b>	Public participation process; stakeholder engagement; facilitation (workshops, focus group and public meetings; public open days; steering committees); monitoring and evaluation of public participation and stakeholder engagement processes
<b>Work Experience:</b>	23 years' experience as a Public Participation Practitioner and Stakeholder Consultant

### VOCATIONAL EXPERIENCE

Over the past 23 years Nicolene established herself as an experienced and well recognised public participation practitioner, facilitator and strategic reviewer of public participation processes. She has experience in managing public participation and stakeholder engagement projects and awareness creation programmes. Her experience includes designing and managing countrywide public participation and stakeholder engagement projects and awareness creation projects, managing multi-project schedules, budgets and achieving project goals. She has successfully undertaken several public participation processes for EIA, BA and WULA projects. The EIA and BA process include linear projects such as the NMPP, Eskom Transmission and Distribution power lines as well as site specific developments such as renewable energy projects i.e. solar, photo voltaic and wind farms. She also successfully managed stakeholder engagement projects which were required to be in line with the Equator Principles, locally and in neighbouring countries.

### SKILLS BASE AND CORE COMPETENCIES

- Project Management
- Public Participation, Stakeholder Engagement and Awareness Creation
- Public Speaking and Presentation Skills
- Facilitation (workshops, focus group meetings, public meetings, public open days, working groups and committees)
- Social Assessments (Stakeholder Analysis / Stakeholder Mapping)
- Monitoring and Evaluation of Public Participation and Stakeholder Engagement Processes
- Community Liaison
- IFC Performance Standards
- Equator Principles
- Minute taking, issues mapping, report writing and quality control

## EDUCATION AND PROFESSIONAL STATUS

### Degrees / Diplomas / Certificates:

- Higher Secretarial Certificate, Pretoria Technicon (1970)

### Short Courses:

- Techniques for Effective Public Participation, International Association for Public Participation, IAP2 (2008)
- Foundations of Public Participation (Planning and Communication for Effective Public Participation), IAP2 (2009)
- Certificate in Public Participation – IAP2SA Modules 1, 2 and 3 (2013)

Certificate in Public Relations, Public Relation Institute of South Africa, Damelin Management School (1989)

### Professional Society Affiliations:

- Member of International Association for Public Participation (IAP2): Southern Africa

## EMPLOYMENT

Date	Company	Roles and Responsibilities
November 2018 – current	Savannah Environmental (Pty) Ltd	<p>Public Participation and Social Consultant</p> <p><u>Tasks include:</u></p> <p><i>Tasks include: Drafting of a Public Participation Plan with key deliverable dates and methodology to be followed, Background Information Document, Letters to Stakeholders and Interested and/or Affected Parties (I&amp;APs) inclusive of key project deliverables and responses to questions / concerns raised; Stakeholder identification; facilitating stakeholder workshops, focus group and public meetings; conduct one-on-one consultation with Community Leaders, Tribal Chiefs, affected landowners, etc.</i></p> <p><i>Managing interaction between Stakeholders and Team Members, liaising with National, Provincial and Local Authorities, managing community consultation and communications in project affected areas, attend to the level of technical information communicated to and consultation with all level of stakeholders involved.</i></p>

Date	Company	Roles and Responsibilities
2016 – October 2018	Imaginative Africa (Pty) Ltd <i>(Director of Imaginative Africa)</i>	Independent Consultant  Consulting to various Environmental Assessment Practitioners for Public Participation and Stakeholder Engagements:  <u>Tasks include:</u>  Tasks include: Drafting of a Public Participation Plan with key deliverable dates and methodology to be followed, Background Information Document, Letters to Stakeholders and Interested and/or Affected Parties (I&APs) inclusive of key project deliverables and responses to questions / concerns raised; Stakeholder identification; facilitating stakeholder workshops, focus group and public meetings; conduct one-on-one consultation with Community Leaders, Tribal Chiefs, affected landowners, etc.  Managing interaction between Stakeholders and Team Members, liaising with National, Provincial and Local Authorities, managing community consultation and communications in project affected areas, attend to the level of technical information communicated to and consultation with all level of stakeholders involved  <u>Clients:</u>  SiVEST Environmental Savannah Environmental Baagi Environmental Royal Haskoning DHV (previously SSI)
2013 - 2016	Zitholele Consulting  Contact person: Dr Mathys Vosloo  Contact number: 011 207 2060	Senior Public Participation Practitioner and Project Manager  <u>Tasks included:</u>  Project managed public participation process for EIA/BA/WULA/EAL projects. Manages two Public Participation Administrators. Public Participation tasks as outlined as above and including financial management of public participation processes.
2011 - 2013	Imaginative Africa (Pty) Ltd  <i>(company owned by Nicolene Venter)</i>	Independent Consultant  Consulting to various Environmental Assessment Practitioners for Public Participation and Stakeholder Engagements  <u>Tasks included:</u>  Drafting of a Public Participation Plan with key deliverable dates and methodology to be followed, Background Information Document,



		<p>Letters to Stakeholders and Interested and/or Affected Parties (I&amp;APs) inclusive of key project deliverables and responses to questions / concerns raised; Stakeholder identification; facilitating stakeholder workshops, focus group and public meetings; conduct one-on-one consultation with Community Leaders, Tribal Chiefs, affected landowners, etc.</p> <p>Managing interaction between Stakeholders and Team Members, liaising with National, Provincial and Local Authorities, managing community consultation and communications in project affected areas, attend to the level of technical information communicated to and consultation with all level of stakeholders involved</p> <p><u>Clients:</u>  Bohlweki Environmental  Bembani Sustainability (Pty) Ltd  Naledzi Environmental</p>
<b>2007 – 2011</b>	SiVEST SA (Pty) Ltd  Contact person: Andrea Gibb  Contact number: 011 798 0600	Unit Manager: Public Participation Practitioner  <u>Tasks included:</u>  Project managed public participation process for EIA/BA projects. Manages two Junior Public Participation Practitioners. Public Participation tasks as outlined as above and including financial management of public participation processes.
<b>2005 – 2006</b>	Imaginative Africa (Pty) Ltd  (company owned by Nicolene Venter)	Independent Consultant  Public Participation and Stakeholder Engagement Practitioner  <u>Tasks included:</u>  Drafting of a Public Participation Plan with key deliverable dates and methodology to be followed, Background Information Document, Letters to Stakeholders and Interested and/or Affected Parties (I&APs) inclusive of key project deliverables and responses to questions / concerns raised; Stakeholder identification; facilitating stakeholder workshops, focus group and public meetings; conduct one-on-one consultation with Community Leaders, Tribal Chiefs, affected landowners, etc.  Managing interaction between Stakeholders and Team Members, liaising with National, Provincial and Local Authorities, managing community consultation and communications in project affected areas, attend to the level of technical

		<p>information communicated to and consultation with all level of stakeholders involved.</p> <p><u>Clients:</u></p> <p>Manyaka-Greyling-Meiring (previously Greyling Liaison and currently Golder Associates)</p>
<p><b>1997 - 2004</b></p>	<p>Imaginative Africa (Pty) Ltd (company owned by Nicolene Venter)</p>	<p>Independent Consultant: Public Participation Practitioner.</p> <p><u>Tasks included:</u></p> <p>Drafting of a Public Participation Plan with key deliverable dates and methodology to be followed, Background Information Document, Letters to Stakeholders and Interested and/or Affected Parties (I&amp;APs) inclusive of key project deliverables and responses to questions / concerns raised; Stakeholder identification; facilitating stakeholder workshops, focus group and public meetings; conduct one-on-one consultation with Community Leaders, affected landowners, etc.</p> <p>Managing interaction between Stakeholders and Team Members, liaising with National, Provincial Local Authorities, managing community consultation and communications in project affected areas, attend to the level of technical information communicated to and consultation with all level of stakeholders involved.</p> <p><u>Clients:</u></p> <p>Greyling Liaison (currently Golder Associates); Bemani Sustainability (Pty) Ltd; Lidwala Environmental; Naledzi Environmental</p>

## PROJECT EXPERIENCE

### RENEWABLE POWER GENERATION PROJECTS

#### PHOTOVOLTAIC SOLAR ENERGY FACILITIES

##### Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Lichtenburg PVs (3 PVs) & Power Lines (grid connection), Lichtenburg, North West Province	Atlantic Energy Partners EAP: Savannah Environmental	Project Manage the Public Participation Process Facilitate all meetings Consultation with Government Officials, Key Stakeholders, Landowners & Community Leaders
Allepad PVs 4 PVs) & Power Lines (grid connection), Upington, Northern Cape Province	IL Energy EAP: Savannah Environmental	
Hyperion Solar PV Developments (4 PVs) and Associated Infrastructures, Kathu, Northern Cape Province	Building Energy EAP: Savannah Environmental	
Aggeneys Solar PV Developments (2 PVs) and Associated Infrastructures, Aggeneys, Northern Cape Province	Atlantic Energy Partners and ABO Wind EAP: Savannah Environmental	
Upilanga Solar Park, Northern Cape (350MW CSP Tower)	Emvelo Capital Projects (Pty) Ltd	
Khunab Solar Development, consisting of Klip Punt PV1, McTaggarts PV1, McTaggarts PV2, McTaggarts PV3 and the Khunab solar Grid Connection near Upington, Northern Cape Province	Atlantic Energy Partners and Abengoa	
Sirius Solar PV3 and PV4, near Upington, Northern Cape Province	Solal	
Geelster PV 1 and PV2 solar energy facilities, near Aggeneys, Northern Cape	ABO Wind	
Naledi PV and Ngwedi PV solar energy facilities, near Upington, Northern Cape	Atlantic Energy Partners and Abengoa	
Kotulo Tsatsi PV1, Kotulo Tsatsi PV3 and Kotulo Tsatsi PV4 solar energy facilities, near Kenhardt, Northern Cape	Kotulo Tsatsi Energy	
Thlitseng PV, including Substations & Power Lines, Lichtenburg, North West Province	BioTherm Energy EAP: SiVEST	Public Participation, Landowner and Community Consultation
Sendawo PVs, including Substations & Power Lines, Vryburg, North West Province		
Helena Solar 1, 2 and 3 PVs, Copperton, Northern Cape Province		
Farm Spes Bona 23552 Solar PV Plants, Bloemfontein, Free State Province	Surya Power EAP: SiVEST	Public Participation, Landowner and Community Consultation
De Aar Solar Energy Facility, De Aar, Northern Cape Province	South Africa Mainstream Renewable Power Developments EAP: SiVEST	Public Participation, Landowner and Community Consultation
Droogfontein Solar Energy Facility, Kimberley, Northern Cape Province		
Kaalspruit Solar Energy Facility, Loeriesfontein, Northern Cape Province		

Platsjambok East PV, Prieska, Northern Cape Province		
Renosterburg PV, De Aar, Northern Cape Province	Renosterberg Wind Energy Company EAP: SIVEST	Public Participation, Landowner and Community Consultation
19MW Solar Power Plant on Farm 198 (Slypklip), Danielskuil, Northern Cape Province	Solar Reserve South Africa EAP: SIVEST	Public Participation, Landowner and Community Consultation

### Basic Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Upilanga Solar Park, Northern Cape (x6 100MW PV's and x3 350MW PV Basic Assessments)	Emvelo Capital Projects (Pty) Ltd	Project Manage the Public Participation Process Facilitate all meetings Consultation with Government Officials, Key Stakeholders, Landowners & Community Leaders
Sirius Solar PV Solar Energy Facility, Upington, Northern Cape Province	SOLA Future Energy	
Khunab Solar Development, consisting of Klip Punt PV1, McTaggart PV1, McTaggart PV2, McTaggart PV3 and the Khunab solar Grid Connection near Upington, Northern Cape Province	Atlantic Energy Partners and Abengoa	

### WIND ENERGY FACILITIES

#### Environmental Impact Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Aletta Wind Farm, Copperton, Northern Cape Province	BioTherm Energy EAP: SIVEST	Public Participation
Eureka Wind Farm, Copperton, Northern Cape Province		
Loeriesfontein Wind Farm, Loeriesfontein, Northern Cape Province	South Africa Mainstream Renewable Power Developments EAP: SIVEST	Public Participation
Droogfontein Wind Farm, Loeriesfontein, Northern Cape Province		
Four Leeuwberg Wind Farms, Loeriesfontein, Northern Cape Province		
Noupoort Wind Farm, Noupoort, Northern Cape Province		
Mierdam PV & Wind Farm, Prieska, Northern Cape Province		
Platsjambok West Wind Farm & PV, Prieska, Northern Cape Province		

### Basic Assessments and Environmental Management Programmes

Project Name & Location	Client Name	Role
Cluster of Renewable Energy Developments, Eastern Cape Province	Wind Relic	

Nama Wind Energy Facility, Northern Cape Province	Genesis ECO EAP: Savannah Environmental	Project Manage the Public Participation Process Facilitate all meetings Consultation with Government Officials, Key Stakeholders, Landowners & Community Leaders
Zonnequa Wind Energy Facility, Northern Cape Province		

## **CONCENTRATED SOLAR FACILITIES (CSP)**

### **Environmental Impact Assessments and Environmental Management Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Upington Concentrating Solar Plant and associated Infrastructures, Northern Cape Province	Eskom Holdings EAP: Bohlweki Environmental	Project Manage the Public Participation Process Facilitate all meetings Consultation with Government Officials, Key Stakeholders, Landowners & Community Leaders

## **CONVENTIONAL POWER GENERATION PROJECTS (GAS)**

### **Environmental Impact Assessments and Environmental Management Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
450MW gas to power project and associated 132kV power line, Richards bay, KwaZulu-Natal	Phinda Power Producers	Project Manage the Public Participation Process Facilitate all meetings Consultation with Government Officials, Key Stakeholders & Landowners
4000MW gas to power project and associated 400kV power lines, Richards bay, KwaZulu-Natal	Phinda Power Producers	
Richards Bay Gas to Power Combined Cycle Power Station, KwaZulu-Natal	Eskom Holdings SoC Limited	

## **GRID INFRASTRUCTURE PROJECTS**

### **Environmental Impact Assessments and Environmental Management Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
132/11kV Olifantshoek Substation and Power Line, Northern Cape	Eskom	Project Manage the Public Participation Process Facilitate all meetings Consultation with Government Officials, Key Stakeholders, Landowners & Community Leaders
Grid connection infrastructure for the Namas Wind Farm, Northern Cape Province	Genesis Namas Wind (Pty) Ltd	
Grid connection infrastructure for the Zonnequa Wind Farm, Northern Cape Province	Genesis Zonnequa Wind (Pty) Ltd	
Khunab Solar Grid Connection, near Upington, Northern Cape Province	Atlantic Energy Partners and Abengoa	
Pluto-Mahikeng Main Transmission Substation and 400kV Power Line (Carletonville to Mahikeng), Gauteng and North West Provinces	Eskom Holdings EAP: Baagi Environmental	
Thyspunt Transmission Lines Integration Project, Eastern Cape Province	Eskom Holdings EAP: SIVEST	
Westrand Strengthening Project, Gauteng Province		Public Participation,

Mookodi Integration Project, North-West Province		
Transnet Coallink, Mpumalanga and KwaZulu-Natal Provinces		
Delarey-Kopela-Phahameng Distribution power line and newly proposed Substations, North-West Province		Public Participation, Landowner and Community Consultation
Invubu-Theta 400kV Eskom Transmission Power Line, KwaZulu-Natal Province	Eskom Holding EAP: Bemani Environmental	
Melkhout-Kudu-Grassridge 132kV Power Line Project (project not submitted to DEA), Eastern Cape Province	Eskom Holdings EAP: SIVEST	Public Participation, Landowner and Community Consultation
Tweespruit-Welroux-Driedorp-Wepener 132Kv Power Line, Free State Province		
Kuruman 132Kv Power Line Upgrade, Northern Cape Province	Eskom Holdings EAP: Zitholele	
Vaalbank 132Kv Power Line, Free State Province		
Pongola-Candover-Golela 132kV Power Line (Impact Phase), KwaZulu-Natal Province		

## **PART 2 AMENDMENTS**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Transalloys Coal-Fired Power Station near Emalahleni, Mpumalanga Province	Transalloys (Pty) Ltd	Project Manage the Public Participation Process
Zen Wind Energy Facility, Western Cape	Energy Team (Pty) Ltd	
Hartebeest Wind Energy Facility, Western Cape	juwi Renewable Energies (Pty) Ltd	
Khai-Ma and Korana Wind Energy Facilities	Mainstream Renewable Power (Pty) Ltd	

## **FACILITATION**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Meeting Type</b>
Bloemfontein Strengthening Project, Free State Province	Eskom Holdings EAP: Baagi Environmental	Public Meetings
Moodraai-Smitkloof 132kV Power Line and Substation, Northern Cape Province	Eskom Holdings EAP: SSI	Focus Group Meetings
Aggeneis-Oranjemond 400kV Eskom Transmission Power Line, Northern Cape Province	Eskom Holdings EAP: Savannah Environmental	Focus Group Meetings & Public Meetings
Ariadne-Eros 400kV/132kV Multi-Circuit Transmission Power Line (Public Meetings)	Eskom Holdings EAP: ACER Africa	Public Meetings
Majuba-Venus 765kV Transmission Power Lines, Mpumalanga Province		
Thabametsi IPP Power Station, Limpopo Province	Thabametsi Power Company EAP: Savannah Environmental	Focus Group Meeting & Public Meeting
Aggeneis-Oranjemond Transmission Line & Substation Upgrade, Northern Cape	Eskom Transmission	Focus Group Meetings & Public Meetings

## **SCREENING STUDIES**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Potential Power Line Alternatives from Humansdorp to Port Elizabeth, Eastern Cape Province	Nelson Mandela Bay Municipality EAP: SiVEST	Social Assessment

## **ASH DISPOSAL FACILITIES**

### **Environmental Impact Assessments and Environmental Management Programmes**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Medupi Flue Gas Desulphurisation Project (up to completion of Scoping Phase), Limpopo Province	Eskom Holdings SOC Ltd EAP: Zitholele Consulting	Public Participation, Landowner and Community Consultation
Kendal 30-year Ash Disposal Facility, Mpumalanga Province		
Kusile 60-year Ash Disposal Facility, Mpumalanga Province		
Camden Power Station Ash Disposal Facility, Mpumalanga Province		
Tutuka Fabric Filter Retrofit and Dust Handling Plant Projects, Mpumalanga Province	Eskom Holdings SOC Ltd EAP: Lidwala Environmental	
Eskom's Majuba and Tutuka Ash Dump Expansion, Mpumalanga Province		
Hendrina Ash Dam Expansion, Mpumalanga Province		

## **INFRASTRUCTURE DEVELOPMENT PROJECTS (BRIDGES, PIPELINES, ROADS, WATER RESOURCES, STORAGE, ETC)**

### **Basic Assessments**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Expansion of LOX and Diesel Storage at the Air Products Facility in Coega, Eastern Cape	Air Products South Africa (Pty) Ltd	Project Manage the Public Participation Process Facilitate all meetings Consultation with Government Officials, Key Stakeholders & Landowners
Transnet's New Multi-Products Pipeline traversing Kwa-Zulu Natal, Free State and Gauteng Provinces	Transnet EAP: Bohlweki Environmental	
Realignment of the Bulshoek Dam Weir near Klaver and the Doring River Weir near Clanwilliam, Western Cape Province	Dept of Water and Sanitation EAP: Zitholele	Public Participation

## **STAKEHOLDER ENGAGEMENT**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Socio-Economic Impact Study for the shutdown and repurposing of Eskom Power Stations: Komati Power Station, Hendrina Power Station & Grootvlei Power Station	Urban-Econ	Project Management for the stakeholder engagement with Community

		Representatives in the primary data capture area
First State of Waste Report for South Africa	Golder Associates on behalf of the Department of Environmental Affairs	Secretarial Services
Determination, Review and Implementation of the Reserve in the Olifants/Letaba System	Golder Associates on behalf of the Department of Water and Sanitation	
Orange River Bulk Water Supply System		
Levuvu-Letaba Resources Quality Objectives		

## **FACILITATION**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Meeting Type</b>
Determination, Review and Implementation of the Reserve in the Olifants/Letaba System	Department of Water and Sanitation	Secretarial Services
Orange River Bulk Water Supply System	Golder Associates	Secretarial Services
Levuvu-Letaba Resources Quality Objectives		Secretarial Services
SmancorCR Chemical Plant (Public Meeting), Gauteng Province	Samancor Chrome (Pty) Ltd EAP: Environmental Science Associates	Public Meeting
SANRAL N4 Toll Highway Project (2 <sup>nd</sup> Phase), Gauteng & North West Provinces	Department of Transport EAP: Bohlweki Environmental	Public Meetings

## **MINING SECTOR**

### **Environmental Impact Assessment and Environmental Management Programme**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Zero Waste Recovery Plant at highveld Steel, Mpumalanga Province	Anglo African Metals EAP: Savannah Environmental	Public Participation
Koffiefontein Slimes Dam, Free State Province	Petra Diamond Mines EAP: Zitholele	Public Participation
Baobab Project: Ethenol Plant, Chimbanje, Middle Sabie, Zimbabwe	Applicant: Green Fuel EAP: SIVEST	Public Participation & Community Consultation
BHP Billiton Energy Coal SA's Middelburg Water Treatment Plant, Mpumalanga	BHP Billiton Group EAP: Jones & Wagener	Public Participation

## **ENVIRONMENTAL AUTHORISATION AMENDMENTS**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Transalloys Coal-Fired Power Station near Emalahleni, Mpumalanga Province	Transalloys (Pty) Ltd	Public Participation
Zen Wind Energy Facility, Western Cape	Energy Team (Pty) Ltd	
Hartebeest Wind Energy Facility, Western Cape	juwi Renewable Energies (Pty) Ltd	
Khai-Ma and Korana Wind Energy Facilities	Mainstream Renewable Power (Pty) Ltd	
Beaufort West 280MW Wind Farm into two 140MW Trakas and Beaufort West Wind Farms, Western Cape	South Africa Mainstream Renewable Power Developments EAP: SIVEST	



## **SECTION 54 AUDITS**

<b>Project Name &amp; Location</b>	<b>Client Name</b>	<b>Role</b>
Mulilo 20MW PV Facility, Prieska, Northern Cape	Mulilo (Pty) Ltd	Public Participation: I&AP Notification process
Mulilo 10MW PV Facility, De Aar, Northern Cape	Mulilo (Pty) Ltd	
Karoshhoek CSP 1 Facility/ Solar One, Upington, Northern Cape	Karoshhoek Solar One (Pty) Ltd	

# Werner Cristiaan Marais

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<b>Summary of qualifications</b>	2008 <b>MSc (Biodiversity and Conservation) – Cum laude</b>	<i>University of Johannesburg</i>
	2006 <b>Hons (Biodiversity and Conservation)</b>	<i>University of Johannesburg</i>
	2005 <b>BSc (Zoology and Botany)</b>	<i>University of Johannesburg</i>
<b>Affiliations to professional bodies and societies</b>	<ul style="list-style-type: none"><li>• Pr.Sci.Nat.– SACNASP (South African Council for Natural Scientific Professions) in the field of Zoological Science, registration number 400169/10.</li><li>• Serves on the steering committee panel of the SABAA (South African Bat Assessment Association).</li><li>• Served on the research committee of the Gauteng and Northern Regions Bat Interest Group (GNorBIG).</li><li>• Served on the steering committee of the Zoological Society of the University of Johannesburg.</li></ul>	
<b>Experience</b>	<b>2008 – Current</b>	<b>Founder of Animalia Consultants (Pty) Ltd.</b>
	Animalia has completed more than <b>500 specialist reports and numerous large-scale projects in the renewable energy sector</b> , as specialist consultants in the EIA process and energy facility operational phase, under the supervision and lead of Werner Marais.	
	<b>2015 – Current</b>	<b>Founder of Lightbulb Innovation (Pty) Ltd.</b>
	Lightbulb Innovation is developing new inventions and products invented by Werner Marais.	

**2008 University of Johannesburg**

- Sensitivity and biodiversity surveys of five caves in the Cradle of Humankind World Heritage Site (COHWHS) and Pretoria areas.
- Preliminary survey to investigate the correlation between insectivorous bats and prey insects in the Krugersdorp Game Reserve.

**2007, 2008 Bertie van Zyl (Pty) Ltd. (ZZ2 Tomato Farms), UJ**

Two-year project to research the biological pest control method of utilizing insectivorous bats in agriculture. Required to conduct an in-depth study of bat (Microchiroptera) behavior and ecologically important factors.

**2006 University of Johannesburg**

Six-month survey of cave dwelling arthropods in the Cradle of Humankind World Heritage Site.

**Additional:**

- *Invited by the EWT (Endangered Wildlife Trust) and ESSA (Exploration Society of Southern Africa) to deliver presentations on current ecological issues regarding bats and wind energy.*
- *Co-author for the: "South African Bat Fatality Threshold Guidelines for Operational Wind Energy Facilities – ed 1. South African Bat Assessment Association. Sept 2017"*
- *Co-author for the: "South African Good Practice Guidelines for Operational Monitoring of Bats at Wind Energy Facilities. First Edition July 2014"; and draft edition October 2019*
- *Contributing editor for the: "South African Good Practice Guidelines for Surveying Bats at Wind Energy Facility Developments – Pre-construction; Edition 4.1, 2017"*
- *As a co-author, received the Dow Greeff price for best annual scientific publication: "Die karst-ekologie van die Bakwenagrot (Gauteng)" published in the Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie, Vol. 31(1), 2012.*

**Presented the following papers at conferences:**

- *The potential of using insectivorous bats (Microchiroptera) as a means of insect pest control in agricultural areas. The Zoological Society of Southern Africa's 50th Anniversary Conference. July 2009.*
- *Inseketende vlermuise (Microchiroptera) en vlermuishuise in landbougebiede. Suid Afrikaanse Akademie vir Wetenskap en Kuns se 100 jaar Eufees kongres. October 2009.*

*Interviewed for two popular magazine articles on ecological aspects of biological pest control utilising bats; published in two consecutive issues of Farmers Weekly.*

## **Education            MSc (Biodiversity and Conservation)**

- The potential of using insectivorous bats (Microchiroptera) as a means of insect pest control in agricultural areas – Passed with distinction
- Involved a large scale in-depth survey of the bat diversity in the Tzaneen and Waterpoort areas, Limpopo.
- Understanding and observing the biology and behavior of local bat species.
- Designing and experimenting with artificial bat roosts.

## **Hons Biodiversity and Conservation**

- Research project: Preliminary study of the terrestrial Arthropoda associated with caves of the Cradle of Humankind World Heritage Site – Passed with distinction
- Introduction to Environmental Management
- Herpetology
- Terrestrial and conservation ecology
- Resource management (incl. forestry, fire ecology, animal behavior)
- Practical fieldwork methodology (4X4, boat training and mapping)
- Mammalogy
- Population genetics and biosystematics
- Philosophy and research methodology: Zoology Nature conservation
- Parasitology
- Molecular evolution

## **BSc Zoology and Botany**

- One-year course in animal diversity and identification
- Six-month course in basic and marine ecology
- Limnology and terrestrial ecology
- Coastal diversity excursion (Marine ecology)
- Introduction to SASS Freshwater pollution monitoring methodology
- Applied freshwater ecotoxicology
- Waterborne diseases
- Integrated animal physiology and processes
- General parasitology
- Cytology
- Six-month course in the identification and diversity of South African flora
- Ethno and economical plants
- Biotechnology
- Plant physiology
- Plant pathology
- Cellular and molecular biology
- Introduction to organic and physical chemistry
- General chemistry
- Mineralogy and earth dynamics

**Additional:**

- **Experienced report writing skills, sufficient computer skills.**
- **Bioacoustics analysis.**
- **Sufficient in GIS.**
- **Fall Arrest Technician and Rescue qualification (for working at heights).**
- **First Aid Level 1 and Basic Firefighting.**
- **Autodesk Inventor Fundamentals course, and 3D modeling skills.**
- **Intermediate 3D printing skills.**
- **Snake Identification and Handling Course.**
- **Multiple training courses in bat related topics - Gauteng and Northern Regions Bat Interest Group (GNoRBIG).**
- **Advanced driving course in 4x4 off-road driving.**
- **Self-taught artist in the fine arts.**
- **Inventing, prototyping and product development skills.**

**Languages** Afrikaans / English – Full professional proficiency in both.

**References** *Dr Francois Durand – Karst ecologist and paleontologist. Pr.Sci.Nat.*

***(Zoology and Earth Sciences).***

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***Stephanie Dippenaar – Independent bat environmental consultant.***

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Stellenbosch  
Western Cape

**Thank You**

# Andrew Husted

## M.Sc Aquatic Health (Pr Sci Nat)

Cell: +27 81 319 1225

Email: [andrew@thebiodiversitycompany.com](mailto:andrew@thebiodiversitycompany.com)

Identity Number: 7904195054081

Date of birth: 19 April 1979

### Profile Summary

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Extensive experience with many mining projects in South Africa, parts of Africa and also Europe, providing specialist input into ESHIAs and EMPs.

Considerable experience with the project management of national and international multi-disciplinary projects.

Specialist guidance, support and facilitation for the compliance with legislative processes, in South Africa as well as with IFC and the Equator principles.

Expertise with Instream Flow and Ecological Water Requirements.

Provide specialist and technical input for faunal, aquatic ecology and wetland studies.

### Areas of Interest

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Mining, Renewable Energy & Infrastructure Development Projects, Sustainability and Conservation.

Publication of scientific journals and articles.

### Key Experience

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- Familiar with World Bank, Equator Principles and the International Finance Corporation requirements
- Environmental, Social and Health Impact Assessments (ESHIA)
- Environmental Management Programmes (EMP)
- Ecological Water Requirement determination experience
- Fish population structure assessments
- The use of macroinvertebrates to determine water quality
- Aquatic Ecological Assessments
- Aquaculture
- Monitoring Programmes

### Countries worked in

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Botswana  
Cameroon  
Democratic Republic of Congo  
Ghana  
Ivory Coast  
Liberia  
Mali  
Mozambique  
Republic of Armenia  
Senegal  
Sierra Leone  
South Africa

### Nationality

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South African

### Qualifications

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- MSc (University of Johannesburg) – Aquatic Health.
- BSc Honours (Rand Afrikaans University) – Aquatic Health
- BSc Natural Science
- Pr Sci Nat (400213/11)
- Certificate of Competence: Mondri Wetland Assessments
- Certificate of Competence: Wetland WET-Management
- SASS 5 Accredited – Department of Water Affairs and Forestry for the River Health Programme
- EcoStatus application for rivers and streams

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## RELEVANT PROJECT EXPERIENCE

**Project Name: The ecological constraints mapping and Critical Habitat re-evaluation for the Anadarko LNG project: Specialist Consultant to conduct Ecological Studies (Fauna and Habitat) and the delineation of wetland systems.**

Client: Anadarko.

Personal position / role on project: Wetland Specialist.

Location: Afungi, Mozambique (2015).

Main project features: To identify and map the ecological constraints is to support contractor activities. To redefine the critical habitats within the project area

**Project Name: A Joint Basin Survey of the Upper Orange, Lower Orange and Vaal catchments to determine the current status of the systems: Specialist Consultants to conduct Ecological Studies (Fish, Macroinvertebrate, Diatoms, Water Quality and Habitat) and report on the current status (defining system trends).**

Client: ORASECOM.

Personal position / role on project: Specialist Ichthyologist.

Location: South Africa (including Namibia, Botswana & Lesotho) (2015).

Main project features: To determine the current status of the catchments and to discuss the temporal and spatial trends of the monitoring reaches.

**Project Name: Ecological baseline assessment of local river systems for the Ntem Iron Ore Mine: Specialist Consultants to Undertake Baseline Studies (Fish, Macroinvertebrate, Water Quality and Habitat).**

Client: IMIC.

Personal position / role on project: Senior Ichthyologist.

Location: Cameroon (2013).

Main project features: Establishment of the ecological baseline status and functioning assessment of the local river systems.

**Project Name: Instream Flow Requirement determination study for the Kibali River hydropower project: Specialist Consultants to Undertake Baseline Studies (Flow, Water Quality and Geomorphology) and Instream Flow Requirement (IFR) Assessment.**

Client: Randgold Resources.

Personal position / role on project: Ichthyologist and IFR.

Location: DRC (2012).

Main project features: Establishment of the ecological flow requirements of fishes within the Kibali River.

**Project Name: Cost analysis, including the current and potential earning potential of an aquaculture facility: Specialist Consultants to determine the Cost (Current & Potential Earnings) and the Construction of an identical facility (Physical Costs).**

Client: Goldstone Resources.

Personal position / role on project: Ichthyologist.

Location: Ghana (2012).

Main project features: Conduct a detailed costs analysis of an aquaculture facility for the compensation for the removal of the operation.

**Project Name: Instream Flow Requirement determination study for the Nzoro River hydropower project: Specialist Consultants to Undertake Baseline Studies (Flow, Water Quality and Geomorphology) and Instream Flow Requirement (IFR) Assessment.**

Client: Randgold Resources.

Personal position / role on project: Ichthyologist and IFR.

Location: DRC (2011).

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Main project features: Establishment of the ecological flow requirements of fishes within the Nzoro River.

**Project Name: Environmental study to establish the baseline biological and physical conditions of the Letsibogo Dam.**

Client: European Union

Personal position / role on project: Ichthyologist.

Location: Selebi-Phikwe, Botswana (2007 - 2009).

Main project features: Evaluation of the existing fish communities within the Letsibogo Man-made lake with specific consideration of the threats of alien invasive fishes in the lake. The study resulted in the publication of two peer-reviewed papers titled: Comparative behavioural assessment of an established and a new Tigerfish *Hydrocynus vittatus* population in two man-made lakes in the Limpopo (O'Brien et al., 2013) and First observation of Africa Tigerfish (*Hydrocynus vittatus*) predating on Barn Swallows (*Hirundo rustica*) in flight (O'Brien et al., in press).

**Project Name: Environmental and Social Impact Assessment of the Kazungula Bridge on the Zambezi River.**

Client: Loci on behalf of the Government of Botswana.

Personal position / role on project: Ichthyologist.

Location: Botswana, Zambia, Namibia and Zimbabwe (2009-2010).

Main project features: Evaluation of the current ecological integrity status of various living and non-living components of the Zambezi River ecosystem and the potential ecological and social consequences of the construction and use of the Kazungula Bridge. The study showed that although water quality and habitat modification impacts will occur as a result of the construction and use of the bridge the long term impacts associated with the operation of the bridge should not result in any major impacts to the local aquatic ecosystem.

## ACHIEVEMENTS

- Co-founded The Biodiversity Company in 2015 to provide scientific technical services and policy advice to various sectors.
- Successfully tasked by Digby Wells Environmental to establish and develop a company presence in the United Kingdom. This included the staffing and development of offices in London and Jersey.
- Designed and implemented numerous "specific" turnkey items for clients, these have included the design of plant nurseries, aquaculture projects, search and rescue of select flora, re-introduction of fish species into systems and tree marking and counting.
- Managed and developed the Biophysical Department at Digby Wells Environmental to consist of four specialist units, namely: Fauna & Flora, Pedology, Wetlands & Aquatics as well as Rehabilitation.
- The establishment and growth of the Rehabilitation Unit at Digby Wells Environmental which now offers specialist services for all levels of rehabilitation, from management plans, off-set strategies to implementation.

## OVERVIEW

An overview of the specialist technical expertise include the following:

- Aquatic ecological state and functional assessments of rivers and dams.
  - Instream Flow Requirement or Ecological Water Requirement studies for river systems.
  - Ecological wetland assessment studies, including the integrity (health) and functioning of the wetland systems.
  - Wetland offset strategy designs.
  - Wetland rehabilitation plans.
  - Monitoring plans for rivers and other wetland systems.
  - Toxicity and metal analysis of water, sediment and biota.
  - Bioaccumulation assessment of fish communities.
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- Fish telemetry assessment that included the translocation of fish as well as the monitoring of fish in order to determine the suitability of the hosting system.
  - Faunal surveys which includes mammals, birds, amphibians and reptiles.
  - The design, compilation and implementation of Biodiversity and Land Management Plans and strategies.

## TRAINING

Some of the more pertinent training undergone include the following:

- Wetland and Riparian Delineation Course for Consultants (Certificate of Competence) – DWAF 2008
- The threats and impacts posed on wetlands by infrastructure and development: Mitigation and rehabilitation thereof – Gauteng Wetland Forum 2010
- Ecological State Assessment of Lentic Systems using Fish Population Dynamics – University of Johannesburg/Rivers of Life 2010
- Soil Classification and Wetland Delineation – Terra Soil Science 2010
- Wetland Rehabilitation Methods and Techniques - Gauteng Wetland Forum 2011
- Application of the Fish Response Assessment Index (FRAI) and Macroinvertebrate Response Assessment Index (MIRAI) for the River Health Programme 2011
- Tools for a Wetland Assessment (Certificate of Competence) – Rhodes University 2011

## EMPLOYMENT EXPERIENCE

### **CURRENT EMPLOYMENT: The Biodiversity Company (December 2014 – Present)**

I co-founded The Biodiversity Company in 2015, consisting of experienced ecologists who provide technical expertise and policy advice to numerous sectors, such as mining, agriculture, construction and natural resources. The team at The Biodiversity Company have conducted stand-alone specialist studies, and provided overall guidance of studies with a pragmatic approach for the management of biodiversity that takes into account all the relevant stakeholders, most importantly the environment that is potentially affected. We manage risks to the environment to reduce impacts with practical, relevant and measurable methods.

### **EMPLOYMENT: Digby Wells Environmental (October 2013 – December 2014)**

Digby Wells assigned me to the role of Country Manager for the United Kingdom. This was a new endeavour for the company as the company's global footprint continues to increase. The primary responsibilities for the role included the following:

- **Clint liaison** to be able to interact more efficiently and personally with current mining clients, mining industry service providers, legal firms and banking institutions in order to introduce Digby Wells as a services provider with the aim of securing work.
- **Project management** for international projects which may require a presence in the United Kingdom, this was dependent on the location and needs of the client. These projects would mostly be based on the Equator Principles (EP) and International Finance Corporation (IFC) Performance Standards.
- **Technical input** to provide specialist technical expertise for projects, this included fauna, aquatic ecology, wetlands and rehabilitation. Continued with the design and implementation of Biodiversity and Land Management Plans to assist clients with managing the natural resources. Responsibilities also included the mentorship and management (including reviewing and guiding) other expertise such as flora, fauna and pedology.

### **EMPLOYMENT: Digby Wells Environmental (March 2012 – September 2013)**

Manager of a multi-disciplinary department of scientists providing specialist services in support of national and international requirements as well as best practice guidelines, primarily focussing on the mining sector. In addition to managing the department, I was also expected to contribute specialist services, most notably focusing on water resources. Further responsibilities also included the management of numerous projects on a national or international scale. A general overview of the required responsibilities are as follows:

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- **Project management** for single as well as multi-disciplinary studies on a national and international scale. This included legislation and commitments for the respective country being operated in, as well as included the World Bank (WB), EP and IFC requirements.
  - **Individual and/or team management** in order to provide mentoring and supportive structures for development and growth in support of the company's strategic objectives.
  - **Scientific report writing** to ensure that the relevant standards and requirements have been attained, namely local country legislation, as well as WB, EP and IFC requirements.
  - **Report reviewing** in order to ensure compliance and consideration of relevant legislation and guidelines and also quality control.
  - **Specialist management** to facilitate the collaboration and integration of specialist skills for the respective projects. This also included the development of Biodiversity and Land Management Plan for clients.
  - **Client Resource Manager** for numerous clients in order to establish as well as maintain working relationships.

An overview of the tenure working with the company is provided below:

- **October 2013 – December 2014: London Operations Manager** – Deployed to establish a presence for the company (remote office) in the United Kingdom by means of generating project work to support the employment of staff and operation of a business structure.
- **March 2012 – September 2013: Biophysical Department Manager** – Responsible for the development and growth of the department to consist of four specialist units. This included the development of a new specialist unit, namely Rehabilitation.
- **January 2011 - February 2012: Ecological Unit Manager** – In addition to implementing aquatic and wetland specialist services, the role required the overall management of additional specialist services which included fauna & flora.
- **June 2010 - December 2010: Aquatic Services Manager** – This required the marketing and implementation of specialist programmes for the client base such as biomonitoring and wetland off-set strategies. In addition to this, this also included expanding on the existing skill set to include services such as toxicity, bioaccumulation and ecological flow assessments.
- **August 2008: Aquatic ecologist** – Employed as a specialist to establish the aquatic services within the company. In addition to this, wetland specialist services were added to the existing portfolio.

**PREVIOUS EMPLOYMENT: Econ@UJ (University of Johannesburg)**

- June 2007 – July 2008: Junior aquatic ecologist
  - Researcher
  - Technical assistant for fieldwork
  - Reporting writing
  - Project management

**GENERAL SKILLS**

<b>Literacy</b>	Read, write and speak English fluently. Read, write and speak Afrikaans. Basic German.
<b>Generic</b>	Advanced user of Microsoft Office applications.
<b>Mapping</b>	Introductory skill level for ArcGIS and Quantum GIS.

**ADDITIONAL EXPERIENCE**

<b>Compliance audits</b>	Conducting site investigations in order to determine the level of compliance attained, ensuring that the client maintains an appropriate measure of compliance with environmental regulations by means of a
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	legislative approach
<b>Control officer</b>	Acting as an independent Environmental Control Officer (ECO), acting as a quality controller and monitoring agent regarding all environmental concerns and associated environmental impacts
<b>Screening studies</b>	Project investigations in order to determine the level of complexity for the environmental and social studies required for a project. This is a form of risk assessment to guide the advancement of the project.
<b>Public consultation</b>	The provision of specialist input in order to communicate project findings as well as assist with providing feedback if and when required.
<b>Water use licenses</b>	Consultation with the relevant authorities in order to establish the project requirements, as well as provide specialist (aquatics/wetland) input for the application in order to achieve authorisation.
<b>Closure</b>	Primarily the review of closure projects, with emphasis on the closure cost calculations. Support was also provided by assisting with the measurements of structures during fieldwork.
<b>Visual</b>	The review of visual studies as well as the collation of field data to be considered for the visual interpretation for the project.

## ACADEMIC QUALIFICATIONS

**University of Johannesburg, Johannesburg, South Africa (2009):** MAGISTER SCIENTIAE (MSc) - Aquatic Health:

**Title:** *Aspects of the biology of the Bushveld Smallscale Yellowfish (Labeobarbus polylepis): Feeding biology and metal bioaccumulation in five populations.*

**Rand Afrikaans University (RAU), Johannesburg, South Africa (2004):** BACCALAUREUS SCIENTIAE CUM HONORIBUS (Hons) – Zoology

**Rand Afrikaans University (RAU), Johannesburg, South Africa (2001 - 2004):** BACCALAUREUS SCIENTIAE IN NATURAL AND ENVIRONMENTAL SCIENCES. Majors: Zoology and Botany.

## PUBLICATIONS

Tate RB and Husted, A. 2015. Aquatic Biomonitoring in the upper reaches of the Boesmanspruit, Carolina, Mpumalanga, South Africa. African Journal of Aquatic Science.

Tate RB and Husted A. 2013. Bioaccumulation of metals in *Tilapia zillii* (Gervai, 1848) from an impoundment on the Badeni River, Cote D'Ivoire. African Journal of Aquatic Science.

O'Brien GC, Bulfin JB, Husted A. and Smit NJ. 2012. Comparative behavioural assessment of an established and new Tigerfish (*Hydrocynus vittatus*) population in two manmade lakes in the Limpopo catchment, Southern Africa. African Journal of Aquatic Science.

Tomschi, H, Husted, A, O'Brien, GC, Cloete, Y, Van Dyk C, Pieterse GM, Wepener V, Nel A and Reisinger U. 2009. Environmental study to establish the baseline biological and physical conditions of the Letsibogo Dam near Selebi Phikwe, Botswana. EC Multiple Framework Contract Beneficiaries.8 ACP BT 13 – Mining Sector (EDMS). Specific Contract N° 2008/166788. Beneficiary Country: Botswana. By: HPC HARRESS PICKEL CONSULT AG

Husted A. 2009. Aspects of the biology of the Bushveld Smallscale Yellowfish (*Labeobarbus polylepis*): Feeding biology and metal bioaccumulation in five populations. The University of Johannesburg (Thesis).

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# Chris van Rooyen Consulting

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## Curriculum vitae: Chris van Rooyen

Name : Chris van Rooyen  
Profession/Specialisation : Avifaunal Specialist  
Highest Qualification : LLB  
Nationality : South African  
Years of experience : 19 years

## Key Qualifications

Chris van Rooyen has twenty years' experience in the assessment of avifaunal interactions with industrial infrastructure. He was employed by the Endangered Wildlife Trust as head of the Eskom-EWT Strategic Partnership from 1996 to 2007, which has received international acclaim as a model of co-operative management between industry and natural resource conservation. He is an acknowledged global expert in this field and has consulted in South Africa, Namibia, Botswana, Lesotho, New Zealand, Texas, New Mexico and Florida. He also has extensive project management experience and he has received several management awards from Eskom for his work in the Eskom-EWT Strategic Partnership. He is the author and/or co-author of 17 conference papers, co-author of two book chapters, several research reports and the current best practice guidelines for avifaunal monitoring at wind farm sites. He has completed more than 100 power line assessments; and has to date been employed as specialist avifaunal consultant on more than 30 renewable energy generation projects. He has also conducted numerous risk assessments on existing power lines infrastructure. He also works outside the electricity industry and he has done a wide range of bird impact assessment studies associated with various residential and industrial developments (see key project experience below).

## Key Project Experience

### **Bird Impact Assessment Studies for Solar Energy Plants:**

1. Concentrated Solar Power Plant, Upington, Northern Cape.
2. De Aar and Droogfontein Solar PV Pre- and Post-construction avifaunal monitoring
3. JUWI Kronos PV project, Copperton, Northern Cape
4. Sand Draai CSP project, Groblershoop, Northern Cape (underway)
5. Biotherm Helena PV Project, Copperton, Northern Cape
6. Biotherm Letsiao CSP Project, Aggenys, Northern Cape
7. Biotherm Enamandla PV Project, Aggenys, Northern Cape
8. Biotherm Sendawo PV Project, Vryburg, North-West
9. Biotherm Tlisitseng PV Project, Lichtenburg, North-West

### **Bird Impact Assessment Studies for the following overhead line projects:**

1. Chobe 33kV Distribution line
2. Athene - Umfolozi 400kV
3. Beta-Delphi 400kV
4. Cape Strengthening Scheme 765kV
5. Flurian-Louis-Trichardt 132kV
6. Ghanzi 132kV (Botswana)
7. Ikaros 400kV
8. Matimba-Witkop 400kV
9. Naboomspruit 132kV
10. Tabor-Flurian 132kV
11. Windhoek - Walvisbaai 220 kV (Namibia)
12. Witkop-Overysse 132kV
13. Breyten 88kV
14. Adis-Phoebus 400kV
15. Dhuvu-Janus 400kV
16. Perseus-Mercury 400kV

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17. Gravelotte 132kV
18. Ikaros 400 kV
19. Khanye 132kV (Botswana)
20. Moropule – Thamaga 220 kV (Botswana)
21. Parys 132kV
22. Simplon –Everest 132kV
23. Tutuka-Alpha 400kV
24. Simplon-Der Brochen 132kV
25. Big Tree 132kV
26. Mercury-Ferrum-Garona 400kV
27. Zeus-Perseus 765kV
28. Matimba B Integration Project
29. Caprivi 350kV DC (Namibia)
30. Gerus-Mururani Gate 350kV DC (Namibia)
31. Mmamabula 220kV (Botswana)
32. Steenberg-Der Brochen 132kV
33. Venetia-Paradise T 132kV
34. Burgersfort 132kV
35. Majuba-Umfolozi 765kV
36. Delta 765kV Substation
37. Braamhoek 22kV
38. Steelpoort Merensky 400kV
39. Mmamabula Delta 400kV
40. Delta Epsilon 765kV
41. Gerus-Zambezi 350kV DC Interconnector: Review of proposed avian mitigation measures for the Okavango and Kwando River crossings
42. Giyani 22kV Distribution line
43. Liphobong-Kao 132/11kV distribution power line, Lesotho
44. 132kV Leslie – Wildebeest distribution line
45. A proposed new 50 kV Spoornet feeder line between Sishen and Saldanha
46. Cairns 132kv substation extension and associated power lines
47. Pimlico 132kv substation extension and associated power lines
48. Gyani 22kV
49. Matafin 132kV
50. Nkomazi\_Fig Tree 132kV
51. Pebble Rock 132kV
52. Reddersburg 132kV
53. Thaba Combine 132kV
54. Nkomati 132kV
55. Louis Trichardt – Musina 132kV
56. Endicot 44kV
57. Apollo Lepini 400kV
58. Tarlton-Spring Farms 132kV
59. Kuschke 132kV substation
60. Bendstore 66kV Substation and associated lines
61. Kuiseb 400kV (Namibia)
62. Gyani-Malamulele 132kV
63. Watershed 132kV
64. Bakone 132kV substation
65. Eerstegoud 132kV LILO lines
66. Kumba Iron Ore: SWEP - Relocation of Infrastructure
67. Kudu Gas Power Station: Associated power lines
68. Steenberg Booyesdal 132kV
69. Toulon Pumps 33kV
70. Thabatshipi 132kV
71. Witkop-Silica 132kV
72. Bakubung 132kV
73. Nelsriver 132kV

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74. Rethabiseng 132kV
75. Tilburg 132kV
76. GaKgapanne 66kV
77. Knobel Gilead 132kV
78. Bochum Knobel 132kV
79. Madibeng 132kV
80. Witbank Railway Line and associated infrastructure
81. Spencer NDP phase 2 (5 lines)
82. Akanani 132kV
83. Hermes-Dominion Reefs 132kV
84. Cape Painsinsula Strengthening Project 400kV
85. Magalakwena 132kV
86. Benfiosa 132kV
87. Dithabaneng 132kV
88. Taunus Diepkloof 132kV
89. Taunus Doornkop 132kV
90. Tweedracht 132kV
91. Jane Furse 132kV
92. Majeje Sub 132kV
93. Tabor Louis Trichardt 132kV
94. Riversong 88kV
95. Mamatsekele 132kV
96. Kabokweni 132kV
97. MDPP 400kV Botswana
98. Marble Hall NDP 132kV
99. Bokmakiere 132kV Substation and LILO lines
100. Styldrift 132kV
101. Taunus – Diepkloof 132kV
102. Bighorn NDP 132kV
103. Waterkloof 88kV
104. Camden – Theta 765kV
105. Dhuvu – Minerva 400kV Diversion
106. Lesedi –Grootpan 132kV
107. Waterberg NDP
108. Bulgerivier – Dorset 132kV
109. Bulgerivier – Toulon 132kV
110. Nokeng-Fluorspar 132kV
111. Mantsole 132kV
112. Tshilamba 132kV
113. Thabamoopo - Tshebela – Nhlovuko 132kV
114. Arthurseat 132kV
115. Borutho 132kV MTS
116. Volspruit - Potgietersrus 132kV
117. Neotel Optic Fibre Cable Installation Project: Western Cape
117. Matla-Glockner 400kV
118. Delmas North 44kV
119. Houwhoek 11kV Refurbishment
120. Clau-Clau 132kV
121. Ngwedi-Silwerkrans 134kV
122. Nieuwehoop 400kV walk-through
123. Booyendal 132kV Switching Station
124. Tarlton 132kV

## **Bird Impact Assessment Studies for the following residential and industrial developments:**

1. Lizard Point Golf Estate
2. Lever Creek Estates
3. Leloko Lifestyle Estates

4. Vaaloewers Residential Development
5. Clearwater Estates Grass Owl Impact Study
6. Sommerset Ext. Grass Owl Study
7. Proposed Three Diamonds Trading Mining Project (Portion 9 and 15 of the Farm Blesbokfontein)
8. N17 Section: Springs To Leandra –“Borrow Pit 12 And Access Road On (Section 9, 6 And 28 Of The Farm Winterhoek 314 Ir)
9. South African Police Services Gauteng Radio Communication System: Portion 136 Of The Farm 528 Jq, Lindley.
10. Report for the proposed upgrade and extension of the Zeekoegat Wastewater Treatment Works, Gauteng.
11. Bird Impact Assessment for Portion 265 (a portion of Portion 163) of the farm Rietfontein 189-JR, Gauteng.
12. Bird Impact Assessment Study for Portions 54 and 55 of the Farm Zwartkop 525 JQ, Gauteng.
13. Bird Impact Assessment Study Portions 8 and 36 of the Farm Nooitgedacht 534 JQ, Gauteng.
14. Shumba's Rest Bird Impact Assessment Study
15. Randfontein Golf Estate Bird Impact Assessment Study
16. Zilkaatsnek Wildlife Estate
17. Regenstein Communications Tower (Namibia)
18. Avifaunal Input into Richards Bay Comparative Risk Assessment Study
19. Maquasa West Open Cast Coal Mine
20. Glen Erasmia Residential Development, Kempton Park, Gauteng
21. Bird Impact Assessment Study, Weltevreden Mine, Mpumalanga
22. Bird Impact Assessment Study, Olifantsvlei Cemetery, Johannesburg
23. Camden Ash Disposal Facility, Mpumalanga
24. Lindley Estate, Lanseria, Gauteng

## **Ongoing involvement in Bird Impact Assessment Studies for wind-powered generation facilities:**

1. Eskom Klipheuwel Experimental Wind Power Facility, Western Cape
2. Mainstream Wind Facility Jeffreys Bay, Eastern Cape (EIA and monitoring)
3. Biotherm, Swellendam, (Excelsior), Western Cape (EIA and monitoring)
4. Biotherm, Napier, (Matjieskloof), Western Cape (pre-feasibility)
5. Windcurrent SA, Jeffreys Bay, Eastern Cape (2 sites) (EIA and monitoring)
6. Caledon Wind, Caledon, Western Cape (EIA)
7. Innowind (4 sites), Western Cape (EIA)
8. Renewable Energy Systems (RES) Oyster Bay, Eastern Cape (EIA and monitoring)
9. Oelsner Group (Kerriefontein), Western Cape (EIA)
10. Oelsner Group (Langefontein), Western Cape (EIA)
11. InCa Energy, Vredendal Wind Energy Facility Western Cape (EIA)
12. Mainstream Loeriesfontein Wind Energy Facility (EIA and monitoring)
13. Mainstream Noupoot Wind Energy Facility (EIA and monitoring)
14. Biotherm Port Nolloth Wind Energy Facility (Monitoring)
15. Biotherm Laingsburg Wind Energy Facility (EIA and monitoring)
16. Langhoogte Wind Energy Facility (EIA)
17. Vleesbaai Wind Energy Facility (EIA and monitoring)
18. St. Helena Bay Wind Energy Facility (EIA and monitoring)
19. Electrawind, St Helena Bay Wind Energy Facility (EIA and monitoring)
20. Electrawind, Vredendal Wind Energy Facility (EIA)
21. SAGIT, Langhoogte and Wolseley Wind Energy facilities
22. Renosterberg Wind Energy Project – 12 month preconstruction avifaunal monitoring project (2014)
23. De Aar – North (Mulilo) Wind Energy Project – 12 month preconstruction avifaunal monitoring project (2014)
24. De Aar – South (Mulilo) Wind Energy Project – 12 month bird monitoring (2014)
25. Namies – Aggenys Wind Energy Project – 12 month bird monitoring (2014)
26. Pofadder - Wind Energy Project – 12 month bird monitoring (2014)
27. Dwarsrug Loeriesfontein - Wind Energy Project – 12 month bird monitoring (2014)
28. Waaihoek – Utrecht Wind Energy Project – 12 month bird monitoring (2014)
29. Amathole – Butterworth Utrecht Wind Energy Project – 12-month bird monitoring & EIA specialist



AFRIMAGE Photography (Pty) Ltd Trading as:

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30. Noupoort East and West Wind Energy Projects 12-month bird monitoring & EIA specialist study (Innowind)
31. Beaufort West Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mainstream)
32. Leeuwdraai Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mainstream)
33. Sutherland Wind Energy Facility 12-month bird monitoring (Mainstream)
34. Maralla Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
35. Esizayo Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
36. Humansdorp Wind Energy Facility 12-month bird monitoring & EIA specialist study (Cennergi)
37. Aletta Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
38. Eureka Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
39. Makambako Wind Energy Facility (Tanzania) 12-month bird monitoring & EIA specialist study (Windlab) study (underway)

## **Bird Impact Assessment Studies for Solar Energy Plants:**

1. Concentrated Solar Power Plant, Upington, Northern Cape.
2. De Aar and Droogfontein Solar PV Pre- and Post-construction avifaunal monitoring
3. JUWI Kronos PV project, Copperton, Northern Cape
4. Sand Draai Solar project, Groblershoop, Northern Cape
5. Helena PV Project, Copperton, Northern Cape
6. Letsitsing Solar Project, Lichtenburg, North-West
7. Sendawo Solar Project, Vryburg, North-West
8. Letsoai Solar Project, Aggeneys Northern Cape
9. Enamandla Solar Project, Aggeneys, Northern Cape

## Professional affiliations

I work under the supervision of and in association with Albert Froneman (SACNASP Zoological Science Registration number 400177/09) as stipulated by the Natural Scientific Professions Act 27 of 2003.

# CURRICULUM VITAE LOURENS DU PLESSIS

## PERSONAL INFORMATION AND CONTACT DETAILS

Name: Lourens Martinus du Plessis  
Date of birth: 1969-11-13  
Marital status: Married  
Nationality: South African  
Profession/specialisation: Geographer/environmental GIS specialist  
Company: MetroGIS (Pty) Ltd  
Years with firm: 11 years  
Position: Director  
Experience: 20 years  
Postal address: PO Box 384, La Montagne, 0184  
Telephone/fax: 012 349 2884/5 (w) 082 922 9019 (cell) 012 349 2880 (fax)  
E-mail: lourens@metrogis.co.za

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## KEY QUALIFICATIONS AND EXPERIENCE

### Primary function

The application of Geographic Information Systems (GIS) in environmental planning and management, impact assessments and spatial modeling.

### Experience and expertise

- Data sourcing and acquisition
- Data capture
- Data evaluation
- Data conversion and transfer
- GIS database development, implementation and maintenance
- Spatial analysis/modelling (visibility, slope, aspect, shadow, surface, raster, proximity, etc.)
- Digital terrain/elevation modeling
- Terrain evaluation
- Image processing
- Impact assessment and impact management
- Environmental management
- Decision support systems interface development
- Project management
- Map production, display, queries and reporting
- Environmental sciences expertise
- Process development
- Visual impact assessment

### Technological (software) expertise

- Arc/Info and ArcGIS
- ArcView
- PlanetGIS
- Vistapro (virtual landscape rendering software)
- Various GIS support software packages and applications
- Range of Microsoft standard applications (including Microsoft Word/Excel/Access, etc.)

## **Awards**

Award: Best South African Environmental Technical Paper  
Awarded for: National Environmental Potential Atlas (ENPAT National)  
Awarded by: Environmental Planning Professions Interdisciplinary Committee (EPPIC)  
Date: 1995

Award: Map Gallery Most Analytical Competition - 3rd Place  
Awarded for: Environmental Potential Atlas for South Africa  
Awarded by: Environmental Systems Research Institute (ESRI)  
Date: 1997 International ESRI User Conference

Award: Best Cartographic Map Gallery Competition - 3rd Place  
Awarded for: Environmental Potential Atlas for South Africa (Publication)  
Awarded by: Environmental Systems Research Institute (ESRI)  
Date: 1998 International ESRI User Conference

Award: QDC Performance Award  
Awarded for: ENPAT Development  
Awarded by: Q Data Consulting  
Date: 1998

Award: Best South African Environmental Technical Paper  
Awarded for: Environmental Potential Atlas for South Africa (Publication)  
Awarded by: Environmental Planning Professions Interdisciplinary Committee (EPPIC)  
Date: 1998

## **Publications/maps featured in publications**

Name: Environmental Potential Atlas for South Africa  
Authors: W. van Riet, J. van Rensburg, P. Claassen, L. du Plessis and T. van Viegen  
Publisher: J.L. van Schaik  
Date: 1997

Name: ESRI Map Book (Volume 13)  
Authors: Various  
Publisher: Environmental Systems Research Institute (ESRI)  
Date: 1998

Name: Pilanesberg Official Map and Park Guide  
Authors: North-West Parks & Tourism Board and Jacana  
Publisher: Jacana Media (Pty) Ltd  
Date: 2001

Name: KwaZulu-Natal - A celebration of biodiversity  
Authors: Jacana  
Publisher: Jacana Media (Pty) Ltd  
Date: 2001

Name: Garden Route - Still Bay to Storms River (Discover the Magic)  
Authors: Jacana  
Publisher: Jacana Media (Pty) Ltd  
Date: 2003

Name: Lowveld and Kruger Guide

Authors: High Branching Team  
Publisher: Jacana Media (Pty) Ltd  
Date: 2004

Name: Heights to Homes to Oceans (H<sub>2</sub>O) Water Wise information poster  
Authors: Rand Water  
Publisher: Rand Water  
Date: 2004

Name: Kruger National Park Map and Photographic Guide  
Authors: Andy Tinker Photography  
Publisher: Andy Tinker Photography  
Date: 2007

## **WORK EXPERIENCE/EMPLOYMENT DETAILS**

**GisLAB CC** (Geographic Information Systems Laboratory - University of Pretoria)  
Period: 4/1990 - 9/1997  
Position: Member / Project Manager

**GISBS** (Geographic Information Systems Business Solutions - Q Data Consulting)  
Period: 10/1997 - 10/1999  
Position: Project Manager

**MetroGIS (Pty) Ltd**  
Period: 11/1999 - to date  
Position: Director / Project Manager

## **EDUCATION/QUALIFICATIONS**

Degree: BA (University of Pretoria) Geography and Anthropology (Majors)  
Other Subjects: Archaeology, Philosophy and Political Science  
Date Received: 1993

## **PROJECTS SUMMARY**

*(A brief description of **some** prominent and relevant projects)*

### **General projects**

GIS mapping and database for Black Eagle habitats and flight patterns in the Karoo National Park

Environmental planning and development control schemes for the Drakensberg *Babangibone, Cathkin Peak and Garden Castle* development nodes

Goukou River (Stilbaai) Environmental Structure Plan

Conservation and open space proposals for the Umhlanga Forest

Grootvlei mine water pumping operation (Blesbokspruit sub-catchment)

GIS services for the Saldannah steel plant

ENPAT Provincial (1:250,000 scale GIS decision support systems) based on an inventory of environmental and socio-economic geographic data

- ENPAT Northern Province (Limpopo Province)
- ENPAT Mpumalanga
- ENPAT North-West

ENPAT Metropolitan (1:50,000 scale GIS decision support systems) containing environmental and socio-economic geographic data that were evaluated for conservation opportunities, development constraints and agricultural constraints

- ENPAT Gauteng
- ENPAT Cape Town
- ENPAT Durban Functional Region (DFR)
- ENPAT Bloemfontein/Botshabello
- ENPAT Port Elizabeth

ENPAT National (1:1,000,000 scale GIS decision support system) and ENPAT publication

Environmental Management Frameworks (EMF). Frameworks of spatially represented information connected to environmental management parameters designed to aid in the pro-active identification of potential conflict between development proposals and critical and/or sensitive environments

- EMF Northern Province (Limpopo Province)
- EMF Mpumalanga
- EMF North-West

Spatial Development Initiatives (SDI). The fast tracking of the EMF concept for priority SDI's

- Lubombo Corridor SDI
- Coega Industrial Development Zone (IDZ)
- Wild Coast SDI
- West Coast Investment Initiative

Sigma colliery: North-West strip operation

Development masterplan for the Tswaing Crater Museum

Conservation plan for the Rietvlei Nature Reserve

GIS services for the planning and management of the Chobe National Park (Botswana)

GIS services for an environmental overview of South Africa

Demarcation/delineation of regions in South Africa

Orange-Vaal (ORVAAL) transfer scheme - Caledon cascades scheme

ENPAT Provincial (1:250,000 scale GIS decision support systems) based on an inventory of environmental and socio-economic geographic data

- ENPAT Eastern Cape
- ENPAT Free State
- ENPAT Kwa-Zulu Natal

Environmental Management Frameworks (EMF). Frameworks of spatially represented information connected to environmental management parameters designed to aid in the pro-active

identification of potential conflict between development proposals and critical and/or sensitive environments

- EMF Eastern Cape
- EMF Free State
- EMF Kwa-Zulu Natal

Hennops River EMF (environmental inventory and management proposals in Centurion)

The Important Bird Areas (IBA) of South Africa map and database

Centurion Metropolitan Substructure Environmental Management Framework (EMF)

Alexandra renewal project EMF

Carbon Sinks and Sequestration - Eastern Cape Wild Coast. Information maps for the "*Carbon Sinks - A Rehabilitation Option for South Africa's Natural Environment*" report

Prince Edward and Marion Islands. Maps for the World Heritage Site (WHS) bid document

Theewaterskloof and Genadendal - Integrated spatial data management system

Gauteng Communication Network Strategy (GAUCONS). Environmental zones for the control of the construction of telecommunication structures

Gauteng Industries Buffer Zones. The mapping of industrial and mining activities, the creation of buffer control zones and the development of a GIS-based decision support system for the Gauteng Province

Limpopo National Park (LNP) Mozambique. Base maps for fieldwork and planning

Schmidtsdrift Environmental Management Program Report (EMPR)

Loch Vaal Environmental Management Framework (EMF)

Rustenburg - Strategic Environmental Assessment (SEA). The creation of environmental control zones, a GIS-based decision support system and information poster

Faerie Glen Nature Reserve Strategic Environmental Assessment (SEA)

Willow Quarries - Environmental Impact Assessment (EIA). Modeling of mining expansion plan and the potential impact on Golden Mole habitats

Ekurhuleni Metropolitan Municipality (EMM) Environmental Management Framework (EMF)

Limpopo - State of the Environment Report (SoER)

Windhoek (Namibia) - Environmental Structure Plan (ESP)

Gauteng Supplementation and Implementation of EIA Regulations Project (EIA SIP)

Siyanda District Municipality Environmental Management Framework (EMF)

Olifants and Letaba River Catchments Environmental Management Framework (EMF)

### **Regional Strategic Environmental Assessments (Regional Assessments)**

Regional assessment for the Eskom Wind Energy Facility (Sere) in the Western Cape

Regional assessments for the Eskom Wind Integration Project (WIP)

- Area 1: West Coast (Saldanha to Garies)
- Area 2: Overberg Region
- Area 3: Beaufort West region
- Area 4: Eastern Cape (Tsitsikamma to Port Elizabeth)
- Area 5: Northern Cape (Hondeklipbaai to Port Nolloth)

Sandveld wind energy Regional Assessment

West Coast National Park (Saldanha area) Regional Assessment

Regional Assessment for the Theewaterskloof Municipal area

Brand-se-Baai (Exxaro) wind energy regional assessment

Overberg (BioTherm) wind energy regional assessments

- Area 1: Gordons Bay to Pearly Beach)
- Area 2: Napier RA (Agulhas NP/Swellendal region)

Suurplaat/Sutherland (Investec Wind Energy Development) Regional Assessment

Waterberg (Limpopo) Concentrating Solar Power (CSP) Regional Assessment (Exxaro)

### **Visual Impact Assessments (VIA), viewshed analyses and visual assessments**

*Some recent or current projects include:*

- Coal strip mining in Zimbabwe viewshed analyses
- Viewshed analyses and sensitivity mapping for telecommunication masts in the northern provinces (Limpopo, Mpumalanga and North-West)
- Siemens 3<sup>rd</sup> license cellular communications infrastructure EIAs. Viewshed analyses and sensitivity mapping for over 4,000 telecommunication mast sites in all major metropolitan areas of South Africa.
- CSIR high mast viewshed analysis and sensitivity mapping
- Atlantis Open Cycle Gas Turbine power station VIA
- Kynoch Gypsum Tailings dam extension VIA
- N1 Western Bypass Shell service station VIA
- Coega regional hazardous waste processing facility VIA
- Robinson Deep landfill extension VIA
- Hazardous waste blending platform VIA
- Mercury-Ferrum-Garona transmission line integration VIA
- Matimba B (Medupi) coal-fired power station VIA
- Concentrating Solar Power (CSP) plant in Upington VIA
- Zeus to Mercury transmission line (comparative viewshed analyses)
- Mmamabula (Botswana) transmission line and power station viewshed analyses
- Petronet new multi-products pipeline VIA
- Wind energy facility (Sere) in the Western Cape province VIA
- Ankerlig power station conversion and transmission line VIA
- Gourikwa power station conversion and transmission line VIA
- Kyalami strengthening project VIA
- Steelpoort integration project VIA
- Medupi reservoir and telecommunication mast VIA
- Cookhouse wind monitoring masts VIA for a Basic Assessment Report
- Hopefield wind monitoring masts VIA for a Basic Assessment Report
- Amakhala wind monitoring masts VIA for a Basic Assessment Report
- Caledon, Worcester and Tulbach wind monitoring masts VIAs for Basic Assessment

## Reports

- Overberg masts VIA for a Basic Assessment Report
- Britannia Bay wind monitoring mast VIA for a Basic Assessment Report
- Brand-se-Baai wind monitoring masts VIA for a Basic Assessment Report
- Deep River wind monitoring masts VIA for a Basic Assessment Report
- Happy Valley wind monitoring masts VIA for a Basic Assessment Report
- River Bank wind monitoring mast VIA for a Basic Assessment Report
- Uiekraal wind monitoring masts VIA for a Basic Assessment Report
- Beaufort West wind monitoring masts VIA for a Basic Assessment Report
- Laingsburg Wind monitoring masts VIA for a Basic Assessment Report
- Rheboksfontein, Suurplaat and West Coast wind monitoring masts VIAs for Basic Assessment Reports
- Cookhouse wind energy facility VIA
- Hopefield wind energy facility VIA
- Mokopane Integration Project VIA
- Cradle of Humankind World Heritage Site (WHS) viewshed protection zone, visual character assessment and visual zonation plan
- Proposed Indwe wind energy facility VIA
- Proposed Amakhala wind energy facility VIA
- Proposed Boontjieskraal wind energy facility VIA
- Proposed Britannia Bay wind energy facility VIA
- Proposed Brand-se-Baai wind energy facility VIA
- Proposed Upington and Pofadder solar thermal facilities VIAs
- Proposed Dorper wind energy facility VIA
- Proposed Flagging Trees wind energy facility VIA
- Proposed Rheboksfontein, Suurplaat and West Coast wind energy facilities VIAs
- Proposed Riverbank wind energy facility VIA
- Proposed Waterberg photovoltaic plant VIA
- Eskom wind intergration projects VIAs (current)
- Welgedacht water care works VIA

## PROFESSIONAL AFFILIATIONS

Application for *Geographical Information Sciences (GISc) Professional Practitioner* submitted to (and currently under review by) The South African Council for Professional and Technical Surveyors (PLATO).

## LANGUAGES

	<b>Reading</b>	<b>Writing</b>	<b>Speaking</b>
Afrikaans	Excellent	Excellent	Excellent
English	Excellent	Excellent	Excellent



## Appendix 7: Curriculum vitae: Dr David Hoare

### Education

Matric - Graeme College, Grahamstown, 1984

B.Sc (majors: Botany, Zoology) - Rhodes University, 1991-1993

B.Sc (Hons) (Botany) - Rhodes University, 1994 with distinction

M.Sc (Botany) - University of Pretoria, 1995-1997 with distinction

PhD (Botany) – Nelson Mandela Metropolitan University, Port Elizabeth

### Main areas of specialisation

- Vegetation ecology, primarily in grasslands, thicket, coastal systems, wetlands.
- Plant biodiversity and threatened plant species specialist.
- Alien plant identification and control / management plans.
- Remote sensing, analysis and mapping of vegetation.
- Specialist consultant for environmental management projects.

### Membership

Professional Natural Scientist, South African Council for Natural Scientific Professions, 16 August 2005 – present. Reg. no. 400221/05 (Ecology, Botany)

Member, International Association of Vegetation Scientists (IAVS)

Member, Ecological Society of America (ESA)

Member, International Association for Impact Assessment (IAIA)

Member, Herpetological Association of Africa (HAA)

### Employment history

1 December 2004 – present, Director, David Hoare Consulting (Pty) Ltd. Consultant, specialist consultant contracted to various companies and organisations.

1 January 2009 – 30 June 2009, Lecturer, University of Pretoria, Botany Dept.

1 January 2013 – 30 June 2013, Lecturer, University of Pretoria, Botany Dept.

1 February 1998 – 30 November 2004, Researcher, Agricultural Research Council, Range and Forage Institute, Private Bag X05, Lynn East, 0039. Duties: project management, general vegetation ecology, remote sensing image processing.

### Experience as consultant

Ecological consultant since 1995. Author of over 500 specialist ecological consulting reports. Wide experience in ecological studies within grassland, savanna and fynbos, as well as riparian, coastal and wetland vegetation.

## SPECIALIST EXPERTISE

### IRIS SIGRID WINK

<b>Profession</b>	Civil Engineer (Traffic & Transportation)
<b>Position in Firm</b>	Associate
<b>Area of Specialisation</b>	Manager: Traffic & Transportation Engineering
<b>Qualifications</b>	PrEng, MSc Eng (Civil & Transportation)
<b>Years of Experience</b>	19 Years
<b>Years with Firm</b>	9 Years

#### SUMMARY OF EXPERIENCE

Iris is a Professional Engineer registered with ECSA (20110156). She joined JG Afrika (Pty) Ltd. in 2012. Iris obtained a Master of Science degree in Civil Engineering in Germany and has more than 15 years of experience in a wide field of traffic and transport engineering projects. Iris left Germany in 2003 and has worked as a traffic and transport engineer in South Africa and Germany. She has technical and professional skills in traffic impact studies, public transport planning, non-motorised transport planning and design, design and development of transport systems, project planning and implementation for residential, commercial and industrial projects and providing conceptual designs for the abovementioned. She has also been involved with transport assessments for renewable energy projects and traffic safety audits.

#### **PROFESSIONAL REGISTRATIONS & INSTITUTE MEMBERSHIPS**

- PrEng** -Registered with the Engineering Council of South Africa No. 20110156  
-Registered Mentor with ECSA for the Cape Town Office of JG Afrika
- MSAICE** -Member of the South African Institution of Civil Engineers
- ITSSA** -Member of ITS SA (Intelligent Transport Systems South Africa)
- SAWEA** -Member of the South African Wind Energy Association
- SARF** -South African Road Federation: Committee Member of Council
- SARF WR** - SARF Western Region Committee Member
- SARF RSC** - Road Safety Committee Member
- IRF** - Global Road Safety Audit Team Leader with the International Road Federation (IRF)

#### **EDUCATION**

- 1996 - Matric** – Matric (Abitur) – Carl Friedrich Gauss Schule, Hemmingen, Germany
- 1998 - Diploma** as Draughtsperson – Lower Saxonian State Office for Road and Bridge Engineering
- 2003 - MSc Eng** (Civil and Transportation) – Leibniz Technical University of Hanover, Germany

#### **SPECIFIC EXPERIENCE**

**JG Afrika (Pty) Ltd (Previously Jeffares & Green (Pty) Ltd)**

**2016 – Date**

**Position – Associate**

- **Rondekop Windfarm** – Transport study for the proposed Kudusberg Windfarm near Sutherland, Northern Cape – Client: G7 Renewable Energies
- **Kudusberg Windfarm** – Transport study for the proposed Kudusberg Windfarm near Sutherland, Northern Cape – Client: G7 Renewable Energies
- **Multiple Traffic Impact and Route Assessment** for the proposed Solar PV Facilities in the Northern Cape – Client: Private Developer
- **Kuruman Windfarm** – Transport study for the proposed Kuruman Windfarm in Kuruman, Northern Cape – Client: Mulilo Renewable Project Developments
- **Coega West Windfarm** – Transportation and Traffic Management Plan for the proposed Coega Windfarm in Coega, Port Elizabeth – Client: Electrawinds Coega
- **Traffic and Parking Audits** for the Suburb of Groenvallei in Cape Town – Client: City of Cape Town Department of Property Management.
- **Road Safety Audit** for the Upgrade of N1 Section 4 Monument River – Client: Aurecon on behalf of SANRAL
- **Sonop Windfarm** – Traffic Impact Assessment for the proposed Sonop Windfarm, Coega, Port Elizabeth – Client: Founders Engineering
- **Universal Windfarm** - Traffic Impact Assessment for the proposed Universal Windfarm, Coega, Port Elizabeth – Client: Founders Engineering
- **Road Safety Audit** for the Upgrade of N2 Section 8 Knysna to Wittedrift – Client: SMEC on behalf of SANRAL
- **Road Safety Audit** for the Upgrade of N1 Section 16 Zandkraal to Winburg South – Client: SMEC on behalf of SANRAL
- **Traffic and Road Safety Studies** for the Improvement of N7 Section 2 and Section 3 (Rooidraai and Piekenierskloof Pass) – Client: SANRAL
- **Road Safety Appraisals** for Northern Region of Cape Town – Client: Aurecon on behalf of City of Cape Town (TCT)
- **Traffic Engineering Services** for the Enkanini Informal Settlement, Kayamandi - Client: Stellenbosch Municipality
- **Lead Traffic Engineer** for the Upgrade of a 150km Section of the National Route N2 from Kangela to Pongola in KwaZulu-Natal, Client: SANRAL
- **Traffic Engineering Services** for the Kosovo Informal Settlement (which is part of the Southern Corridor Upgrade Programme), Client: Western Cape Government
- **Traffic and Road Safety Studies** for the proposed Kosovo Informal Housing Development (part of the Southern Corridor Upgrade Program), Client: Western Cape Government.
- **Road Safety Audit Stage 3** – Upgrade of the R573 Section 2 between Mpumalanga/Gauteng and Mpumalanga/Limpopo, Client: AECOM on behalf of SANRAL

- **Road Safety Audit Stage 1 and 3** – Upgrade of the N2 Section 5 between Lizmore and Heidelberg, Client: Aurecon on behalf of SANRAL
- **Traffic Safety Studies** for Roads Upgrades in Cofimvaba, Eastern Cape – Client: Cofimvaba Municipality
- **Road Safety Audit Stage 1 and 3** – Improvement of Intersections between Olifantshoek and Kathu, Northern Cape, Client: Nadeson/Gibb on behalf of SANRAL
- **Road Safety Audit Stage 3** – Upgrade of the Beacon Way Intersection on the N2 at Plettenberg Bay, Client: AECOM on behalf of SANRAL
- **Traffic Impact Assessment** for a proposed Primary School at Die Bos in Strand, Somerset West, Client: Edifice Consulting Engineers
- **Road Safety Audit Stage 1 and 3** – Improvement of R75 between Port Elizabeth and Uitenhage, Eastern Cape, Client: SMEC on behalf of SANRAL

# Ivan Baker

M.Sc Environmental Science and  
Hydropedology (*Pr Sci Nat pending*)

Cell: +27 79 898 4056

Email: [ivan@thebiodiversitycompany.com](mailto:ivan@thebiodiversitycompany.com)

Identity Number: 9401105251087

Date of birth: 10 January 1994



## Profile Summary

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Working experience throughout Southern Africa

Working experience in West-Africa

Specialist experience with mining, construction and agriculture.

Specialist expertise include hydropedology, pedology, land contamination, agricultural potential, land rehabilitation, rehabilitation management and wetlands resources.

Experience hydropedological modelling (HYDRUS model)

## Areas of Interest

Mining, Oil & Gas, Renewable Energy & Bulk Services Infrastructure Development, Farming, Land contamination, Sustainability and Conservation.

## Key Experience

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- Environmental Impact Assessments (EIA)
- Environmental Management Programmes (EMP)
- Wetland delineations and ecological assessments
- Rehabilitation Plans and Monitoring
- Soil-and rock classification
- Level 1, 2 and 3 hydropedology assessments
- Agriculture potential assessments
- Land contamination assessments
- Modulation of surface- and subsurface flows (HYDRUS model)

## Country Experience

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South Africa	Mozambique
Swaziland	Zimbabwe
Guinea	Zambia

## Nationality

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South African

## Languages

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English – Proficient

Afrikaans – Proficient

## Qualifications

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- MSc (North-West University of Potchefstroom) – Hydropedology
- BSc Honours (North-West University of Potchefstroom) – Environmental geology- Pedology and rehabilitation
- BSc Environmental sciences
- Cand Sci Nat (Pr Sci Nat Pending)
- Certificate of Competence: Fertiliser Society of South Africa
- Certificate of Competence: Tools for Wetland Assessments

## **SELECTED PROJECT EXPERIENCE**

### **Project Name: Environmental impact assessment for the construction of Road DR08606 leading to Mlamli Hospital, Sterkspruit**

Personal position / role on project: Wetland ecologist

Location: Sterkspruit, Eastern Cape Province, South Africa

Main project features: To conduct a wetland assessment, as a component of the environmental authorisation process and Water Use Licence Application (WULA) for the construction of Road DR08606 leading to Mlamli Hospital

### **Project Name: Biodiversity Baseline & Impact Assessment Report for the proposed Nondvo Dam Project**

Personal position / role on project: Wetland ecologist

Location: Mbabane, Swaziland

Main project features: To conduct various assessments according to IFC standards in regard to delineation of wetlands and assessing ecosystem services.

### **Project Name: Agricultural Potential Assessment - Proposed Kalabasfontein Coal Mining Project Extension**

Personal position / role on project: Project Manager and Soil Specialist.

Location: Bethal, Mpumalanga, South Africa

Main project features: To conduct a soil assessment to identify any sensitive resources that might be affected by the proposed mining activities and associated infrastructure as part of an environmental impact assessment.

### **Project Name: Soil assessment for the closure of the St Helena Shaft, Harmony**

Personal position / role on project: Soil specialist

Location: Welkom, Free State, South Africa

Main project features: To conduct a thorough soil and fertility assessment to recommend relevant mitigation and rehabilitation measures to finalise closure at the relevant mine

### **Project Name: Wetland Functionality Assessment for the Environmental, Health and Socio-Economic Baseline Studies for Block 2 at Siguiri Gold Mine**

Personal position / role on project: Wetland ecologist

Location: Siguiri, Guinea, West-Africa

Main project features: To conduct various assessments according to IUCN standards in regard to delineation of wetlands and assessing ecosystem services.

### **Project Name: Level 3 Hydropedological Assessment for the Sara Buffels Mining Project**

Personal position / role on project: Hydropedologist

Location: Ermelo, Mpumalanga, South-Africa

Main project features: To conduct various assessments to determine the hillslope hydrology and to acquire information relevant to the vadose zone's hydraulic properties to quantify sub-surface flows by means of modelling.

### **Project Name: Level 3 Hydropedological Assessment for the Buffalo Coal Mining Project**

Personal position / role on project: Hydropedologist

Location: Dundee, KwaZulu-Natal, South-Africa

Main project features: To conduct various assessments to determine the hillslope hydrology and to acquire information relevant to the vadose zone's hydraulic properties to quantify sub-surface flows by means of modelling

### **Project Name: Biodiversity Baseline & Impact Assessment for the proposed Tereane 15MW Solar PV Plant**

Personal position / role on project: Ecosystem Services Specialist

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Location: Cuamba, Mozambique, Southern-Africa

Main project features: To conduct various assessments according to IUCN standards in regard to ecosystem services

**Project Name: Land contamination assessment for the proposed Fleurhof Development**

Personal position / role on project: Soil Specialist

Location: Fleurhof, South Africa

Main project features: To conduct assessments relevant to the determination of land contamination, including recommendations, mitigations and risk assessments.

**OVERVIEW**

An overview of the specialist technical expertise include the following:

- Ecological wetland assessment studies, including the integrity (health) and functioning of the wetland systems.
- Wetland offset strategy designs.
- Wetland rehabilitation plans.
- Monitoring plans for wetland systems.
- Soil classification and agricultural assessments.
- Stripping and stockpiling guidelines.
- Soil rehabilitation plans.
- Soil and stockpile monitoring plans.
- Hydropedological assessments.

**TRAINING**

Some of the more pertinent training undergone includes the following:

- Tools for a Wetland Assessment (Certificate of Competence) – Rhodes University 2018; and
- Workshop on digital soil mapping.

**EMPLOYMENT EXPERIENCE**

**Internship at SRK consulting (January 2017-August 2017)**

- **Field assistant** for SRK consulting during 2017 included the sampling of surface and groundwater as well as on site tests, the accumulation of various different data sets from field loggers, presenting and arranging the relevant data and ultimately using it for my own personal post-graduate studies.

**Internship at The Biodiversity Company (August 2017-December 2017)**

Employed as an intern (wetland and soil scientist) during the last few months of 2017. During this period, I was part of a variety of soil- and wetland projects, both as report writer and/or field assistant.

**CURRENT EMPLOYMENT: The Biodiversity Company (January 2018 – Present)**

- **Scientific report writing** to ensure that the relevant standards and requirements have been attained, namely local country legislation, as well as WB, EP and IFC requirements.

**ACADEMIC QUALIFICATIONS**

**North-West University of Potchefstroom: MAGISTER SCIENTIAE (MSc) - Hydropedology:**

**Title:** *Characterisation of vadose zone processes in a tailings facility*

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**North-West University of Potchefstroom (2016):** BACCALAUREUS SCIENTIAE HONORIBUS (Hons) – Environmental Geology- Pedology and rehabilitation

**North-West University of Potchefstroom (2015):** BACCALAUREUS SCIENTIAE IN NATURAL AND ENVIRONMENTAL SCIENCES. Majors: Geology and Geography

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## CURRICULUM VITAE



**Jenna Lavin**

Tel: 083 619 0854 (c); 013 0131 (w)  
E-mail address: jenna.lavin@cedartower.co.za  
ID number: 8512050014089

### **EDUCATION:**

#### **Tertiary**

- 2014 - M.Phil in Conservation of the Built Environment (University of Cape Town)  
Ongoing - expected to graduate in 2015
- 2011 Continued Professional Development Course in Urban Conservation Management (University of Cape Town) Part I and Part II
- 2010 M.Sc. with Distinction in Archaeology (University of Cape Town)  
Title: *Palaeoecology of the KBS member of the Koobi Fora Formation: Implications for Pleistocene Hominin Behaviour.*
- 2007 B.Sc. Honours in Archaeology (University of Cape Town)  
Title: *The Lost Tribes of the Peninsula: An Investigation into the historical distribution of Chacma baboons (*Papio ursinus*) at the Cape Peninsula, South Africa.*  
Koobi Fora Field School, Rutgers University (U.S.A.)/ National Museums of Kenya
- 2006 B.Sc. Archaeology (University of Cape Town)  
B.Sc. Environmental and Geographic Science (University of Cape Town)

#### **Secondary**

- 1999-2003 Rustenburg High School for Girls  
Firsts in English, Afrikaans, Mathematics HG, Biology HG, History HG, Entrepreneurship.



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## **EMPLOYMENT HISTORY:**

### **PROFESSIONAL DEVELOPMENT**

#### **Environmental and Heritage Management:**

- Head of Heritage Operations for Heritage CTS Consultants and member of OpenHeritage NPC.  
*July 2016 to present*
- Assistant Director for Policy, Research and Planning at Heritage Western Cape.  
*August 2014 to June 2016*

Responsibilities include drafting of new heritage related policy, the grading and declaration of Provincial Heritage Sites, the development of Conservation Management Plans, facilitating the development of inventories of heritage resources through local authorities as well as managing the development of the Western Cape's Heritage Information Management System (HIMS).

Acting Deputy Director from April to December 2015.

- Heritage Officer for Palaeontology and for the Mpumalanga Province at the South African Heritage Resources Agency (SAHRA).  
*January 2013 to June 2014*

Responsibilities include dealing with palaeontological permit applications in terms of Section 35 of the NHRA and development applications in terms of Section 38 of the NHRA. Projects included the development of a National Palaeotechnic Report identifying significant palaeontological deposits throughout SA, as well as developing professional relationships between SAHRA and the Palaeontological Society of South Africa (PSSA) and the Geological Society of South Africa (GSSA). During this time, I was part of the team that developed the digitised National Palaeontological Sensitivity Map (<http://www.sahra.org.za/about/news/nov2013/palaeosensitivitymap>), the first of its kind in the world.

- Heritage Officer for Archaeology, Palaeontology and Meteorites at Heritage Western Cape (HWC).  
*September 2010 to December 2012*

HWC is a Public Entity that forms part of the Heritage Resource Management Component of the Provincial Governments' Department of Cultural Affairs and Sport (DCAS). Projects included the declaration of Pinnacle Point and the West Coast Fossil Park as Provincial Heritage Sites (PHS), the management of the development of the Baboon Point PHS Conservation Management Plan as well as an educational outreach program as part of the DCAS MOD Centre Project.



CEDAR TOWER  
SERVICES

- Heritage Officer for the Archaeology, Palaeontology and Meteorites Unit of the South African Heritage Resources Agency (SAHRA) as part of a three month contract.  
*January 2010 to March 2010*
- Environmental Control Officer, Amathemba Environmental Management Consulting  
*Part time: 2007 to 2009*

### **Other**

My private experience as a traveler in South Africa, Tanzania, Kenya, Namibia, Zambia, Malawi and Mozambique has inspired a passion for the conservation of environmental and heritage resources. I am passionate about sustainable living, with my Bachelor of Science in Environmental and Geographical Science providing a framework on which to base my values.

With a friend, I established the fundraising initiative, Chicks4Change, through which we managed to organize a number of successful events and raise R40 000 for Project Rhino to assist with anti-poaching initiatives.

In 2013 I was asked to join the panel of judges for the Ministerial awards for Heritage in the Western Cape. From 2013 to July 2014, I was a member of the Heritage Western Cape Archaeology, Palaeontology and Meteorites Committee. In July 2014, I presented at the Conference for the Palaeontological Society of South Africa on the use of GIS in the management of palaeontological resources in the face of increased development pressures. In April 2015 I participated in a conference on Landscape Archaeology hosted by the Leakey Foundation in San Fransisco, presenting on the management of archaeological landscapes in South Africa. In April 2016, I presented at the ICAHM Conference in Salalah, Oman on the management of archaeological heritage in South Africa.

In November 2013, I was awarded a bursary from the Department of Arts and Culture to complete the Masters in Philosophy in Conservation of the Built Environment through the UCT Faculty of Engineering and the Built Environment in 2014 and 2015.

I am a paid up member of the Association for Southern African Professional Archaeologists (ASAPA), the Association of Professional Heritage Practitioners (APHP), the Palaeontological Society of South Africa (PSSA) and ICOMOS South Africa, for which I am Vice-President of the Board. I am also a member of the International Committee for Archaeological Heritage Management (ICAHM).

# Curriculum Vitae

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## Tony Barbour

### ENVIRONMENTAL CONSULTING AND RESEARCH

10 Firs Avenue, Claremont, 7708, South Africa  
(Tel) 27-21-761 2355, (Fax) 27-21-761 2355, (Cell) +27-82 600 8266  
(E-Mail) [tbarbour@telkomsa.net](mailto:tbarbour@telkomsa.net)

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Tony Barbour has 24 years' experience in the environmental sector. His experience includes ten years as an environmental consultant in the private sector in South Africa followed by four and a half years at the University of Cape Town's Environmental Evaluation Unit. In 2004 he established his own environmental consulting company, Tony Barbour Environmental Consulting and Research, with a focus on Social Impact Assessment (SIA), Strategic Environmental Assessment (SEA), Independent Review Work, Training and Capacity Building and Environmental Project Management.

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### PERSONAL DETAILS

Tony Barbour, born on 8 June 1961  
Nationality: South African and Irish  
Marital Status: Married

### EDUCATION

- BSc (Geology and Economics) Rhodes, 1984;
- BEcon (Honours) Rhodes, 1985;
- MSc (Environmental Science) University of Cape Town, 1992

### ADDITIONAL QUALIFICATIONS

- Advanced and basic mediation/facilitation skills training course, Centre for Conflict Resolution, University of Cape Town (1999);
- Multi-party negotiation and facilitation skills for natural resource management, MEPC/CIDA (1999).

### ACADEMIC AWARDS

- Schwartz Award, Top Student, Geology III, Rhodes University;
- Shell Medal of Excellence, Top student, Masters Course Work, MSc Environmental Science, UCT.

### AREAS OF EXPERIENCE AND EXPERTISE

Project management, proposal writing, preparation, review and editing of reports and documents, environmental planning and management, Social Impact Assessment (SIA); Environmental Impact Assessment (EIA); Strategic Environmental Assessment (SEA); waste management, environmental economics, facilitation, public participation, training and teaching. Countries with work experience include South Africa, Namibia, Angola, Botswana, Zambia, Lesotho, Swaziland, Ghana, Mozambique, Mauritius, Kenya, Ethiopia, South Sudan, Sudan and Oman.

## **EMPLOYMENT RECORD**

- **Private Consultant:** November 2004-current.
- **University of Cape Town:** August 2000-October 2004, Environmental Evaluation Unit (EEU), University of Cape Town. Senior Environmental Consultant and Researcher;
- **Private sector: 1991-August 2000.** 1991-1996: Ninham Shand Consulting (Cape Town). Senior Environmental Scientist, 1996-August 2000: Steffen, Robertson and Kirsten (SRK Consulting) – Associate Director, Manager Environmental Section, SRK Consulting, Cape Town.

## **RELEVANT AREAS OF EXPERIENCE AND EXPERTISE**

### ***SOCIAL IMPACT ASSESSMENT***

#### ***Infrastructure and development projects***

- SIA for small scale hydropower project on Orange River, South Africa (2015);
- SIA for 150 MW coal power station, Mpumalanga, South Africa (2014);
- SIA for waste to energy plant, Pretoria, South Africa (2014);
- SIA for mixed use development in Khayelitsha, Western Cape (2014);
- SIA for small scale hydro scheme on the Orange River, South Africa (2014);
- SIA for Eskom sub-station and power lines, George, South Africa (2014);
- SIA for Trawal Dam, Clanwilliam, Western Cape Province (2013);
- SIA for Eskom transmission lines from proposed Bantamsklip Nuclear Power Station, Western Cape (2010). Project put on hold after initial scoping phase;
- SIA for Eskom transmission lines from proposed Koeberg Nuclear Power Station, Western Cape (2010);
- SIA Bloubos Road, Somerset West, Western Cape (2010);
- SIA for Boschendal Farm Mixed Use Development, Stellenbosch, Western Cape (2008-current);
- SIA Driftsands Nature Reserve, Cape Town, Western Cape (2009);
- SIA Kidds Beach Golf Estate, East London (2009);
- SIA Swartland Regional Mall, Malmesbury, Western Cape (2009);
- SIA Klipfontein Mixed Use Residential Development, Malmesbury, Western Cape (2009);
- SIA Struisbaai Harbour Development, Struisbaai, Western Cape (2009);
- SIA De Plaat Mixed Use Residential Development, Velddrift, Western Cape (2009);
- SIA Woodlands Golf Estate, East London, Eastern Cape (2009);
- SIA Duttons Cove Residential Development, Herolds Bay, Western Cape (2008);
- SIA Ashton Mixed Use Development, Ashton, Western Cape (2009);
- SIA for Mandela Bay Mixed Development Precinct, Mandela Bay, Eastern Cape (2008);
- SIA for Annandale Mixed Development Precinct, Cape Town, Western Cape (2008);
- SIA for Garden Route Dam development, George, Western Cape (2008);
- SIA for Moropule Coal Power Station, Botswana (2007);
- SIA for proposed residential development near Stillbaai, Western Cape (2007);
- SIA for proposed residential development near Gansbaai, Western Cape (2007);
- SIA Bulk Water Scheme, City of Cape Town, Western Cape (2007);
- SIA Montague Golf Estate, Western Cape (2006);
- SIA for Schalkenbosch Golf Estate, Tulbagh, Western Cape (2006);
- SIA for 2010 World Cup Stadium on Green Point Common, Cape Town (2006);
- SIA for raising of the Clanwilliam Dam, Western Cape (2005-06);
- SIA Kransvlei Golf Estate, Clanwilliam, Western Cape (2005);
- SIA for road up-grade between Gansbaai and Bredadorp, Southern Cape (2005);
- SIA Zeekoevlei Golf Estate, Somerset West, Western Cape (2005)
- SIA Silwersand Golf and Resort Estate, Robertson, Western Cape (2003)
- SIA Assessment for Valkenberg East Site, Cape Town (2003).
- N2 – Outeniqua Pass by-pass, George, SA. Socio-economic assessment for proposed by-pass options between the N2 and the Outeniqua Pass (1997).
- Social Assessment for Sparrebosch Golf Course, Knysna, SA (1996).
- Social Assessment for Riversonderend Road By-pass (1991).

### ***Mining and Industrial projects***

- SIA for Lucunga Mine, Angola (2016);
- Social Labour Plan for Granite Quarry, North West Province, South Africa (2015);
- Social Labour Plan for coal mine in Mpumalanga, South Africa (2014);
- SIA for heavy mineral separation plant, Vredendal, Western Cape Province (2012);
- SIA Otjizondo Manganese Mine, Namibia (2011);
- SIA for upgrade of PPC Riebeeck cement plant, Western Cape, South Africa (2009);
- SIA for Elitheni Coal Mine, Eastern Cape (2008);
- SIA and Resettlement Action Plan (RAP) for Southern Ashanti Gold Mining Project, Ghana (2007);
- SIA for Valencia Uranium Mine, Swakopmund, Namibia (2007);
- SIA for expansion of PPC cement factory, Riebeck West, Western Cape (2007);
- SIA and Social Labour Plan for Xolobeni Heavy Mineral Sands Project, Eastern Cape, South Africa (2007);
- SIA and Social Labour Plan for Tormin Heavy Mineral Sands Project, Western Cape, South Africa (2007);

### ***Renewable energy projects***

- SIAs for wind energy facilities: SIAs for over 50 wind energy projects in Western Cape, Eastern Cape and Northern Cape Province of South Africa (2008-current);
- SIAs for solar energy facilities: SIAs for over 60 solar energy projects in Western Cape, Northern Cape, Free State, North West, Mpumalanga and Limpopo Provinces of South Africa (2009-current).

### ***Strategic social input into projects***

- Social Specialist for funder review based on IFC standards for hydropower project in Zambia (2014-2015);
- Social Specialist for identification of multi-sector investment opportunities in the Eastern Nile Basin, World Bank and Eastern Nile Technical Office (2015);
- SIA as part of SEA undertaken for industrial area located near Wellington, Western Cape Province (2014);
- Social specialist for assessment of large dam developments on the Eastern Nile Basin, specifically the Blue Nile (Abbay River) in Ethiopia and the consequences for the downstream countries of Sudan and Egypt, World Bank and Eastern Nile Technical Office (2012-2013);
- Social specialist for development and design of Decision Support System for the Nile Basin. Input included development of social indicators used to assess water related projects and development scenarios (dams and irrigation schemes) in the Nile Basin (2012);
- Social specialist for the water resource classification of the Olifants/Doorn Catchment Area (Western and Northern Cape Province) (2011-2012).

### ***Social Impact Assessment and Resettlement Guidelines***

- Development of Guidelines for Social Impact Assessment for Department of Environmental Affairs and Development Planning, Western Cape, (2007);
- Development of a Social Assessment and Development Framework for Department of Water Affairs and Forestry, South Africa, including development of guidelines for Social Impact Assessment, Conflict Management, Relocation and Resettlement and Monitoring and Evaluation (2005). The aim of these guidelines was to assist DWAF to identify, assess and manage social impacts (positive and negative) during the design, development, operation and closure of projects.

### ***Resettlement Action Plans (RAPs)***

- RAP for farming community located near Paarl in the Western Cape (current);
- SIA and RAP for Southern Ashanti Gold Mining Project, Ghana (2007);
- RAP for Mare Chicose Landfill Site, Mauritius (2005);
- Maguga Dam, Swaziland. Development of socio-economic monitoring and evaluation programme, including indicators, for the resettlement programme, Swaziland (2001).

### **Waste management projects**

- SIA for Integrated Waste Management Facility, City of Cape Town (2015);
- SIA for Waste to Energy Facility, Wellington, Western Cape (current);
- SIA for Vissershok landfill expansion, Cape Town (2014);
- SIA for Stellenbosch Landfill Site (2011);
- SIA for Barka Landfill Site, Barka, Oman (2011);
- SIA Helderberg Waste Transfer Station, Western Cape, (2009);
- SIA for Mare Chicose Landfill Site, Mauritius (2005);
- SIA for Coastal Park Landfill Site (1998).

### **STRATEGIC ENVIRONMENTAL ASSESSMENT**

- Project Manager SEA for assessment of option to develop biofuels in Northern Namibia (2010-2011);
- Project Manager SEA City of Windhoek, Namibia (2010-2011);
- Project manager and environmental specialist for SEA for Phase 2 of the National Roads Strategy for Mozambique (2007);
- Joint project manager for SEA of Cape Town 2004 Olympic Bid, Cape Town, SA (1999);
- Baralink SEA, Johannesburg, SA. Specialist input on socio-economic aspects for Baralink SEA (1998).
- Series of 4 Strategic Environmental Assessment training courses for officials of the Government of Botswana, 2000 & 2001.
- Guest lecturer in SEA for MPhil course in Environmental Management at University of Cape Town, 2000-2004.
- Paper presented at IAIA 98, Christchurch, New Zealand (1998). Strategic Environmental Assessment of the Cape Town 2004 Olympic Bid,

### **ENVIRONMENTAL IMPACT ASSESSMENT**

Experience includes developing proposals (technical and financial), liaising with clients, authorities and the public, developing terms of reference for specialist sub-consultants, project management and reviewing reports. Projects include:

- Barka Landfill Site, Barka, Oman (2011);
- Darling Wind Farm, Western Cape, South Africa. Environmental assessment of proposed Wind Farm near the town of Darling (2002).
- Walvis Bay Naval Facility, Walvis Bay, Namibia. Environmental assessment of the proposed naval facilities in Walvis Bay (2001).
- Portnet Saldanha, Western Cape, SA. EIA for the expansion of a bulk iron ore export facility at the Port of Saldanha (2000).
- Coastal Park Waste General Waste Site, Cape Town, SA. EIA, including public participation for a large, general waste site (1998).
- Sanderlings Development Plettenberg Bay, SA. EA, including public participation, for proposed residential development adjacent to the coast (1999).
- Stellenbosch Mountain Golf Course Development, Stellenbosch, SA. EIA, including public participation, for golf course, hotel and residential development (1998).
- Sparrebosch EIA, Knysna, South Africa (SA). EIA, including public participation, for golf course, hotel and residential development (1996).
- Stones Hill by-pass, Grahamstown, SA. EIA, including public participation, of a proposed by-pass near Stones-Hill, Grahamstown (1992).
- Riversonderend N2 by-pass, Riversonderend, SA. EIA, including public participation, of a proposed by-pass of the N2 around the town of Riversonderend (1991).

### **REVIEW**

- Review of SIA for N3 by-pass around Harrismith, Free State Province, (2015-16)
- Review of social implications associated with proposed SANRAL N1-N2 Winelands Toll Road

- Project as part of the City of Cape Town's legal challenge of SANRAL's proposal to develop toll roads (2015);
- Internal Review of Gamsberg Zinc Mine SIA for ERM (Northern Cape Province, South Africa), March, 2013;
  - Internal Review of Waterval Tailings Dam SIA for WSP (North West Province, South Africa), March, 2013,
  - Review of SIA for the proposed N1-N2 Winelands Toll Road Project as part of the City of Cape Town's legal challenge to the proposed project (2011-2012);
  - Review of SIA for Nuclear 1 for Arcus Gibb (3 conventional nuclear power plants) located along the western and south eastern coasts of South Africa (2009);
  - Review of SIA for proposed PMBR Plant at Koeberg, Western Cape (2008);
  - Review of specialist reports for the Groot Letaba Dam EIA, Mpumalanga, South Africa (2008).
  - External Review Consultant for SIA component of N2 Wild Coast Toll Road EIA (2008).
  - Internal Review Consultant for Golder Associates on Namakwa Sands Heavy Mineral Mining EIA, Western Cape (2006);
  - Review of EIA for Palm Valley Golf Course Estate, Durbanville, Western Cape (2005);
  - Review of EIA for Zeekoevlei Golf Course Estate, Somerset West, Western Cape (2005);
  - Review of EIA for Oostenberg Waste Transfer Station, Brackenfell, Western Cape (2004);
  - Review of Socio-Economic Study undertaken for the R300 Toll Road EIA, Cape Town, Western Cape (2004);
  - Review of EIA for proposed establishment of Toll booths on Chapman's Peak Drive, Cape Town, Western Cape (2003);
  - Review of EIA for Cell Phone Mast, Cedeberg, Western Cape (2003);
  - Review of EIA for Hotel and Conference Center, Durbanville, Western Cape (2003);
  - Review of EIA for N7 Road Up-grade, Clanwilliam, Western Cape (2002);
  - Review of EIA for Up-grade of Sewage Works, Western Cape (2002).

## **ENVIRONMENTAL RESEARCH**

Experience and projects include:

- Environmental and social specialist for the development of Mozambique Biofuels Strategy (2007).
- Development of strategy for the development of the Environmental Goods and Service Industry in the Western Cape for the Department of Environmental Affairs and Development Planning in the Western Cape (2006).
- Review of the Environmental Goods and Service Industry in South African and development of a strategy for the Department of Trade and Industry, South Africa (2006).
- Chapter on the South African Environmental Goods and Services Industry for study commissioned by the Department of Environmental Affairs and Tourism (2006).
- Integrating Sustainable Development into the Integrated Development Planning Process in South Africa. Review of 4 case studies in SA for the World Summit on Sustainable Development, Johannesburg (2002).
- Development of Integrated Sustainable Transportation Assessment Framework for Transportation Planning in South Africa. Project Manager for joint project between EEU and Urban Transportation Research Group at UCT (2003).
- Project Manager for South African Cleaner Development Mechanism (CDM) initiative being undertaken by South South North Trust. Project involves the recovery of methane gas from the Bellville South Landfill Site in Cape Town (2004)
- Development of Toolkit for incorporating Sustainable Development in to the Integrated Development Planning Process in South Africa (2004).
- Integrating Sustainable Development into the Eastern Cape Province Provincial Growth and Development Plan, 2004-2020 (2003-2004).
- Department of Housing, South Africa. Assessment of options for the development of energy and water efficient low cost housing in South Africa and an assessment of potential financing mechanisms, South Africa (2000).



## **ENVIRONMENTAL PLANNING**

- Development of a Rehabilitation and Land Use Plan for the Alexkor Mining Area in the Richtersveld in the Northern Cape Province (2003-2007). This formed part of a land claim for the Richtersveld Community and included acting as the lead expert witness for the community in the associated court case.
- Southern Cape Spatial Development Framework (SCSDF), Southern Cape Region, SA. Environmental opportunities and constraints assessment for SCSDF study (2000).
- Stellenbosch Rivers Management Plan, Stellenbosch, SA. Integrated management plan for the urban river systems in Stellenbosch (1998).
- Wetton-Lansdowne corridor project, Cape Town, SA. Habitat conservation and biodiversity study to inform planning proposals for the Wetton-Lansdowne corridor (1998).
- Tygerberg Spatial Development Framework, City of Tygerberg, Cape Town, SA. Environmental baseline study for the spatial development framework study for the City of Tygerberg (1999).
- Protea Valley development options, City of Tygerberg, Cape Town, SA. Assessment and identification of suitable land use development options for Protea Valley (2000).

## **WASTE MANAGEMENT**

- Project Manager, Al Wusta Regional Waste Site Investigation, Oman (2011).
- Project Manager, Al Batinah Regional Waste Site Investigation, Oman (2011);
- Project Manager, Barka Landfill Site EIA, Muscat, Oman (2010);
- Mare Chicose Landfill, Mauritius. SIA and Compensation and Relocation Plan for proposed expansion of the current landfill site (2005).
- Robertson Waste Site, Robertson, SA. EA, including public participation, for the identification of a new waste site (2000).
- Project Manager, Coastal Park General Waste Site, Cape Town, SA. EIA for proposed expansion of a large, general waste site (1998).
- Project Manager, Windhoek general and hazardous waste site, Windhoek, Namibia. Investigation to identify new general and hazardous waste disposal site for Windhoek (1997).
- Project Manager, Walvis Bay general and hazardous waste site, Walvis Bay, Namibia. Investigation to identify new general and hazardous waste disposal site for Walvis Bay (1998).
- Project Manager, Port Elizabeth Waste Site, Port Elizabeth, SA. Environmental Assessment for permit application (1998).
- Project Manager, Brackenfell general waste site, Cape Town, SA. Permit application report and environmental assessment for Brackenfell waste site (1995).
- Project Manager, Ceres general waste site, Ceres, SA. Permit application report and environmental assessment for Ceres waste site (1995)
- Project Manager, Caledon general waste site, Caledon, SA. Permit application report and environmental assessment for Caledon waste site (1996).
- Project Manager, Wellington general waste site, Wellington, SA. Permit application report and environmental assessment for Wellington waste site (1996).
- Project Manager, Greyton general waste site, Greyton, SA. Permit application report and environmental assessment for Greyton waste site (1999);

## **ENVIRONMENTAL TRAINING AND CAPACITY BUILDING**

Experience includes design of training courses, development of training manuals and running courses for both the private and public sector. Courses include:

- 2 X 5 day course on Resource Economics for Coastal Managers and Government Officials, Namibian Government (2009).
- 5 day course on EIA and Environmental Management course for Swaziland Local Authorities, 2004.
- Integrated Coastal Management course for Department of Marine and Coastal Management, 2004.
- 5 regional Social Assessment Training Workshops for officials from the South African Department of Water Affairs and Forestry, 2004.

- EIA training course for officials of the South African National Parks, Kruger National Park, 2003.
- Environmental Management course for Shell South Africa, 2003.
- 10 Local Agenda (LA) 21 training courses for provincial and local government departments in South Africa during period 2000-2002.
- Resource Economics Workshop for South African Department of Water Affairs and Forestry, 2002.
- Conflict Resolution Workshop for subsistence fishermen, Kwa-Zulzu Natal, 2002.
- Integrating the principles of LA 21 into Integrated Development Planning. Course presented at World Summit on Sustainable Development, Johannesburg, 2002.
- Environmental facilitation, mediation and conflict management. Training course for Independent Mediation Services in South Africa (IMSSA) facilitators, 1998, 1999 and 2000.
- Series of 4 Strategic Environmental Assessment training courses for officials of the Government of Botswana, 2000 & 2001.
- EIA training course for officials of the Government of Lesotho, 2000 and 2001.
- EIA training courses for local government officials in Cape Town, 2000.

### ***LECTURING AND TEACHING***

Experience includes lecturing and teaching at an under and post-graduate level since 1990. The areas of interest include Environmental Economics, EIA, SEA, SIA and Waste Management.

- Guest Lecturer in SIA, Department of Environmental and Geographical Science and Department of Planning, University of Cape Town (current);
- Lecturer in Environmental Economics for the MPhil course in Environmental Management at University of Cape Town from 1990 –2006.
- Guest lecturer in SIA, EIA and SEA for MPhil course in Environmental Management at UCT, 2000-2004.
- Coordinator and lecturer in Environmental Economics at Cape Technikon, 1999.
- Coordinator and lecturer of waste management course, Peninsula Technikon in 1998.
- Guest lecturer at Peninsula Technikon for waste management, 1994 – 1998.
- Moderator for Peninsula Technikon waste management course, 1994-2002.
- Environmental Management for senior managers, module on a business management course for AngloVaal Management run by Prof John Simpson of UCT, 2000 and 2001.
- Guest lecturer on SIA and EIA for Geography and Environmental Science Honours, UCT. 2000-2004.
- Presenter and coordinator on annual Integrated Environmental Management Short Course run by the Environmental Evaluation Unit at UCT (2000-2006).
- Presenter on Integrated Coastal Management course run by Environmental Evaluation Unit at UCT 2005-2006.

### ***PUBLIC PARTICIPATION***

Experience includes designing public participation processes and facilitating public meetings and workshops. Projects include:

- SEA for Wellington Industrial Area, managed and facilitated public meetings and workshops (2014).
- Green Point Common, Cape Town. Public participation and facilitation processes for development of new market area for informal traders (2005);
- Chapman's Peak Drive. Managed and facilitated the public participation processes for looking at the technical and funding options for re-opening Chapman's Peak Drive on the Cape Peninsula as a toll road (2001).
- Visserhok Hazardous waste disposal sites, Cape Town City Council and Wastetech, Cape Town, SA. Managed and facilitated the public participation processes for the permit application for two hazardous waste sites located at Visserhok (1994).
- Grand West Casino, Cape Town. Public participation processes for proposed establishment of the Grand West Casino at the Cape Show Grounds, Cape Town (1997).
- Coastal Park waste site, Cape Town, SA. Managed and facilitated public participation processes for the permit application for the Coastal Park general waste site (1998).

- Managed and facilitated public participation processes associated with EIA's listed above.

### ***ENVIRONMENTAL MANAGEMENT PLANS AND REHABILITATION REPORTS***

- Development of rehabilitation programme and cost estimate for damage caused by 80 years of alluvial diamond mining between Alexander Bay and Port Nolloth, West Coast, South Africa (current). This project is linked to the Richtersveld Land Claim and involved acting as an expert witness in the associated court case.
- Corridor Sands Heavy Mineral Project, Mozambique. Development of an Environmental Management Plan (EMP) for the construction phase of the project (2001).
- Walvis Bay Naval facilities, Walvis Bay, Namibia. EMP for the construction phase of the project (2001).
- APC cement factory, Otjiwarongo, Namibia. Operational management plan for up-grade to meet the legislative requirements (2000).
- Sparrebosch golf course, hotel and residential development, Knysna, SA. Environmental Management Plan (EMP) for the construction phase (1997).
- M3 highway up-grade, Johannesburg, SA. EMP for the design and construction phase of the M3 (1995).
- Trunk Road 46, Grahamstown-Port Alfred, Eastern Cape, SA. EMP for the construction phase (1994).
- Trunk Road 46, Grahamstown to Port Alfred, Eastern Cape, SA. Rehabilitation proposals for borrow pits, quarries, cuts, fills and road surfaces (1993).
- Trunk Road 19, Maclear to Halcyon Drift, Eastern Cape, SA. Rehabilitation proposals for borrow pits and quarries (1992).
- Namakwa Sands, Heavy Mineral Mining Operation, West Coast SA. Conceptual Rehabilitation Plan (1991).

### ***ENVIRONMENTAL MANAGEMENT SYSTEMS AND AUDITS***

- APC Cement Factory, Otjiwarongo, Namibia. Operational audit of APC cement factory to assess compliance with Namibian legislation (2000).
- Vodacom, SA. Conceptual Development of an Environmental Policy and outline for an Environmental Management System for Vodacom, SA (1998).
- Marine Oil, SA, initial site audit (1999).
- Rose Foundation, SA. Audit of 15 waste oil-recycling facilities in SA (1997).
- Zambian Copper Belt, Zambia. Pre-acquisition audit of 20 electrical transformer stations (1997).

### ***SUPERVISION OF STUDENTS***

- 1994-2006: Supervision of the thesis component of MPhil in Environmental Management for a number of students. Usually requested to act as supervisor for at least one or two students per year.
- Internal and external examiner for a number of theses submitted in fulfillment of the MPhil Environmental Management at UCT.

### ***PUBLICATIONS AND PAPERS***

#### ***Environmental publications and guidelines***

- Principal Author of Health, Safety and Environmental Guidelines for Bitumen and Coal Tar Products, prepared for the SA Bitumen Association (Sabita), in 1994 and revised in 1998.
- Co-author of document outlining an integrated Waste Management Strategy for the Western Cape, SA, produced in 1995;
- Principal Author of Guidelines for Waste Management in South Africa, a handbook for local authorities, produced by Ninham Shand in 1993.

## ***Papers and articles***

The majority of the articles aimed at the layperson as opposed to journal articles.

1. SOWMAN, M R, GLAZEWSKI, J I, FUGGLE, R F, BARBOUR, A (1990) " Planning and legal responses to sea-level rise in South Africa", South African Journal of Science, v 86, 1990.
2. BARBOUR, T (1992) 'Addressing the social impacts of waste disposal by incorporating permit applications into the latest Integrated Environmental Management (IEM) procedures", Paper presented at Wastecon '92, 3 – 5 November 1992.
3. BARBOUR, T (1992) "Internalising externalities: An attempt to address social costs", paper presented at a workshop on the Economy and Environment, 25 November 1992.
4. BARBOUR, T (1993) "The importance of taking waste disposal seriously", IMIESA, v 18 no 7 July 1993.
5. BARBOUR, T (1993) "Community based waste collection", Earthyear 5<sup>th</sup> edition, winter 1993.
6. BARBOUR, T (1993) "Guidelines for waste management in South Africa", Ninham Shand, 1993.
7. BARBOUR, T (1994) "Quarry Rehabilitation Reports: Are they effective working documents or merely legal requirements?", EPM, v 5, no 2, February 1994.
8. BARBOUR, T (1994) "Environmental factors relating to site selection for dams", Paper presented at SAICE one-day seminar on earth dam design, 3 June 1994.
9. BARBOUR, T (1994) "Environmental Economics", Earthyear 7<sup>th</sup> edition, Summer 1994.
10. BARBOUR, T (1996) "Lessons learnt from Vissershok for public participation and landuse planning", Paper presented at Wastecon 96, Durban, South Africa.
11. BARBOUR, T and COLEMAN, A (1996) "Towards an integrated waste management strategy for the Western Cape", Paper presented at Wastecon 96, Durban, South Africa.
12. BARBOUR, T (1998) Strategic Environmental Assessment of the Cape Town 2004 Olympic Bid", paper presented at IAIA 98, Christchurch, New Zealand.
13. BARBOUR, T (2000) Robertson Waste Site: A Case Study, paper presented at Wastecon 2000, Somerset West, SA.
14. BARBOUR, T (2000) National Environmental Management Act: Implications for Waste Management and the Minimum Requirements, paper presented at Wastecon 2000, Somerset West, SA.
15. BARBOUR, T (2001). The role of economic incentives in promoting and/or improving environmental rights. Paper presented a Conference on Environmental Rights, Cape Town, 30 July 2001.
16. BARBOUR, T (2002). The role of environmental assessments in land-use planning. Paper presented at Southern African Town Planning Conference, Somerset West, 18-19 March 2002.
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## APPENDIX 3: REHABILITATION MANAGEMENT PLAN

# REVEGETATION AND REHABILITATION PLAN

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## 1. PURPOSE

The purpose of the Revegetation and Rehabilitation Plan is to ensure that areas cleared or impacted during construction activities within the development footprint for the Kwana Solar PV Facility, and that are not required for operation, are rehabilitated to their original state before the operation phase commences, and that the risk of erosion from these areas is reduced. The purpose of the Rehabilitation Plan for the site can be summarised as follows:

- » Achieve long-term stabilisation of all disturbed areas.
- » Re-vegetate all disturbed areas with suitable local plant species.
- » Minimise visual impact of disturbed areas.
- » Ensure that disturbed areas are rehabilitated to a condition similar to that found prior to disturbance.

This Revegetation and Rehabilitation Plan must be read in conjunction with other relevant site-specific plans. Prior to the commencement of construction, a detailed Revegetation and Rehabilitation Plan and Method Statement for the site must be compiled with the aid of a suitably qualified and professionally registered specialist (with a botanical or equivalent qualification).

## 2. RELEVANT ASPECTS OF THE SITE

There are three plant species listed as Rare (*Anisodonteia malavastroides*, *Aloe broomii* var. *tarkaensis* and *Tridentea virescens*) that could potentially occur on site, but these are all three widespread species that are naturally rare where they are found. None have been previously recorded on this site. There are also two plant species protected according to National legislation (*Crinum bulbispermum* and *Harpagophytum procumbens*) that could potentially occur in the geographical area, but these are also very widespread species. In all five cases the loss of some individuals, if they are found to occur on site, would not affect the conservation status of any of the species. It is, however, unlikely that any of them would be affected.

There are a small number of fauna species of conservation concern that were assessed as having a possibility of occurring on site. The Riverine Rabbit has been previously recorded in the grid in which the site is found and there are some small patches of habitat that are marginally suited to the species, but the known distribution of the species does not include the site and it is not known to occur in this area so it is therefore considered unlikely that it would be found on site. All other species listed here are highly mobile species that are unlikely to be affected by any activities on site.

## 3. REHABILITATION METHODS AND PRACTISES

The following general management practices should be encouraged or strived for:

- » Clearing of invaded areas must be conducted as per the Alien Management Plan, included in the EMPr.
- » No harvesting of vegetation may be undertaken outside the area to be disturbed by construction activities.
- » Indigenous plant material must be kept separate from alien material.

- » Indigenous seeds may be harvested for purposes of revegetation in areas that are free of alien invasive vegetation, either at the site prior to clearance or from suitable neighbouring sites.
- » Topsoil must be reserved wherever possible on site, to be utilised during rehabilitation.
- » Sods used for revegetation must be obtained directly from the site, but not from the sensitive areas. Sods must contain at least a 50mm topsoil layer and be minimally disturbed, in particular to existing root systems. Sods must ideally be obtained from areas as close as possible to the region that is to be rehabilitated.
- » Water used for the irrigation of re-vegetated areas must be free of chlorine and other pollutants that might have a detrimental effect on the plants.
- » All seeded, planted or sodded grass areas and all shrubs or trees planted are to be irrigated at regular intervals.
- » On steep slopes and areas where seed and organic matter retention is low, it is recommended that soil savers are used to stabilise the soil surface. Soil savers are man-made materials, usually constructed of organic material such as hemp or jute and are usually applied in areas where traditional rehabilitation techniques are not likely to succeed.
- » In areas where soil saver is used, it must be pegged down to ensure that it captures soil and organic matter flowing over the surface.
- » The final rehabilitated area must resemble the current composition and structure of the soil as far as practicably possible.
- » Progressive rehabilitation is an important element of the rehabilitation strategy and must be implemented where feasible.
- » No construction equipment, vehicles or unauthorised personnel must be allowed onto areas that have been rehabilitated.
- » Where rehabilitation sites are located within actively grazed areas, they must be fenced off, this must be undertaken in consultation with the landowner.
- » Any runnels, erosion channels or wash-aways developing after revegetation must be backfilled and consolidated and the areas restored to a proper stable condition.
- » Re-vegetated areas must be monitored frequently and prepared and revegetation from scratch should inadequate signs of surface coverage or growth be evident after two growth seasons. Adequate recovery must be assessed by a qualified botanist or rehabilitation specialist.
- » The stockpiled vegetation from the clearing operations must be reduced to mulch where possible and retained along with topsoil to encourage seedbank regrowth and soil fertility.
- » Mulches must be collected in such a manner as to restrict the loss of seed.
- » Mulch must be stored for as short a period as possible.
- » Mulch is to be harvested from areas that are to be denuded of vegetation during construction activities, provided that they are free of seed-bearing alien invasive plants.
- » Where herbicides are used to clear vegetation, species-specific chemicals must be applied to individual plants only. General spraying must be strictly prohibited, and only the correct herbicide type must be applied.
- » Once rehabilitated, areas must be protected to prevent trampling and erosion.
- » Fencing must be removed once a sound vegetative cover has been achieved.

#### **4. MONITORING AND FOLLOW-UP ACTION**

Throughout the lifecycle of the development, regular monitoring and adaptive management must be in place to detect any new degradation of rehabilitated areas. During the construction phase, the Environmental Officer (EO) and EPC Contractor will be responsible for initiating and maintaining a suitable

monitoring system. Once the development is operational, the Developer will need to identify a suitable entity that will be able to take over and maintain the monitoring cycle and initiate adaptive management as soon as it is required. Monitoring personnel must be adequately trained.

The following are the minimum criteria that must be monitored:

- » Associated nature and stability of surface soils.
- » Re-emergence of alien and invasive plant species. If noted, remedial action must be taken immediately, as per the alien management plan and mitigation measures contained within the EMPr.

Rehabilitation success, monitoring and follow-up actions are important to achieve the desired cover and soil protection. The following monitoring protocol is recommended:

- » Rehabilitation areas must be monitored every 4 months for the first 12 months following construction, or as per the recommendations of specialist.
- » Ensure that steep slopes are not de-vegetated unnecessarily and subsequently become hydrophobic (i.e. have increased runoff and a decreased infiltration rate) increasing the erosion potential.
- » Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilisation. Therefore, the timeframe between construction activities and rehabilitation must be minimised. Phased construction and progressive rehabilitation, where practically possible, are therefore important elements of the erosion control and rehabilitation strategy.
- » Any areas showing erosion, must be adaptively managed with particular erosion control measures, depending on the situation.

If the current state of the environment prior to construction (which will be disturbed during the construction phase) is not achieved post impact, within the specified rehabilitation period, maintenance of these areas must continue until an acceptable state is achieved (excluding alien plant species or weeds). Additional rehabilitation methods may be necessary to achieve the current state before construction commences.

Monitoring of the rehabilitation success, as well as follow-up adaptive management, combined with the clearing of emerging alien plant species must all continue for as long as is considered necessary, depending on regrowth rates.



## APPENDIX 4: ALIEN VEGETATION MANAGEMENT PLAN

# ALIEN PLANT AND OPEN SPACE MANAGEMENT PLAN

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## 1. PURPOSE

Invasive alien plant species pose the second largest threat to biodiversity after direct habitat destruction. The purpose of this Alien Plant and Open Space Management Plan is to provide a framework for the management of alien and invasive plant species during the construction and operation of the Kwana Solar PV Facility and the associated infrastructure. The broad objectives of the plan include the following:

- » Ensure alien plants do not become dominant in parts of the site, or the whole site, through the control and management of alien and invasive species presence, dispersal, and encroachment.
- » Develop and implement a monitoring and eradication programme for alien and invasive plant species.
- » Promote the natural re-establishment and planting of indigenous species in order to retard erosion and alien plant invasion.

This plan should be updated throughout the life cycle of the wind farm, as required in order to ensure that appropriate measures are in place to manage and control the establishment of alien and invasive plant species and to ensure compliance with relevant legislation.

## 2. LEGISLATIVE CONTEXT

### ***Conservation of Agricultural Resources Act (Act No. 43 of 1983)***

In terms of the amendments to the regulations under the Conservation of Agricultural Resources Act (Act No. 43 of 1983), all declared alien plant species must be effectively controlled. Landowners are legally responsible for the control of invasive alien plants on their properties. In terms of this Act, alien invasive plant species are ascribed to one of the following categories:

- » Category 1: Prohibited and must be controlled.
- » Category 2 (commercially used plants): May be grown in demarcated areas provided that there is a permit and that steps are taken to prevent their spread.
- » Category 3 (ornamentally used plants): May no longer be planted. Existing plants may be retained as long as all reasonable steps are taken to prevent the spreading thereof, except within the flood line of watercourses and wetlands.

### ***National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004)***

The National Environmental Management: Biodiversity Act (NEM:BA) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Regulations have been published in Government Notices R.506, R.507, R.508 and R.509 of 2013 under NEM:BA. According to this Act and the regulations, any species designated under Section 70 cannot be propagated, grown, bought or sold without a permit. Below is an explanation of the three categories:

- » **Category 1a:** Invasive species requiring compulsory control. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.

- » **Category 1b:** Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
- » **Category 2:** Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
- » **Category 3:** Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

The following guide is a useful starting point for the identification of alien plant species: Bromilow, C. 2010. Problem Plants and Alien Weeds of South Africa. Briza, Pretoria.

It is important to note that alien plant species that are regulated in terms of the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) as weeds and invader plants are exempted from NEM:BA. This implies that the provisions of the CARA in respect of listed weed and invader plants supersede those of NEM: BA.

### **3. ALIEN PLANT MANAGEMENT PRINCIPLES**

#### **3.1. Prevention and early eradication**

A prevention strategy should be considered and established, including regular surveys and monitoring for invasive alien plants, effective rehabilitation of disturbed areas and prevention of unnecessary disturbance of natural areas.

Monitoring plans should be developed which are designed to identify Invasive Alien Plant Species already on site, as well as those that are introduced to the site by the construction activities. Keeping up to date on which weeds are an immediate threat to the site is important, but efforts should be planned to update this information on a regular basis. When additional Invasive Alien Plant Species are recorded on site, an immediate response of locating the site for future monitoring and either hand-pulling the weeds or an application of a suitable herbicide (where permissible only) should be planned. It is, however, better to monitor regularly and act swiftly than to allow invasive alien plants to become established on site.

#### **3.2. Containment and control**

If any alien invasive plants are found to become established on site, action plans for their control should be developed, depending on the size of the infestations, budgets, manpower considerations and time. Separate plans of control actions should be developed for each location and/or each species. Appropriate registered chemicals and other possible control agents should be considered in the action plans for each site/species. The use of chemicals are not recommended for any wetland areas. Herbicides should be applied directly to the plant and not to the soil. The key is to ensure that no invasions get out of control. Effective containment and control will ensure that the least energy and resources are required to maintain this status over the long-term. This will also be an indicator that natural systems are impacted to the smallest degree possible.

### 3.3. General Clearing and Guiding Principles

Alien species control programmes are long-term management projects and should consist of a clearing plan which includes follow up actions for rehabilitation of the cleared area. The lighter infested areas should be cleared first to prevent the build-up of seed banks. Pre-existing dense mature stands ideally should be left for last, as they probably won't increase in density or pose a greater threat than they are currently. Collective management and planning with neighbours may be required in the case of large woody invaders as seeds of alien species are easily dispersed across boundaries by wind or watercourses. All clearing actions should be monitored and documented to keep records of which areas are due for follow-up clearing.

#### i. Clearing Methods

Different species require different clearing methods such as manual, chemical or biological methods or a combination of both. Care should however be taken so that the clearing methods used do not encourage further invasion and that they are appropriate to the specific species of concern. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum.

Fire should not be used for alien species control or vegetation management at the site. The best-practice clearing method for each species identified should be used.

#### » Mechanical control

This entails damaging or removing the plant by physical action. Different techniques could be used, e.g. uprooting, felling, slashing, mowing, ringbarking or bark stripping. This control option is only really feasible in sparse infestations or on a small scale, and for controlling species that do not coppice after cutting. Species that tend to coppice, need to have the cut stumps or coppice growth treated with herbicides following the mechanical treatment. Mechanical control is labour intensive and therefore expensive and could cause severe soil disturbance and erosion.

#### » Chemical Control

Although it is usually preferable to use manual clearing methods where possible, such methods may create additional disturbance which stimulates alien plant invasion and may also be ineffective for many woody species which re-sprout. Where herbicides are to be used, the impact of the operation on the natural environment should be minimised by observing the following:

- \* Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- \* All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.
- \* Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of at a suitable site.
- \* To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation.
- \* Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.
- \* The appropriate health and safety procedures should also be followed regarding the storage, handling and disposal of herbicides.
- \* The use of chemicals is not recommended for wetland areas.

For all herbicide applications, the following Regulations and guidelines should be followed:

- \* Working for Water: Policy on the Use of Herbicides for the Control of Alien Vegetation.
- \* Pesticide Management Policy for South Africa published in terms of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947) – GNR 1120 of 2010.
- \* South African Bureau of Standards, Standard SANS 10206 (2010).

According to Government Notice No. 13424 dated 26 July 1992, it is an offence to “*acquire, dispose, sell or use an agricultural or stock remedy for a purpose or in a manner other than that specified on the label on a container thereof or on such a container*”.

Contractors using herbicides need to have a valid Pest Control Operators License (limited weeds controller) according to the Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947). This is regulated by the Department of Environment, Forestry and Fisheries.

» **Biological control**

Biological weed control consists of the use of natural enemies to reduce the vigour or reproductive potential of an invasive alien plant. Biological control agents include insects, mites, and micro-organisms such as fungi or bacteria. They usually attack specific parts of the plant, either the reproductive organs directly (flower buds, flowers or fruit) or the seeds after they have dropped. The stress caused by the biological control agent may kill a plant outright or it might impact on the plant's reproductive capacity. In certain instances, the reproductive capacity is reduced to zero and the population is effectively sterilised. All of these outcomes will help to reduce the spread of the species.

To obtain biocontrol agents, provincial representatives of the Working for Water Programme or the Directorate: Land Use and Soil Management (LUSM), Department of Environment, Forestry and Fisheries (DEFF) can be contacted.

### **3.4. General management practices**

The following general management practices should be encouraged or strived for:

- » Establish an on-going monitoring programme for the construction phase to detect and quantify any alien species that may become established.
- » Alien vegetation regrowth on areas disturbed by construction must be immediately controlled.
- » Care must be taken to avoid the introduction of alien invasive plant species to the site. Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment.
- » Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.
- » Cleared areas that have become invaded by alien species can be sprayed with appropriate herbicides provided that these herbicides break down on contact with the soil. Residual herbicides should not be used.
- » The effectiveness of vegetation control varies seasonally, and this is also likely to impact alien species. Control early in the wet season will allow species to regrow, and follow-up control is likely to be required. It is tempting to leave control until late in the wet season to avoid follow-up control. However, this may allow alien species to set seed before control, and hence will not contribute towards reducing alien species abundance. Therefore, vegetation control should be aimed at the

middle of the wet season, with a follow-up event towards the end of the wet season. There are no exact dates that can be specified here as each season is unique and management must therefore respond according to the state and progression of the vegetation.

- » Alien plant management is an iterative process, and it may require repeated control efforts to significantly reduce the abundance of a species. This is often due to the presence of large and persistent seed banks. However, repeated control usually results in rapid decline once seed banks become depleted.
- » Some alien species are best individually pulled by hand. Regular vegetation control to reduce plant biomass within the site should be conducted. This should be timed so as to coincide with the critical growth phases of the most important alien species on site. This will significantly reduce the cost of alien plant management as this should contribute towards the control of the dominant alien species and additional targeted control will be required only for a limited number of species.
- » No alien species should be cultivated on-site. If vegetation is required for aesthetic purposes, then non-invasive, water-wise locally occurring species should be used.
- » During operation, surveys for alien species should be conducted regularly. It is recommended that this be undertaken every 6 months for the first two years after construction and annually thereafter. All alien plants identified should be cleared using appropriate means.

### 3.5. Monitoring

In order to assess the impact of clearing activities, follow-ups and rehabilitation efforts, monitoring must be undertaken. This section provides a description of a possible monitoring programme that will provide an assessment of the magnitude of alien plant invasion on site, as well as an assessment of the efficacy of the management programme.

In general, the following principles apply for monitoring:

- » Photographic records must be kept of areas to be cleared prior to work starting and at regular intervals during initial clearing activities. Similarly, photographic records should be kept of the area from immediately before and after follow-up clearing activities. Rehabilitation processes must also be recorded.
- » Simple records must be kept of daily operations, e.g., area/location cleared, labour units and, if ever used, the amount of herbicide used.
- » It is important that, if monitoring results in detection of invasive alien plants, that this leads to immediate action.

The following monitoring should be implemented to ensure management of alien invasive plant species.

#### **Construction Phase**

Monitoring Action	Indicator	Timeframe
Document alien species present at the site	List of alien plant species	Preconstruction Monthly during Summer and Autumn 3 Monthly during Winter and Spring
Document alien plant distribution	Alien plant distribution map within priority areas	3 Monthly
Document and record alien plant control measures implemented	Record of clearing activities	3 Monthly

### **Operation Phase**

<b>Monitoring Action</b>	<b>Indicator</b>	<b>Timeframe</b>
Document alien plant species distribution and abundance over time at the site	Alien plant distribution map	Biannually
Document alien plant control measures implemented, and success rate achieved	Records of control measures and their success rate A decline in alien distribution and cover over time at the site	Biannually
Document rehabilitation measures implemented, and success achieved in problem areas	Decline in vulnerable bare areas over time	Biannually

