

Red Cap Investments (Pty) Ltd



**Draft Environmental Management Programme
for a Wind Farm in the Kouga Local
Municipality**

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DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME FOR A WIND FARM IN THE KOUGA LOCAL MUNICIPALITY

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1 INTRODUCTION

Red Cap Investments (Pty) Ltd. (hereafter referred to as 'Red Cap') proposes to establish a commercial wind farm and associated infrastructure in the greater Kouga area south of the N2, stretching from St Francis Bay in the east to the Tsitsikamma River on the western boundary of the development.

Red Cap appointed Arcus GIBB (Pty) Ltd as the Environmental Assessment Practitioner (EAP) to undertake the legally required Environmental Impact Assessment (EIA) of the proposed Koega wind farm project, which commenced in January 2009. Arcus GIBB developed this draft Environmental Management Programme (EMP) as part of the EIA process. The draft EMP follows on from the Environmental Impact Assessment Report (EIR), in as much as all the measures for mitigation of impacts that were identified during the EIA are incorporated. The EMP covers the pre-construction planning and design, construction, operational and decommissioning phases of the Koega wind farm project.

This draft Environmental Management Programme will accompany the Final EIR to the competent authority for review and approval through an Environmental Authorisation, should it be granted. It is important to note that the EMP must be amended to incorporate any additional specifications required in terms of the Environmental Authorisation and any additional requirements the proponent may find necessary.

1.1 EMP Structure

This EMP is structured as follows:

Chapter 1	Provides the introduction and details of proponent; Environmental Assessment Practitioner that undertook the EIA and the authorities that dealt with the application for Environmental Authorisation
Chapter 2	Presents the Glossary of Terms
Chapter 3	Sets the context of the EMP; including brief descriptions of the EMP objectives; project overview; EMP revisions and authorisations; EMP structure, contractual obligations and legislative compliance
Chapter 4	Provides details on the roles and responsibilities; compliance monitoring and reporting of various role-players
Chapter 5	Provides details on requirements, procedures and content of specific method statements to be developed for the project
Chapter 6	Defines the environmental specifications to be adhered to during the pre-construction phase of the project
Chapter 7	Defines the environmental specifications to be adhered to during the construction phase of the project



Chapter 8 Defines the environmental specifications to be adhered to during the decommissioning phase of the project

Chapter 9 Concludes the EMP.

1.2 Details of the Project Team

This section provides details on the planning team that was involved in the development of the draft EMP. The team includes the proponent organisation and Environmental Assessment Practitioner. Details of the contact persons are provided.

1.2.1 The Proponent: Red Cap

Details of the Red Cap contact person are provided below.

Name of Applicant:	Red Cap Investments (Pty) Ltd
Contact Person:	Mr Lance Blaine
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Fax:	
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1.2.2 The Environmental Assessment Practitioner: Arcus GIBB (Pty) Ltd

Arcus GIBB (Pty) Ltd, is a multi-disciplinary engineering and environmental consultancy organisation. Arcus GIBB's Environmental Division has a proven track record in the planning, co-ordination, management and execution of a wide range of environmental projects, including EIAs and EMPs.

Details of EAP's that prepared the draft EMP are as follows:

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Postal Address:	PO BOX 1365 Westville



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Expertise	BSc (Hons) Environmental Management <i>Pri.Sci.Nat</i> 10 years of experience in undertaking EIAs and associated EMPs

Name	Ms Rashieda Davids (nee Thomas)
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Fax:	031 266 3310
E-mail:	rdavids@gibb.co.za
Expertise	BSc Hons Environmental Management 5 years of experience in undertaking EIAs and associated EMPs

1.2.3 The Environmental Authority: Department of Environmental Affairs

The Department of Environmental Affairs (DEA) is the designated authority responsible for authorising the EIA and this EMP. DEA has overall responsibility for ensuring that the applicant, Red Cap, complies with the conditions of its Environmental Authorisation as well as this EMP.



2 GLOSSARY OF TERMS, DEFINITIONS AND ABBREVIATIONS

Construction Activity	A construction activity is any action taken by the Contractor, his Sub Contractors, suppliers or personnel during the construction process.
Contractor	That main organisation appointed by the Developer, through the Project Manager, to undertake construction activities on the site.
DEA	Department of Environmental Affairs
Demolition	The tearing down of buildings and other structures: the opposite of construction.
Developer	Red Cap Investments (Pty) Ltd
ECO	Environmental Control Officer The ECO monitors compliance with the EMP during the construction phase and advises the Project Manager on environmental matters relating to construction.
EMP	Environmental Management Programme The EMP for the project sets out general instructions that will be included in a contract document for the construction phase of the project. The EMP will ensure the construction activities are conducted and managed in an environmentally sound and responsible manner. The EMP also details the organisational structure required to ensure the effective implementation of the EMP and measures to monitor and improve the application of the EMP.
Environment	Means the surroundings within which humans exist and that are made up of: a. The land, water and atmosphere of the earth; b. Micro-organisms, plant and animal life; c. Any part or combination of a) and b) and the interrelationships among and between them; and d. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.
Environmental Specifications	Instructions and guidelines for specific construction activities designed to help prevent, reduce and/or control the potential environmental implications of these construction activities.
Method Statement	A written submission by the Contractor to the Project Manager in response to the Specification setting out the plant, materials, labour, timing and method the Contractor proposes using to carry out an activity. The Method Statement shall cover applicable details with regard to: <ul style="list-style-type: none">• Construction 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 solid material that may occur
- Timing and location of activities
- Compliance/ non-compliance with the Specifications
- Any other information deemed necessary by the PM.

Micro-siting	The on-site final checking and repositioning with input of relevant specialists, of all wind turbines and associated infrastructure locations as per Layout 3.
MSDS	Material Safety Data Sheet
Project	This refers to all construction activities associated with the proposed activities.
PM	Project Manager or Representative of appointed firm responsible for overall management of the construction phase of the project including the management of all Contractors.
Rehabilitation	Rehabilitation is defined as the return of a disturbed area, feature or structure to a state that approximates to the state (where possible) that it was before disruption, or to an improved state.
SHE	Safety, Health and Environment
Solid Waste	Means all solid waste, including construction debris, chemical waste, excess cement/concrete, wrapping materials, timber, tins and cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).



3 SETTING THE CONTEXT

3.1 Brief overview of the proposed project

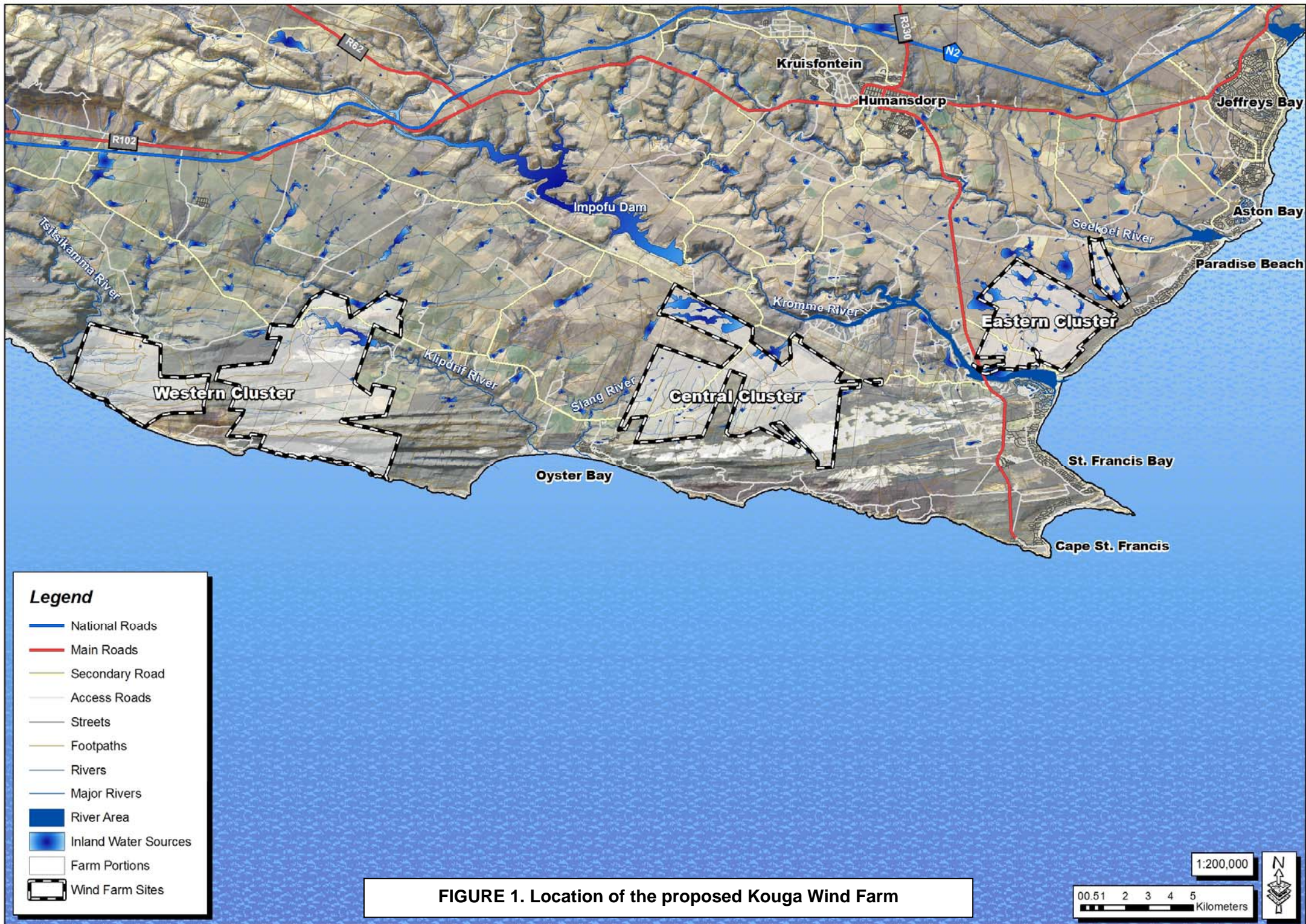
Red Cap proposes to develop a wind farm near the villages of St Francis Bay and Oyster Bay in the Eastern Cape. The proposed development site spans three areas: the eastern cluster close to Cape St Francis; the central cluster close to Oyster Bay and the western cluster close to the mouth of the Tsitsikamma River (see Figure 1)

3.2 Objectives of the EMP

It is imperative that the remedial and mitigation requirements identified during the EIA process are effectively realised during construction, operation through to the final decommissioning phase of the project. Accordingly, the EMP plays a key role in the implementation of consistent and continued environmental management for the duration of the project life cycle.

Specifically, this Kogea wind farm EMP aims to:

- Draw attention to all the key environmental management requirements applicable to the project
- Organise environmental management requirements for the various phases of the project in a meaningful and structured way
- Provide an environmental management planning document for incorporation into construction tender and contract documents, commissioning procedures, operational Environmental Management System (EMS), decommissioning and final site remediation procedures
- Be used as an 'environmental gate keeper' for contractor assessment prior to appointment
- Define and outline the functions, roles and responsibilities of accountable persons for effective environmental management
- Outline mitigation measures and environmental specifications which are required to be implemented during various phases of the project, in order to minimise the extent of- and to manage- environmental impacts associated with the project through effective control
- Identify the requirements for detailed Method Statements (construction phase) and safe operating procedures (operational and decommissioning phases) for certain aspects or activities





- Prevent long-term or permanent environmental degradation
- Define requirements and procedures for monitoring
- Outline procedures for environmental management and control, in the event of pollution or similar incidents.

3.3 EMP Revisions and Authorisation

The EMP and its associated environmental specifications may be amended at various stages of the Kogea wind farm project. Anticipated events that would ‘trigger’ the need for an update and amendment of the EMP are as follows:

- Receipt of the Environmental Authorisation
- Significant change in applicable environmental legislation
- Instructions from DEA to do so
- Changing circumstances
- Changes in the project scope (which have been approved by the DEA)
- Amendments of the Environmental Authorisation by the DEA.

The EMP may also need to be amended should relevant authorities or key EMP role-players consider it necessary. RedCap shall consult with DEA to establish whether the DEA requires approving specific EMP amendments, and if yes, RedCap shall follow due process to gain approval for such amendments. RedCap may consult with the ECO and/or another suitably experienced party to assist with and/or accept the amendment of the EMP; and/or assist with the application for approval of the amendments.

3.4 Environmental Authorisation

(This section will be inserted once the Environmental Authorisation has been issued. It will provide a brief overview of the requirements and conditions of the authorisation and how these have been incorporated in the EMP.)

3.5 Environmental Specification’s Structure and Application

As mentioned, environmental specifications to be adhered to by the various role players throughout the project phases are based on sets of mitigation measures, which were specified in the EIR and associated or the Environmental Authorisation (refer to copy of EIR maintained on site for further details).

The EMP was developed by transferring and translating the mitigation measures per phase into:

- Specifications to be complied with by the Developer
- Specifications to be complied with by the Contractor



As such, the EMP covers the various phases and associated key organisational requirements as presented in the table below.

Phase	Developer Specifications	Contractor Specifications
• Preconstruction Planning & Design	√ Section 6.2	√ Section 6.3
• Construction	√ Section 7.1	√ Section 7.2
• Operational	√ Section 8.1	√ Section 8.3
• Decommissioning & Site Closure	√ Section 9	√ Section 9

However, all parties must fully acquaint themselves with the EMP in its entirety.

3.6 Compliance with Other Policies and Legislation

RedCap and the Contractor shall commit to complying with the relevant provisions of the applicable environmental legislation and associated regulations promulgated in terms of these laws, through all phases of the project. In order to achieve this, these parties need to acquaint themselves with relevant environmental legislation and/or seek advice from the relevant authorities and/or a suitably qualified legal specialist.

In addition to the environmental authorisation in terms of NEMA, the proposed Koega wind farm requires a number of other authorisations from various departments, such as the the Department of Water Affairs (DWA), the Department of Environment Affairs (DEA), as well as the regulatory authorities such as the National Energy Regulator of South Africa (NERSA).

A list of applicable legislation is contained in Appendix A to this EMP.

3.7 Contractual obligation

In order to ensure that the EMP is enforced and implemented, this document must be given legal standing. This shall be achieved through incorporating the EMP as an addendum to the contract documents as conditions of the contract that must be met. This will ensure that the obligations are clearly communicated to Contractors and that submitted tenders have taken into account, and budgeted for the environmental requirements specified in the EMP. The successful tender ultimately becomes the signed contract, thereby ensuring that the included EMP becomes legally binding.



4 MANAGEMENT AND ORGANISATIONAL STRUCTURE

4.1 Organisational Requirements

In order to ensure sound development and effective implementation of the EMP, it is necessary to identify and define the responsibilities and authority of the various persons and organisations that will be involved in the project.

During construction, all instructions and official communications regarding environmental matters shall follow the generic organogram shown in **Figure 2**. The organisational structure identifies and defines the authority structure, and the communication structure for the various parties involved in the construction of the proposed development. The structure may require revision as the project unfolds.

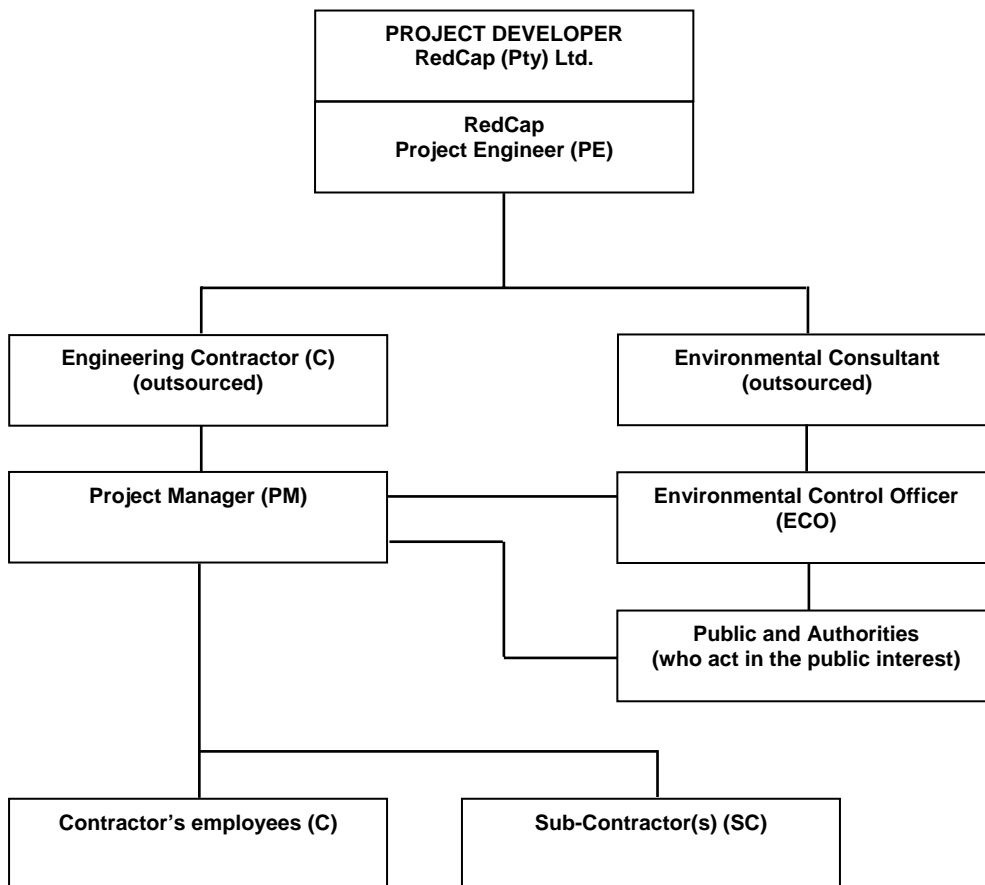


Figure 2: Organisational / Reporting Structure for implementation of the EMP

RedCap will appoint a Project Engineer (PE) who will represent RedCap for the proposed development. RedCap would appoint an Engineering Consultant / Contractor (hereafter 'Contractor') to implement the project. Two separate appointments will be made; for the civil and electrical construction phases respectively. RedCap shall require each Contractor to appoint a Project Manager



(PM) to direct and monitor all contractor activities during the construction of the development.

RedCap shall appoint an Environmental Consultancy to fulfil the role of Environmental Control Officer (ECO) to oversee the implementation of the construction component of the EMP on site. It will be the responsibility of the ECO to consult with the PE and/or PM regarding instructions pertaining to contravention, corrective actions, and penalties or working methods. Except in an emergency situation, where instructions may be given directly to the Contractor's employees and sub-contractors, all instructions given by the ECO shall go through the PE.

The EMP will be an item of the monthly site meetings, and the ECO may attend these meetings in order to provide input with respect to compliance with the EMP.

Key roles and responsibilities of each party are outlined in more detail in **Section 4.2**. It is important to note that, while parties are assigned various environmental roles and responsibilities, parties are severally and jointly responsible to ensure compliance with all environmental legislation and best practice.



4.2 Roles and Responsibilities

Role	Responsibility
4.2.1 Provincial Environmental Authorities	
<p>The Department of Environmental Affairs (DEA) is the authority responsible for compliance with all environmental legislation.</p>	<ul style="list-style-type: none"> • Convey legal requirement for the EMP. • Give directives in terms of specific requirements for EMP specifications. • Review draft, final and revision EMPs. • Undertake spot inspections of the site at its own discretion. • Review ECO Audit Reports. • Request and view Environmental Incident Report. • Request and view the Complaints Register. • Issue directives, notices and/or fines for significant transgressions with the EMP or environmental legislation.
4.2.2 RedCap Project Engineer	
<p>The PE assumes overall responsibility for the environmental aspects and management of the Koega wind farm project. This includes compliance to all environmental regulatory and good management practice requirements for the duration of the project, in order to ensure effective minimisation of all environmental impacts. The PE is also responsible for the overall management and implementation, administration and enforcement of the EMP.</p>	<ul style="list-style-type: none"> • Ensure that all designs appropriately incorporate the required environmental provisions as discussed in the Environmental Impact Report (EIR) and EMP. • Ensure that the EMP is finalised and adequately describes the minimum environmental regulatory requirements at the time construction commences. • Ensure that the final EMP is approved by all relevant authorities. • Ensure that the EMP specifications are included in all tender documents issued to prospective engineering consultants/contractors for the development works and activities on site. • Review and where necessary, revise the 'incident and associated penalty values list' and include the list in the tender document. • Ensure that the prospective Tenderers/Contractors adequately provide for the provisions of the EMP in their submissions. • Appoint the Engineering Contractor(s) and Environmental Consultants, and through them a PM and ECO respectively, for the duration of the construction period and ensure that their scope of work sufficiently covers responsibilities that will ensure implementation and compliance with the EMP and good environmental management throughout the project. • Ensure that the EMP is fully implemented and remains so, and when necessary is revised and



Role	Responsibility
	<p>updated.</p> <ul style="list-style-type: none">• Give instructions regarding the development and implementation of Method Statements.• Ensure that the Contractor develops and provides all required Method Statements.• Review the Method Statements, with the assistance from the Environmental Consultant/ECO, to confirm their conformance with EMP requirements as well as with reasonable practicality and financial feasibility and provide relevant feedback to the Contractor.• Approve acceptable Method Statements and inform the Environmental Consultant/ECO of such approval.• Keep record of all Method Statements and the associated review and approval status.• Review and approve drawings produced by the Contractor in connection with, e.g. construction site layout, access/haul roads, construction stormwater management plan, etc.• Be liable / accountable, to the relevant authority, DEA, for any contravention/non-compliance by any Contractor under their supervision.• Liaise with the environmental authorities and RedCap Senior Management as and when necessary.• Establish and maintain regular and proactive communications with the Consultant/PM, Contractor and Environmental Consultant/ECO.• Assist the Contractor in finding environmentally responsible solutions to problems with input from the ECO.• Undertake periodic audits, site visits and inspections to ensure that the environmental requirements are implemented.• Review and comment on environmental compliance assessments and/or reports.• Review the Complaints Register.• Give instructions on any procedures and corrective actions.• Report any significant environmental incidents or impacts to the relevant environmental authorities.• Deal with policing, fining, penalties and discrepancies.• Instruct the Contractor on the requirements and procedures in terms of environmental non-compliance 'near misses', incidents and public complaints recording, investigation and reporting.• Order the removal of, or issue spot fines for, person(s) and/or equipment not complying with the specifications.• Issue fines, penalties or 'work suspend' orders for contravention of the EMP and give instructions regarding corrective action to the Contractor/PM.



Role	Responsibility
4.2.3 Engineering Contractor (Civil & Electrical Phase)	
<p>The Engineering Contractor's role to implement and comply with recommendations and conditions of the EMP at all times. As such he needs to incorporate and cover all the relevant EMP requirements in the budget plans, detail designs, planning, sub-contractor appointments and all project implementation activities. The Contractor also needs to appoint an individual for the role of Project Manager.</p>	<ul style="list-style-type: none"> • Study the EMP and all its specifications carefully and gain a full understanding of its implications. • Provide for full compliance with the EMP and all its relevant specifications in the submitted Tender; and/or provide motivation and/or alternative specifications through Method Statement(s) for any deviation from or 'tailor making' of the EMP for RedCap to consider. • Include all relevant EMP specifications in the tender documents and subcontractor appointments. • Avail him / her, as well as any employee he may identify, for induction training on the EMP by the ECO. • Notify the PE and ECO of the anticipated programme of works and fully disclose all details of activities involved (includes off-site activities associated with the project). • Prepare all the required / agreed Method Statements for submission to the PE and Environmental Consultant / ECO. • Sign off on approved Method Statements. • Provide appropriate training on the latest version of the EMP and all approved Method Statements to all employee and sub-contractors and keep record of such training (e.g. keep record of the date of training, version of the EMP the training was for, the employee/sub-contractor trained). • Appoint a competent, experienced and responsible individual as PM to administer and implement EMP with regard to engineering and construction. • Ensure that the EMP environmental specifications (of this document including any revisions, additions or amendments) and all approved Method Statements are effectively implemented. • Implement on-site steps to mitigate environmental impacts. • Ensure that all employees and sub-contractors employed comply with the requirements and provisions of the EMP at all times. • Report any serious environmental incidents or impacts to the RedCap PE and ECO
4.2.4 Project Manager	
<p>The Project Manager (PM) oversees the construction programme and all construction activities performed by the contractor and as such also any EMP implementation, EMP compliance and environmental related activities, issues and impacts.</p>	<ul style="list-style-type: none"> • Gain an in-depth understanding of the EMP. • Ensure implementation of all aspects and specifications of the EMP and approved Method Statements. • Oversee all site works. • Enforce the implementation of and compliance with this document with Contractor and Sub-contractor employees and Sub-contractors. • Monitor and verify that environmental impacts are kept to a minimum at all times.



Role	Responsibility
	<ul style="list-style-type: none"> • Record and inform the PE and ECO of 'near miss' incidents or problems arising when implementing the EMP, including accidents and transgressions and recommend ways of improving it. • Take action to address all EMP, Method Statement and/or environmental legislation non-compliances. • Report and record all accidents, incidents resulting in injury or death or significant environmental liability immediately to the PE and ECO. • Record all public complaints received and immediately inform the PE and ECO thereof. • Report progress towards implementation of and non-conformances with the latest EMP version and approved Method Statements at site meetings with the PE and ECO. • Ensure that suitable records are kept of all compliance status/feedback reports, incident reports and complaints register and that these documents are available for auditing by the PM or ECO at all times. • Communicate to the Contractor employees and Sub-contractors, verbally and in writing, the advice of the ECO and the content of the ECO reports. • Designate and manage the working areas as per approved construction site layout, including sensitive environments. • Issue penalties for contravention of the EMP to Contractor Staff and Sub-contractor (as deemed necessary).
4.2.5 Environmental Control Officer	
<p>Fulfil an advisory consultancy, monitoring and reporting role with regard to overseeing the effective implementation and updating of the EMP. Making recommendations for addressing EMP and/or environmental legal non-compliances. Liaising with the relevant Environmental Authorities on any environmental issues to confirm their requirements, as and when required and communicating such requirement to the RedCap Project Engineer and/or PM.</p>	<ul style="list-style-type: none"> • Revise and update the EMP as and when necessary and submit such updates to the PE for review. • Submit copies of revised EMP to all relevant stakeholders for their information and review. • Advise the PE on necessary environmental authorisations and permits that would be required. • Prepare EMP introduction and environmental awareness training course material/manual and present this course to the PE, Contractor, PM and possibly sub-contractors, including any employee member they deem necessary, prior to them starting any work on site. • Keep record of everyone who attended the EMP introduction training course. • Review and comment on all Method Statements relevant to environmental management and make recommendations to the PE on whether or not to accept the Method Statement and/or any amendments or revisions required. • Make recommendations on any additional Method Statements that may be required as the construction process progresses. • Undertake regular site inspections and liaison with the PE and/or Contractor (meetings) to



Role	Responsibility
	<p>monitor, audit and verify that all works comply with environmental legislation and the EMP compliance; that environmental impacts are kept to a minimum; and ascertain the level of such compliance and impact minimisation.</p> <ul style="list-style-type: none"> • Keep record of EMP implementation, monitoring and audits. • Prepare regular monitoring/audit reports which reflect the EMP compliance status, findings, issues and recommended actions for addressing non-compliances and submit these to the project team and relevant Environmental Authorities (DEA). • Review 'near miss' reports, incident reports and complaints register and recommend corrective actions. • Report any serious environmental incidents or environmental impacts immediately to the PM, PE. • Assist the project team in finding environmentally responsible solutions to problems. • Maintain a photographic record of the site before, during and after construction. • Advise the PM on the removal of person(s) and/or equipment not complying with the specifications. • Make recommendations to the PE and PM on the issuing of fines for transgressions of site rules and penalties for contravention.
4.2.6 Sub-contractor	
<p>It is the Sub-contractor's role to implement and comply with recommendations and conditions of the EMP at all times.</p>	<ul style="list-style-type: none"> • Study all relevant EMP sections, specifications and approved Method Statements carefully and gain a full understanding of the implications thereof. • Prepare and provide Method Statement(s) as per the PM's instructions. • Implement and comply with all relevant EMP sections, specifications and approved Method Statements. • Notify the PM of the anticipated programme of works and fully disclose all details of activities involved. • Avail him / her, as well as any employee he may identify, for induction training on the environmental requirements as per PM's instructions. • Be responsible for Sub-contractor's employees. • Report progress towards implementation of and non-conformances with the relevant sections of the latest EMP version and approved Method Statements to the PM. • Notify the PM of any and all 'near misses', incidents, accidents and transgressions on site with respect to environmental management and non-compliance with the latest EMP version and approved Method Statements and seek advise from the PM for required corrective actions and/or site remediation. • Record all incidents and the corrective actions/remedial action taken in incident report and submit



Role	Responsibility
	<p>these to the PM for signing off.</p> <ul style="list-style-type: none">• Report and record all accidents and incidents resulting in injury or death immediately to the PM.• Record all complaints received and immediately inform the PM thereof.
4.2.7 Public and Authorities Acting on Their Behalf	
<p>The public, as well as the authorities responsible of acting on behalf of the public, watches over the project and reports on any non-compliances with the Environmental Authorisation and EMP.</p>	<ul style="list-style-type: none">• Monitor EMP compliance.• Register complaints on any EMP or Method Statement non-conformances.



5 METHOD STATEMENTS

5.1 Method Statements - Contractor

1. Method Statements indicate what will be done to comply with relevant environmental specifications as set out in the EMP.
 2. Submit written Method Statements to the PM and ECO for the activities identified by the PM and/or the ECO, at least 10 working days prior to the proposed commencement of construction activities, to allow the PM (and/or ECO) time to study and approve the method statement.
 3. The ECO may require changes to a Method Statement if it does not comply with the specification or if, in the reasonable opinion of the ECO, the proposal may result in, or carries a greater than reasonable risk of damage to the environment in excess of that permitted by the EMP or any legislation.
 4. Carry out the activities in accordance with the approved Method Statement.
 5. Make approved Method Statements readily available on the site and communicate the content of the Method Statement to all relevant personnel.
 6. Approval of the Method Statement shall not absolve the Contractor from any of his obligations or responsibilities in terms of the contract.
 7. No claim for delay or additional cost incurred by the Contractor shall be entertained due to inadequacy of a Method Statement.
-

5.2 Content of Method Statements

The Method Statement shall state clearly:

- The type of construction activity
- Locality where the activity will take place
- Timing of activities
- Materials to be used
- Equipment and staffing requirements
- Identification of activities, and resultant impacts that may result from the activity
- Methodology and/or specifications for impact prevention or containment
- The system to be implemented to ensure compliance with the specifications
- Emergency or disaster incident and reaction procedures
- Other information deemed necessary by the ECO.

The Contractor shall be responsible for the implementation of the method statements and must demonstrate that these measures are working effectively.

5.3 Required Method Statements

- Method Statements that are initially identified and required from the Contractor in terms of this EMP are listed in Appendix B.
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6 ENVIRONMENTAL SPECIFICATIONS: PLANNING AND DESIGN PHASE

The following section details the minimum range of constraints, controls, procedures and standards that are required during the planning and design phase of the proposed wind farm development.

The key activities undertaken during this phase involve:

- Additional specialist studies and/or investigations
 - Final planning and design of the wind farm infrastructure and micro-siting
 - Development of a set of site management master plans, e.g. for stormwater, water supply, facilities, waste, remediation, etc.
 - Tendering, adjudication and induction of Contractor/s
 - Addressing certain environmental requirements, concerns, roles and responsibilities in preparation for the construction phase; e.g. through contract negotiation.
-

6.1 Environmental principles and best practice guidelines

1. The environment is considered to be composed of both biophysical and social components.
 2. Construction is a disruptive activity and all due consideration must be given to the environment, including the social environment during the execution of the project to minimise the impact on affected parties.
 3. Minimisation of areas disturbed by construction activities (i.e. the 'footprint' of the construction area) should minimise many of the construction related environmental impacts of the project and reduce rehabilitation requirements and costs.
 4. All relevant standards relating to international, national, provincial and local legislation, as applicable, should be adhered to. This includes requirements relating to waste emissions, waste disposal practices, noise regulations, road traffic ordinances, etc.
 5. Every effort should be made to minimise, reclaim and/or recycle waste materials.
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6.2 Pre-construction Phase Specifications – Developer

This section details specifications to be adhered to by the Developer / RedCap Project Engineer during the Pre-Construction Phase.

6.2.1 Additional Specialist Studies

Solicit additional specialist input that is required in accordance with and based on recommendations of specialists and direction from the relevant environmental authorities.

The following additional specialist input is required to finalise these documents once micro-siting has occurred:

- Vegetation rehabilitation: Draft Rehabilitation Specification is presented in



Appendix C

- Vegetation search and rescue and relocation plan
- Alien and fire management plan
- Avifaunal monitoring: Draft monitoring specifications provided in Appendix D.

6.2.2 Pre-construction Phase Specialist Environmental Specifications

Implement Pre-construction Phase Specifications mitigation measures as provided below per specialist category.

Vegetation

1. Micro-siting of all turbine final layouts
2. Turbines 104, 105, 112, 127, 128 to be micro-sited to just outside the active inland primary dune field in the Western Cluster
3. Mitigation particular to **Fynbos, Renosterveld and Dune Strandveld**:
 - a. Road network to be kept to minimum width and avoid more sensitive seep areas and drainage lines.
4. Mitigation particular to **Thicket and Dune Forest**
 - a. Loss of Forest and Thicket limited in extent but no unnecessary thicket clearing to occur
5. Mitigation particular to **Rocky Outcrops**
 - a. Crossing through outcrops adjacent to streams should be avoided or kept to a minimum.
6. Mitigation particular to **Seeps, Wetlands and Streams**
 - a. Road crossing to avoid seep and wetland areas as far as possible, where not possible appropriate crossing design to limit loss of habitat
 - b. Ecological corridors occur predominantly along the rivers, drainage lines and seep areas, so design should be such that it does not impede these corridors unnecessarily
7. A vegetation search and rescue and relocation plan, an alien and fire management plan along with a Rehabilitation Plan (based on the specification provided in Appendix C) are to be finalised during the final design stage.

Hydrology

1. The undertaking of a Water Use Licence Application (WULA) as required by the National Water Act (Act 36 of 1998) and complying with all requirements of the Act with regards to surface water hydrology.

Terrestrial Fauna

1. Where roads pass right next to major water bodies provision should be made for fauna such as toads to pass under the roads by using culverts or similar.
2. Placing of structures under roads to allow reptiles such as tortoises and terrapins to cross under the road
3. Do not place fences on the side of the roads
4. Construction of roads over wetlands/rivers/streams must be of the nature that the water is allowed to flow under the road, this will secure corridor continuity for amphibians.

Birds

5. Only tubular towers for turbines be used (i.e. not lattice)
6. Lighting of the turbines should be at the lowest level as provided for by CAA requirements
7. Monitoring of birds and interaction with turbines in line with monitoring specifications presented in the Avifauna Specialist report.



8. If any nesting birds are found pre construction the EWT must be notified for advice in dealing with these species.

Bats

1. As far as possible, set back turbines 500 m from the Krom, Tsitsikamma, Slang and Klipdrift Rivers, and from Soutvlei.

Cultural Heritage

1. All turbine localities and linear development routes should be reassessed during the micro-siting process
2. No development to impact on Site 2.3 - a significant Stone Age site
3. No development to impact on Colonial Period Farmsteads or Structures, pre-dating 60 years of age or on Colonial/ Historical Period Cemeteries
4. A cleaning and healing process on the land should be undertaken under the guidance of Chief Michael Williams and the Gamtkwqua Khoisan First Nation before construction starts.

Visual

1. New road construction should be minimised and existing roads should be used where possible.
2. Erosion risks should be assessed and minimised as erosion scarring can create areas of strong contrast which can be seen from long distances especially on the palaeo-dune fields of the western cluster.
3. Laydown areas and stockyards should be located in low visibility areas (e.g. valleys between ridges) and existing vegetation should be used to screen them from views where possible.
4. Ensure that there are no wind turbines closer than 500m to a residence or farm building unless sufficiently screened by vegetation from shadow flicker.
5. Lighting should be designed to minimise light pollution without compromising safety. Investigate using motion sensitive lights for security lighting. Turbines are to be lit according to Civil Aviation regulations.

Noise

1. All wind turbines should be located at a setback distance of 500m from any homestead and a day/night noise criteria level at the nearest residents of 45 dB(A) should be used to locate the turbines. The 500m setback distance can be relaxed if local factors; such as high ground between the noise source and the receiver, indicates that a noise disturbance will not occur.
2. Positions of turbines jeopardizing compliance with accepted noise levels should be revised during the micro-siting of the units in question and predicted noise levels remodelled by the noise specialist, in order to ensure that the predicted noise levels are less than 45 dB(A) at adjacent NSAs.

Socio-economic

1. The Developer must establish a community based trust and implement a Corporate Social Investment policy.

6.2.3 Civil Aviation Authority Requirements

1. Lighting of the turbines must be at a low level as provided for by CAA requirements.
2. Remove any turbines within the exclusion zone required by the CAA for the Paradise Beach Aerodrome once the design has been finalised after issuing of the ROD.



6.2.4 Turbine Micro-siting

1. After authorisation, a team of relevant specialists must perform a detailed “walkdown” assessment of the site, namely, micro-siting. This assessment must investigate, in detail, the recommended location of wind turbines and associated infrastructure, as well as all elements of the construction site.
2. Plan the layout of the wind turbines and the elements of construction infrastructure placed on site based on the findings of the micro-siting assessment to ensure that environmental impacts are minimised.
3. Revise the positions of turbines jeopardizing compliance with accepted noise levels during the micro-siting of the units in question and predicted noise levels re-modelled by the noise specialist, in order to ensure that the predicted noise levels are less than 45 dB(A) at adjacent NSAs.
4. Micro-siting of footprints should avoid seep and wetland areas during final site planning.
5. Comply with Table #, for micro-siting of turbines in high sensitivity vegetation areas

Table 1. Summary of turbines in high sensitivity areas with specific mitigation recommendations

Turbine	GRBSP habitat unit	Status	Vegetation	Cluster*	CBA /ESA	Comment
29	Tsitsikamma Perennial Stream	Cr	Seep	C	CBA	Final siting to keep footprint outside of seep and buffer
36	Oyster Bay Thicket-Grassy Fynbos	En	Thicket Grassy Fynbos	C	CBA	Final site selection to maximise use of surrounding degraded and transformed portions
40	Oyster Bay Thicket-Grassy Fynbos	En	Thicket Grassy Fynbos	C	CBA	Final site selection to maximise use of surrounding degraded and transformed portions
48	Oyster Bay Thicket-Grassy Fynbos	En	Thicket Grassy Fynbos	C	CBA	Final site selection to maximise use of surrounding degraded and transformed portions
54	Oyster Bay Thicket-Grassy Fynbos	En	Thicket Grassy Fynbos	C	CBA	Final site selection to maximise use of surrounding degraded and transformed portions
58	Oyster Bay Thicket-Grassy Fynbos	En	Thicket Grassy Fynbos	C	CBA	Final site selection to maximise use of surrounding degraded and transformed portions
60	Oyster Bay Thicket-Grassy Fynbos	En	Thicket Grassy Fynbos	C	CBA	Final site selection to maximise use of surrounding degraded and transformed portions
63	Oyster Bay Thicket-Grassy Fynbos	En	Thicket Grassy Fynbos	C	CBA	Final site selection to maximise use of surrounding degraded and transformed portions
74	Oyster Bay Thicket-Grassy Fynbos	En	Thicket Grassy Fynbos	C	CBA	Final site selection to maximise use of surrounding degraded and transformed portions
76	Oyster Bay Thicket-Grassy Fynbos	En	Thicket Grassy Fynbos	C	CBA	Final site selection to maximise use of surrounding degraded and transformed portions
104	Inland Primary Dune	En	Primary Dune	W	CBA	Turbines to be micro sited to edge or outside of dune field.
105	Inland Drift Sands	Vu	Drift Sands	W	CBA	Turbines to be micro sited to edge or outside of dune field.



Turbine	GRBSP habitat unit	Status	Vegetation	Cluster*	CBA /ESA	Comment
109	Tsitsikamma Perennial Stream	Cr	Perennial Stream (Modified)	W	CBA	Occurs in a modified stream, final siting to keep footprint outside of stream and buffer
112	Inland Primary Dune	En	Primary Dune	W	CBA	Turbines to be micro sited to edge or outside of dune field.
127	Inland Primary Dune	En	Primary Dune	W	CBA	Turbines to be micro sited to edge or outside of dune field.
128	Inland Primary Dune	En	Primary Dune	W	CBA	Turbines to be micro sited to edge or outside of dune field.
130	St Francis Dune Stream	Lt	Wetland	W	CBA	Final siting to keep footprint south of wetland and buffer

*E= Eastern Cluster, C= Central Cluster, W= Western Cluster

6.2.5 Transportation of components of the WTG and access routes

Details, including a drawing, showing where and how the access points and routes will be located and managed must be provided in a Method Statement. The time of day and route from the relevant port of arrival of the components to the development site must be clearly indicated and adhered to by the transport service provider.

6.3 Pre-construction Phase Specifications – Contractor

This section details specifications to be adhered to by the Contractor during the Pre-Construction Phase.

6.3.1 Contractor's SHE Officer and Fire Officer

The name and letter of appointment of the Contractors SHE Officer and Fire Officer must be given to the ECO and the terms of reference for the work to be undertaken must be detailed including time on site, roles and responsibility, interaction with the Contractor and environmental offices, etc.

6.3.2 Pollution control

Expected solid waste types, quantities, methods and frequency of collection and disposal as well as location of disposal sites must be identified and stated in a Method Statement. The Method Statement shall further include methods of minimising, controlling, collecting and disposing of contaminated water, and details of any hazardous substances/materials to be used, together with the transport, storage, handling and disposal procedures for the substances.

6.3.3 Safety considerations

Provide details identifying what safety precautions will be implemented to ensure the safety of all staff, and the general public at large, on site during the life of the project. This will include protective clothing requirements for all types of construction activities on site, e.g. protection against dust, noise, falling objects, work in trenches, work at heights, etc.



6.3.4 Emergency procedures

Provide details regarding all relevant emergency procedures that will be implemented for fire control and accidental leaks and spillages of hazardous substances (including fuel and oil). Detail the risk reduction measures to be implemented including fire fighting equipment, fire prevention procedures and spill kits.

6.3.5 Waste management control

Provide details regarding how solid and liquid waste generated on the construction site and site camp will be collected, stored, transported and disposed off. Details of any service provider(s) appointed to manage this task must also be provided.

6.3.6 Stormwater and erosion control

Provide details of how stormwater emanating within or adjacent to the construction site may impact on construction activities. Details on how the Contractor will deal with stormwater runoff and potential erosion within the construction footprint must further be provided. Details of any service provider(s) appointed to manage this task must also be provided.

6.3.7 Site layout

1. Determine the site for the construction camp in collaboration with the PM and ECO before the moving onto site, such that it is effectively isolated from the surrounding environment and takes into consideration:
 - The need to be more than 50 meters from a water body in a position that will facilitate the prevention of storm water runoff from the site from entering a water body.
 - The risk of public nuisance through, for example, noise generation, visual intrusion, light pollution or disruption to access.
 - Security implications.
2. The construction camp should also be of sufficient size to accommodate the needs of all Sub Contractors that may work on the project.
3. Submit to the engineer for his approval a site layout plan at least 7 days before construction can begin.
4. Provide the graphical representation with detailed notes of the location, layout and method of establishment of the construction camp, including the following:
 - The extent of the Contractors site camp, and other required areas if not located within the site camp;
 - All Contractor's buildings, and/or offices;
 - Lay down areas;
 - Vehicle and plant storage areas, including wash areas;
 - Workshops and drip trays;
 - Fuel storage areas (including filling and dispensing from storage tanks);
 - Cement/concrete batching areas (including the methods employed for the mixing of concrete and particularly the containment of runoff water from such areas and the method of transportation of concrete); and
 - Other infrastructure required for the running of the project.



7 ENVIRONMENTAL SPECIFICATIONS: CONSTRUCTION PHASE

7.1 Construction Phase Specifications – Developer

This section details specifications to be adhered to by the Developer / RedCap Project Engineer during the Construction Phase.

7.1.1 Compliance monitoring

1. The PM shall appoint a qualified and experienced ECO to ensure implementation of and adherence all parties to the EMP.
2. The appointed ECO shall conduct a pre-construction site inspection to identify all sensitive environments, habitats, and No-Go areas.
3. The ECO shall prepare a pre-construction audit report, which will include a photographic record of the site and will report on the key features of the site. The photographic record of the site shall serve as a measuring staff against which rehabilitation will be measured later.
4. The ECO shall conduct regular audits to ensure that the system for implementation of the EMP is operating effectively. The audit shall check that a procedure is in place to ensure that:
 - The EMP and the Method Statements being used are the up to date versions.
 - Variations to the EMP, Method Statements and non-compliances and corrective actions are documented.
 - Emergency procedures are in place and effectively communicated to personnel.
5. The audit programme shall consist of the following at a minimum:
 - First audit no later than 1 month after construction commences;
 - Thereafter audits at monthly intervals;
 - An audit one week prior to practical completion of the project is granted; and
 - A post construction audit within 1 week after the Contractor has moved off site. This is to ensure that the Contractor has met all his environmental obligations in terms of the EMP.

7.2 Construction Phase Specifications - Contractor

This section details specifications to be adhered to by the Contractor during the Construction Phase.

7.2.1 Construction Phase Specialist Environmental Specifications

Vegetation

1. Vegetation clearing must be limited to the required footprint.
2. Alien species should be monitored and cleared when necessary.
3. Search and rescue operation to be undertaken before commencement of construction
4. Rehabilitation to be implemented in a phased manner directly after construction
5. Mitigation particular to **Fynbos, Renosterveld and Dune Strandveld:**
 - a. Flammable litter and discarded glass bottles should be removed regularly
6. Mitigation particular to **Thicket and Dune Forest**



- b. Clearing of forest and thicket should be avoided, especially along drainage lines

Terrestrial Fauna

1. Search and rescue operations to be conducted before construction phase begins.
2. Fauna must be relocated to a place similar to the place where they were found.
3. Construction areas must be clearly demarcated.
4. Habitat islands should be created within the area cleared for the constructional site office etc.
5. Materials, such as rocks, removed during the constructional phase must be kept aside and used later for the rehabilitation.
6. Construction Waste which will attract reptiles must not be left on site, this will increase the presence of reptiles
7. Care must be taken to ensure slow driving on the site especially during rainfall periods
8. Speed limits should be enforced.
9. Signs should be erected to remind and warn vehicle users where frog/toad crossings are, extreme slow driving needs to be practised in these zones.
10. Dead animals must be removed off the road as this will attract scavengers which may also be harmed on the road.
11. Do not feed animals on or near the roads.
12. Fences must be of a nature to allow fauna to pass through.
13. Regular visits to the site to check if any fauna are trapped.
14. Access gates into the fenced off areas to be closed at all times.
15. Inward facing 90 degree corner fences must rather be designed as two 45 degree corners
16. Fences must be visible to animals.
17. Avoid using electric fencing
18. The workers on site must be educated about the laws protecting wildlife. Penalties should be used as a deterrent.
19. Regular fence inspections need to be conducted to remove any snares.
20. Workers in the area should be made aware of penalties for feeding of animals.

Birds

1. If any nesting birds are found pre construction the EWT must be notified for advice in dealing with these species.

Cultural Heritage

1. Central Cluster, turbine localities 28, 33, 36, 40, 41 and 48 are located particularly close to the archaeologically potentially sensitive vegetated dune landscape to the south of the study site. On-site archaeological monitoring is recommended at the start of construction (surface and sub-surface archaeological inspection).
2. In the Western Cluster, on-site archaeological monitoring to assess surface and sub-surface sections is recommended at the start of construction in the vicinity of Area 1 (Turbine 99, 123 and 124) and Area 2 (turbine 104, 105 and 112).
3. Should any archaeological or cultural heritage resources as defined and protected by the NHRA 1999 and not reported on in this report be identified during the course of construction, the developer should immediately cease operation in the vicinity of the find and report the site to SAHRA or an ASAPA accredited CRM archaeologist.

Visual

1. Night lighting of the construction sites should be minimised within requirements of safety and efficiency.



Noise

1. All construction operations should only occur during daylight hours if possible.
2. No construction piling should occur at night.
3. Construction staff should be given “noise sensitivity” training in order to mitigate the noise impacts caused during construction.

Socio-economic

1. Construction vehicles carrying materials to the site should avoid using roads through densely populated built-up areas along the coast so as not to disturb existing retail and commercial operations.

7.2.2 Health and Environmental Awareness

1. Provide adequate health and environmental training.
2. Ensure that all employees undergo project induction on environmental awareness and conduct such training in the language of the employees.
3. Provide evidence that the environmental awareness induction courses have been presented.
4. Place emphasis on any (potential) environmental impacts relating to the construction activities on site and to the related environmental precautions taken to avoid or mitigate these impacts.
5. The environmental training should, as a minimum, include the following:
 - The importance of conformance with all environmental policies
 - The significance of environmental impacts, actual or potential, as a result of their work activities
 - Their roles and responsibilities in achieving conformance with the environmental policy and procedures, including emergency preparedness and response requirements
 - The mitigation measures required to be implemented when carrying out their work activities
 - The importance of not littering
 - The need to use water sparingly
 - Details of, and encouragement to, minimise the production of waste and re-use, recover and recycle waste where possible
 - Details regarding archaeological and/or historical sites which may be unearthed during construction and the procedures to be followed should these be encountered
 - The procedures which should be followed should a grave be encountered, or unearthed during the construction phase
 - Details regarding fauna and flora of special concern, including protected/endangered plant and animal species, and the procedures to be followed should these be encountered during the construction phase
6. Conduct a training needs analysis in consultation with the ECO, to identify the appropriate environmental and health training programmes, and the appropriate target groups amongst the employees of the Contractor.
7. File the results of the environment and health training needs analysis with the environmental records.
8. Environmental awareness training programmes should contain the names, positions and responsibilities of personnel to be trained, the framework for appropriate training plans, and a schedule for the presentation of the training courses.
9. Maintain records of all training interventions. The ECO shall monitor the records and undertake regular follow ups.



7.2.3 Emergency preparedness

1. Compile and maintain environmental emergency procedures to ensure an appropriate response to unexpected or accidental incidents that may cause environmental impacts.
2. Activities that may be addressed in the environmental emergency procedures include, for example, accidental exposure of employees to hazardous substances, veld fires and accidental spillage of hazardous substances.
3. These plans should include as a minimum:
 - A list of key personnel
 - Details of emergency services applicable to the various areas along the route that turbine components will need to be transported and for the site itself (e.g. the fire department, spill clean-up services, etc.)
 - Internal and external communication plans, including prescribed reporting procedures where required by legislation
 - Actions to be taken in the event of different types of emergencies
 - Incident recording, progress reporting and remediation measures required to be implemented
 - Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release
 - Training plans, testing exercises and schedules for effectiveness
 - Comply to emergency preparedness and incident and accident-reporting requirements, as required by the Occupational Health and Safety Act, 1993 (Act No 85 of 1993), the National Environmental Management Act, 1998 (Act No 107 of 1998), the National Water Act, 1998 (Act No 36 of 1998) and the National Veld and Forest Fire Act, 1998 (Act No 101 of 1998) as amended and/or any other relevant legislation.
4. Maintain an environmental incidents register to record incidents that occur on site as a result of the activities associated with the contract. Environmental incidents constitute all those activities and incidents that may have a negative impact on the surrounding natural environment.
5. Ensure that each environmental incident is investigated by the ECO and forward an environmental incident report to the Contractor, Proponent and relevant authority, including details on the manner in which the incident was remedied.
6. Ensure that each environmental incident report contains as a minimum, a description of the incident, a statement on the severity and significance of the impact, and actions taken to remediate the resultant damage.

7.2.4 Site Establishment

(a) Site Identification

1. Produce a Site Layout Plan illustrating the location and layout of the proposed site camp in each cluster and the working areas. This plan must be approved by the PM.
2. Ensure that the site camp is fenced and provided with a lockable access gate to prevent vandalism, theft and unauthorised entry by the public, where necessary.
3. Obtain approval from the landowner prior to establishing the site camp in the event that the site camp is to be situated on private land.
4. Produce a photographic record of the area earmarked for the site camp prior to site establishment. This will serve as the benchmark against which rehabilitation will be measured and shall be kept in the site environmental file.
5. Ensure that the site camp is reinstated to its original agricultural condition once the project has been completed.



6. Do not use the land for the site camp for any purpose other than for the proper carrying out of the works under the contract.

(b) Site Demarcation

1. Prior to construction commencing, the ECO, Contractor, and/or PM shall inspect the site and identify any sensitive environments.
2. Where necessary, demarcate the construction footprint areas using materials as specified by the PM. These may include fencing, rope, hazard tape, wire mesh, or other approved materials or means.
3. The Contractor will be required to maintain all demarcation fencing and other demarcating materials for the duration of construction activities or as otherwise instructed by the PM.

(c) Vegetation Clearance

1. Vegetation clearance shall take place strictly in accordance with the Site Layout Plan developed by the Contractor.
2. Collection or wilful damage to any plants outside of the areas demarcated for clearing is not allowed.
3. Only trees and shrubs directly affected by the works may be felled or cleared, subsequent to approval from the ECO or PM in writing.

(d) Protection of natural features

1. The Contractor shall not deface, paint, damage or mark any natural features situated in or around the Site for survey or other purposes unless agreed beforehand with the ECO. Any features affected by the Contractor in contravention of this clause shall be restored / rehabilitated to the satisfaction of the ECO.
2. The Contractor shall not permit his employees to make use of any natural water sources (e.g. springs, streams, and open water bodies) for the purposes of swimming, personal washing and the washing of machinery or clothes.

(e) Protection of archaeological and palaeontological sites

1. Any person who causes intentional damage to archaeological or historical sites and/or artefacts could be penalised or legally prosecuted in terms of the national Heritage Resources Act 25 of 1999.
2. If at any stage during construction any semblance of a fossil were to be observed, it must be reported to the geological staff at either the Albany Museum or Rhodes University in Grahamstown so that it can be removed safely. Alternatively it can be reported to staff at the Council for Geosciences in Port Elizabeth.
3. Should any archaeological or cultural heritage resources as defined and protected by the NHRA 1999 and not reported on in this report be identified during the course of construction, the developer should immediately cease operation in the vicinity of the find and report the site to SAHRA or an ASAPA accredited CRM archaeologist.

(f) Topsoil

1. Topsoil can only be stripped from the following areas in or adjacent to the construction site or site camp:
 - Areas which is to be used for temporary storage of soil and/or materials
 - Areas which could be polluted by any aspect of the construction activity
 - Areas within the footprint of the proposed infrastructure to be constructed.



2. Undertake the stripping of topsoil in a manner that minimises erosion by wind or runoff.
3. Topsoil will be stripped to a depth not exceeding 150 mm from the original ground level, unless greater depth is required during the execution of the construction phase of the project.
4. Clear areas from which the topsoil is to be removed of any foreign material which may come to form part of the topsoil during removal including bricks, rubble, any waste material, litter, excess vegetation and any other material which could reduce the quality of the topsoil.
5. Ensure that subsoil and topsoil are not mixed during stripping, excavation, reinstatement and rehabilitation.
6. Soils should be exposed for the minimum time possible once cleared.
7. Topsoil will be temporarily stockpiled, separately from (clay) subsoil and rocky materials.
8. Topsoil will be stockpiled in areas designated by the ECO.
9. Soil must not be stockpiled on drainage lines or near watercourses without proper risk assessment conducted and prior consent from the ECO.
10. Stockpiles will either be vegetated with indigenous , covered by a suitable fabric or maintained in some other suitable way approved by the PM and ECO to prevent erosion and invasion of weeds.
11. Stockpiled topsoil will not be compacted and shall not exceed 2 m in height.

7.2.5 Record keeping

1. Maintain an environmental site file containing at a minimum the following documents:
 - Final Environmental Impact Assessment Report compiled for the Kouega wind farm
 - Latest version of Environmental Management Programme
 - Final design documents and diagrams issued to and by the Contractor
 - All communications detailing changes of design/scope that may have environmental implications
 - Site monitoring reports
 - Complaints register
 - Training manual
 - Training attendance registers
 - Incident and accident reports
 - Emergency preparedness and response plans
 - Disciplinary procedures
 - Monthly site construction meeting minutes
 - All relevant permits
 - Letters or legal documents authorising identified site staff to act in a specified authoritative capacity relating to the protection and preservation of the environment, and on behalf of the Contractor
 - Environmental Authorisation on the EIA from the DEA
 - All method statements from the Contractor for all phases of the project.

7.2.6 Community relations

1. Erect and maintain information boards in the positions, quantities, designs and dimensions required by municipal specifications. Such boards shall include contact details for complaints by members of the public in accordance with details provided by the ECO.
2. Keep a Complaints Register on site, containing contact details of complainants, the nature of the complaint, details on the complaint itself, as well as the date and time that the complaint was made and resolved.



3. The Contractor, or if required the ECO, shall be responsible for responding to queries and/or complaints and may request assistance from the Contractor's Management Staff.

7.2.7 Non-working times

1. Daily timeframes for construction works is to be agreed to by the Contractor, ECO and landowners.
2. For any deviation from the ordinary working hours the written approval of the PM must be obtained before such works commences.

7.2.8 Safety at the construction site

1. Safety precautions must be taken to ensure that residents in the area do not come to harm. The construction site shall be off limits to the general public at all times during the construction period and during site clean-up.
2. Clearly demarcate construction areas, open sewers, trenches and other potential construction-related danger areas with hazard tape and/or appropriate fencing.
3. Erect hazard warnings and maintain in good condition warning signs in the relevant languages and at appropriate positions, warning traffic of construction activities ahead and at problem sites.
4. Ensure that all staff is compliant with the relevant safety regulations on site and wear applicable safety clothing and gear at all times while on site.

7.2.9 Social disruption

1. Staff shall in no way be a nuisance to residents or clients seeking the services of the established businesses in the area. Any complaints received by the PM will be investigated, addressed and, if deemed necessary, the relevant persons will be suspended from the project.
2. Give at least seven days notice to the residents in the vicinity of the construction activities of his intention to begin construction activities in their area.
3. The PM may request a representative of the Contractor to be available to discuss issues raised by residents and make information available to them on construction activities.

7.2.10 Existing Services and Infrastructure

1. Take cognisance of the position of existing services and infrastructure (e.g. roads, pipelines, power lines and telephone services) that may get damaged due to construction activities.
2. Ensure that existing services are not damaged or disrupted unless required by the contract and with the permission of the PM.
3. The repair and reinstatement of any infrastructure that is damaged or services that are interrupted during construction will be done at the expense of Contractor's and shall receive top priority over all other activities.
4. Adhere to the time limit for the repairs as stipulated in consultation with the PM.

7.2.11 Traffic

1. The movement of trucks to and from the construction site must be well coordinated by the PM together with the Contractor, so as to cause the least disruption to the residents in the area.
2. Do not leave large trucks and other heavy-duty machinery unattended outside the Contractor's site camp or designated area.



3. Erect appropriate signage indicating construction works ahead of strategic locations along the site access road(s), clearly observable by all road users by day and night. Warning signs must comply with the applicable municipal, provincial or SANRAL specifications governing road works.
4. All temporary or permanent traffic calming measures, if required, must be erected according to the appropriate municipal, provincial or SANRAL specifications governing road works.

7.2.12 Prevention of damage to surrounding infrastructure

1. Be extra vigilant, during the construction activities, to prevent damage from occurring to any buildings, road furniture and motor vehicles located in the vicinity of the construction site.
2. The Contractor shall be responsible, at his own cost, for the repair and reinstatement of any damages to existing structures resulting from the construction works.
3. Investigate any complaints received from the public regarding any of the listings above. If substantiated, the above listings may result in a fine, or suspension or dismissal of the guilty party.

7.2.13 Unpleasant visual impact at the construction site

1. Keep the construction site neat and tidy at all times during the life of the project.
2. Locate the construction camp(s) inconspicuously in the landscape to reduce visual impact severity.
3. Keep signage and other infrastructure to a minimum.
4. Minimise new road construction and existing roads where possible.
5. Minimise night lighting of the construction sites within requirements of safety and efficiency.
6. Contain and store general and construction related waste, upon approval by the PM, as prescribed by relevant specifications.
7. Maintain good housekeeping on site to avoid litter and minimise waste.
8. Ensure that any lighting installed on site for his activities does not interfere with road traffic or cause an unreasonable disturbance to the surrounding community.

7.2.14 Site Maintenance

(a) Workshop

1. If an on-site workshop is to be established for the duration of construction, obtain the approval of the PM prior to commencing activities and confine maintenance activities to the identified workshop area.
2. Ensure that there is no contamination of the soil or surface water from the on-site workshop.
3. Maintain a spill control kit and staff appropriately trained to utilise it.

(b) Equipment Maintenance and Storage

1. Keep all vehicles and equipment in good working order in the site camp or an area approved by the PM.
2. Inspect all vehicles and plant daily for leaks and spills. Log and sign off maintenance checks in a site maintenance file after each inspection.
3. Repair or remove leaking equipment from the site immediately.
4. Stationary plant must be supplied with drip trays to prevent soil contamination after hours and when not in use.



(c) Cooking Facilities

1. Designate an all weather cooking and eating area, subject to the approval of the PM.
2. Any cooking on site shall be done on either well-maintained gas cookers or by contained fires (e.g. in a drum), located away from flammable vegetation or construction materials. No fires for heating purposes shall be allowed on site.
3. Keep the cooking and eating areas kept tidy and clean at all times to prevent the luring of vermin, domesticated or wild animals.
4. Provide sufficient bins with vermin proof lids for waste disposal, within a 5 m radius of the cooking/eating area at all times.

(d) Water for human consumption

1. Water for human consumption should be available at the site offices and at other convenient locations on site.

7.2.15 Transport of materials/components

1. Secure and ensure safe passage for components and materials between destinations. Loads including, but not limited to sand, stone chip, fine vegetation, refuse, paper and cement, shall have appropriate cover to prevent it from spilling over the side of the vehicle during transit.
2. Be responsible for any clean-up resulting from the failure by staff or supplier to properly secure materials to be transported.

7.2.16 Solid Waste Management

1. Prepare and submit a Method Statement on waste control and management at the site.
2. No burning, burying or dumping of any waste materials, vegetation, litter or refuse shall be permitted.
3. Remove, or appoint a suitable service provide to remove solid waste from site on a weekly or fortnightly basis.
4. Solid waste must be recycled where possible and the remainder spoiled at an approved municipal land fill site or waste disposal service provider.
5. Disposal certificates for each waste removal event shall be issued and kept in the site environmental file for auditing purposes.
6. Do not allow burning of cleared vegetation on site. Chipping or composting of vegetation shall be allowed where viable.

7.2.17 Trenching and excavations

1. Top soil and subsoil excavated during trenching may be stockpiled next to the trench, but must be set back from the edge of the trench be a minimum distance of 1 m.

7.2.18 Excavations and stockpiling

1. The movements of the construction vehicles must be confined to the immediate vicinity of each tower location.
2. Top soil is to be stockpiled upslope of the excavation where possible.
3. Rocks and debris are to be stockpiled separately within the immediate construction site, and used as fill where necessary.
4. Rocks can be stacked as walls to prevent the loss of top and subsoil on cut or fill banks.



5. Banks should not be steeper than 1:3 and cut back where the ECO deems necessary.
6. Berms may be specified on sloped sites, depending on the gradient and length of slope affected.
7. Any stockpiling of gravel, cut, fill or any other material including spoil shall be in areas approved by the ECO within the defined working area.
8. Ensure that stockpiled material is not lost due to exposure to the elements. If the stockpiled material is in danger of being washed or blown away, cover it with a suitable material, such as hessian or plastic. Do not cover stockpiles of topsoil with plastic.
9. Do not allow stockpiling of any material within the 100 m of any residential areas or 20 m of any “no go” area.

7.2.19 Sanitation

1. Provide adequate washing and toilet facilities at the construction site camp.
2. Provide portable chemical toilets at a ratio of one toilet per 15 workers.
3. The toilet facilities must be easily accessible.
4. All temporary/portable toilets shall be secured to the ground to the satisfaction of the PM to prevent them from toppling over or being blown over by wind.
5. The type and exact location of the toilets shall be approved by the PM prior to establishment. No septic tanks are to be established.
6. Ensure maintenance of all toilets in a clean sanitary condition to the satisfaction of the PM. Toilets are to be serviced at least once per week and toilet paper shall be provided.
7. Ensure that no spillage occurs when the toilets are cleaned or emptied and that the contents are removed from the site to an appropriate location/facility. The Contractor/service provider is to provide proof that the toilet contents are disposed of at an appropriate facility.
8. Discharge of waste from toilets into the environment and burial of toilet waste is strictly prohibited.

7.2.20 Waste water and Contaminated Water Management

1. Prepare a Method Statement on the control and management of waste water on site, including providing for the appropriate disposal of contaminated water.
2. No grey water runoff or uncontrolled discharges from the site/working areas (including wash down areas) to adjacent or nearby water bodies shall be permitted.
3. Discharge water containing environmental pollutants into a conservancy tank, where appropriate, for removal from site.
4. Prevent runoff loaded with sediment and other suspended materials from the site/working areas from discharging to adjacent watercourses and/or stormwater infrastructure.
5. Potential pollutants of any kind and in any form shall be kept, stored and used in such a manner that any escape can be contained.
6. Wash down areas must be approved by the PM and ECO and shall not pollute the surrounding environment.
7. Notify the PM and ECO of any pollution incidents on site.

7.2.21 Storm Water Management and Erosion Control

1. The following areas will require appropriate erosion control measures and re-vegetation methods as these are regarded as being of high erosion risk:
 - Slopes > 20°
 - Slopes with convergent sub-surface drainage (percolines)



- Road culverts
 - Cut and fill slopes in areas of slope instability or erodable geology.
2. Take all reasonable measures to control storm water and the erosive effects thereof and provide a Method Statement for approval by the PM and ECO.
 3. Protect streams, rivers, pans, wetlands, dams, and their catchments from erosion, direct or indirect spillage of pollutants such as refuse, garbage, cement, concrete, sewage, chemicals, fuels, oils, aggregate, tailings, wash water, organic materials and bituminous products.
 4. Protect areas susceptible to erosion by installing necessary temporary or permanent drainage works as soon as possible.
 5. Areas affected by construction related activities and/or susceptible to erosion must be monitored regularly for evidence of erosion.
 6. Inspect storage containers regularly to prevent leaks into the aquatic system.
 7. Weather forecasts of up to three days in advance must be monitored on a daily basis to avoid exposing soil or building works or materials during a storm event and appropriate action must be taken in advance to protect construction works should a storm event be forecasted.
 8. On any areas where the risk of erosion is evident, special measures may be necessary to stabilise the areas and prevent erosion. These may include, but not be restricted to:
 - Confining construction activities
 - Using cut-off berms
 - Using mechanical cover or packing structures such as geo-fabric to stabilise steep slopes or hessian, gabions and mattress and retaining walls
 - Straw stabilising
 - Brush cut packing
 - Constructing anti-erosion berms.
 9. The erosion prevention measures must be implemented to the satisfaction of the PM and ECO.
 10. Where erosion does occur on any completed work/working areas, reinstate such areas and areas damaged by the erosion at the expense of the Contractor and to the satisfaction of the PM and ECO.
 11. Restrict and control traffic and movement over stabilised areas.
 12. Repair and maintain any damage to the stabilised areas to the satisfaction of the PM and ECO.
 13. The Contractor shall be liable for any damage to downstream property caused by the diversion of overland storm water flows.

7.2.22 Air Emissions and Odour Control

1. Ensure that all vehicles and plant used are maintained in good working order to help reduce air emissions.
2. The burning of substances that may emit foul smelling smoke or vapour, e.g. oil rags, tar paper etc., is not permitted.

7.2.23 Noise Control

1. Keep noise level within acceptable limits in compliance with all relevant guidelines and regulations.
2. All vehicles and machinery shall be fitted with appropriate silencing technology that shall be properly maintained.
3. Reverse hooters of heavy earthmoving vehicles must be set at such a level that the beeping sound does not create a nuisance to residents of nearby houses.



4. The use of all plant and machinery shall be appropriate to the task required in order to reduce noise levels and/or environmental damage.
5. Notify affected residents and ECO, should the PM approve any noisy construction activities outside of normal working hours, least 5 days in advance of the event.

7.2.24 Dust Control

1. Control dust arising from construction operations and activities, through e.g, regular spraying of working/exposed areas with water at an application rate that will not result in soil erosion or runoff. The frequency of spraying will be agreed with the PM.
2. Avoid the excavation, handling and transport of erodable materials under high wind conditions.
3. Soil stockpiles shall be wetted and/or sheltered from the wind, as required.

7.2.25 Hazardous Substances

1. All potentially hazardous raw and waste materials are to be handled by the Contractor's trained staff and stored on site in accordance with manufacturer's instructions and legal requirements.
2. Provide appropriate training for the handling and use of such materials as necessary. This includes providing for any spills and pollution threats that may occur.
3. Clearly labelled products and provide symbolic safety/hazard warning signs.
4. Ensure that areas for the storage of fuel and other flammable materials comply with standard fire safety regulations.
5. Locate fuel and chemical depot(s) at least 100 m from any water body.
6. If potentially hazardous substances are to be stored on site, provide a Method Statement detailing the substances/materials to be used together with the procedures for the storage, handling and disposal of the materials in a manner which will reduce the risk of pollution that may occur from day to day storage, handling, use and/or from accidental release of any hazardous substances used.
7. Store hazardous chemical substances used during construction in secondary containers.
8. Retain the relevant Material Safety Data Sheets (MSDS) on site. Procedures detailed in the MSDS shall be followed in the event of an emergency situation.
9. Where hazardous substances is removed from site for disposal, proof of disposal for auditing purposes shall be kept in the form of disposal certificates.

7.2.26 Fuels (Petrol and Diesel) and Oil

1. Obtain all necessary approvals regarding storage and dispensing, where fuel is to be stored on site, from the appropriate authorities.
2. Ensure that the location of the fuel storage area is approved by the PM and ECO.
3. Ensure that all liquid fuels and oils are stored in tanks with lids and that these are kept firmly locked at all times. The design and construction of the storage tanks shall be in accordance with a recognised code and as approved by the PM.
4. Situate the tanks situated in a bunded area that has a volume of at least 110% of the volume of the largest tank. The floor of the bunded area must be impermeable and the bunds must be without leaks.
5. Remove storage tanks on completion of the works.
6. No smoking shall be allowed in the vicinity of the fuel storage area. Erect at least one no-smoking warning sign, which is clearly visible at the fuel storage area, to warn all staff of associated dangers.
7. Provide adequate fire fighting equipment at or close to the fuel storage and dispensing area(s).
8. Keep fuel under lock and key at all times.



9. Where reasonably practical, plant shall be refuelled at a designated refuelling area or at the workshop as applicable. If it is not reasonably practical then the surface under the temporary refuelling area shall be protected against pollution to the reasonable satisfaction of the PM prior to any refuelling activities.
10. Ensure that there is always a supply of absorbent material readily available to absorb/break down any hydrocarbon spillage. The quantity of such materials shall be able to handle a minimum of 200 litres of hydrocarbon liquid spill. This material must be approved by the PM prior to any refuelling or maintenance activities.
11. In the case of a spill, contaminated material must be removed from the site immediately and disposed of at an appropriate hazardous waste facility.

7.2.27 Fire Prevention and Control

1. Take all reasonable and precautionary steps to ensure that fires are not started as a consequence of construction activities.
2. Ensure that there is basic fire-fighting equipment available on site. Fire-fighting equipment must be in working order and serviced to date.
3. Appoint a Fire Officer who shall be responsible for ensuring immediate and appropriate actions in the event of a fire and shall ensure that employees are aware of the procedures to be followed. Forward the name of the Fire Officer to the ECO for his approval within 7 days of being on site.
4. Flammable materials should be stored under conditions that will limit the potential for ignition and the spread of fires.
5. Smoking shall not be permitted in those areas where there is a fire hazard, e.g. fuel storage areas and areas susceptible to the rapid spread of fires.
6. Hold fire prevention talks with staff to create an awareness of the risks of fire.

7.2.28 Emergency Procedures

1. Ensure that employees and Sub Contractors on site are aware of the procedure for dealing with accidental spills and leaks.
2. Ensure that the necessary materials and equipment for dealing with the spills and leaks are available on site at all times.
3. The site shall have a supply of absorbent material readily available to absorb any accidental hydrocarbon spills. The quantity of such material shall be able to absorb/deal with a minimum of 200 litres of spill.
4. Contain any spill using sand berms, sandbags, sawdust or absorbent materials.
5. The area shall be cordoned off and secured.
6. Notify the ECO, PM and relevant authorities of any spills that occur.
7. Assemble and clearly list the relevant emergency telephone contact numbers for staff and brief staff on the required procedures. These contact details shall be listed in English, and any other relevant language, in the site office, construction camp and any other suitable areas.
8. The treatment and remediation of areas affected by emergencies shall be undertaken to the satisfaction of the PM and ECO at the cost of the Contractor where his staff have been proven to be responsible for the emergency.

7.2.29 Work Stoppage and Temporary Site Closure

1. The PE, in consultation with the ECO, shall have the right to order work to be stopped in the event of significant infringements of the Project Environmental Specifications until the situation is rectified in compliance with the specifications. In this event, the Contractor shall not be entitled to claim for delays or incurred expenses.



7.2.30 Monitoring and record keeping

1. Inspect the site on a daily basis to ensure that the environmental specifications of the EMP are adhered to.
2. Provide the PM with a verbal report, at least fortnightly, detailing compliance with the EMP as well as environmental performance.
3. Maintain a record of incidents (spills, impacts, complaints, legal transgressions, etc.) as well as corrective and preventive actions taken, for submission to the PM at the scheduled project meetings.

7.2.31 Compliance with the EMP

1. The Contractor and/or his agents are deemed not to have complied with the EMP and remedial action if:
 - There is evidence of contravention of the EMP clauses within the boundaries of the site or extensions.
 - Environmental damage ensues due to negligence.
 - The Contractor fails to comply with corrective or other instructions issued by the PM, within a time period specified by the PM.
 -

7.2.32 Vegetation

1. Rehabilitation shall be undertaken in line with the Rehabilitation plan developed for the project during the final design phase
2. Rehabilitation shall be required for all specified areas disturbed by the works and site camp.
3. Rehabilitation shall ensure that all specified areas disturbed by the works are returned to a similar or better state than before the construction works commenced.
4. The Contractor shall rehabilitate all disturbed areas to the satisfaction of the PM and the ECO.
5. Implement a programme of progressive rehabilitation, i.e. rehabilitation and/or re-vegetation must commence once works are complete in a particular area with acceptable regrowth being achieved after 3 months.
6. A programme of progressive rehabilitation will provide an opportunity to assess whether or not the methods employed are suitable and successful. Where rehabilitation of an area is not successful, the Contractor will rehabilitate these areas at no additional cost to the Developer.
7. Rehabilitation includes, but is not limited to, the following activities:
 - Clearance of rubble associated with construction, including removal of surplus materials, excavation and disposal of consolidated waste concrete and concrete wash water, litter etc.
 - Removal of all soil/sand contaminated by hydrocarbons by excavation to the depth of contaminant penetration and removal to an appropriate landfill site.
 - Backfilling and contouring using stockpiled subsoil removed during site clearing.
 - Finishing and grading of final levels of all disturbed areas shall be consistent with the master plan for the site.
 - Rehabilitation of all drainage lines affected by construction to approximately their original profile. Where this is not feasible due to technical constraints, the profile is to be agreed upon by the PM.
 - Ripping along the contour of compacted disturbed areas, including stockpile areas, to a depth of 150 mm prior to the replacement of topsoils, except where otherwise specified by the PM.
 - The eradication of young invasive/alien species that may have grown up during



the construction period in impacted and rehabilitated areas.

- The removal of visually detracting or environmentally unacceptable piles of blast rock and boulders to an approved spoil site.
8. Areas compacted by vehicles during construction must be scarified to allow penetration of plant roots and the regrowth of natural vegetation.
 9. Excess subsoil shall be spoiled in a pre-identified location or be used, where possible, as infill material or building material, in conjunction with the ECO's approval.

7.2.33 Heritage Impact

Regulating authorities such as SAHRA may provide comment and recommendations in their approval of the Heritage Impact Assessment (Archaeological Impact Assessment). These recommendations may include additional specifications not addressed in the AIA. These recommendations may be incorporated into this section.



8 ENVIRONMENTAL SPECIFICATIONS: OPERATIONAL PHASE

This section details specifications to be adhered to by the Developer / RedCap Project Engineer during the Operational Phase.

8.1 Operational Phase Specifications – Developer

8.1.1 Solid waste management

1. During the operation phase, the area of the development should be cleared of litter on a regular basis. Once collected, this litter shall be disposed of at a DEA approved waste disposal site.

8.1.2 Hazardous waste

1. Hazardous materials (if any) which may be generated during the operation phase must be disposed of in a DEA approved hazardous waste landfill site.
2. The Proponent or Contractor acting on his behalf shall ensure that an emergency preparedness plan is in place for implementation in the case of a spill.

8.1.3 Emergency procedures

1. The Proponent or Contractor acting on his behalf shall compile and maintain environmental emergency procedures during the operational phase of the project to ensure that there will be an appropriate response to unexpected or accidental environment-related incidents, e.g. during routine maintenance and servicing.
2. These plans should include:
 - A list of key personnel, including responsibilities, accountability and liability.
 - Details of emergency services applicable to the various areas along the route that the turbine components will need to be transported as well as for the site itself.
 - Internal and external communication plans, including prescribed reporting procedures where required by legislation.
 - Actions to be taken in the event of different types of emergencies.
 - Incident management plans for the site.
 - Incident recording, progress reporting and remediation measures required to be implemented.
 - Information on hazardous materials, including the potential impact associated with each and measures to be taken in the event of accidental release.
 - Fire fighting strategy.
 - Training plans and testing exercises and schedules for effectiveness.

8.1.4 Erosion control

1. The various protective measures that were installed during the construction phase must be properly maintained, e.g. the vegetation of road verges and cut faces must be inspected and maintained on a regular basis.



8.1.5 Access and signage

1. All access requirements must be identified and detailed by the Contractor. Communities, landowners and/or developers within the turbine site will be required to apply for access to the Operator. The Operator must consider each application and consult with each applicant in this regard.
2. Avoid signs near wind turbines unless they serve to inform the public about wind turbines and their function. Advertising billboards should be avoided.

8.1.6 Maintenance

1. The components of the turbines and associated infrastructure shall be maintained so in a good working order so as to minimise impacts associated with the malfunctioning of a wind turbine.
2. Scheduled repairs must be carried out during daylight working hours during the working week.
3. Road maintenance must be conducted on the service roads within and around the development site by the Developer as and when necessary.
4. spinning rotor is perceived as being useful but stationary rotor when the wind is blowing is seen as not fulfilling its purpose and a negative impression is created.

8.2 Specialist environmental considerations

Vegetation

1. Alien invasive monitoring to be implemented
2. No additional clearing to be undertaken during operational phase
3. Maintaining sufficient buffer zones to allow the presence of suitable fire breaks
4. Road borders should be regularly maintained to ensure that vegetation remains short and that they therefore serve as an effective firebreak.
5. Flammable litter and discarded glass bottles should be removed regularly

Terrestrial Fauna

6. Keep the grass/vegetation short next to the road to reduce mammal activity near the road.
7. Care must be taken to ensure slow driving on the site especially during rainfall periods
8. Speed limits should be enforced.
9. Dead animals must be removed off the road as this will attract scavengers which may also be harmed on the road.
10. Do not feed animals on or near the roads.
11. Regular visits to the site to check if any fauna are trapped.
12. Access gates into the fenced off areas to be closed at all times.
13. Fences must be visible to animals.

Birds

1. Monitoring of birds and their interaction with turbines as specified Appendix D.

Bats

1. Monitoring of Bat Mortalities (morning searches) as part of the bird monitoring process
2. Any retrieved carcasses should be sent frozen to bat specialists for analysis, together with the circumstances of their finding.



Cultural Heritage

1. Should any archaeological or cultural heritage resources as defined and protected by the NHRA 1999 and not reported on in this report be identified during the course of operation, it should be reported to SAHRA or an ASAPA accredited CRM archaeologist.

Visual

1. Maintain the turbines in good working order to ensure operation under the right conditions.
2. Signs near wind turbines should be avoided unless they serve to inform the public about wind turbines and their function. Advertising billboards should be avoided.
3. An information kiosk can enhance the project by educating the public about the need and benefits of wind power. Engaging school groups can also assist the wind farm proponent, as energy education is paramount in developing good public relations over the long term.

Hydrology

1. The undertaking of a Water Use Licence Application (WULA) as required by the National Water Act (Act 36 of 1998) due to roads crossing streams/ wetlands.

Noise

1. If the Nordex or similar turbines are used, they should be operated in a low noise mode in the 4-6m/s wind speed range only if onsite measurements (after construction) at the West cluster NSA West Ext 1 & 2 and the Central cluster NSA 7,8,9 & Ext1 show the noise emissions exceed the recommended limits.
2. Ambient noise monitoring is recommended once the turbines are erected. This is to determine the exact power mode settings needed to comply with the guideline limit in the 45 dB(A) range.

Socio-economic

1. Always have a representative of the developer as one of the trustees of the Trust to ensure good corporate governance

8.3 Operational Phase Specifications – Contractor

8.3.1 Demolition Activities

In the event that demolition activities are required during the life of the project, the demolisher shall use razing methods that offer a high degree of control, e.g. jack-hammering and long reach excavators. The use of the wrecking ball or blasting with explosives should only be made as a last resort.

8.3.2 Jack-hammering and demolishing with excavators

1. Take all reasonable measures to limit dust generation as a result of jack-hammering and excavator operations.
2. Noise and dust nuisances shall comply with the applicable standards.
3. Ensure that no pollution results from demolishing operations, e.g. as a result of oil and fuel drips.
4. Machine-assisted demolishing is to be undertaken during standard working times only.



8.3.3 Blasting

1. Obtain a current and valid authorisation from the relevant authorities prior to any blasting activity. A copy of this authorisation shall be given to the PM and ECO.
2. A Method Statement shall be required for any blasting related activities. No blasting will be permitted unless the Contractor has satisfied the PM and ECO that his proposed blasting methods and controls are such that no damage will be caused to any adjoining structures, pipelines, service or surrounding sensitive environmental areas.
3. A qualified and registered blaster shall supervise all blasting and rock-splitting operations at all times.
4. Appropriate pre blast monitoring records must be in place (i.e. photographic and inspection records of structures in close proximity to the blast area).
5. Allow for good quality vibration monitoring equipment and record keeping on site at all times during blasting operations as required by the PM.
6. Take necessary precautions to prevent damage to special features and the general environment, which includes the removal of fly-rock.
7. The relevant occupants/owners of surrounding land shall be notified by the Contractor at least one week prior to blasting and any concerns addressed. Buildings within the potential damaging zone of the blast shall be surveyed preferably with the owner present, and any cracks or latent defects pointed out and recorded either using photographs or video. Failing to do so shall render the Contractor fully liable for any claim of whatsoever nature, which may arise.
8. Environmental damage caused by blasting/drilling shall be repaired at the Contractor's expense to the satisfaction of the PM.
9. All warning signals shall be clearly visible.
10. Use blast mats for cover material during blasting. Topsoil shall not be used as blast cover.
11. During demolition, ensure where possible, that vegetation in the area is not damaged.
12. Appropriate blast shaping techniques shall be employed to aid in the landscaping of blast areas, and a Method Statement to be approved by the PM, shall be required in this regard.
13. Blast rock may only be disposed of at a licensed landfill site.



9 ENVIRONMENTAL SPECIFICATIONS: DECOMMISSIONING PHASE

The lifespan of a wind energy converter is generally 25 years. Due to the long term nature of the development, no tangible specifications can be made during this time. It is therefore recommended that prior to decommissioning of the wind turbines at some future date, a comprehensive decommissioning EMP be prepared that can reassess the potential environmental and socio-economic impacts at the time. This decommissioning EMP should be based on the construction EMP as the impacts and mitigation measures will be very similar. Specifications applicable to the Developer and the Contractor will be defined in the decommissioning EMP.



DOCUMENT CONTROL SHEET (FORM IP180/B)

CLIENT :
 PROJECT NAME : PROJECT No. :
 TITLE OF DOCUMENT :
 ELECTRONIC Document1
 LOCATION :

	Approved By	Reviewed By	Prepared By
ORIGINAL	NAME	NAME	NAME
DATE	SIGNATURE	SIGNATURE	SIGNATURE

	Prepared by	Prepared By	Prepared By
ORIGINAL	NAME	NAME	NAME
DATE	SIGNATURE	SIGNATURE	SIGNATURE

	Approved By	Reviewed By	Prepared By
REVISION	NAME	NAME	NAME
DATE	SIGNATURE	SIGNATURE	SIGNATURE

	Approved By	Reviewed By	Prepared By
REVISION	NAME	NAME	NAME
DATE	SIGNATURE	SIGNATURE	SIGNATURE

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Appendix A

List of Applicable Legislation



ENVIRONMENTAL LEGISLATION AND POLICY

Environmental policies and guidelines

The Developer is required to develop an environmental management policy before commencement of the proposed works. This policy must consider:

- The Developer's mission, vision and core values;
- Guiding principles;
- Requirements of, and communication with interested and affected parties (I&APs);
- The commitment to prevent pollution and ecological degradation;
- The importance of coordination with other organisational policies (e.g. quality, occupational health and safety, etc.);
- Reference to specific local and/or regional conditions;
- A commitment to comply with relevant environmental laws, regulations, by-laws.

The policy, once approved by Project Manager and ECO, must be communicated to all employees and Contractors (and sub-Contractors), and made available to the public, if requested.

Legislative Framework

This EMP informs all parties as to their duties in the fulfilment of the project objectives, with particular reference to the prevention and mitigation of environmental impacts caused by construction activities associated with the project. All parties associated with the project should note that obligations imposed by the approved EMP are legally binding in terms of environmental statutory legislation. In the event that any rights and obligations contained in this document contradict those specified in the standard or project specifications then the latter shall prevail.

Statutory and Other Applicable Legislation and Standards

The Contractor shall identify and comply with all South African national and provincial environmental legislation, including associated regulations and all local by-laws relevant to the project. Key legislation currently applicable to the design, construction and implementation phases of the project include:

- The Constitution of the Republic of South Africa Act 108 of 1996;
- Environment Conservation Act 73 of 1989;
- National Environmental Management Act 107 of 1998, as amended;
- National Environmental Management: Protected Areas Act 57 of 2003;
- National Environmental Management: Biodiversity Act 10 of 2004;
- National Forests Act 43 of 1983;
- National Water Act 36 of 1998;
- Conservation of Agricultural Resources Act 43 of 1983;
- National Veld and Forest Fire Act 101 of 1998;
- Hazardous Substances Act 15 of 1973;



- National Heritage Resources Act 25 of 1999;
- National Environmental Management: Air Quality Act 39 of 2004;
- National Environmental Management: Waste Management Act 59 of 2008;
- Mineral and Petroleum Resources Development Act 28 of 2002;
- Health Act 63 of 1977;
- Occupational Health and Safety Act 85 of 1993;
- White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity;
- All relevant provincial legislation, Municipal by-laws and ordinances.

The following permit requirements would be relevant to the proposed project:

- Water Use Licence Application from Department of Water Affairs and Forestry
- All relevant licenses from the Civil Aviation Authority
- Permit for the removal of protected plants on the site;
- Approval from the South African Heritage Resources Agency (SAHRA) on cultural issues;
- Hazardous chemicals permit for asphalt plants, if to be used – obtained from the Department of Water and Environmental Affairs (DWEA);
- Health permits for sanitation (Provincial health authorities);
- Fuel storage permit (temporary and permanent) – obtained from DEA;
- Blasting permit – obtained from the Department of Mineral Resources (DMR), if required;

The list of applicable legislation and permits provided is intended to serve as a guideline only and is not exhaustive.



Appendix B
Construction Activities that will Initially Require Method
Statements



ACTIVITY	SPECIFICS
Access Routes and Roads	<ul style="list-style-type: none"> • Upgrading and construction of access routes • Rehabilitation of temporary access routes • Location of proposed access routes
Blasting	Details of all methods and logistics associated with blasting if required
Excavation	Method for all excavations, including minimisation of environmental impact.
Bunding	Method for the bunding of static plant
Cement/Concrete Batching	Location, layout and preparation of cement/ concrete batching facilities including the methods employed for the mixing of concrete including the management of runoff water from such areas.
Contaminated Water	Contaminated water management plan, including the containment of runoff and polluted water
Drilling and Jack Hammering	<ul style="list-style-type: none"> • Method of drill coring with water or coolant lubricants • Methods to prevent pollution during drilling operations
Dust	Dust control plan
Earthwork, Erosion Control and Stormwater management	<ul style="list-style-type: none"> • Method for the control of erosion during bulk earthworks operations • Method of erosion control of spoil materials • Method of undertaking earthworks, including hand excavation and spoil management • Construction of earth and stormwater control berms or drainage ditches around campsite to contain dirty water
Emergency	<ul style="list-style-type: none"> • Emergency response plan • Emergency procedures must include but not be limited to electrical hazards, fires, spills, and contamination of ground and surface water, accidents to employees and damage to services
Environmental induction training	Ensure that all site employees are aware of, and understand the contents and conditions of the EMP, the key environmental issues and the consequences of non-compliance
Fire, Hazardous and Poisonous substances Management	<ul style="list-style-type: none"> • Handling and storage of hazardous waste in impermeable banded areas with separate storage of incompatible substances • Construction and location of concrete platform / bund wall to accommodate hazardous substances • Emergency spillages procedures and compounds to be used • Emergency procedures for fire • Emergency remediation / clean-up procedures for spills or leaks of hazardous substances • Location of hazardous substance storage areas • Methods of the disposal of hazardous building materials, including asbestos, fibre claddings, refrigerants and coolants. • Details of methods for fuel spills and clean up operations • Rehabilitation of batching plant area at completion of construction.
Health and safety	<ul style="list-style-type: none"> • Compile a Construction Health and Safety Plan • Take all necessary precautions to effectively address any potential health and safety hazards • Display appropriate hazard warning signs conspicuously at all potential hazards that may affect public members
Rehabilitation	<ul style="list-style-type: none"> • Rehabilitation of disturbed areas and re-vegetation after



ACTIVITY	SPECIFICS
Site Camp Establishment	construction is complete <ul style="list-style-type: none">• Layout and preparation of the construction camp• Location, layout, preparation and operation of all wash areas, including vehicle wash, workshop washing and paint washing and clearing• Construction camps, equipment storage sites and ablution facilities serving the construction phase should be sited a reasonable distance away from the river• Location of storage areas for materials, equipment, plant and vehicles• Method of vegetation clearing• Installation of ablution facilities with chemical toilets prior to construction commencing (minimum of one toilet to 15 people)
Traffic	Any traffic diversions must be undertaken with approval of the relevant Transport Authority and in accordance with relevant legislation.
Waste Control and Management	<ul style="list-style-type: none">• Types of wastes generated• Location of designated waste areas• On-site disposal facilities• Collection arrangements• Disposal procedures• Disposal site verification• Solid waste and sewerage collection and disposal procedures
Water abstraction	Water abstraction from water resources if undertaken



Appendix C

General Vegetation Rehabilitation Specification Guideline



GENERAL VEGETATION REHABILITATION SPECIFICATION GUIDELINE

a. Objective

To provide guidelines for vegetation clearing and rehabilitation during all phases.

b. Materials

To revegetate an area as accurately as possible to its original flora, plant species used should be those that occur naturally in the nearest site with a similar soil type and aspect. A suitably qualified botanist should be consulted with in this regard.

i. Shrubs and trees

1. Indigenous plants shall be obtained either from the site prior to clearing or from an area in close proximity to and of the same vegetation type as the site, as indicated by the Botanist.
2. Seedlings and young plants of the abovementioned plants should be collected and placed in bags to be stored in the on-site nursery before construction commences to be used during revegetation in consultation with an appointed horticulturalist, the ECO and a botanist.
3. Nursery plants shall be grown from locally obtained seed unless approved by the Botanist.
4. Plants shall be obtained from their natural habitat.
5. The Horticulturalist shall ensure that each plant is handled and packed in the approved manner for that species or variety, and that all necessary precautions are taken to ensure that the plants arrive on Site in a proper condition for successful growth.
6. Trucks used for transporting plants shall be equipped with covers to protect the plants from windburn. Containers shall be in a good condition. Plants shall be protected from wind during the transportation thereof.
7. No plants or plants with exposed roots shall be subjected to prolonged exposure to drying winds and sun, or subjected to water logging or force-feeding at any time after purchase.
8. The Horticulturalist shall ensure that the plants are in a good condition and free from plant diseases and pests. The Horticulturalist shall immediately remove plants containing any diseases and/ or pests from the Site.
9. All plants supplied by the Horticulturalist shall be healthy, well formed, and well rooted. Roots shall not show any evidence of having been restricted or deformed at any time. The potting materials used shall be weed free.
10. There shall be sufficient topsoil around each plant to prevent desiccation of the root system. Where plants are stored on site prior to planting they shall be maintained to ensure that the root systems remain moist.

ii. Grass

Sods and runners

1. Grass sods shall be clean of invasive plants or weeds.
2. Sods shall be obtained from a source approved by the Botanist. Sods rejected by the Botanist shall be removed from the site immediately.
3. Grass shall have been grown specifically for sod purposes, mown regularly and cared for to provide an approved uniformity to the satisfaction of the Botanist. It shall be harvested by special machines manufactured for this purpose to ensure an even depth of cut with sufficient root material and soil.
4. Sods shall be delivered in healthy conditions and be free from weeds and disease.



5. Sods shall be obtained from an approved nursery. Nursery sods shall have been maintained regularly to the required quality. Nursery grass sods shall have at least a 30 mm layer of topsoil.
6. Sods shall be obtained directly from the surrounding area and shall contain at least a 50 mm topsoil layer and the roots shall be minimally disturbed. They shall be obtained from the near vicinity of the site from an area selected by the Botanist. The soil shall be compatible with that removed from the area to be revegetated and shall not have been compacted by heavy machinery.
7. Runners shall be of an approved quality and free from disease or weeds.

Indigenous vegetation sods

1. Sods of indigenous vegetation (e.g., rushes, sedges and grass) shall be obtained from areas approved by the Botanist, within or near the site.
2. The Horticulturalist shall identify suitable sods, as directed by the Botanist.
3. Sods rejected by the Botanist shall be removed from the site immediately.
4. Indigenous vegetation sods shall be clean of weeds or invasive plants in specified areas before planting.

Seed

1. The seed mix quantities and purity levels shall be specified by the horticulturalist and approved by the Botanist.
2. Seed shall be utilised for the cultivation of material for revegetation.
3. Seed shall be utilised for direct sowing.
4. Seed must be pre-dried then stored under cool, dry, insect free conditions until required either for cultivation in the nursery or in the rehabilitation process. Only viable, ripe seed shall be used.
5. A record of stock relevant to the project that is held in the nursery shall be provided to the Botanist on a monthly basis.

Harvested seed

1. Indigenous seed shall be harvested in areas which are free of alien/ invasive vegetation, either at the site prior to clearance or from suitable neighbouring sites, as indicated by the Botanist.
2. Following harvesting, the seed shall be dried under cool airy conditions. The seed shall be insect-free and shall be stored in containers under cool conditions that are free of rodents or insects. No wet, mouldy or otherwise damaged seed is acceptable.
3. Seed harvested by hand from selected species, should be treated and stored separately.
4. Seed gathered by vacuum harvester or other approved mass collection method, from suitable shrubs or from the plant litter surrounding the shrubs shall be kept apart from individually harvested seed.
5. Harvested seed obtained by means of vacuum harvesting, shall be free of excessive quantities of organic and/ or substrate material.

iii. Mulch

Mulch shall be utilised as follows depending on local and seasonal availability of material.

Brush-cut mulch

1. The stockpiled vegetation from the clearing operations shall be reduced to mulch.
2. Indigenous plant material shall be kept separate from alien material. The vegetative material, shall be reduced by either mechanically means (chipper) or by hand-axing



to sticks no longer than 100 mm. The chipped material shall be mixed with the topsoil at a ratio not exceeding 1:1.

3. Mulch shall 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.
4. No harvesting of vegetation outside the area to be disturbed by construction activities shall occur.
5. Mulch shall be harvested from areas in close proximity to the site, as approved by the Botanist. Any collection of indigenous material from nearby area that will not be subject to complete denudation shall only be done in mature vegetation in areas identified by the Botanist.
6. Harvesting shall be performed in a chequer board fashion, cutting the indigenous vegetation down to ± 100 mm above the ground, in 2 m wide strips, leaving 2 m gaps of undisturbed vegetation in between.
7. The Horticulturalist shall take every effort to ensure the retention of as much seed as possible in mulches made from indigenous vegetation. Mulches shall be collected in such a manner as to restrict the loss of seed.
8. Brush-cut mulch shall be stored for as short a period as possible, and seed released from stockpiles shall be collected for use in the rehabilitation process.
9. Fynbos vegetation cleared from the site prior to construction activities, that is suitable for mulching, shall be stockpiled for later use. The Horticulturalist shall ensure that no alien species are used to make indigenous vegetation brush cut mulch without the approval of the Botanist.
10. Natural topsoil shall be mixed with fynbos.

Wood chips

1. Wood chips (including bark) shall be utilised as mulch during revegetation and rehabilitation of the site.
2. The chips shall be no longer than 50 mm in length or breadth and shall be free of seed. The Botanist shall approve the source of chips.
3. The wood shall be chipped during winter
4. Chips shall not be made from wood treated with preservatives.
5. Half-composted chips shall be utilised in preference to non-composted chips
6. Indigenous seed shall always be added to wood chip mulches.

Compost

1. Compost shall be utilised as mulch during revegetation and rehabilitation of the site.
2. The compost shall be well decayed, friable and free from weed seeds, dust or any other undesirable materials.
3. Seed free, half-composted material, such as mulled-bark, shall be used as an additive to extend indigenous mulch. No more than 50% compost shall be used under these circumstances.

iv. Slope stabilizers and anti-erosion measures

Stabilisation cylinders

1. Stabilisation cylinders shall consist of cylindrical capsules approximately 125 mm in diameter by 1.5 m in length.
2. Stabilisation cylinders shall be manufactured from biodegradable material such as hessian or of extruded biodegradable plastic netting. The plastic material shall be sufficiently robust to last for a period of not less than 3 years and not more than 10 years before disintegrating under normal service conditions.



3. Stabilisation cylinders shall be filled with shredded or partly compressed pine chips or similar material. Only material passing through a 31 mm sieve with round holes and retained on a 5 mm sieve with square holes shall be used. Splinters and flat chips are not acceptable.
4. A seed approved by the Botanist shall be included in the cylinders.
5. Cylinders shall be anchored in position using biodegradable material.
6. Cylinders shall not be used to stabilise any rock faces.

Biodegradable netting / matting

1. Biodegradable netting/matting shall be made from jute, sisal, coir or similar material.
2. A 1 m² sample of the geofabric, geogrid or nylon (biodegradable) fabric shall be submitted to the Botanist for approval prior to procurement.
3. The netting/matting shall be sufficiently robust to last for a period of not less than 5 years under normal service conditions.
4. Holes in the netting/matting shall have a minimum size of 400 mm² and a maximum size of 900 mm² and be made from at least 4-6 mm thick cord.

Logs

1. For slopes of less than 1:3, the Site shall be stabilised by means of “geojute” (if available) and continuous rows of logs, secured to the slope with timber pegs, parallel to the contour. Logs shall be untreated pine (or gum) poles of not less than 150 mm with a taper of not more than 75 mm over its length. Timber pegs to be treated and not less than 400 mm in length. Timber pegs must be longer if thicker logs than the minimum are used.
2. Logs shall be secured to the slope in such a manner that they will not become dislodged during construction and/ or planting. Logs to be secured to the slope by means of a minimum of two pegs driven into the soil not less than 250 mm deep. For logs longer than 3 m, additional pegs shall be required. Log ends to be butt-jointed and plugged with wood chips or similar to prevent water from washing through at the joint. Logs shall be placed at 2 m intervals with a bottom row parallel to the edge of the road. Logging of the slope to start at the top of the slope to prevent the stretching of the “geojute”.

v. Soil stabilizers

1. Soil stabilisers shall consist of an organic or inorganic material to bind soil particles together and shall be a proven product able to suppress dust and form an encrustation.
2. Soil stabilisers shall be of such a quality that grass and indigenous seeds may germinate and penetrate the crust. Samples of the proposed material shall be supplied to the Botanist before any of the material is delivered to the Site.

vi. Topsoil and subsoil

1. All soil imported to act as bedding material shall be free of alien plant seeds, and their use shall be restricted to 500 mm below the soil surface.

vii. Boulders and rocks

1. Boulders or rocks used in rehabilitation shall come from comparable geomorphological units to those that they are being utilised to rehabilitate.



2. Where possible, boulders and rocks utilised during rehabilitation, shall be collected from the Site and stockpiled prior to the commencement of construction activities on Site.

c. Facilities

i. Seed store

1. Facilities should be available to store seed, collected or required on-site, in *rodent- and insect-free, cool (7 - 10 °C), dry* conditions.

ii. Site-specific nursery

1. On-site nursery facilities shall be erected for the holding of rescued plant material and the propagation of appropriate species for revegetation. The nursery shall be suitably located and constructed under the supervision of the Botanist and horticulturalist, accommodating the following factors:
 - a. Close proximity to permanent sustainable water for irrigation;
 - b. Suitably shielded from roads, where dust may be problematic;
2. The site nursery should be constructed before any vegetation clearing activities commence;
3. The nursery should be of sufficient design to be able to accommodate the various functions it will be required to perform during its lifespan, including but not limited to:
 - a. A sufficiently large tunnel with required facilities for material propagation;
 - b. A large shaded area (of varying degrees of shade) to store material in transit between being rescued and being relocated;
 - c. A large hardening off (unshaded) area for storage of bagged material;
 - d. An area for storage and production of materials such as compost, mulch and
4. The site-specific nursery shall be utilised for the cultivation and maintenance of the stocks of living plant material required for the revegetation and rehabilitation of the Site.
5. The nursery, including irrigation, water shall be free of Phytophthora.
6. Irrigation water shall be de-chlorinated if necessary;
7. Soil used to cultivate or grow plants shall be weed free.
8. The area where plants are stored shall be kept free of weeds.
9. A record of stock relevant to the project that is held in the nursery shall be provided to the Botanist on a monthly basis.

iii. Irrigation

1. The design and layout of the irrigation shall be indicated on a plan and approved by the Botanist and horticulturalist prior to its installation.

d. Vegetation clearing and relocation

i. Infrastructural Requirements

Vegetation clearing

- Once the site layout has been determined the botanist should be consulted and in association with the horticulturalist devise a plant relocation and vegetation clearing plan.
- Areas to be cleared of vegetation should be clearly demarcated before clearing commences.
- Areas should only be stripped of vegetation as and when required, especially grasses, to minimize erosion risk.



- Once demarcated the area to be cleared of vegetation should be surveyed by the vegetation clearing team under the supervision of the botanist and horticulturalist to identify and mark species suitable for rescue.
- Plants to be rescued should include both species of special concern requiring removal for relocation as well as species that would be suitable for use in rehabilitation.
- Depending on growth form this material should be appropriately removed from its locality and stored in the nursery holding areas or immediately relocated where it may be required elsewhere immediately.
- Small trees and shrubs (<1 m in height) can often be rescued and planted temporarily in potting bags for later use.
- Arboreal species (orchids) should be collected attached to the substrate (i.e. branch) they are growing on and stored (hung) in a moist, lightly shaded nursery area for later relocation.
- Wherever possibly any seed material should be collected immediately and stored for later use, particularly species that occur in low numbers.
- Before any earthmoving activities are commenced any ripe grass seed should be collected (using a sickle or similar implement), dried and stored for use during regressing.
- Comprehensive notes should be kept as to the identification, habitat, and any potential biophysical requirements of plants, and any species of special concern removed for relocation should have a GPS locality recorded.
- Grass sods can also be collected for immediate use in any areas requiring revegetation.

Topsoil

- Sufficient topsoil must be stored for later use during decommissioning, particularly from outcrop areas.
- Topsoil shall be removed from all areas where physical disturbance of the surface will occur.
- All available topsoil shall be removed after consultation with the Botanist and horticulturalist prior to commencement of any operations.
- The removed topsoil shall be stored on high ground within the footprint outside the 1:50 flood level within demarcated areas.
- Topsoil shall be kept separate from overburden and shall not be used for building or maintenance of roads.
- The stockpiled topsoil shall be protected from being blown away or being eroded. The application of a suitable grass seed/runner mix will facilitate this and reduce the minimise weeds.

Road Construction

- Should a portion of the access road be newly constructed the following must be adhered to:
 - The route shall be selected that a minimum disturbance to natural vegetation under guidance of the ECO and botanical specialist;
 - Water courses and steep gradients shall be avoided as far as practical;
 - Adequate drainage and erosion protection in the form of cut-off berms or trenches shall be provided where necessary.
- No other routes shall be used by vehicles or personnel for the purpose of gaining access to the site.
- Newly constructed access roads shall be adequately maintained so as to minimise dust, erosion or undue surface damage.



- The liberation of dust into the surrounding environment shall be effectively controlled by the use of inter alia, water spraying and /or other dust-allaying agents. The speed of haul trucks and other vehicles must be strictly controlled to avoid dangerous conditions, excessive dust or excessive deterioration of the road being used.
- The access roads to the site must be strictly maintained during the operation process. Sections of the access road that erodes during the construction phase shall be suitably rehabilitated upon completion of the project.

Operating Procedures in the Study Area

- Grass and vegetation of the immediate environment, or adapted grass / vegetation will be re-established on completion of construction activities, where applicable.
- No firewood to be collected on site and the lighting of fires must be prohibited.
- Cognisance is to be taken of the potential for endangered species occurring in the area and appropriate measures must be implemented.

Excavations and Disturbed Areas

Whenever any excavation is undertaken, the following procedures shall be adhered to:

- Topsoil shall be handled as described in this EMP.
- The construction site will not be left in any way to deteriorate into an unacceptable state.
- Once overburden, rocks and coarse natural material have been placed in the waste pile, they will be profiled with acceptable contours (including erosion control measures), and the previous stored topsoil shall be returned to its original depth over the area.
- The area shall be fertilised if necessary to allow vegetation to establish rapidly. The site shall be seeded with a local or adapted indigenous seed mix in order to propagate the locally occurring flora.

e. Construction

i. Preparation of ground surfaces

1. Prior to the application of topsoil, the ground surface shall be ripped or scarified with a mechanical ripper to a depth of approximately 150 mm.
2. Prior to the application of topsoil, the ground surface shall be ripped or scarified by hand tilling to a depth of approximately 150 mm. *{this specification shall be used on small sites}*
3. Compacted soil shall be ripped to a depth of greater than 250 mm. The ripped area shall be hand-trimmed.
4. The subsoil shall be thoroughly tilled to a depth of at least 100 mm by means of a plough, disc, harrow or any other approved method until the condition of the soil is acceptable, as approved by the Botanist.
5. Where tilling is difficult, the Horticulturalist shall use rotary tillage machinery until no clods or lumps larger than 40 mm in size remain, and the mixing of soil is acceptable to the Botanist.
6. In road cuttings, a weed-free gravel / sand / organic mix shall be utilised as a sub-surface layer.
7. Topsoil shall be applied.



8. Subsequent to the addition of the sub-soil, topsoil shall be spread evenly over the ripped or tilled surface to a depth of 75-150 mm on flat ground or to a minimum depth of 75 mm on slopes of 1:3 or steeper or as specified in this specification.
9. The final prepared surface shall not be smooth but furrowed to follow the natural contours of the land, with scattered rocks of varying sizes according to the natural condition of the area.
10. Where sodding is required slight scarification shall be carried out to contain the sods. The soil shall be uniformly moist to a depth of 150 mm prior to planting or seeding. If this condition is not met by rainfall, the Horticulturalist, as directed by the Botanist, shall carry out irrigation.
11. In artificial wetland areas, topsoil shall be removed to a depth of approximately 200 mm, the wetlands excavated, and topsoil replaced. Wetland areas are then to be selectively composted, as determined by the Botanist, and permanent irrigation systems installed where necessary.
12. Prior to any site clearance, the wetland areas, along with 10 m buffer zones, as indicated on the Revegetation Plan are to be effectively fenced off to prevent any damage to wetland material on sites prior to transplanting.

ii. Soil stabilization

Various options can be utilized for soil stabilization, based on material availability and

Straw stabilisation

1. Straw shall be utilised as a binding material in areas with deep sand, where possible.
2. Baled straw shall be placed on the cleared area, opened and spread evenly by hand or machine at a coverage rate of 1 bale per 10 m² over the area to be stabilised. It shall then immediately be rotovated into the upper 100 mm layer of soil. This operation shall not be attempted when the wind strength is such as to remove the straw before it can be rotovated into the sand.

Mulch stabilisation

1. Mulch shall be applied by hand to achieve a layer of uniform thickness. The mulch shall then be lightly worked into the topsoil layer so that it mixes with the soil and serves to bind it.
2. The mulch shall be spread at a coverage rate of 100 kg per 250 m² or 4 t/ha.
3. Where brush-cut material is to be utilised as mulch, this material shall be evenly spread across the area to a uniform depth of 25 mm. The mulch shall then immediately be rotovated into the upper 100 mm layer of soil. This operation shall not be attempted when the wind strength is such as to remove the mulch before it can be rotovated in.
4. In very rocky areas a layer of mulch shall be added prior to adding the top-material. The mulch must then be worked into the top-material to bind it.
5. Alien vegetation mulch shall be in a non-seed bearing state and shall be chipped prior to application. The preparation of alien vegetation mulch shall be done at source.
6. The Horticulturalist shall cut bush to a height of 400 mm above ground level from designated areas. This vegetation shall then be passed through the chipping machine as above, and be stockpiled for later use as mulch.
7. If the area is exposed to strong wind the mulch stockpile shall be covered with a fine nylon net with 100 mm × 100 mm openings.



Compost stabilisation

1. The soil shall be stabilised by placing and lightly compacting a 75 mm layer of compost over the designated areas or by working a 75 mm layer of compost into the ground to a depth of 150 mm.

Stabilisation of steep slopes

1. The Horticulturalist shall take measures to protect all areas susceptible to erosion by installing all the necessary temporary and permanent drainage works as soon as possible. The Horticulturalist shall take any other measures that may be necessary to prevent surface water from being concentrated in streams and from scouring the slopes, banks or other areas.
2. If runnels or erosion channels develop, they shall be back-filled and compacted, and the areas restored to a proper condition. The Horticulturalist shall not allow erosion to develop on a large scale before effecting repairs.
3. Where artificial slope stabilisers are used, these shall be applied to the slope, preferably before topsoiling, but according to the detailed construction plan and as specified in this specification.
4. Near vertical slopes (1:1 to 1:2) shall be stabilised using hard structures following specifications.
5. Where the slopes are 1:3 to 1:6 they shall be logged or otherwise stepped (using stabilisation cylinders or similar) in order to prevent soil erosion. Logs/ cylinders must be laid in continuous lines following the contours and spaced vertically 0.8-1.2 m apart, depending on the steepness of the slope. These logs/ cylinders must be secured by means of steel pegs and wire in rocky areas, and treated wooden pegs in other areas.
6. In areas where slopes are less than 1:6, horizontal grooves, shallow steps or ledges parallel to contours shall be made on the cut slopes. They shall be made at random to appear natural.
7. In areas where slopes are less than 1:6 these slopes shall be stabilised by using logs in parallel rows, or stabilisation cylinders fastened randomly into position or using biodegradable netting. These structures shall hold the top-material on the slopes and serve as erosion prevention structures.
8. Shallow slopes shall be stabilised using commercial available and approved anti-erosion compounds.

iii. Slope modification and stabilization

Cut slopes adjacent to roads

1. Cut and fill slopes shall be shaped and trimmed to approximate the natural condition and contours as closely as possible and be undulating. Levels, incongruous to the surrounding landscape, shall be reshaped using a grader and other earthmoving equipment.
2. All cut and fill slopes shall be left as rough as possible, and shall contain ledges to facilitate the accumulation of topsoil. The ledges shall be dug at random to appear natural. Furthermore, the Horticulturalist shall ensure that any embedded rocks that will not pose a danger to traffic, remain on the slopes.
3. Boulders / rocks, collected on the site before disturbance, shall be scattered at a predetermined density approved by the Botanist.
4. Any eroded areas deeper than 50 mm shall be either trimmed down by back cutting the slope face or repaired to the satisfaction of the Botanist with boulders and soil or any other approved method.



5. Catchwater drains shall be installed above the cut slopes.
6. Where cut slopes are greater than 4 m in height, the Horticulturalist shall construct berms at regular intervals.
7. Natural water flow paths shall be identified and subsurface drains (using riprap or superfluous rock material) or surface drains and chutes *{use water speed control structures where necessary}*, preferably using cemented natural rock, shall be constructed along the flow paths.
8. Near vertical slopes (1:1 to 1:2) shall be stabilised using natural rock wall structures constructed using conventional building methods or in forms with slurry forced between the structures. All structures shall have a 'natural' look and facilities for plants to grow in.
9. Near vertical slopes (1:1 to 1:2) shall be stabilised using stacked precast concrete blocks. All structures shall have a 'natural' look and facilities for plants to grow in.
10. All areas where the slopes are 1:3 to 1:6 shall be logged or otherwise stepped (using stabilisation cylinders or similar) in order to prevent soil erosion. Logs/ cylinders shall be laid in continuous lines following the contours and spaced vertically 0.8-1.2 m apart, depending on the steepness of the slope. These logs/ cylinders shall be secured by means of steel pegs and wire in rocky areas, and treated wooden pegs in other areas.
11. In areas where slopes are less than 1:6 horizontal groves and shallow steps and ledges parallel to contours shall be made on the cut slopes. They shall be made at random to appear natural.
12. In areas where slopes are less than 1:6 horizontal, these slopes shall be stabilised by using logs in parallel rows, or stabilisation cylinders fastened randomly into position shall be utilised. These structures shall hold the top-material on the slopes and serve as erosion prevention structures.

Blasted areas

1. Blasted areas shall be finished so as to be as rough as possible to facilitate establishment of vegetation, where revegetation will be implemented.

Trees and shrubs

1. One third of the fertiliser shall be scattered at the bottom of the hole, one third dug into the topsoil to be replaced in the hole and the remainder watered into the soil at surface level.

Basic regressing

1. 2:3:2 fertiliser shall be applied with the seed mix, at the rate of 400 kg/ha. Super phosphate shall be applied post germination at the rate of 200 kg/ha

f. Rehabilitation

i. Rehabilitation Objective

The overall objective of the rehabilitation plan is to minimize adverse environmental impacts whilst maximizing the future utilization of the property. Additional broad rehabilitation strategies / objectives include the following:

- Rehabilitating the disturbed areas to take place concurrently within prescribed framework established in the EMP.
- All infrastructure, equipment, plant and other items used during construction will be removed from the site



- Waste material of any description, including scrap, rubble and tyres, will be removed entirely from the site and disposed of at a recognised landfill facility. It will not be permitted to be buried or burned on site.
- Final rehabilitation shall be completed within a specified period.

ii. Rehabilitation Plan

The overall revegetation plan will be as follows:

- Ameliorate the aesthetic impact of the site
- Stabilise disturbed soil and rock faces
- Minimize surface erosion and consequent siltation of natural water course located on site
- Control wind-blown dust problems
- Enhance the physical properties of the soil
- Re-establish nutrient cycling
- Re-establish a stable ecological system

Every effort must be made to avoid unnecessary disturbance of the surrounding natural vegetation during construction operations.

Drainage and Erosion Control

To control the drainage and erosion at site the following procedures will be adopted:

- Areas where construction is completed should be rehabilitated immediately.
- All existing disturbed areas will be revegetated to control erosion and sedimentation
- Existing vegetation will be retained as far as possible to minimize erosion problems.

Visual Impacts Amelioration

The overall visual impact of the proposed activity will be minimised by the following mitigating measures:

- Re-topsoiling and vegetating all disturbed areas

Topsoil and Subsoil Replacement

- Topsoil and subsoil will be stripped separately from the area under construction. The topsoil and subsoil removed will be stockpiled separately and only used in rehabilitation work towards the end of the operation.
- The vegetative cover will be stripped with the thin topsoil layer to provide organic matter to the relayed material and to ensure that the seed store contained in the topsoil is not diminished. Reseeding may be required should the stockpiles stand for too long and be considered barren from a seed bank point of view. Stockpiles should ideally be stored for no longer than a year.
- The topsoil and overburden will be keyed into the reprofiled surfaces to ensure that they are not eroded or washed away. The topsoiled surface will be left fairly rough to enhance seedling establishment, reduce water run-off and increase filtration.

iii. Timing of planting

1. Reseeding shall occur in late Winter (July to September).
2. Replanting shall occur during April / June.



3. Wetland preparation shall occur during Autumn and planting shall occur during early Winter after the first rains (May to June). If planting occurs in a dry late Autumn (end March) or early Winter (April to June) season it shall be necessary to irrigate plants to ensure their successful establishment.
4. Plant material shall be planted into the ground within a maximum period of 5 days after delivery to the Site, unless otherwise specified by the Botanist.

iv. Planting guidelines

Planting shall be carried out as follows:

Reseeding

5. Where broadcast seeding is carried out, the seed shall be sown evenly over the designated area.
6. In confined areas the seed shall be covered by means of rakes or other approved hand tools. Broadcast seeding shall not be done under windy conditions.
7. Drill seeding shall be done in rows not more than 0.25 m apart. The seeding shall be done with an approved grain drill with fine seed attachment or a combination grass planter and land packer or pulveriser. A combine grain and fertiliser drill may be used where appropriate, as directed by the Botanist.
8. Reseeding shall only occur during a period approved by the Botanist.
9. The Horticulturalist shall demonstrate to the Botanist in a trial section that the application of the materials required can be made at the rates specified in this specification.

Basis regrassing

1. Grass seed shall be applied at a rate that should be calculated by the horticulturalist and botanist based on field trials and seed availability.

Planting of grass runners

1. The runners shall be planted within 30 hours of being harvested. Storage in the interim period shall be in aerated bags under cool dry conditions. The runners shall be planted at even spacing, by hand or mechanically at a rate of at least 70 grain bags of runners per hectare.
2. Only fresh runners, that are in good condition and have not dried out, shall be accepted. These runners shall be planted in trenches not less than 50 mm deep with leafy ends, and not roots, exposed.
3. The runners shall be well watered after planting and rolled with a light agricultural roller when the soil has dried sufficiently, as directed by the Botanist.

Sodding

1. Prior to sodding, the area shall be re-inoculated with microbes contained within natural sods. Sods of sedges or grasses shall be collected, as directed by the Botanist, and replanted in shallow hollows for this purpose.
2. Re-inoculation shall occur during or immediately after a rain event. Inoculation sods shall be watered lightly after placement.
3. Revegetation sods shall be planted in strips to reduce erosion.
4. Sodding shall take place on moist, rock free topsoil that has been scarified.



5. Sods, once harvested or delivered from a nursery, shall not be allowed to dry out and shall be planted within 30 hours of being removed from the soil or growing medium. If necessary, they shall be lightly watered prior to planting.
6. Sods shall be planted so they abut tightly against one another. The first row shall be in a straight line with subsequent rows planted so that the joints are staggered. Any gaps shall either be planted with a sod reduced to the gap size or filled with topsoil.
7. Where grass sods are planted on slopes steeper than 1:2, wooden stakes of 500 mm diameter shall be used to anchor the sods in position.
8. In the absence of rain, sods shall be well watered after planting and not be allowed to deteriorate through a lack of moisture.
9. Where grass sods are planted in the floodplain, wooden stakes of 500 mm in diameter shall be used to anchor the sods in position.

Planting trees, shrubs and herbs

1. Where planting is not direct, the plants must be brought to an approved holding area in the intended planting area where they shall be suitably maintained. The Horticulturalist, as directed by the Botanist, shall provide sufficient shade and water. The operation of relocation from the nursery to the planting site must occur on the same day so as to minimise losses through death and to maintain or improve their condition at delivery.
2. During transplanting of indigenous plants care shall be taken to ensure that they are not exposed to the sun. The roots as well as the leaves shall be covered with wet hessian to limit transpiration during transportation and storage. Plants shall be kept in this state for as short a time as is reasonably possible.
3. Planting shall occur as specified in this specification or planting/ landscaping plan.

Planting guidelines

1. The size of holes shall be sufficiently large to ensure that the entire root system is well covered with topsoil, without having to be compressed. The soil around the roots of the plants being transplanted shall not be disturbed. Topsoil and subsoil from the hole shall be stored nearby to be replaced to the same depth intervals from which it was originally removed.
2. Individual spacing between trees shall be 2-3 m and clumps shall consist of 6-12 trees. The trees in the clumps shall be planted in staggered rows of 5 trees per 6 m² with low to medium tall shrubs planted between the clumps. The clumps shall be spaced at about 8-12 m distance.
3. In the case of transplanted trees up to 3 m tall, the hole size shall be 2 500 mm × 2 500 mm in width and 1 800 mm deep
4. Shrubs shall be planted 1-2 m apart around the trees and in the intervening areas between the clumps or as circumstances dictate.
5. Plugs of herbs shall be planted at densities of up to 12 per 1 m².
6. Bulbous plants shall be planted as features in selected areas and shall be protected from moles and baboons using rock linings to the holes and surface soil.
7. Before the placement of the plant specimens into prepared holes, the holes shall be watered substantially.
8. One to two handfuls of bone meal shall be added to the hole before planting.
9. Plants shall be carefully transplanted into holes.
10. Plant holes shall be back-filled using a mixture of two-thirds loamy to sandy topsoil to one-third compost. Where the natural soil is very clayey or heavy, sand shall be added at a ratio of one-third soil, one-third compost and one-third sand. The soil and compost / sand additives shall be well mixed to the satisfaction of the Botanist.



11. The topsoil shall be replaced at the same depth intervals at which it was excavated. The soil shall be lightly compacted and well watered.
12. Care shall be taken to keep root damage to a minimum when transplanting seedlings. Where plants have a taproot this shall not be cut. Excess foliage, flowers and side branches shall be pruned as directed by the Botanist.
13. Coarsely chipped bark from pine trees shall be supplied and placed in a 75 mm deep layer at the bases of the trees following planting.
14. Large rocks shall be placed around the base of planted trees in fire-prone environments.
15. Plants planted at the waters edge in wetlands and rivers shall be planted as follows:
 - a. Wetland material harvested from existing wetland areas shall be transplanted directly to the newly created wetland area, along with as much soil, and surrounding material as possible.
 - b. Indigenous shrubs and small trees shall be planted 3 m apart
 - c. Palmiet shall be planted 1- 2 m apart
 - d. Bulrushes, reeds, sedges and herbs shall be planted in sods 0.4-0.5 m apart or as circumstances dictate.
16. Plants shall be watered immediately after transplanting to ensure that the soil is wet around the plants. If necessary additional soil must be added after initial watering to fill any subsidence back up to ground level.

v. Traffic on revegetated areas

All revegetated areas shall be clearly demarcated and all not traffic (vehicular or otherwise) excluded.

vi. Establishment

Irrigation

1. The Horticulturalist shall be responsible for maintaining the desired level of moisture necessary to maintain vigorous and healthy growth. The quantity of water applied at one time shall be sufficient to penetrate the soil to a minimum depth of 800 mm, where appropriate, and at a rate that will prevent saturation of the soil.
2. Water used for the irrigation of revegetated areas shall be free of chlorine and other pollutants that will have a detrimental effect on the plants.
3. All seeded, planted or sodded grass areas and all shrubs or trees planted shall be irrigated regularly at the specified intervals.
4. Grassed areas shall require irrigation coverage of 100% and a permanent watering programme. The watering programme shall be modifiable to accommodate natural climatic variations.
5. Revegetated areas shall require irrigation coverage of 100% and a modifiable watering programme.
6. Were an irrigation system is required, the Horticulturalist shall be responsible for its installation and maintenance.
7. In the event of a delay between the planting programme and installation of the irrigation system, a water truck shall be utilised for watering, according to a programme approved by the Botanist.
8. Every effort shall be made to reduce irrigation overspray onto natural patches.
9. The Horticulturalist shall water the planted areas as necessary, using a suitable fine spray which shall not disturb the vegetation and which will not cause any erosion.
10. The Horticulturalist shall supply all water required and shall provide all pipework, pumps, irrigation equipment and other plant necessary. All this infrastructure and its positioning shall be approved by the Botanist.



Fertilising

1. The ECO shall strictly control the use of fertilisers.
2. Care shall be exercised strict control when using such materials near sensitive natural areas, so as to avoided contamination of these areas.
3. The ECO shall manage the fertilisation programme for different areas of planting.
4. Additional fertiliser shall be applied at the intervals specified with due regard to favourable climatic conditions and the state of growth of the vegetation. Application shall be by hand or approved mechanical spreader and shall provide uniform distribution.
5. Fertilisers shall be suitably sealed and stored in a location approved by the Botanist.

Weeding and mowing

1. All woody alien or invasive species must be controlled and removed.
2. Where seedlings occur sparsely, they should be removed manually.
3. Where dense stands of seedlings are present a suitable foliar spray (with a wetting agent and a blue dye to indicate area applied) shall be utilised.
4. Larger individuals of alien/ invasive species shall be controlled by cutting or lopping and treating the cut stumps with herbicide to prevent regrowth.
5. Alien/ invasive plants and weeds shall not be stockpiled, they should be removed from the site and dumped at an approved site or burned.
6. If, during the establishment period, any noxious or excessive weed growth occurs or other undesirable vegetation threatens to smother the planted species in the seeded or planted areas, such vegetation shall be removed.
7. The grass in specified grassed areas or on road verges shall be mowed at intervals ordered by the Botanist/ECO. Grass cuttings shall be collected and disposed of as directed by the Botanist/ECO. The grass shall be mown at regular intervals to stimulate lateral growth. The first cutting shall take place when the grass is 50 mm high and thereafter the height shall be maintained at between 30 and 50 mm.
8. If during the establishment period, non-indigenous weeds or other non-indigenous plants are present in the planted areas, such vegetation shall be removed by hand.

Disease and pest control

1. All plant materials should be inspected at least once a month to locate any diseased or insect pest infestation and appropriate measures implemented.

Pruning

1. All plant material shall be kept free from dead wood, broken branches, dead flower heads or otherwise harmful or objectionable branches or twigs. All other pruning shall be done only as directed by the Botanist.
2. All pruning wounds greater than 12 mm diameter shall be painted with an approved tree wound paint.
3. Secateurs and other cutting equipment shall be kept sterilised to avoid spreading fungal infestations.

Tree establishment

1. Trees that die or become unhealthy from any cause or appear to be in a badly impaired condition shall be promptly removed and replaced, or as soon as the weather permits, as directed by the Botanist. All replacements shall be trees of the same kind and quality as those originally planted.



Erosion control

1. In the case of surface wash-away or wind erosion, the Horticulturalist shall implement remedial measures, as approved by Botanist, as soon as possible.
2. Appropriate erosion control/ soil stabilisation measures shall be implemented.

g. Monitoring and Reporting

- Adequate management, maintenance and monitoring will be carried out annually by the applicant to ensure successful rehabilitation of the property until a closure certificate is obtained.
- To minimise adverse environmental impacts associated with operations it is intended to adopt a progressive rehabilitation programme, which will entail carrying out the proposed rehabilitation procedures concurrently with construction activities.

Inspecting and Monitoring

- Regular monitoring of all the environmental management measures and components shall be carried out to ensure that the provisions of this programme are adhered to.
- Ongoing and regular reporting of the progress of implementation of this programme will be done. An environmental audit shall be carried out by an independent consultant on an annual/biannual basis.
- Inspections and monitoring shall be carried out on both the implementation of the programme and the impact on plant life.

▪ Responsibility for establishing an acceptable cover

1. Where only indigenous seed, harvested from the site, has been used, acceptable cover shall mean that:
 - a. Not less than 80% of the area seeded shall be covered with acceptable plants; and
 - b. There shall be no bare patches greater than 800 mm in maximum dimension through the area, except where large rocks or boulders occur.
2. Where commercial grass seed is used, acceptable cover shall mean that:
 - a. Not less than 75% of the area seeded shall be covered with grass; and
 - b. There shall be no bare patches greater than 500 mm in maximum dimension.
3. In the case of grass sodding, acceptable cover shall mean that the full area shall be covered with live grass at the end of any period not less than three months after sodding. Where this cover is not achieved, plant additional grass and tend it in a similar manner to the original planting until the acceptable cover is achieved.



Appendix D
Preliminary Avifaunal Pre and Post Construction
Monitoring Plan



PRELIMINARY AVIFAUNAL PRE AND POST CONSTRUCTION MONITORING PLAN

This section of the report gives details on what would be expected and how to go about this monitoring programme. This detail has been provided from the “Birds and Wind Energy Specialist Group” draft report compiled by Andrew Jenkins, 2010. Once environmental authorization is obtained, it is recommended that a reconnaissance survey be conducted by a suitable ornithologist, to set up the final protocol, analyse data and report to Redcap.

Summary:

The below is a summary of actions, for the purposes of planning and budgeting. The full description below should be read for more detail. The proposed plan will result in at least 12 months of pre construction monitoring, 9 months of monitoring during the construction period and 12 months post construction. The time required to do this monitoring amounts to approximately 24 days per 12 month period, although this will be refined once the initial reconnaissance survey is conducted.

Phase	2010	2011				2012				2013			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Pre-construction monitoring	Reconnaissance survey, preparation of detailed protocol, identification of staff, training etc	Jan (4 days) Mar (4 days)	May (4days)	Jul (4 days) Sep (4 days)	Nov (4 days)	Jan (4 days) Mar (4days)							
During construction monitoring							May (4days) Jul (4 days) Sep (4 days)		Nov (4 days)				
Post construction monitoring										Jan (4 days) Mar (4 days)	May (4days)	Jul (4 days) Sep (4 days)	Nov (4 days)

Pre- and post-construction monitoring

The primary aims of each monitoring project would be to:

- Determine the densities (including breeding densities for key species) of birds resident within the impact area of the wind energy facility (WEF) before construction of the facility, and afterwards, once the facility, or phases of the facility, become operational.
- Document patterns of bird activity and movements in the vicinity of the proposed WEF before construction, and afterwards, once the facility is operational.
- Monitor patterns of bird activity and movement in relation to weather conditions, time of day, season and land use for at least a full calendar year after the facility is commissioned.
- Register and as far as possible document the circumstances surrounding all avian collisions with the turbines, and all bird mortalities caused by ancillary infrastructure of the WEF, for at least a full calendar year after the facility becomes operational.

Bird density and activity monitoring should focus on the rare and/or endemic, potentially disturbance or collision prone species, which occur with some regularity in the area (and possibly including more common species which may perform an important ecological function in the area). The priority species for the current project have been listed above in the main report.



Ultimately, the study should provide much needed quantitative information on the effects of the facility on the distribution and abundance of birds, and the actual risk it poses to the local avifauna, and serve to inform and improve mitigation measures to reduce this risk. It will also establish a precedent and a template for research and monitoring of avian impacts at possible, future wind energy sites in the region. This project outline is informed by monitoring studies established in other countries (e.g. Erickson et al. 1999, Scottish National Heritage 2005), but is based substantially on those developed for both the Darling and the Klipheuwel wind power demonstration facilities in South Africa (Jenkins 2003, Küyler 2004).

The bulk of the work involved should be done by trained observers, under the guidance and supervision of a qualified and experienced ornithologist (it is envisaged that for the Kouga facility, this role would be played by the EWT, if the developer agrees).

Monitoring protocols

1. Avian densities before and after construction

A set of at least 5-10 walk-transect routes, each of at least 500-1000 m in length, should be established in areas representative of all the avian habitats present within a 5-10 km radius of the centre of the development site. Each of these should be walked at least once every two months over the six months preceding construction, and at least once every two months over the same calendar period, at least six months after the facility is commissioned. The transects should be walked after 06h00 and before 09h00, and the species, number and perpendicular distance from the transect line of all birds seen should be recorded for subsequent analysis and comparison (Bibby *et al.* 2000). Ideally, these before and after surveys should be done at a control site, situated nearby and similar in extent and nature to the development site, to fully validate the comparisons made within the WEF impact area.

In addition, any habitats within a 5-10 km radius of the WEF site deemed likely to support nest sites of key raptor species - cliff-lines or quarry faces, power lines, stands of large trees, marshes and drainage lines - should be surveyed at least once every six months using documented protocols (Malan 2009). All sightings of key species (and particularly those suggestive of breeding or important feeding or roosting sites) within this broader study area should be carefully plotted and documented (with a view to determining population densities), and the major wetlands on and close to the development area should be surveyed for waterbirds on each visit to the site, using the standard protocols set out by the CWAC initiative (Taylor et al. 1999).

2. Bird activity monitoring

Radar: The state of the art in monitoring bird movements in relation to WEFs involves the use of custom-built radar installations (www.detect-inc.com/wind.html). When set up correctly, these systems can provide round-the-clock coverage of a sizeable area in all weather conditions. They are expensive, and cannot easily distinguish between different species, types or even sizes of birds, but when used in combination with limited direct observation (primarily to calibrate and ground-truth remotely collected information), they are likely to provide the most comprehensive and accurate data possible describing the frequency, height and direction of bird flight paths through a proposed or operational wind farm. Wherever possible and necessary (in situations with a high traffic of impact susceptible and threatened birds), these radar should be used.

Direct observation: Where direct observation is the primary data source (perhaps due to the high costs associated with radar above), monitoring of bird activity in the vicinity of the facility should be done over a 2-3 day period at least every two months for the six months preceding construction, and at least once per quarter for a full calendar year starting at least six months after the facility is commissioned. Each monitoring day should involve:



- Half-day counts of all priority species flying over or past the impact area (see passage rates below)
- Opportunistic surveys of large terrestrial species and raptors seen when travelling around the site.

Passage rates of priority bird species: Counts of bird traffic over and around the proposed/operational facility should be conducted from suitable vantage points (and a number of these should be selected and used to provide coverage of avian flights in relation to all areas of the site), and extend alternately from dawn to midday, or from midday to dusk, so that the equivalent of four full days of counts is completed each count period (how often). This should provide an adequate (if minimal) sample of bird movements around the facility in relation to a representative cross-section of conditions and times of day, for all seasons of the year. These vantage points will be identified during the site specific EMP.

Once in position at the selected count station, the observer should record (preferably on a specially designed data sheet) the date, count number, start-time and conditions at start - extent of cloud cover, temperature, wind velocity and visibility – and proceed with the count. The counts should detail all individuals or flocks of the stipulated priority bird species, all raptors, and any additional species of particular interest or conservation concern, seen flying within 500 m of the envisaged or actual periphery of the facility. Each record should include the following data: time, updated weather assessment, species, number, mode of flight (flapping, gliding, soaring), flight activity (commuting, hunting other), direction of flight, vertical zoning relative to the envisaged or actual turbine string (low – below or within the rotor arc, medium – within c.100 m of the upper rotor arc, high – >100 m above the upper rotor arc), and horizontal zoning relative to the envisaged or actual turbine string (near – through the turbine string or within the outer rotor arc, middle – within c.100 m of the outer rotor arc, distant - >100 m beyond the outer rotor arc) and, for post construction monitoring, notes on any obvious evasive behaviour or flight path changes observed in response to the WEF. The time and weather conditions should again be noted at the end of each count.

3. Avian collisions

Collision monitoring should have two components: (i) experimental assessment of search efficiency and scavenging rates of bird carcasses on the site, and (ii) regular searches of the vicinity of the wind farm for collision casualties.

Assessing search efficiency and scavenging rates:

The value of surveying the area for collision victims only holds if some measure of the accuracy of the survey method is developed (Morrison 2002). To do this, a sample of suitable bird carcasses (of similar size and colour to the priority species – e.g. Egyptian Goose *Alopochen aegyptiacus*, domestic waterfowl and pigeons) should be obtained and distributed randomly around the site without the knowledge of the surveyor, some time before the site is surveyed. This process should be repeated opportunistically (as and when suitable bird carcasses become available) for the first two months of the monitoring period, with the total number of carcasses not less than 20. The proportion of the carcasses located in surveys will indicate the relative efficiency of the survey method.

Simultaneous to this process, the condition and presence of all the carcasses positioned on the site should be monitored throughout the initial two-month period, to determine the rates at which carcasses are scavenged from the area, or decay to the point that they are no longer obvious to the surveyor. This should provide an indication of scavenge rate that should inform subsequent survey work for collision victims, particularly in terms of the frequency of surveys required to maximise survey efficiency and/or the extent to which estimates of collision frequency should be adjusted to account for scavenge rate (Osborn et al. 2000, Morrison 2002). Scavenger numbers and activity in the area may vary seasonally



so, ideally, scavenge and decomposition rates should be measured twice during the monitoring year, once in winter and once in summer.

Collision victim surveys:

The area within a radius of at least 50 m of each of the turbines at the facility should be checked regularly for bird casualties (Anderson et al. 1999, Morrison 2002). The frequency of these surveys should be informed by assessments of scavenge and decomposition rates conducted in the initial stages of the monitoring period (see above), but they should be done at least weekly for the first two months of the study. The area around each turbine, or a larger area encompassing the entire facility, should be divided into quadrants, and each should be carefully and methodically searched for any sign of a bird collision incident (carcasses, dismembered body parts, scattered feathers, injured birds). All suspected collision incidents should be comprehensively documented, detailing the precise location (preferably a GPS reading), date and time at which the evidence was found, and the site of the find should be photographed with all the evidence in situ. All physical evidence should then be collected, bagged and carefully labelled, and refrigerated or frozen to await further examination. If any injured birds are recovered, each should be contained in a suitably-sized cardboard box. The local conservation authority should be notified and requested to transport casualties to the nearest reputable veterinary clinic or wild animal/bird rehabilitation centre. In such cases, the immediate area of the recovery should be searched for evidence of impact with the turbine blades, and any such evidence should be fully documented (as above).

In tandem with surveys of the wind farm for collision casualties, sample sections of any new lengths of power line associated with the development should also be surveyed for collision victims using established protocols (see Anderson 2001, Shaw et al. 2010 a & b).