ROGGEVELD WIND FARM PHASE 1 AND ASSOCIATED INFRASTRUCTURE NORTHERN CAPE & WESTERN CAPE PROVINCES (DEA REF NO.: 12/12/20/1988/1)

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

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PROJECT DETAILS

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Title	**:**	Draft Environmental Management Programme: Roggeveld Wind Farm Phase 1 And Associated Infrastructure, Northern Cape & Western Cape Provinces
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CONTENTS

1 ENVIRONMENTAL MANAGEMENT PROGRAMME – PHASE 1 OF THE ROGGEVELD WIND FARM

1.1 INTRODUCTION

An Environmental Management Programme (EMPr) is a set of guidelines and actions aimed at ensuring that construction and/or installation activities, and subsequent management of facilities, are undertaken in a manner that minimises environmental risks and impacts.

The following EMPr has been prepared by ERM Southern Africa (Pty) Ltd and updated by Savannah Environmental (Pty) Ltd (in 2014), for Roggeveld Wind Power (Pty) Ltd, hereafter referred to as RWP, for the proposed construction and operation of Phase 1 of the Roggeveld Wind Farm . This EMPr addresses potential impacts associated with the installation, operation and decommissioning phases of the project.

The EMPr is required in order to:

- assist in ensuring continuing compliance with South African legislation and RWP Environmental Health and Safety Policy (a policy is currently being developed for the Wind Energy industry);
- provide a mechanism for ensuring that measures identified in the EIA designed to mitigate potentially adverse impacts, are implemented;
- provide a framework for mitigating impacts that may be unforeseen or unidentified until construction is underway;
- provide assurance to regulators and stakeholders that their requirements with respect to environmental and socio-economic performance will be met; and
- provide a framework for compliance auditing and inspection programs.

This EMPr has been developed using the information and design details currently available. The EMPr will remain a working document and must be updated at various stages of the planning and implementation process, to ensure incorporation of any additional findings from further studies (e.g monitoring) and as design details become clearer. The EMPr must also be updated with the conditions stipulated in the environmental authorisation.

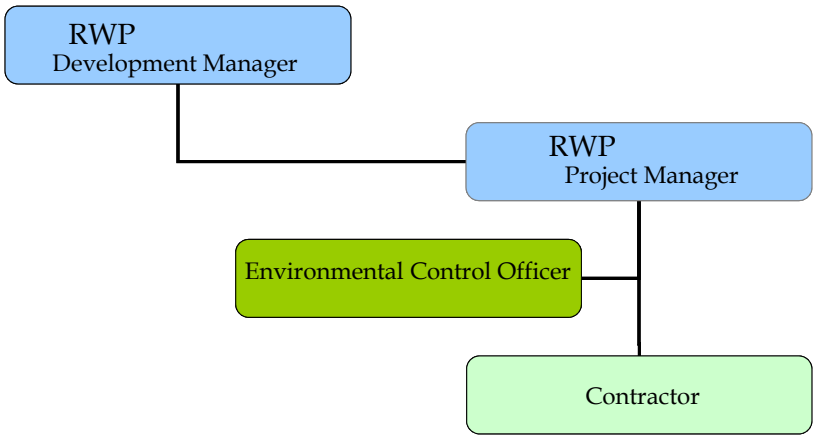
This EMPr has been updated to include information requested by the Department of Environmental Affairs and contains the following Sections:
Section 2: Permit Requirements
Section 3: Biological Monitoring
Section 4: Storm Water Management
Section5: Storage and Handling of Hazardous Substances

Section 6: Traffic Management Plan
Section 7: Mitigation and Compliance
Section 8: General Contractor Compliance Standards

1.2 *ROLES AND RESPONSIBILITIES*

The following section outlines the roles and responsibilities of those involved in the proposed installation, operation and decommissioning of the wind energy facility. An organogram showing reporting structures is provided in Figure 1.1.

Figure 1.1 Reporting Structures



1.2.1 *RWP*

RWP's Development Manager will have the ultimate responsibility for ensuring the measures outlined in the EMPr are delivered and that the measures are implemented by their contractors and subcontractors. In this respect the Development Manager will review and approve contractor plans for delivery of the actions contained in the EMPr during construction and ensure that during operation performance will be evaluated through monitoring and auditing.

Development Manager

The Development Manager's responsibilities will encompass the following:

- Liaison with the project engineers to ensure that the Wind Farm is designed to meet all the specified environmental parameters and legal requirements as specified in the EMPr and Environmental Authorisation;
- Authority to stop works in emergency situations;
- Approval of method statements; and

- Liaison with authorities.

The Project Manager, Nicolas Rolland, or any other person appointed to the role, is responsible for the implementation of the EMPr, and will report directly to the Development Manager on environmental, health and safety matters.

Project Manager

The Project Manager, Kilian Hagemann, or any other person appointed to the role, is the designated person responsible for the implementation of the EMPr and therefore the person responsible for managing the environmental issues that arise during the construction phase of the project.

The Project Manager's main role is to regularly inspect and manage the construction activities on site in order to ensure compliance with the EMPr. The Project Manager will liaise with the Environmental Control Officer (ECO) and Contractor and report to the Development Manager.

The Project Manager's responsibilities will encompass the following:

- Training of contractors on environmental matters (see *Section 1.4*);
- Inspect the site at least once every two weeks for the duration of the construction phase;
- Management of the contractors in terms of the EMPr;
- Review of contractor method statements and ensure alignment with the EMPr;
- Reporting on environmental problems to the Development Manager;
- Record keeping of:
  - environmental incidents;
  - contractors non-compliance to the EMPr; and
  - contractor fines and penalties.
- Making recommendations or implementing actions relating to a contractor's failure to comply with the EMPr, which may include enforcement of penalties and even contract termination and removal of contactor from the site;
- Recommend the suspension of work activities where such activities contravene the EMPr requirements; and
- The authority to stop works in emergency situations when the Development Manager is not available and construction activities seriously threaten the environment.

The Project Manager will also be responsible for implementing the community engagement plan. The Project Manager will be required to participate in community meetings that will be held in affected communities prior to, during and upon completion of construction.

During the construction phase an ECO will be responsible for ensuring the overall environmental and socio-economic objectives of the EMPr are met. Specialists such as palaeontologists, bird specialists etc. will be employed as required. When working on site, the ECO will report to the Project Manager.

1.2.2 Environmental Control Officer

RWP will appoint an independent Environmental Control Officer (ECO) prior to commencement of construction and throughout the construction phase of the project until such time as rehabilitation is complete and the site is ready for operation. The ECO shall hold a relevant environmental degree or diploma and have a few years of experience in ECO work.

The primary role of the ECO will be to monitor the construction activities and ensure that the mitigation measures of the EMPr and Environmental Authorisation (EA) are implemented.

The ECO's responsibilities will encompass the following:

- Brief the Contractor on EMPr requirements and site layout;
- Retain a copy of the EMPr and EA and all records relating to monitoring and auditing on site, and keep these available for inspection;
- Visit the site at least once a day, particularly for the following activities:
  - Site clearance;
  - Excavation;
  - Turbine arrival, assembly and placement;
  - Set up of concrete batching; and
  - Establishment of all works areas including latrines and wash areas.

- Specific tasks of the ECO will include ensuring:
  - Sensitive areas are demarcated and cordoned off;
  - Activities are restricted to demarcated works areas;
  - No sensitive features are damaged or disturbed;
  - Any notifiable features (eg fossils or other heritage remains) are recorded and work stopped or redirected to avoid such areas, and the appropriate authorities informed;
  - All incidents are recorded in a logbook and appropriate remedial action taken;
  - Site visit reports are kept and feedback provided to the Project Manager as required; and
  - Liaise with DEA regarding implementation of the EMPr, if and when required.

The ECO will be expected to be contactable telephonically in case of emergencies at all times.

1.2.3 Contractors and Site Personnel

During site preparation and construction, the contractor will be responsible for ensuring compliance with all relevant legislation as well as adherence to all environmental and socio-economic mitigation measures specified in the EMPr and the Environmental Authorisation (EA). The contractor is also responsible under the contract for managing the potential environmental, socio-economic, safety and health impacts of all contracted activities whether these are undertaken by themselves or by their subcontractors. The contractor has overriding responsibility for the activities of all direct staff and subcontractors.

Adherence to the provisions of the EMPr will be a condition of contract with the contractor. The contractor will need to demonstrate to RWP's satisfaction how compliance with the requirements of the EMPr will be met. The contractor will also be expected to demonstrate commitment to the EMPr at all levels in the contractor's management structure and will be required to identify individuals responsible for overall environment, socio-economic, safety and health management.

The contractor will be required to undertake regular environmental and socio-economic inspections and provide reports to RWP to monitor and evaluate performance against the measures and objectives established in the EMPr. In this regard, the contractor's performance in complying with the EMPr will be monitored and audited by the ECO, Project Manager and Development Manager.

1.3 ALLOCATION OF RESOURCES

Financial and personnel resources must be allocated to the implementation of the EMPr, including provisions for contractor training and environmental awareness, contingencies to deal with environmental emergencies, monitoring and auditing. Such resources must be available during the operational and closure, as well as the construction phase.

Environmental requirements requiring cost allocation must be clearly identified the terms of reference for contractors and suppliers to ensure these service providers budget effectively.

1.4 TRAINING AND HSE AWARENESS

Training and awareness raising around HSE issues is essential for ensuring that the EMPr is effectively implemented and that unforeseen HSE incidents are managed timeously and appropriately. The ultimate responsibility for HSE training and awareness raising rests with RWP.

It is suggested that the following be included in the approach to training and awareness raising:

- Induction course/briefing for all contractors including a description of RWP's expectations, specific responsibilities of wind farm workers with regard to HSE issues. The briefing will usually take the form of an on site talk and demonstration by the ECO. The education / awareness programme should be aimed at all levels of personnel within the contractor team;
- Refresher courses as and when required;
- Focused training sessions in relation to specific tasks, such as the erection of turbines; and
- Toolbox talks to alert workers to particular HSE concerns associated with their tasks for the day/period and to encourage generally responsible behaviour on site.

Courses should be provided by a qualified person and in a language and medium understood by contractors/employees.

1.5 DOCUMENTATION AND RECORD KEEPING

All documentation relevant to the implementation of the EMPr during construction, operation and closure must be maintained on site in a structured and ordered manner. These documents should be distributed in a controlled manner to affected personnel and must also be made available for public / authority inspection, if requested.

The type of documents that should be managed and retained include, at minimum:

- Method statements;
- Policies and plans;
- Project specific HSE audit reports;
- Training material and records of attendance;
- Incident reports;
- Emergency preparedness and response procedures (in accordance with IFC Performance Standard 2);
- Monitoring reports; and
- Minutes of key meetings with service providers and project team members.

1.6 AUDITING AND REPORTING

Auditing by an external, independent auditor should be undertaken at the end of both the construction and rehabilitation phases, as well as annually thereafter during operation. After each audit a report should be submitted to the DEA and other relevant authorities. The audit must cover compliance with any specific conditions included in the Environmental Authorisation as well as specific management and monitoring actions included in this EMPr. The completed audit reports must be accurately dated and form part of the document control system. Report back to stakeholders and the DEA should be undertaken after each audit.

A monthly audit should be undertaken by the independent ECO during construction and the resultant independent audit reports will be communicated with senior management within RWP and sent to the DEA and other relevant authorities as and when required.

1.7 REVISION OF THE EMPR

This EMPr has been formulated in draft so as to allow for appropriate changes and modifications subject to inclusion of final requirements as per the EA and specific measures identified at any later stage during the project planning/development.. The EMPr should be subject to review by senior management responsible for the project at the following stages of the project:

- Prior to the initiation of the construction phase (post pre-construction monitoring) to ensure that all relevant management actions have been included;
- Following the construction and rehabilitation phase and after the start of operation, to capture additional and unforeseen mitigation measures that are identified during these activities, and would be relevant to the operational phase;
- Prior to final decommissioning and closure.

1.8 SUBSIDIARY PLANS AND POLICIES

Environmental and socio-economic management issues at various stages in the life of the project from detailed design through to decommissioning are governed or guided by a number of standards, including:

- those contained in South African legislation;
- those established by industry codes of practice;
- those required by RWP policy or manufactures specifications;

- those within relevant international standards (e.g. World Bank environmental guidelines, IFC Performance Standards, World Health Organisation, International Labour Organisation); and

- commitments made in the EIA.

Prior to construction a number of subsidiary plans, policies and monitoring programmes will be required to manage various activities or potential risks. These are summarised in *Box 1.1*.

Box 1.1 ***Summary of Subsidiary Plans, Policies and Programmes required for the Project***

Policies, Plans and Programmes to be developed

- Environmental Policy
- Recruitment Policy
- Local Procurement Policy
- Health and Safety Policy
- Bat Monitoring Programme
- Bird Monitoring Programme
- Code of Conduct
- Emergency Response Plan
- Health and Safety Plan
- Traffic Management Plan
- Waste Management Plan
- Spoil Management Plan
- Community Development Trust Plan
- Community Engagement Plan (CEP)
- Recruitment Policy
- Local Procurement Policy

1.9 STAKEHOLDER ENGAGEMENT

RWP will continue to engage with stakeholders throughout project construction and operation. Communication with local communities and other local stakeholders will be a key part of this engagement process and will require RWP and the contractor to work closely during the construction period. Development of a Community Engagement Plan (CEP) will be important to facilitate this communication.

The objectives of communication and liaison with local communities are the following.

- To provide residents in the vicinity of the wind farm (e.g. neighbouring landowners/ farmers and other residents) and other interested stakeholders, with regular information on the progress of work and its implications.

- To monitor implementation of mitigation measures and the impact of construction on communities via direct monitoring and feedback from those affected in order to ensure that mitigation measures are implemented and the mitigation objectives achieved.

- To manage any disputes that may arise between RWP, the contractors and local people.

This engagement process can serve to inform the establishment and provisions of the Community Development Trust linked to the project.

1.9.1 Grievance Procedure

RWP should develop a grievance procedure to ensure fair and prompt resolution of problems that may arise from the project. The grievance procedure should be underpinned by the following principles and commitments:

- Implement a transparent grievance procedure, and disseminate key information to directly impacted stakeholders.

- Seek to resolve all grievances timeously.

- Maintain full written records of each grievance case and the associated process of resolution and outcome for transparent, external reporting.

The responsibility for resolution of grievances will lie with RWP and its contractors. The ECO should ensure that the grievance procedure is made accessible to the local community and other relevant stakeholder.

The revised layout for Phase 1 of the Roggeveld Wind Farm based on the findings of the Final EIA Report (Savannah Environmental: 2014) has been designed based on a combination of the sensitivity constraints mapping of the site identified by specialists during the EIA process and available wind resource mapping and data from RWP.

The turbine positions may be micro-sited based on additional site data from the following sources:

- detailed geotechnical investigations and surveys; and
- specific site checks by ecologist and paleontological specialist.

Micro-siting will be done as part of the detailed site planning process to ensure that the environmental risks are minimised and the technical requirements of the project can be achieved. Micro-siting will ensure that the turbine positions will be located in areas not mapped or identified as high sensitivity and that any environmental constraints at the specific turbine positions and road alignments are identified, avoided or managed.

The layout for Phase 1 of the Roggeveld Wind Farm is shown in Figure 1. The layout is superimposed on the environmental sensitivity map. Any potential change to the final turbine positions will be submitted to the Department of Environmental Affairs (DEA) before construction with an indication of the extent of change from the approved layout, and associated amendments in significance ratings of impacts where applicable.

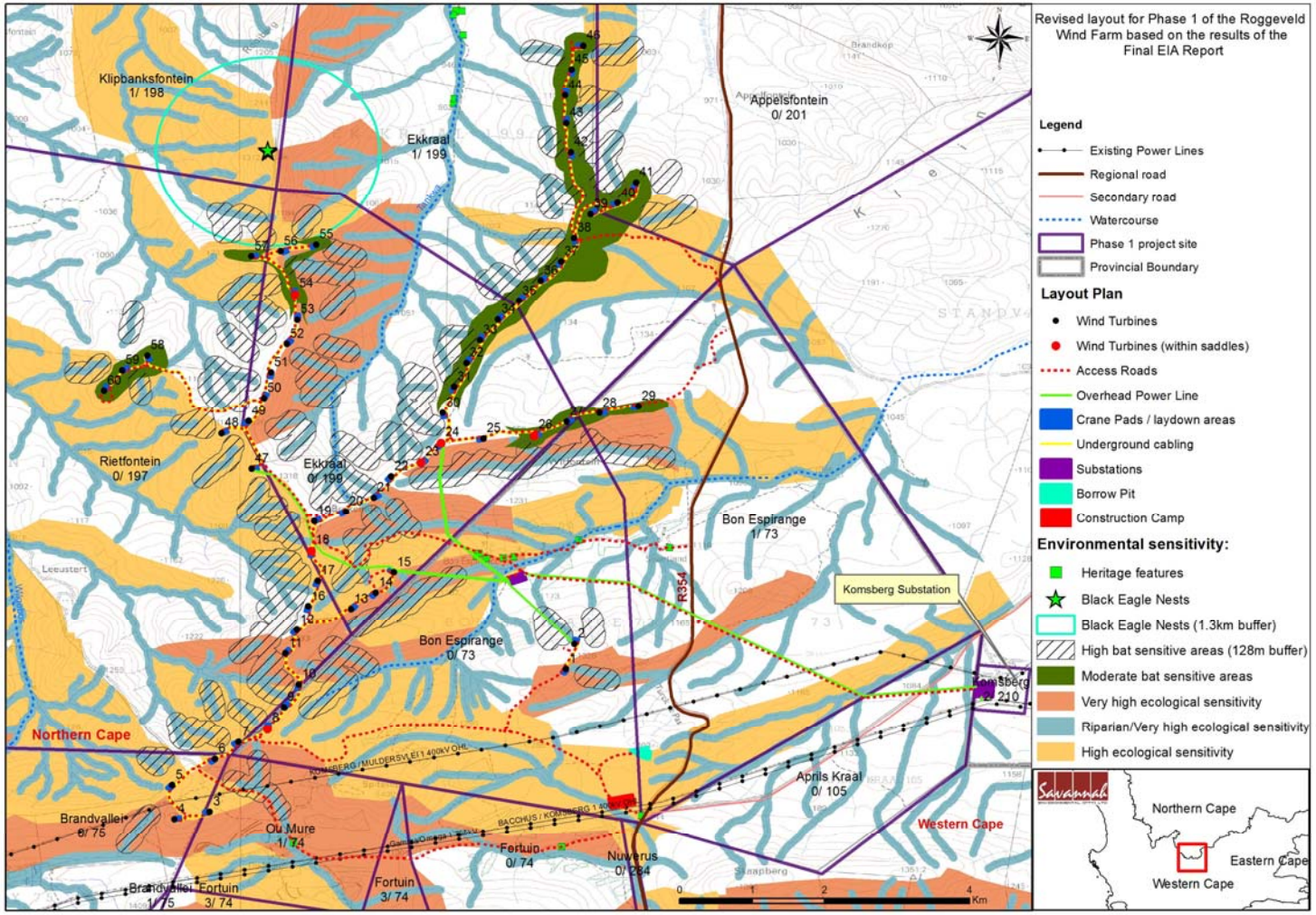


Figure 1: Revised Layout based on the Findings of the Final EIA Report for Phase 1 of the Roggeveld Wind Farm (Sourced from: Savannah Environmental (2014) Final EIA Report for Phase 1 of the Roggeveld Wind Farm

Activities undertaken during site preparation, construction and operation may require additional permits, over and above the Environmental Authorisation. RWP is responsible for ensuring that the necessary permits are in place in order to comply with national and local regulations. Additional permit requirements are described below.

3.1 HERITAGE

The protection and management of South Africa's heritage resources is controlled by the National Heritage Resources Act (NHRA), 1999 (Act No. 25 of 1999). The objective of the NHRA is to introduce an integrated system for the management of national heritage resources.

Archaeology, Palaeontology and Meteorites

According to Section 35 (Archaeology, Palaeontology and Meteorites) and Section 38 (Heritage Resources Management) of the South African National Heritage Resources Act, palaeontological heritage impact assessments (PIAs) and archaeological impact assessments (AIAs) are required by law in the case of developments in areas underlain by potentially fossiliferous (fossil-bearing) rocks, especially where substantial bedrock excavations are envisaged, and where human settlement is known to have occurred during prehistory and the historic period. Depending on the sensitivity of the fossil and archaeological heritage, and the scale of the development concerned, the palaeontological, and archaeological impact assessment required may take the form of (a) a stand-alone desktop study, or (b) a field scoping plus desktop study leading to a consolidated report. In some cases these studies may recommend further palaeontological and archaeological mitigation, usually at the construction phase. These recommendations would normally be endorsed by the responsible heritage management authority, in this case Heritage Western Cape (HWC) and the South African heritage Resources Agency (SAHRA), to whom the reports are submitted for review. A cultural heritage, archaeological and palaeontological specialist report with mitigation and recommendations has been undertaken as part of the EIA and sent to the relevant authorities. Table 3.1 outlines when a permit is required depending on the sensitivity of the heritage resources.

Table 3.1 Permitting requirements for fossil, built environment and Stone Age archaeology

PERMIT APPLICATION SECTION 35 – FOSSILS, BUILT ENVIRONMENT FEATURES, SHIPWRECKS & STONE AGE ARCHAEOLOGY (Ref : NHRA 1999: 58):
(a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;

PERMIT APPLICATION SECTION 35 – FOSSILS, BUILT ENVIRONMENT FEATURES, SHIPWRECKS & STONE AGE ARCHAEOLOGY (Ref : NHRA 1999: 58):
(b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite; (c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite.

Burial Grounds and Graves

A Section 36 permit application is made to the South African Heritage Resources Agency (SAHRA) which protects burial grounds and graves that are older than 60 years, and must conserve and generally care for burial grounds and graves protected in terms of this section, and it may make such arrangements for their conservation as it sees fit. SAHRA must also identify and record the graves of victims of conflict and any other graves which it deems to be of cultural significance and may erect memorials associated with these graves and must maintain such memorials. A permit is required under the conditions listed in Table 3.2.

Table 3.2 ***Permitting requirements for burial grounds and graves older than 60 years to Heritage Western Cape (HWC) and historic burials to the South African Heritage Resources Agency (SAHRA)***

PERMIT APPLICATION SECTION 36 – BURIAL GROUNDS & GRAVES (REF: NHRA 1999 : 60)
(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves (b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or (c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals (d) SAHRA or a provincial heritage resources authority may not issue a permit for The destruction or damage of any burial ground or grave referred to in subsection (3)(a) unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation and re-interment of the contents of such graves, at the cost of the applicant

3.2 BORROW PITS

A borrow pit refers to an open pit where material (soil, sand or gravel rock) is removed for use at another location. RWP are likely to require the use of borrow pits for certain earthworks operations, such as the construction of roads, embankments, bunds, berms, and other structures.

The establishment of borrow pits is regarded as a mining activity and is legislated in terms of the Mineral and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA). Prior to the establishment of borrow pits on the

site RWP must comply with the provisions of the MPRDA or obtain a mining permit from the Department of Minerals and Energy if licence application is triggered.

3.3 WATER USE

There are licensing procedures, in terms of the National Water Act (No. 36 of 1998), that need to be followed for particular "water uses". Water uses that may be of relevance to the development of wind farms and associated road construction include the following:

- Taking of water from a water resource, including a water course, surface water, estuary or aquifer (i.e. borehole)
- altering the bed, banks, course or characteristics of a water course; and/or
- impeding or diverting of a flow in a water course.

3.4 TRAFFIC MANAGEMENT

Traffic management issue and mitigation are discussed in *Section 6*, below. Wind turbine components will be delivered to site using road transport and due to the size of the components, the vehicles used to deliver turbine components will be considered abnormal loads in terms of the Road Traffic Act (Act No 29 of 1989). A permit for a vehicle carrying an abnormal load must be obtained from the relevant Provincial Authority. The vehicle must comply with the Administrative Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads, issued by the Department of Transport, 2009.

The site will be accessed via the R354. Some existing public roads may need to be upgraded to facilitate the transport of the turbines and other construction materials to the site. Within the site area existing farm tracks will be used, some existing farm tracks with be up-graded and new gravel roads may be constructed to facilitate movement of construction and maintenance vehicles.

It is likely that there will be two or more site access roads including one accessing the south of the site from the R354 and one accessing the north of the site from the R354. There may also be a site access road accessing the centre of the site from the R354. In addition to site access roads there will be a network of access roads between each of the turbines. Site access roads will be up to 12 m wide with drainage trenches adjacent to the road.

3.5 AVIATION COMMUNICATIONS

Written approval or a permit must be obtained from the South African Civil Aviation Authority that the wind farm will not interfere with the performance of aerodrome radio Communication, Navigation and Surveillance (CNS) equipment, especially radar.

4 SEARCH AND RESCUE AND ALIEN INVASIVE MANAGEMENT PLAN

4.1 SEARCH AND RESCUE

4.1.1 Purpose

The purpose of the plant rescue and protection plan is to implement avoidance and mitigation measures to reduce the impact of the development of the Roggeveld Wind Farm on listed and protected plant species and their habitats.

4.1.2 Background & Identification of Species of Conservation Concern

The recently promulgated ToPS (Threatened and Protected Species) regulations provide for the regulation of activities which may directly or indirectly impact threatened and protected species. Such species are identified under NEMBA as well as by the National Red Data List of Plants. At a provincial level, the Western Cape Nature Conservation Laws Amendment Act (2000), also provides lists of species which are protected within the province. Species listed under the National Red Data List of Plants as well as those protected under the provincial legislation must be specified on permit applications required for site clearing.

4.1.3 Mitigation and Avoidance Options

Ideally, the development should strive to avoid impact to listed plant species through micrositing of the roads and turbines. However, due to various other constraints, this may not always be possible and some impact on listed plant species may be inevitable. Where listed plant species fall within the development footprint and avoidance is not possible, then it may be possible to translocate the affected individuals outside of the development footprint. However, not all species are suitable for translocation as only certain types of plants are able to survive the disturbance. Suitable candidates for translocation include most geophytes and succulents. Although there are exceptions, the majority of woody species do not survive translocation well.

4.2 RESCUE AND PROTECTION PLAN

4.2.1 Preconstruction

- Identification of all listed species which may occur within the site; and
- As the scope for changing layouts is limited once the final layout has been submitted, a preliminary walk-through of the final layout should be conducted to assess the presence of listed plant species within the development footprint and the layout adjusted as necessary to avoid significant populations of species of conservation concern. Such a walk-

through should be conducted at the favorable time of year when the probability of recognizing species of conservation concern is high.

Before construction commences at the site, the following actions should be taken:

- Walk-through of the final development footprint by a suitably qualified botanist/ecologist to locate and identify all listed and protected species which fall within the development footprint. This would need to happen during the peak flowering season at the site which depending on rainfall is likely to be during September;
- Walk-through report which identifies areas where minor deviations to roads and other infrastructure can be made to avoid sensitive areas and important populations of listed species. As well as contains a full list of localities where listed species occur within the development footprint and the number of affected individuals in each instance; and
- Search and rescue operation of all listed species within the development footprint that cannot be avoided. Affected individuals should be translocated to a similar habitat outside of the development footprint and marked for monitoring purposes.

4.2.2 Construction

- ECO to monitor vegetation clearing at the site. Any deviations from the plans that may be required should first be checked for listed species by the ECO and any listed species present which are able to survive translocation should be translocated to a safe site;
- Any listed species observed within the development footprint that were missed during the preconstruction plant sweeps should be translocated to a safe site;
- Many listed species are also sought after for traditional medicine or by collectors and so the ECO should ensure that all staff attend environmental induction training in which the legal and conservation aspects of harvesting plants from the wild are discussed; and
- The ECO should monitor construction activities in sensitive habitats such as near rivers and wetlands carefully to ensure that impacts to these areas are minimized.

4.2.3 Operation

- Access to the site should be strictly controlled and all personnel entering or leaving the site should be required to sign and out with the security officers; and
- The collecting of plants of their parts should be strictly forbidden and signs stating so should be placed at the entrance gates to the site.

4.3 IDENTIFICATION OF LISTED SPECIES

In this section, the listed species known to occur in the area based on previous studies is provided from the SANBI SIBIS database.

According to the SIBIS database 1209 species are known from the quarter degree squares 3220 CD, DC and 3320 AB, BA. This is an exceptionally high number of species given the relative aridity of the area. Of these species, 70 are of conservation concern and of these 26 are priority species that are listed as Critical, Endangered or Vulnerable (Table 4.1). Species listed as Threatened (CR, EN and VU) are regulated under the Biodiversity Act (Act No. 10 of 2004), by the Threatened and Protected Species Regulations (ToPS) promulgated under the Act. Any activities which have a direct or indirect impact on ToPS-listed species require a ToPS permit.

Refer to the ecological report and TOPS species list which is appended to the Final EIA Report for Phase 1 results of the ecological survey. This can be ascribed firstly to their rare nature, and possibly also the fact that the site is very large. In addition, a large proportion of the site is highly inaccessible and it was not possible to access some of the more remote areas during the site visits. A proportion of the species of conservation concern are associated with the dry lowlands, such as the two listed *Tanquana* species and are not likely to be impacted by the development. In addition, the fynbos species such as *Protea convexa* and *Leucodendron teretifolium*, were not observed in the area and it is likely that these species are restricted to the ridges towards the N1 and do not actually occur within the study area as such.

Table 4.1 Summary of the conservation status of the different species known from the broad area surrounding the proposed G7 Roggeveld WEF.

Status	Number of Species
CR	3
EN	5
VU	18
NT	10
Rare	25
Declining	3
DDD	6
DDT	18
LC	908
Not evaluated	213
Grand Total	1209

Table 4. 2. Species of high conservation concern which are known to occur in the vicinity of the G7 Roggeveld WEF. The number of quarter degree squares each species is known from is provided and gives an indication of the distribution of the species the extent of potential negative impact from the development. The

species listed below are regulated as Threatened Species under the ToPS regulations.

Family	Species	Status	QDS
ASPHODELACEAE	Gasteria disticha	CR	4
MESEMBRYANTHEMACEAE	Tanquana hilmarii	CR	2
PROTEACEAE	Protea convexa	CR	7
CRASSULACEAE	Adromischus mammillaris	EN	>30
FABACEAE	Amphithalea villosa	EN	9
FABACEAE	Lotononis comptonii	EN	4
FABACEAE	Lotononis gracilifolia	EN	2
MESEMBRYANTHEMACEAE	Lampranthus amoenus	EN	25
AMARYLLIDACEAE	Brunsvigia josephinae	VU	18
APOCYNACEAE	Duvalia parviflora	VU	4
ASPHODELACEAE	Astroloba herrei	VU	2
ASTERACEAE	Euryops namaquensis	VU	26
COLCHICACEAE	Wurmbea capensis	VU	19
FABACEAE	Amphithalea spinosa	VU	5
FABACEAE	Lotononis densa subsp. congesta	VU	5
FABACEAE	Lotononis venosa	VU	1
FABACEAE	Xiphotheca fruticosa	VU	13
HYACINTHACEAE	Drimia arenicola	VU	6
HYACINTHACEAE	Lachenalia martinae	VU	4
IRIDACEAE	Geissorhiza karooica	VU	2
IRIDACEAE	Moraea aspera	VU	5
IRIDACEAE	Romulea eburnea	VU	1
MESEMBRYANTHEMACEAE	Antimima hamatilis	VU	2
MESEMBRYANTHEMACEAE	Tanquana archeri	VU	5
POLYGALACEAE	Muraltia karroica	VU	7
RUTACEAE	Acmadenia argillophila	VU	7

4.4 POTENTIAL IMPACT OF THE DEVELOPMENT ON LISTED SPECIES

The impact of the wind turbines themselves is likely to be minor compared to the access roads which will result in a much larger total footprint than the turbines. Since the turbines are restricted to some of the ridges within the development area, the impact of the development will also be concentrated within these areas. Many of these ridges are composed of loose weathered shale and dominated by various low shrubs within the genera *Eriocephalus*, *Pteronia*, *Elytropappus* and *Euryops*. Within the ridgeline habitat the diversity was observed to be quite low and it is not likely that many listed species occur within this habitat. Areas of higher diversity, where listed species are more likely to occur include slopes on various aspects, rocky outcrops, seeps and drainage lines. Impacts to these areas can be minimized through preconstruction surveys for listed fauna as well as by making route adjustments to access roads which must traverse these areas.

Table 4.3 Species of conservation concern which are not considered priority species in terms of their threat status. These species are not regulated under the ToPS regulations, but are species of potential conservation significance that are regulated at the provincial level.

Family	Species	Status
A		
MARYLLIDACEAE	Strumaria karooica	Rare
AMARYLLIDACEAE	Strumaria pubescens	Rare
ANTHERICACEAE	Chlorophytum lewisiae	Rare
ASPHODELACEAE	Aloe ciliaris var. tidmarshii	Rare
ASPHODELACEAE	Bulbine torta	Rare
ASTERACEAE	Cineraria lobata subsp. lasiocaulis	Rare
ASTERACEAE	Eriocephalus grandiflorus	Rare
ASTERACEAE	Phymaspermum schroeteri	Rare
ASTERACEAE	Pteronia hutchinsoniana	Rare
CRASSULACEAE	Adromischus humilis	Rare
CRASSULACEAE	Adromischus phillipsiae	Rare
CRASSULACEAE	Crassula alpestris subsp. massonii	Rare
CRASSULACEAE	Crassula roggeveldii	Rare
CRASSULACEAE	Crassula rupestris subsp. commutata	Rare
GERANIACEAE	Pelargonium denticulatum	Rare
GERANIACEAE	Pelargonium torulosum	Rare
HYACINTHACEAE	Lachenalia maximiliani	Rare
IRIDACEAE	Geissorhiza inaequalis	Rare
MESEMBRYANTHEMACEAE	Cleretum lyratifolium	Rare
MESEMBRYANTHEMACEAE	Ruschia altigena	Rare
OXALIDACEAE	Oxalis tenuipes var. tenuipes	Rare
POLYGALACEAE	Muraltia montana	Rare
SCROPHULARIACEAE	Globulariopsis wittebergensis	Rare
SCROPHULARIACEAE	Oftia glabra	Rare
SCROPHULARIACEAE	Selago albomontana	Rare
APOCYNACEAE	Hoodia pilifera subsp. pilifera	NT
ASPHODELACEAE	Haworthia fasciata	NT
ASTERACEAE	Helichrysum tricostatum	NT
ASTERACEAE	Relhania tricephala	NT
EUPHORBIACEAE	Euphorbia nesemannii	NT
FABACEAE	Amphithalea tomentosa	NT
POACEAE	Ehrharta eburnea	NT
PROTEACEAE	Leucadendron teretifolium	NT
PROTEACEAE	Protea lepidocarpodendron	NT
RUTACEAE	Agathosma adenandriflora	NT
AMARYLLIDACEAE	Boophone disticha	Declining
ASTERACEAE	Cineraria lobata subsp. lobata	Declining
HYACINTHACEAE	Drimia altissima	Declining
AMARYLLIDACEAE	Gethyllis roggeveldensis	DDT
AMARYLLIDACEAE	Gethyllis uteana	DDT
APOCYNACEAE	Hoodia pilifera subsp. pillansii	DDT
ASTERACEAE	Senecio erysimoides	DDT
ERICACEAE	Erica discolor var. puberula	DDT
GERANIACEAE	Pelargonium brevipetalum	DDT
MESEMBRYANTHEMACEAE	Aloinopsis loganii	DDT
MESEMBRYANTHEMACEAE	Antimima pumila	DDT
MESEMBRYANTHEMACEAE	Antimima wittebergensis	DDT
MESEMBRYANTHEMACEAE	Drosanthemum albiflorum	DDT
MESEMBRYANTHEMACEAE	Drosanthemum eburneum	DDT
MESEMBRYANTHEMACEAE	Drosanthemum globosum	DDT
MESEMBRYANTHEMACEAE	Ruschia fredericii	DDT
MESEMBRYANTHEMACEAE	Ruschia inclusa	DDT
MESEMBRYANTHEMACEAE	Ruschia laxipetala	DDT
MESEMBRYANTHEMACEAE	Trichodiadema hallii	DDT

Family	Species	Status
SANTALACEAE	Thesium hillianum	DDT
SANTALACEAE	Thesium marlothii	DDT
AMARYLLIDACEAE	Gethyllis fimbriatula	DDD
ASPHODELACEAE	Aloe longistyla	DDD
ASTERACEAE	Helichrysum archeri	DDD
MALVACEAE	Hermannia repetenda	DDD
SCROPHULARIACEAE	Phyllopodium tweedense	DDD
SCROPHULARIACEAE	Polycarena comptonii	DDD

4.5 PROVINCIALLY PROTECTED SPECIES

Apart from the species listed above by the South African Red Data list of Plants a number of genera are listed in their entirety as protected by the Western Cape Nature Conservation Laws Amement Act of 2000. Of particular relevance to the current site, are the species within the following families and genera: *Amaryllidaceae*, *Asclepiadaceae*, *Iridaceae*, *Aloe* except *Aloe ferox*, *Haworthia*, *Lachenalia*, *Mesembryanthemaceae*, *Orchidaceae*, *Anacampseros, Rutaceae* and *Diascia*. Although the affected species within these families and genera may not be rare, they are protected under the provincial legislation and will need to be specified on any clearing permit applications for the site.

4.5.1 Monitoring and Reporting Requirements

The following reporting and monitoring requirements are recommended as part of the plant rescue and protection plan:

- Preconstruction walk-through report detailing the location and distribution of all listed and protected species. This should include a walk-through of all infrastructure including all new access roads, turbine positions, underground cables, power line routes and substations. The report should include recommendations of route adjustments where necessary, as well as provide a full accounting of how many individuals of each listed species will be impacted by the development;
- Monitoring during construction by the ECO to ensure that listed species and sensitive habitats are avoided. All incidents should be recorded along with the remedial measures implemented; and
- Post construction monitoring of plants translocated during search and rescue to evaluate the success of the intervention. Monitoring for a year post-transplant should be sufficient to gauge success.

4.6 ALIEN INVASIVE PLANT MANAGEMENT PLAN

4.6.1 Overall Objective

Manage alien and invasive plant species during the construction and operation of the G7 Roggeveld Wind Energy Facility, through the

implementation of an alien invasive species management and control programme.

4.6.2 Problem Outline

Alien plants replace indigenous vegetation leading to severe loss of biodiversity and change in landscape function. Potential consequences include loss of biodiversity, loss of grazing resources, increased fire risk, increased erosion, loss of wetland function, impacts on drainage lines, increased water use etc.

In addition, the Conservation of Agricultural Resources Act (Act 43 of 1983), as amended in 2001, requires that landusers clear Declared Weeds from their properties and prevent the spread of Declared Invader Plants on their properties. A list of declared weeds and invader plants is attached.

4.6.3 Current Status of Alien Plants at the Site

The site was visited during the field assessment for the EIA of the proposed development as well as several times thereafter for related purposes. The majority of time was spent along the ridgelines and higher-lying parts of the site where the turbines will be located. These site visits revealed that the higher-lying parts of the site are currently in good condition with regards to the presence of alien species and very few alien species were observed in these areas. This can be ascribed to the low levels of disturbance in these areas. The disturbance associated with the construction of the facility will however encourage the invasion of alien species into these previously near-pristine areas. The lowlands of the site on the other hand have been more heavily impacted by intensive agriculture and human activity and a variety of alien species were observed present within these areas. Species observed include:

- Bromus spp.
- Salsola kali
- Malva parviflora
- Prosopis glandulosa
- Atriplex inflate

Although the presence of these species within the lowlands is not directly of concern to the development of the wind energy facility, these are the species that are likely to become a problem within the disturbed areas of the site on account of seed input from these adjacent areas.

4.6.4 Vulnerable Habitats

The susceptibility of the site to alien invasion is not homogenous and specific environments and habitats can be singled out as being more vulnerable to invasion. This includes:

- Riparian areas and wetlands
- Disturbed areas which receive runoff
- Construction camps experiencing prolonged use
- Lay down areas experiencing prolonged use

These areas are likely to require specific attention and repeated alien clearing may be required to keep these areas clear of invasives.

4.6.5 Specific Management Objectives:

- Although the wind energy facility includes a number of different landowners, the alien plant management plan should be inclusive and cover all the properties involved.
- Ensure alien plants do not become dominant in parts or the whole landscape
- Initiate and implement a monitoring and eradication programme for alien and invasive species
- Control alien and invasive species dispersal & encroachment
- Promote the planting of indigenous species

4.6.6 General Clearing & Guiding Principles

- Alien control programs are long-term management projects and should include a clearing plan which includes follow up actions for rehabilitation of the cleared area. Alien problems at the site should be identified during preconstruction surveys of the development footprint. This may occur simultaneously to other required searches and surveys. The clearing plan should then form part of the preconstruction reporting requirements for the site.
- The plan should include a map showing the alien density & indicating dominant alien species in each area.
- The lighter infested areas should be cleared first (with young/ immature, less dense trees) to prevent the build-up of seed banks.. In the case of alien species confined to rivers, it is ideal to start in the headwaters and then move downstream, thereby removing the source of re-infestation.
- Dense mature stands ideally should be left for last, as they probably won't increase in density or pose a greater threat than they are at the moment.
- Collective management and planning with neighbours may be required as seeds of aliens are easily dispersed across boundaries by wind or water courses.
- All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing.

4.6.7 Clearing Methods

- **Different species require different clearing methods such as manual, chemical or biological methods or a combination of both.**

- **The best-practice clearing method for each species identified should be used. The preferred clearing methods for most alien species can be obtained from the DWAF Working for Water Website**

4.6.8 Identification of Alien Species

Table 3 of CARA (the Conservation of Agricultural Resources Act) lists all declared weeds and invader plants. Alien plants are divided into 3 categories based on their risk as an invader.

- Category 1 - These plants must be removed and controlled by all land users. They may no longer be planted or propagated and all trade in these species is prohibited.
- Category 2 – These plants pose a threat to the environment but nevertheless have commercial value. These species are only allowed to occur in demarcated areas and a landuser must obtain a water use licence as these plants consume large quantities of water.
- Category 3 – These plants have the potential of becoming invasive but are considered to have ornamental value. Existing plants do not have to be removed but no new plantings may occur and the plants may not be sold.

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

4.6.9 Use of Herbicides for Alien Control

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

- The use of herbicides should be restricted for the control of alien species that cannot easily be controlled manually and should be applied according to the relevant instructions and by appropriately trained personnel.
- Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.
- Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of in a suitable site.
- To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation.
- Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.

- The appropriate health and safety procedures should also be followed regarding the storage, handling and disposal of herbicides.

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

Working for Water: Policy on the Use of Herbicides for the Control of Alien Vegetation.

4.7 ALIEN PLANT MANAGEMENT PLAN

Construction Phase Activities

The following management actions are aimed at reducing soil disturbance during the construction phase of the development, as well as reducing the likelihood that alien species will be brought onto site or otherwise encouraged.

Action	Frequency
The ECO is to provide permission prior to any vegetation being cleared for development.	Daily
Clearing of vegetation must be undertaken as the work front progresses – mass clearing is not allowed unless the entire cleared area is to be rehabilitated immediately.	Weekly
Should revegetation not be possible immediately, the cleared areas must be protected with packed brush, or appropriately battered with fascine work. Alternatively, jute (Soil Saver) may be pegged over the soil to stabilise it.	Weekly
Cleared areas that have become invaded can be sprayed with appropriate herbicides provided that these are such that break down on contact with the soil. Residual herbicides should not be used.	Weekly
Although organic matter is frequently used to encourage regrowth of vegetation on cleared areas, no foreign material for this purpose should be brought onto site. Brush from cleared areas should be used as much as possible. Arid soils are usually very low in organic matter and the use of manure or other soil amendments is likely to encourage invasion.	Weekly
Clearing of vegetation is not allowed within 32m of any wetland, 80m of any wooded area, within 1:100 year floodlines, in conservation servitude areas or on slopes steeper than 1:3, unless permission is granted by the ECO for specifically allowed construction activities in these areas.	Weekly
Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment.) Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.	Weekly
Alien vegetation regrowth must be controlled throughout the entire site during the construction period.	Monthly
The alien plant removal and control method guidelines should adhere to best-practice for the species involved. Such information can be obtained from the DWA Working for Water website, as well as the attached herbicide guidelines.	Monthly
Clearing activities must be contained within the affected zones and may not spill over into demarcated No Go areas.	Daily
Pesticides may not be used. Herbicides may be used to control listed alien weeds and invaders only.	Monthly
Wetlands (existing), forest edges, riverine fringe vegetation and potentially unstable areas must remain demarcated with appropriate fencing or hazard tape. These areas are no-go areas (this must be explained to all workers) that must be	Daily

Action	Frequency
excluded from all development activities – workers entering these zones for any reason other than rehabilitation work must be disciplined.	

Monitoring – Construction Phase

The following monitoring actions should be implemented during the construction phase of the development.

Monitoring Action	Indictor	Timeframe
Document alien species present at the site	List of alien species	Preconstruction
Document alien plant distribution	Alien plant distribution map	3 Monthly
Document & record alien control measures implemented	Record of clearing activities	3 Monthly
Review & evaluation of control success rate	Decline in documented alien abundance over time	Biannually

Operational Phase Activities

The following management actions are aimed at reducing the abundance of alien species within the site and maintaining non-invaded areas clear of aliens.

Action	Frequency
Surveys for alien species should be conducted regularly. Every 3 months for the first two years after construction and biannually thereafter. All aliens identified should be cleared.	Every 3 months for 2 years and biannually thereafter
Revegetation with indigenous, locally occurring species should take place in areas where natural vegetation is slow to recover or where repeated invasion has taken place.	Biannually, but revegetation should take place at the start of the rainy season.
Areas of natural vegetation that need to be maintained or managed to reduce plant height or biomass, should be controlled using methods that leave the soil protected, such as using a weed-eater to mow above the soil level.	When necessary
No alien species should be cultivated on-site. If vegetation is required for esthetic purposes, then non-invasive, water-wise locally-occurring species should be used.	When necessary

Monitoring – Operational Phase

The following monitoring and evaluation actions should take place during the operational phase of the development.

Monitoring Action	Indictor	Timeframe
Document alien species distribution and abundance over time at the site	Alien plant distribution map	Biannually
Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Quarterly
Document rehabilitation measures implemented and success achieved in problem areas	Decline in vulnerable bare areas over time	Biannually

Decommissioning Phase Activities

The following management actions are aimed at preventing the invasion, by alien plant species, of the re-vegetated areas created during the decommissioning phase. Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to operation.

Action	Frequency
All damaged areas shall be rehabilitated upon completion of the contract.	Once off
All natural areas must be rehabilitated with species indigenous to the area. Re-seed with locally-sourced seed of indigenous grass species that were recorded on site pre-construction.	Once off, with annual follow up re-vegetation where required.
Maintain alien plant monitoring and removal programme for 5 years after rehabilitation.	Biannually

Monitoring – Decommissioning Phase

The following monitoring and evaluation actions should take place during the decommissioning phase of the development.

Monitoring Action	Indictor	Timeframe
Monitor newly disturbed areas where infrastructure has been removed to detect and quantify any aliens that may become established for 5 years after decommissioning and rehabilitation.	Alien plant surveys and distribution map	Biannually until such time as the natural vegetation has recovered sufficiently to resist invasion.
Monitor re-vegetated areas to detect and quantify any aliens that may become established for 5 years after decommissioning and rehabilitation.	Alien plant surveys and distribution map	Biannually for 5 years
Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Annually for 5 years

5 EROSION MANAGEMENT PLAN

5.1 PURPOSE

The purpose of the G7 Roggeveld WEF erosion management plan plant is to implement avoidance and mitigation measures to reduce the erosion potential and likely impact of erosion associated with the construction and operational phases of the proposed Roggeveld Wind Farm.

5.2 SCOPE & LIMITATIONS

This plan is intended at introducing measures aimed reducing the negative impacts of erosion on biodiversity as well as reducing the vulnerability of the site to erosion problems during the construction and operational phases of the development. The focus is on managing runoff and reducing the construction phase impact on ecologically sensitive areas. The plan does not cover engineering-side issues which are of relevance to soil management and erosion. Therefore issues such as the presence of heaving clays, compressible soils, perched water tables, dispersive soils and corrosive groundwater at the site are beyond the general scope of this study and are not directly dealt with. These issues would need to be addressed and their relevance assessed during detailed geotechnical investigation of the site.

5.3 RELEVANT ASPECTS OF THE SITE

The site occurs in a mountainous region and while there are currently numerous access roads through the site, the majority of these are in low-lying areas. The turbines occur along the higher-lying ridges of the site and new access roads will be required across a large proportion of the site. The ridges themselves are largely of a rocky or gravel nature and erosion risk in these areas is generally quite low. In addition, the tops of the ridges are quite flat and the majority of turbines would be located in areas of locally flat topography. The major risk factor in terms or erosion potential at the site is therefore the access roads and other infrastructure such as power lines and underground cabling trenches, which must traverse lowland areas and steep slopes. On account of the mountainous topography of the site, some of the access road routes would need to traverse some steep slopes as well as cross numerous drainage lines. In such areas, the risk or erosion problems and secondary ecological impact is very high and mitigation measures should pay specific attention of these susceptible areas.

5.4 BACKGROUND

5.4.1 Types of Erosion

Erosion comes in several forms, some of which are not immediately apparent. The major types of erosion are briefly described below:

Raindrop impact

This is the erosion that occurs due to the "bomb blast" effect of raindrop impact. Soil particles can be blasted more than a metre into the air.

Sheet erosion

This is the removal of a shallow and uniform layer of soil from the surface. It is caused initially by raindrop splash and then by runoff. Sheet erosion is often difficult to see as no perceptible channels are formed. Accumulated sediment at the bottom of the slope is often the only indicator.

Rill erosion

This is the removal of soil from the surface whereby small channels or rills up to 300mm are formed. It is caused by runoff concentrating into depressions, wheel tracks etc.

Gully erosion

This is the removal of soil from the surface and sub-surface caused by concentrated runoff eroding channels greater than 300mm deep. Gully erosion often begins as rill erosion which is not addressed.

5.4.2 Promoting Factors

Rainfall

High-intensity, short-duration storm events have much greater erosion potential than low intensity, longer duration storm events with the same runoff volume. Intense storms produce larger raindrops, and are more likely to break up the soil and dislodge particles. The erosion potential of rainfall is dependent on its geographical location. Rainfall within the winter-rainfall region is generally less erosive than rainfall within the summer rainfall region of South Africa.

Soil erodibility

Soil erodibility is determined by the soils ability to resist detachment and transport due to rainfall, runoff and infiltration capacity. Well-structured soils with a high clay content are generally least erodible. Some clays are dispersible meaning that they break down when wet and become highly erodible. Silts and fine sands are highly erodible.

Length and steepness of slope

Steeper slopes cause runoff flow velocities to increase, resulting in increased erosion. As the slope length increases the opportunity for runoff to concentrate and achieve an erosive velocity increases.

Soil surface cover

Soil surface covers such as vegetation and mulches protect the soil surface from raindrop impact, reduce flow velocity, disperse flow, and promote infiltration and the deposition of sediment. This is a basic principle underlying many erosion control approaches which aim to modify the surface characteristics in order to reduce the flow velocity and reduce the potential for erosion.

5.5 EROSION AND SEDIMENT CONTROL PRINCIPLES

The goals of erosion and sediment control during and after construction at the site should be to:

- Protect the land surface from erosion;
- Intercept and safely direct run-on water from undisturbed upslope areas through the site without allowing it to cause erosion within the site or become contaminated with sediment; and
- Progressively revegetate or stabilise disturbed areas.

These goals can be achieved by applying the following principles:

1. Integrate project design with site constraints;
2. Plan and integrate erosion and sediment control with construction activities;
3. Minimise the extent and duration of disturbance;
4. Control stormwater flows onto, through, and from the site in stable drainage structures;
5. Use erosion controls to prevent on-site damage;
6. Use sediment controls to prevent off-site damage;
7. Control erosion and sediment at the source;
8. Stabilise disturbed areas promptly; and
9. Inspect and maintain control measures.

5.5.1 On-Site Erosion Management

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, the erosion management plan and the revegetation and rehabilitation plan are closely linked to one another and should not operate independently, but should rather be seen as complementary activities within the broader environmental management of the site and should therefore be managed together.

General factors to consider regarding erosion risk at the site includes the following:

- Soil loss will be greater during wet periods than dry periods. Intense rainfall events outside of the wet season, such as occasional summer

thunder storms can also however cause significant soil loss. Therefore precautions to prevent erosion should be present throughout the year;

- Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilization. Therefore the gap between construction activities and rehabilitation should be minimized. Allied to this the fact that topsoil does not store well and should preferably be used within a month or at most within 3 months to aid in the revegetation and rehabilitation of disturbed areas;
- Phased construction and progressive rehabilitation are important elements of the erosion control strategy; and
- The extent of disturbance will influence the risk and consequences of erosion. Therefore large areas should not be cleared at a time, especially in areas such as slopes where the risk of erosion is higher.
- Roads should be constructed and routed in manner which minimises their erosion potential. Roads should therefore follow the contour as far as possible and roads parallel to the slope direction should be avoided as much as possible.
- All roads should have water diversion structures present with energy dissipation features present to slow and disperse the water into the receiving area.
- Regular monitoring of the site (minimum of twice annually) for erosion problems is recommended, particularly after large summer thunderstorms have been experienced.
- Any erosion problems observed should be rectified as soon as possible and monitored thereafter to ensure that they do not re-occur.
- All bare areas should be revegetated with locally occurring species, to bind the soil and limit erosion potential.
- Roads and other disturbed areas should be regularly monitored for erosion problems and problem areas should receive follow-up monitoring to assess the success of the remediation.
- Silt traps should be used where there is a danger of topsoil or material stockpiles eroding and entering streams and other sensitive areas.
- Topsoil should be removed and stored separately and should be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation on cleared areas.
- Phased development and vegetation clearing so that cleared areas are not left unvegetated and vulnerable to erosion for extended periods of time.
- Construction of gabions and other stabilisation features on steep slopes to prevent erosion.
- Reduced activity at the site after large rainfall events when the soils are wet. No driving off of hardened roads should occur immediately following large rainfall events until soils have dried out and the risk of bogging down has decreased.

5.5.2 *Specific Recommendations to Reduce Erosion Potential and Degradation of Drainage Systems*

Concentration of flows into downstream areas

Road crossings over drainage lines, streams and wetlands can impact downstream wetland ecosystems. Crossings that result in narrowing of the downstream system can result in concentration of flows and channelisation downstream. This may result in a loss of wetland function, and result in the drying out and shrinkage of the wetland area. Erosion and increased vulnerability to invasion of drier banks by alien vegetation may occur.

- Culverts should be adequately spaced such that they do not result in shrinkage of downstream wetlands. Where roads cross minor drainage channels, a single culvert may be adequate, aligned with the downstream drainage line. Where more substantial wetland systems are intercepted by a road, sufficient culverts should be provided such that downstream shrinkage of wetland width does not occur. Moreover, culverts should be aligned, as far impossible, with existing, natural channels;
- All crossings of drainage systems should ensure that both surface and shallow subsurface flows can be accommodated where appropriate and that unnatural channelisation does not occur downstream; and
- Significant wetlands should be avoided. There is sufficient space at the site and flexibility in the design constraints of the access roads, such that it should not be necessary to traverse wetlands.

Runoff Concentration

The increase in hardened surfaces associated with roads and turbine service areas, will lead to an increase in the volumes and velocities of flows generated from the hardened surfaces during rainfall events.

- Runoff from road surfaces is usually channeled of the road surface towards the downslope side of the road. On steep slopes, the volumes and velocity of runoff generated may result in erosion of the surrounding areas. Therefore specific measures to curb the speed of runoff water is usually required in such areas, such as rock beds or even gabions. In addition, these areas should be monitored for at least a year after construction to ensure that erosion is not being initiated in the receiving areas. Once erosion on steep slopes has been initiated, it can be very difficult to arrest.

Diversion of flows

Diversion of flows from natural drainage channels may occur when roads interrupt natural drainage lines, and water is forced to run in channels along the manipulated road edge to formalized crossing points. Even slight diversion from the natural drainage line can result in excessive downstream erosion, as the new channel cuts across the slope to reach the valley bottom.

- Adequate culverts should be provided along the length of all roads to prevent diversion of flow from natural drainage lines;
- Culverts should be carefully located, such that outlet areas do in fact align with drainage lines;
- The downstream velocity of runoff should be managed, such that it does not result in downstream erosion – on steep slopes, where roads have been constructed on cut areas, allowance should be made for culverts to daylight sufficiently far down the slope that their velocities are managed and erosion does not occur;
- Where necessary, anti-erosion structures should be installed downstream of road drains – these may comprise appropriate planting, simple riprap or more formal gabion or other structures; and
- roads and their drainage system should be subject to regular monitoring and inspection, particularly during the wet season, so that areas where head cut erosion is observed can be addressed at an early stage.

Existing Erosion

In some parts of the site, erosion problems are already present. In these areas particular precautions should be exercised to avoid exacerbating the existing problems. In the long-term these areas should be rehabilitated as part of the overall erosion management plan for the site. In cases where severe erosion is already present the following broad-scale measures are recommended:

- the advice of a wetland ecologist, working in association with an engineer should be sought regarding rehabilitation / remediation activities – these may include the construction of gabions to halt head cut erosion and further loss of wetlands, as well as planting of disturbed areas;
- the design of the existing drainage system should be addressed, and incorrect culvert or outlet alignment, as and downstream flow velocity, addressed through changes in design;
- the eroded area should be carefully monitored for up to three years after remediation, and until a new stable state is achieved in wetland structure and function;
- eroded areas should be protected from grazing and trampling by livestock during their re-establishment phases.

5.6 MONITORING REQUIREMENTS

5.6.1 Construction Phase

The following monitoring actions should be implemented during the construction phase of the development.

Monitoring Action	Indictor	Time frame
Identify all river and drainage line crossings affected by the development	Map of sites of potential concern	Preconstruction

Monitoring Action	Indictor	Time frame
Identify all sections of access roads along steep slopes (>10%)	Map of vulnerable slopes	Preconstruction
Identify and delineate all wetlands near access roads and other infrastructure	On-site demarcation of sensitive no-go areas by suitably qualified ecologist	Preconstruction
Monitor cleared areas for erosion problems	Record of monitoring site, problems encountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events otherwise
Monitor vegetation clearing activities near sensitive areas such as wetlands drainage lines	Activity log of monitoring actions and any mitigation and avoidance measures implemented	Monthly during the rainy season and following significant rainfall events otherwise
Monitor revegetated and stabilised areas	Record of monitoring site, problems encountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events otherwise

5.6.2 Operational Phase

The following monitoring actions should be implemented during the operational phase of the development.

Monitoring Action	Indictor	Time frame
Monitor for the development of new erosion problems across the site, with a focus on areas where water has been diverted or collected from upslope onto downslope areas	Map of erosion problem areas	Quarterly
Document erosion control measures implemented	Records of control measures and their success rate.	Quarterly
Document the extent of erosion at the site and the remedial actions implemented	Decline in erosion and vulnerable bare areas over time	Biannually

6 REVEGETATION AND REHABILITATION PLAN

6.1 PURPOSE

The purpose of the Roggeveld WEF revegetation and rehabilitation plan is to ensure that areas cleared or impacted during construction activities of the proposed Roggeveld Wind Farm are rehabilitated with a plant cover that reduces the risk or erosion from these areas as well as restores some ecosystem function. The purpose the rehabilitation at the site can be summarized as follows:

- Achieve long-term stabilisation of all disturbed areas to minimise ongoing erosion;
- Re-vegetate all disturbed areas with suitable plant species;
- Minimise visual impact of disturbed areas; and
- Ensure that disturbed areas are safe for future uses.

It is also important to recognize that the rehabilitation plan and the erosion control plan should function hand in hand as the two factors are inextricably linked.

6.2 ECOSYSTEM CONTEXT

The site occurs within a semi-arid environment and a fundamentally different approach to rehabilitation efforts in such areas is required as compared to traditional rehabilitation approaches within more mesic areas. In addition, the site is within a extensive natural ecosystem of high biodiversity value and the use of any rehabilitation techniques which rely on agricultural techniques such as the application of fertilizer and the planting of annual grasses or other alien species are not appropriate. The major implication of the semi-arid nature of the site is that active rehabilitation outside of the wet season may lead to very poor results on account of dry conditions and low rainfall which is likely to characterize the dry season.

6.3 IDENTIFICATION OF TARGET AREAS

The construction activities required for the development will result in a lot of disturbance at the site. Rehabilitation is costly and time-consuming and therefore priority areas where rehabilitation should be focused must be identified. Priority areas include areas vulnerable to erosion such as on steep slopes as well as areas near to important ecosystems such as areas near to drainage lines.

6.4 TOPSOIL MANAGEMENT

Effective topsoil management is a critical element of rehabilitation, particularly in arid and semi-arid areas where soil properties are a

fundamental determinant of vegetation composition and abundance. Although large parts of the site are devoid of topsoil, the lower-lying areas contain significant topsoil that should be saved wherever possible. The topsoil should be used to cover cleared and disturbed areas once construction activity has ceased.

- Topsoil is the top-most layer (0-25cm) of the soil in undisturbed areas. This soil layer is important as it contains nutrients, organic matter, seeds, micro-organisms fungi and soil fauna. All these elements are necessary for soil processes such as nutrient cycling and the growth of new plants. The biologically active upper layer of the soil is fundamental in the maintenance of the entire ecosystem;
- Topsoil should be retained on site in order to be used for site rehabilitation. The correct handling of the topsoil is a key element to rehabilitation success. Firstly it is important that the correct depth of topsoil is excavated. If the excavation is too deep, the topsoil will be mixed with sterile deeper soil, leading to reduction in nutrient levels and a decline in plant performance on the soil;
- Wherever possible, stripped topsoil should be placed directly onto an area being rehabilitated. This avoids stockpiling and double handling of the soil. Topsoil placed directly onto rehabilitation areas contains viable seed, nutrients and microbes that allow it to revegetate more rapidly than topsoil that has been in stockpile for long periods;
- If direct transfer is not possible, the topsoil should be stored separately from other soil heaps until construction in an area is complete. The soil should not be stored for a long time and should be used as soon as possible. The longer the topsoil is stored, the more seeds, micro-organisms and soil biota are killed;
- Ideally stored topsoil should be used within a month and should not be stored for longer than three months. In addition, topsoil stores should not be too deep, a maximum depth of 1m is recommended to avoid compaction and the development of anaerobic conditions within the soil;
- If topsoil is stored on a slope then sediment fencing should be used downslope of the stockpile in order to intercept any sediment and runoff should be directed away from the stockpiles upslope.

6.4.1 Mulching

Mulching is the covering of the soil with a layer of organic matter of leaves, twigs bark or wood chips, usually chopped quite finely. The main purpose of mulching is to protect and cover the soil surface as well as serve as a source of seed for revegetation purposes.

- During site clearing the standing vegetation should not be cleared and mixed with the soil, but should be cleared separately, either mechanically or by hand using a brush-cutter. The cleared vegetation should be

stockpiled and used whole or shredded by hand or machine to protect the soil in disturbed areas and promote the return of indigenous species;

- Mulch is to be harvested from areas that are to be denuded of vegetation during construction activities, provided that they are free of seed-bearing alien invasive plants;
- No harvesting of vegetation may be done outside the area to be disturbed by construction activities; and
- 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.

6.4.2 Seeding

In some areas the natural regeneration of the vegetation may be poor and the application of seed to enhance vegetation recovery may be required. Seed should be collected from plants present at the site and should be used immediately or stored appropriately and used at the start of the following wet season. Seed can be broadcast onto the soil, but should preferably be applied in conjunction with measures to improve seedling survival such as scarification of the soil surface or simultaneous application of mulch.

- Indigenous seeds may be harvested for purposes of re-vegetation in areas that are free of alien / invasive vegetation, either at the site prior to clearance or from suitable neighbouring sites;
- Seed may be harvested by hand and if necessary dried or treated appropriately;
- Seed gathered by vacuum harvester, or other approved mass collection method, from suitable shrubs or from the plant litter surrounding the shrubs must be kept apart from individually harvested seed;
- No seed of alien or foreign species should be used or brought onto the site.

6.4.3 Transplants

Where succulent plants are available or other species which may survive translocation are present, individual plants can be dug out from areas about to be cleared and planted into areas which require revegetation. This can be an effective means of establishing indigenous species quickly.

- Plants for transplant should only be removed from areas that are going to be cleared;
- Perennial grasses, shrubs, succulents and geophytes are all potentially suitable candidates for transplant;
- Transplants should be nearby and should not be transported around the site to distant areas; and
- Transplants must remain within the site and may not be transported off the site.

6.4.4 Use of soil savers

On steep slopes and areas where seed and organic matter retention is low, it is recommended that soil savers are used to stabilise the soil surface. Soil savers are man-made materials, usually constructed of organic material such as hemp or jute and are usually applied in areas where traditional rehabilitation techniques are not likely to succeed.

- In areas where soil saver is used, it should be pegged down to ensure that is captures soil and organic matter flowing over the surface; and
- Soil saver may be seeded directly once applied as the holes in the material catch seeds and provide suitable microsites for germination.

6.4.5 General

- Progressive rehabilitation is an important element of the rehabilitation strategy and should be implemented where feasible;
- Once revegetated, areas should be protected to prevent trampling and erosion;
- No construction equipment, vehicles or unauthorised personnel should be allowed onto areas that have been vegetated;
- Where rehabilitation sites are located within actively grazed areas, they should be fenced;
- Fencing should be removed once a sound vegetative cover has been achieved; and
- Any runnels, erosion channels or wash aways developing after revegetation should be backfilled and consolidated and the areas restored to a proper stable condition.

6.5 MONITORING REQUIREMENTS

As rehabilitation success, particularly in arid areas is unpredictable, monitoring and follow-up actions are important to achieve the desired cover and soil protection.

- Re-vegetated areas should be monitored every 3 months for the first 12 months and every 6 months thereafter for the next year;
- Re-vegetated areas showing inadequate surface coverage (less than 30% within 12 months after re-vegetation) should be prepared and re-vegetated; and
- Where transplants have been used the survival rate of the different species used should be monitored every 3 months for the first 12 months and every 6 months thereafter for the next year. The results should be used to inform the choice of species for transplant and other factors which may influence survival.

7 BIOLOGICAL MONITORING

7.1 INTRODUCTION

Specific biological monitoring requirements that are required to be undertaken through the various phases of the Roggeveld Wind Farm have been identified through specialist studies and are described in this section. The monitoring programs described below were developed by the specialists as part of the EIA specialist studies. Biological monitoring is required during the pre-construction, construction and operational phases of the project, particularly for birds and bats.

Table 3.1 provides a summary of what monitoring is required at the various phases of the development. RWP is responsible for ensuring that all monitoring measures described in this section are undertaken by appointing the relevant specialists where necessary. The pre-construction bird and bat monitoring for Phase 1 of the Roggeveld wind farm has been completed and therefore no protocol is included in this section.

Table 3.7.1 Monitoring Requirements

	Ecology	**Bats**	**Birds**
Pre-construction		X	X
Construction	X		
Operational	X	X	X

7.2 PRE-CONSTRUCTION PHASE

Pre-construction monitoring is an essential requirement prior to construction in order to validate within reason that final turbine placement and arrangement, as well as mitigation and management measures as included in this EMPr, will minimize potential impacts on birds, bats and other terrestrial ecological components and also in order to gain consequential knowledge for future wind farm projects to be developed in the country. The pre-construction bird and bat monitoring for Phase 1 of the Roggeveld wind farm has been completed and therefore no protocol is included in this section.

7.2.1 *Ecological Monitoring (excluding Bats and Birds)*

Monitoring Impacts on Rare or Endangered Plant Species

There are a number of listed plant species which may occur at the site. If required and determined by the ecologist, monitoring should occur pre-construction to identify listed species within areas that will be impacted by the development. The following recommendations are made in this regard:

- preconstruction surveys of the turbine sites is recommended in order to avoid impacts on listed species and rare edaphic habitats and should be marked so that they can be relocated to an adjacent similar environment at the appropriate time.

- Number and identities of all species translocated should be recorded.

- Relocated individuals should be marked and monitored for at least a year after transplanting to establish the success rate of the relocation exercise.

7.3 CONSTRUCTION PHASE

Mammals, reptiles and amphibians are most likely to be exposed to impacts during the construction phase of the Roggeveld Wind Farm primarily through loss of habitat and impacts associated with construction vehicles and workforce. This section describes the biological monitoring measures that should be undertaken during the construction phase.

7.3.1 Ecological Monitoring (excluding Bats and Birds)

In general, during the construction phase, monitoring should be used to ensure that the development takes place within the guidelines provided by this document to ensure that construction minimises or avoids impacts on adjacent natural vegetation, fauna and ecosystems. This monitoring could be undertaken by the ECO.

Monitoring Loss of Habitat and Habitat Fragmentation

Habitat loss and fragmentation is primarily a concern during the construction phase since this is when the majority of disturbance will take place. Specific areas that should be monitored include:

- Any deviations from the final construction plan, including the location, extent and nature of vegetation impact and transformation.
- The location and extent of temporary lay-down areas, these should be included in the sweeps for alien species.
- Any inadvertent or otherwise unintended destruction of natural vegetation and the remediation steps taken to encourage the recovery of the impacted areas.
- Monitoring frequency would need to be high, daily or weekly during the construction phase. During the operational phase monitoring could be conducted on an ad-hoc basis coincide with maintenance activities that may impact natural vegetation, such as servicing of the turbines.
- During the operational phase, it is recommended that a fire monitoring system is set in place to record the date, extent and source of all fires at the

site. Fire is a key ecological driver in fynbos vegetation and the extent to which the development impacts the fire regime at the site should be established so as to better inform long-term fire management at the site.

Monitoring Impacts on Sensitive Environments

The sensitive environments at the site require specific attention to avoid and mitigate negative impacts to these areas. Sensitive areas include rare edaphic environments as well as drainage lines, seeps and wetlands. These areas will be particularly vulnerable to negative impact during the construction phase when the major infrastructure associated with the development is laid down. During the construction phase, monitoring should largely be directed towards enforcement to ensure that these areas are not negatively impacted. As such, monitoring of these aspects should be on a continuous basis. During the operational phase there are not likely to be many activities which pose a direct risk to these areas. Specific recommendations include:

- Before roads are constructed, their proposed routes should be inspected on foot and all wetlands and riparian areas mapped and recorded on a GPS. Where planned roads traverse wetlands, these should be rerouted so as to avoid the wetlands. The services of an ecologist trained in the field may be required to accurately identify and delineate the wetlands.

- Where roads traverse rivers and drainage lines, the sites should be monitored to ensure that the presence of the road is not resulting in erosion or the deposition of large amounts of silt.

- The state of vulnerable wetlands near to roads should be recorded, preferably during the late wet season. A repeat photography method is suggested as a simple yet cost effective manner for monitoring wetland state. It is important to note that near and close-up pictures would be required to adequately assess changes in wetland state.

Monitoring Impacts on Rare or Endangered Plant Species

There are a number of listed plant species which may occur at the site. Monitoring should occur pre-construction to identify listed species within areas that will be impacted by the development. The following recommendations are made in this regard:

- Number and identities of all species translocated should be recorded.
- Relocated individuals should be marked and monitored for at least a year after transplanting to establish the success rate of the relocation exercise.

Monitoring Direct Faunal Impacts

Particularly during the construction phase but also during the operational phase, direct faunal impacts are a concern of the development. Monitoring

during the construction phase should be used to ensure that human-animal interactions are kept to a minimum and during the operational phase to assess the extent to which animal populations are vulnerable to or recover from the negative effects of the development.

- The traffic on the access and service roads poses a significant risk to many animals, particularly during the construction phase when traffic volumes on the roads are likely to be heavy. Any fauna accidentally killed during construction or maintenance activities should be reported and a log of such mortalities maintained. Where possible the species killed should be identified and recorded as well. Monitoring should be on an ad-hoc basis, as incidents occur.

- The activities of construction staff should be monitored to ensure that undesirable activities such as hunting, illegal collecting of plants, seeds or any other biological material does not occur, and that fires outside of the designated and demarcated areas do not occur. Any incidents or transgressions relating to these aspects should be logged, as well as the remedial steps taken to rectify the situation.

- As part of mitigation, monitoring studies on potentially vulnerable species or groups of species such as tortoises, by students or universities could be encouraged and funded. There is a general paucity of knowledge on the ecological impacts of renewable energy facilities in South Africa and better knowledge will enable improved understanding of the nature of impacts as well as improve mitigation strategies.

- If any parts of the facility need to be fenced off then no electrical fencing should be placed within 40cm of the ground to avoid impacts on tortoises.

7.4 OPERATIONAL PHASE

Birds and bats are likely to be impacted during the operational phase of the Roggeveld Wind Farm, primarily through collisions with the wind turbines or electrocutions with existing power lines. This section describes the monitoring measures to be undertaken during the operational phase of the Roggeveld Wind Farm. The monitoring requirements presented here may be modified based on the results of pre-construction monitoring and should therefore be regarded as provisional.

7.4.1 Bat Monitoring

The degree and type of post-construction monitoring is dependent on pre-construction monitoring programme results.

Identifying spatial patterns of bat fatalities among turbines within a facility is important for developing mitigation strategies to reduce or eliminate fatalities. For example, if fatalities are concentrated at specific turbines, then turbine specific mitigation strategies, such as curtailment, removal, or relocating the turbine, may reduce bat fatalities; however, if fatalities are broadly distributed, then facility-wide mitigation strategies must be considered.

7.4.2 Bird Monitoring

The primary aims of long term bird monitoring during the operational phase of the wind farm are similar to those of the pre-construction monitoring discussed above. In addition, monitoring during the operational phase seeks to register and as far as possible document the circumstances surrounding all avian collisions with the turbines for at least a full calendar year after the facility becomes operational.

The monitoring protocol outlined below was developed by an avifauna specialist (Dr. Andrew Jenkins), however, the final monitoring methodology for the Roggeveld Wind Farm may be further refined by the specialist appointed to undertake the monitoring, using the latest guidelines and best practice.

Avian densities

A set of at least 10 walk-transect routes, each of at least 1000 m in length, should be established in areas representative of all the avian habitats present within a 10 km radius of the centre of the Roggeveld site. Each of these should be walked at least 6-12 months after the wind farm 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.

In addition:

- The cliff-lines within or close to the development area should be surveyed for cliff-nesting raptors at least every six months using documented protocols (Malan 2009).
- Known large eagle nest sites should also be checked twice annually for signs of occupation and breeding activity.
- All sightings of key species () as stated in the pre-construction bird monitoring programme report should be carefully plotted and documented.

Bird activity monitoring

Monitoring of bird activity in the vicinity of the Wind Farm should be done over a 2-3 day period at least once per quarter for a full calendar year starting at least six months after the Wind Farm is commissioned. Each monitoring day should involve:

- Half-day counts of all priority species flying over or past the wind energy facility impact area; and
- Opportunistic surveys of cranes (and bustards) and raptors seen when travelling around the Roggeveld site.

Passage Rates of Priority Bird Species

Counts of bird traffic over and around the operational wind farm 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 wind farm), and extend alternately from an hour before dawn to midday, or from midday to an hour after dusk, so that the equivalent of four full days of counts is completed each count period. 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. Details regarding specific measures to be undertaken post construction are identical to those listed for monitoring of passage rates of priority bird species during the pre-construction phase .

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 (e.g. Shaw *et al.* 2010a & b). 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 maximize 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 the outer arc of the blades 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, and surveys should commence as soon as possible after construction is completed. The area around each turbine, or a larger area encompassing the entire WEF, 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 (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 (in this case CapeNature, failing this inform the monitoring project specialist) 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).

7.4.3 Ecological Monitoring (Excluding Birds and Bats)

During the operational phase, monitoring should be focused on ensuring that that there are no residual impacts such as soil erosion and alien plant invasion resulting from the construction phase, and on reducing the day to day impact of the Roggeveld Wind Farm.

Operational monitoring can be undertaken by a suitably qualified ecologist or environmental control officer on a monthly basis. After the first year, monitoring of rehabilitation measures could be checked twice annually for the next two years, and thereafter operational monitoring could be restricted to annual checks.

Specific aspects to be monitored during operation would include:

Disturbance of sensitive habitat during maintenance:

Habitat damage caused by movement of vehicles and equipment during turbine or infrastructure maintenance activities.

Alien Plant Invasion

The large amount of disturbance at the site is likely to render it highly vulnerable to alien plant invasion, particularly in the first few years post-construction. The roads and disturbed areas around the turbines are likely to be the major invasion foci. Monitoring for aliens should include the following:

- In a similar manner to erosion, an alien monitoring system should be set up which allows for the occurrence, persistence and treatment of alien plants to be monitored in a manner which allows the data to be interrogated in a GIS.

- Monitoring for alien plants could be done simultaneously with erosion monitoring and at a similar interval.

- The system should record the species present, their location, the control measures used and their success rate.

8 STORM WATER MANAGEMENT AND EROSION CONTROL

8.1 INTRODUCTION

Within the site area there are numerous small non-perennial watercourses that flow from areas of high ground into and along valleys within the site. Tributaries of two perennial rivers, the Wilgebosrivier and Furrowrivier flow from within the site area to beyond in the north and south of the site respectively. Other perennial watercourses that are located in the areas surrounding the site include the following:

- Kereekloofrivier (approximately 2 km west of site);
- Matjiesfontein se Kloof (approximately 5 km west of the site); and
- Roggeveldrivier (approximately 5 km east of the site).

Given the size of the site and varied topography it is likely that the site is located within a number of different watersheds. A number of farm dams are also located within the site area and beyond. It is, therefore important that storm water is appropriately managed to ensure potential impacts to these water bodies are mitigated.

Storm water management measures are outlined below, however, the storm water management plan must be updated and refined once the construction/ civil engineering plans have been finalised.

8.2 ROAD DRAINAGE

It has been assumed that internal roads will have a gravel surface. To assist with the storm water run-off, gravel roads should be graded and shaped with a 2 percent crossfall where technically feasible within the limitation of the turbine component transport requirements (the slope of a road from the centre toward the shoulder or gutter on either side) back into the slope, allowing storm water to be channelled in a controlled manner towards the natural drainage lines. Where proposed roads intersect with natural, defined drainage lines, a suitably sized pipe culvert or drive through causeways must be installed/ constructed and should take into account the hydrology criteria for a major storm as outlined below.

A minor storm design period should be used to determine the size of channels. A return period of 1:5 years is applicable in this instance.

The major storm occurrence i.e. 1:25 year, 1:50 & 1:100 year return should be used to calculate culverts in defined drainage lines and to determine flood

levels where necessary. A detailed 1:100 year floodline analysis must be undertaken prior to the final detailed design being completed.
Construction monitoring must be undertaken by the ECO as part of the routine site visits. Operational monitoring must be undertaken by the ECO on a by-monthly basis throughout the first year after construction (or more frequently after storm or extended rainfall events to check for erosion). After the first year, monitoring of rehabilitation measures could be checked twice annually for the next two years, and thereafter operational monitoring could be restricted to annual checks. Where roads traverse rivers and drainage lines, the sites should be monitored to ensure that the presence of the road is not resulting in erosion or the deposition of large amounts of silt.

8.3 EROSION PREVENTION

The preparation of the site for the establishment of turbines, underground cables, access roads, lay-down areas, substation site and operation and maintenance building during the construction phase will result in vegetation clearance, removal of topsoil and subsoil to varying depths and soil compaction. Areas cleared of vegetation are prone to erosion by wind or rain and although the area directly affected may be small, the effects of potential soil erosion and increased sediment load in surface runoff may extend to other areas.

Erosion prevention measures and monitoring is key to ensure this potential impact is managed effectively. Specific recommendations include:

- Establishment of an erosion monitoring system to record the location and extent of all erosion sites in the vicinity of the roads and wind turbines. The results should be recorded and stored in manner that they can be used in a GIS.

- The erosion monitoring system should record the measures taken to address existing erosion problems, their success and the occurrence of new erosion sites.

- Sweeps specifically for erosion problems should be made after large storms or heavy rainfall events as these are likely to be the trigger events for erosion and control will be more easily affected while the problem is still of a small extent and low severity.

- Sweeps should be more frequent in the first year of construction as this is when the majority of problems are likely to manifest as the soil will still be loose and unvegetated. Particular attention should be paid to roads and other disturbed areas on slopes or vulnerable soil types.

- In terms of frequency, erosion should be checked at least quarterly, more often in the rainy season.

Operational monitoring can be undertaken by the ECO on a monthly basis throughout the first year after construction (or more frequently after storm or extended rainfall events to check for erosion). After the first year, monitoring of rehabilitation measures could be checked twice annually for the next two years, and thereafter operational monitoring could be restricted to annual checks.

8.4 BORROW PITS

Borrow pits that may be developed on site will produce overburden and will expose soil, leaving it vulnerable to potential erosion. Due to the exposed soil and rock faces, silt laden run off can be expected from within the confines of the borrow pit and also from the access track leading down to the borrow pit. The following measures must be put in place to reduce erosion and the impact on surface water bodies.

- Consideration should be given to the location of any aggregate or overburden stockpiles such that erosion and run off is limited.
- Measures should be put in place to minimise erosion and run off from the overburden stockpiles.
- A silt fence should be installed on the down-gradient side of the stockpile to reduce silt load.
- An up-gradient cut off ditch should be installed around the edge of stock pile, above the borrow pit, in order to collect up-gradient surface water runoff and divert water runoff from eroding the base of the stock pile. This will eliminate or reduce the flow of water onto the exposed rock and soil faces and into the worked quarry floor, thereby reducing the amount of potential silt laden run off.
- Clean runoff water from cut off ditches should be discharged into an area of vegetation for dispersion or infiltration. Silt fencing and anchored straw bales may be required at the discharge point in order to alleviate flow and aid in flow dispersion across a wider area of vegetation to prevent potential scour effects.
- Silt laden run off will be captured and directed via berms or ditches towards specially constructed sediment control structures. Sediment control structures may comprise a series of settlement ponds with additional incorporated filtration measures, where required.

8.5 TURBINE FOUNDATIONS AND CRANE HARDSTANDINGS

Large areas of soil may be exposed during the excavation of turbine foundations and on the associated hardstanding areas. Prior to

commencement of each foundation excavation, the Contractor will assess the local gradient and the potential risk of silt laden run-off exiting the base area and design appropriate sediment control and silt mitigation measures accordingly. The standard mitigation measures outlined below must be implemented at each excavation:

- Overburden must be stripped and stored on the up-gradient side of the turbine base and crane hardstanding. If necessary, a silt fence should be installed on the down-gradient side of the stockpile.

- An up-gradient cut off ditch should be installed around the edge of the stock pile above the deep excavation in order to collect up-gradient surface water runoff and divert water runoff from eroding the bund foot. This will eliminate or reduce the flow of water into the deep excavation and reduce the amount of potential silt laden run off.

- Diversion dams / berms will be constructed accordingly in order to channel siltladen run-off water into the 'dirty' water drainage system for discharge into a suitable sediment control structure.

8.6 CONSTRUCTION COMPOUNDS, SUBSTATION AND CONTROL BUILDINGS

During construction works, large areas of soil may be exposed at the site of the construction compounds and substation/ control building construction footprints. As with borrow pits, clean up-slope run off and run off from the exposed construction area will be kept separate and appropriate silt mitigation measures will be deployed.

9 STORAGE AND HANDLING OF HAZARDOUS SUBSTANCES

9.1 INTRODUCTION

During the construction and operation of the Roggeveld Wind Farm, petroleum products such as diesel and oil will be transported to the site and stored on site in Aboveground Storage Tanks (ASTs). An accidental spill or leak of such product could result in the contamination of soil and/ or groundwater. As such, the mitigation measures outlined below must be implemented during both the construction and operation phase to minimise this risk.

Safety training focused on operational procedures, emergency procedures and safe working practices, information on specific hazards, first aid and fire-fighting must be included in the induction, prior to the commencement of construction. Furthermore, relevant operational staff must receive training on the correct operation of storage tanks, as well as maintenance and repair procedures when leaks are detected.

9.2 INSTALLATION OF ASTS AND STORAGE

The installation of the ASTs and storage of fuel must comply with South African National Standards (SANS) 10089-1. This includes, but is not limited to, the following:

- All atmospheric storage tanks shall be adequately vented to prevent, in the case of a cone-roof tank, the development of a vacuum or pressure that could distort the roof.
- ASTs within a bund should be arranged so that any fires in nearby tanks in the same or adjacent bunded areas, or in equipment or buildings nearby will have minimal effect on the ASTs.
- The capacity of the bunded area must not be less than the capacity of the largest AST in the bunded area.
- Bund walls may be constructed of earth or concrete, designed to be liquid-tight, and may not be covered with any material that will deteriorate under the effects of any petroleum product.
- No flammable or combustible products from draining water from bunded areas should be allowed to enter natural water courses.
- Service buildings must be located a distance from where products are stored and handled and out of the line of possible vapour travel (at least 15

m away in the case of Class I products and at least 6 m away in the case of Class II products).

- Hydrants and fire-fighting equipment must be so located that they can be approached from different directions, and distinctly marked that they can be easily seen.

- Adequate supplies of absorbents must be available on site at all times.

- Appropriate Health & Safety signage must be placed on and around the tank (in accordance with SANS standards).

- The tank area should be secured to prevent tampering and theft.

9.3 TRANSPORTATION AND HANDLING OF DANGEROUS SUBSTANCES

During the time that the ASTs are in use, petroleum products will be delivered to site by a selected supplier. The supplier will be responsible for ensuring that the transport of fuel complies with SANS 10231 "*Transportation of dangerous goods - Operational requirements for road vehicles*". The following precautionary measures must be implemented at the site to reduce the risk of a spill or leak during the handling of petroleum products.

- No private vehicles must be used for the transportation of petroleum products.

- No vehicle will be left unattended while loading or unloading is in progress.

- A closed cuppling must be used when chemicals are being transferred from the delivery vehicle to the ASTs.

- Accidental movement of the vehicle must be prevented by ensuring that the vehicle's hand break is active and the vehicle is in gear.

- All vehicle engines must be switched off before loading, and must only be restarted once all caps, valves and covers have been closed and secured.

- Vehicles waiting for loading must remain at a safe distance from the loading point in parking areas allocated for petroleum carrying vehicles.

- Special parking areas for bulk tankers shall be so designed that a large spill will not endanger the tank farm, buildings or any other structures.

- No smoking is permitted in the AST area, smoking will only be permitted in designated areas, away from the ASTs.

- A list of spill response contact numbers should always be displayed in a prominent position on site and should include the following numbers:
  - Ambulance;
  - Nearest clinic / hospital;
  - Fire brigade;
  - Key regulatory authorities; and
  - Supplier Customer Service Centre.

- Regular inspection of all pipes, tanks and other associated infrastructure must be undertaken to ensure there are no leaks.

- Accidental spills that occur outside of the bund area must be contained and prevented from entering the storm water system.

- Spills must be treated with the appropriate neutralising chemical or spill absorbent and, where necessary, spill absorbent must be removed by a certified hazardous waste removal company.

10 TRAFFIC MANAGEMENT PLAN

10.1 INTRODUCTION

During the construction of the Roggeveld Wind Farm, turbine components will be delivered to site using road transport. The purpose of a Traffic Management Plan (TMP) is to minimise the potential traffic related incidences on the project site, as well as impact of project related traffic on other road users and people living along transport routes.

The Roggeveld Wind Farm is still in the early planning phase and contractors and the final route from port to sites has not been confirmed. A Transport Study, covering this aspect will be undertaken at least three months prior to construction and the findings and any additional mitigation measures should be incorporated into this TMP.

10.2 LEGAL REQUIREMENTS

Due to the size of the turbine components, the vehicles used to deliver components will be considered abnormal loads in terms of the Road Traffic Act (Act No 29 of 1989). A permit for a vehicle carrying an abnormal load must be obtained from the relevant Provincial Authority. The vehicle must comply with the Administrative Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads, issued by the Department of Transport, 2009.

10.3 VEHICLE MOVEMENTS

Approximately eight truck loads would be required to deliver the required components for one turbine, as indicated below:

- One for the nacelle;
- Three for the turbine tower;
- One for the spinner and hub; and
- Three for the blades.

Up to 2000 vehicle movements would be required to deliver the wind turbine components for the 250 proposed turbines over the construction period. The construction will, however, be phased and the above mentioned vehicle movements will be spread out through during of the construction period of over 24 months. Other heavy vehicle deliveries would be required to transport cables, machinery and construction material for the substation. The construction phase of the project would take over 24 months and during this time increases in traffic levels would be intermittent and temporary in nature.

During the construction phase, workers would also have to travel to and from the site on a daily basis. .

Once all phases are operational, there would be an operations team comprising of up to 122 full time personnel,. These employees would have to commute to and from the site on a daily basis. Maintenance staff would visit the site several times a month requiring one or two vehicles. In addition, infrequent deliveries of replacement parts may be made during the lifespan of the Wind Farm. Potential traffic impacts associated with the operation of the facility would be largely limited to the site and the local access road.

10.4 PORT TO SITE DELIVERY ROUTE

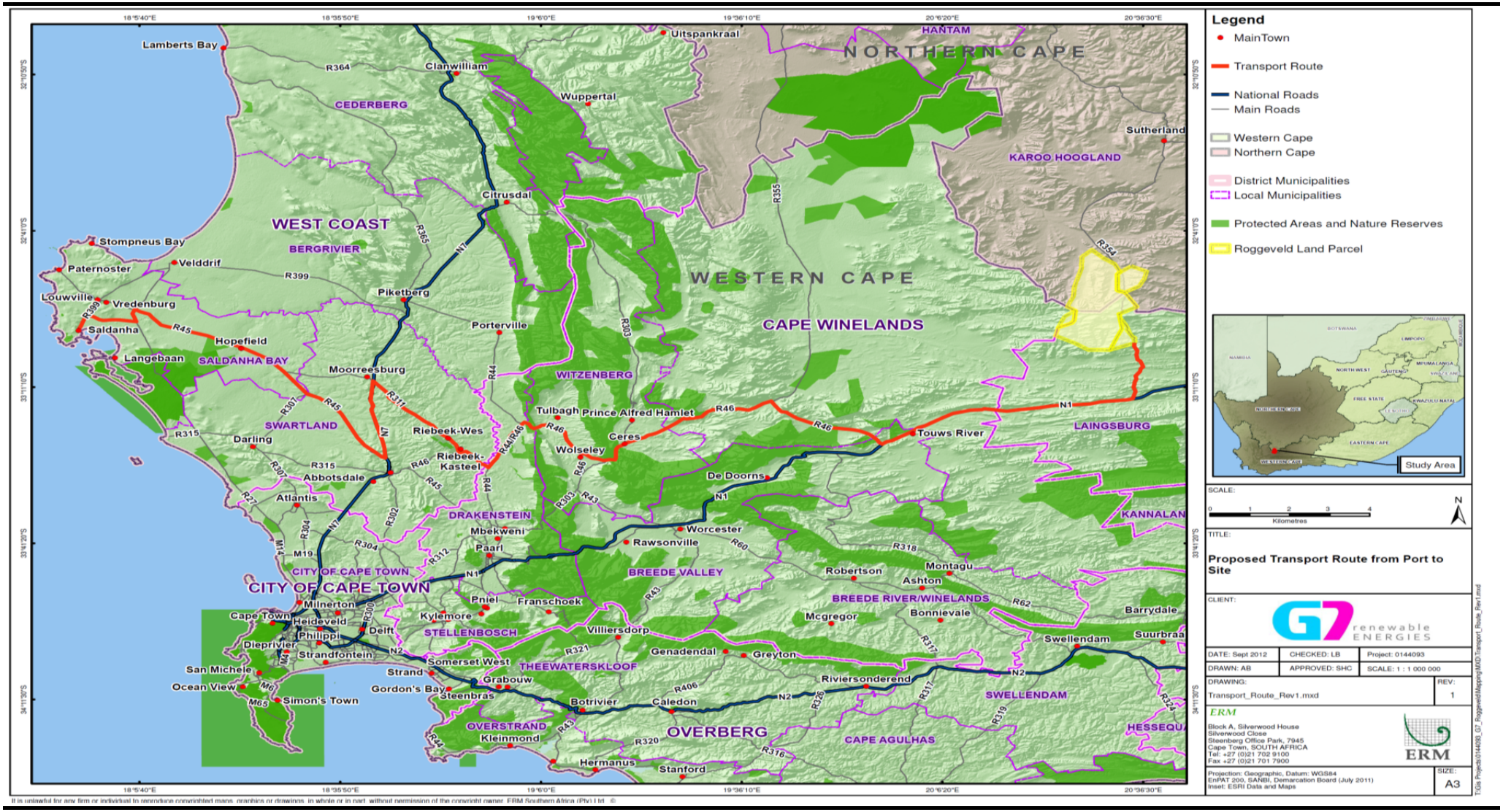
Port of Saldanha Bay in the Western Cape will be the port of entry. The most likely route is outlined below and can be seen in *Figure 10.1*.

Turbine components will arrive by sea at the Port of Saldanha and be transported by road to the R27 heading North. The R27 connects to the R45 and then to the N7. From the N7 the route will connect to the R311 and then the R46 at Riebeeck Kasteel. The vehicles will then stay on the R46/R45/R44 (Ceres Road) past Ceres via the Ceres Pass and connect to N1 south west of Touws River. The route would then connect onto the R354 and the site will be accessed via the R354.

It is likely that there will be two or more site access roads from the R354, including one accessing the south of the site from the R354 and one accessing the north of the site from the R354. There may also be a site access road accessing the centre of the site from the R354. Site access roads will be up to 12 m wide with drainage trenches adjacent to the road.

The above route has been investigated by several transport companies and is currently being discussed amongst several government departments and the industry to become the designated and cleared route for wind farm components for all projects planned in the Central Karoo area.

Figure 10.1 Traffic route from Port to site



11 SPECIFIC TRAFFIC MANAGEMENT MITIGATION

Mitigation and compliance monitoring measures required to be undertaken by the developer, RWP or the ECO, are presented in this section under the following headings:

- Pre-Construction Planning Phase;
- Construction Phase; and
- Operational Phase.

Mitigation and compliance monitoring measures listed in this section must be implemented by RWP during the various phases of the project. These measures are based on best practice and specialist recommendations to minimise impacts on the Roggeveld site.

Table 9.1 PRE-CONSTRUCTION PLANNING PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
1	Permit Requirements	Ensure compliance with legal and other permitting requirements.	1.1	All necessary transportation permits will be applied for at this stage and obtained from the relevant authorities, including permits for abnormal loads.	Permits	RWP	Prior to construction
			1.2	Oversee development of permits required by contractors.			
2	Transport routes	Ensure the selection of the most suitable route from port to site.	2.1	A transport study must be undertaken at least three months prior to construction.	Transport Study	RWP	Prior to construction
3	Site layout and laydown area	Ensure that layout of the laydown area and constructors camp allow for ease of vehicle movement.	3.1	The layout of the construction camp must allow for sufficient space for vehicles to turn on site and avoid the need to reverse as far as possible.	Engineering drawings	RWP	Prior to construction
			3.2	Ensure potential blind spots are eliminated when layout is being finalised.			
			3.3	Ensure adequate crossing points (roads and delivery zones) for pedestrians are indicated in the final layout.			
			3.4	Ensure storage areas, particularly ASTs, are protect from potential impacts with			

Table 9.1 PRE-CONSTRUCTION PLANNING PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
				vehicles.			
			3.5	Ensure adequate parking exists on site for all construction vehicles.			
			3.6	Internal roads must have adequate turning circles and over taking zones for delivery vehicles.			

Table 9.2 CONSTRUCTION AND OPERATION PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
1	Driver Education	To ensure all drivers are aware of driving portocols and familiar with the TMP.	1.1 1.2	Driver education must be included in the contractor's induction process. A copy of the TMP must be readily available on site at all times.	Induction TMP on site	Contractor	Prior to construction
2	Route Management	To minimise risk to other road users and residents along the transport route.		Prior to the transport of abnormal loads, the hauler must liaise with local authorities, police and emergency services to ensure they are aware of the abnormal load movements. Any conditions given in the abnormal load permit must be adhered to. Construction vehicles must obey all road signs on public roads.	Proof of communication Abnormal Load Permit	Contractor/ Haulier Contractor	Prior to transportation During construction During construction
3	On site driving	To minimise risks to drivers and other site users while vehicles are moving on site.	3.1 3.2	The vehicles of the contractor and his suppliers shall not exceed a speed of 40 km/h on gravel or earth roads on site and within 500m of the site. One way systems must be implemented to	Grievance Procedure	Contractor	During construction and operation During construction and operation

Table 9.2 CONSTRUCTION AND OPERATION PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
				ensure the flow of vehicles and to reduce the need to reverse vehicles.			
			3.3	All vehicle traffic routes must be kept clear of obstruction.			During construction and operation
			3.4	Ensure suitable signage to warn pedestrians about vehicle movements are clearly visible in appropriate zones, such as delivery zones.			During construction and operation
			3.5	Ensure vehicle reverse warning lights and alarms are in working order.			During construction and operation
4	Deliveries	Minimise potential risks during deliveries to the site.	4.1	Deliveries must be limited to working hours.			
			4.2	Prior notice must be given for abnormal load deliveries to ensure that adequate staff are available to guide vehicles.			
			4.3	Deliveries should be scheduled to prevent congestion on site.			
5	Lighting	Reduce the potential	5.1	Any security lighting at the contractor's			

Table 9.2 CONSTRUCTION AND OPERATION PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
		impact of lighting on other road users.		camp is to be placed in such a way as to not cause a nuisance to traffic on adjacent roads.			
6	Road Maintenance	Ensure public and internal roads are maintained and losses are compensated for.	6.1	All internal and access roads that will be used during the construction and operation phase of the project will be maintained by RWP.			
			6.2	RWP will develop a policy and procedure for assessing all damages and losses (e.g. damage to property, injury or death of people or livestock) resulting from project vehicles.			

12 MITIGATION AND COMPLIANCE MONITORING MEASURES

Mitigation and compliance monitoring measures required to be undertaken by the developer, RWP or the ECO, are presented in this section under the following headings:

- Pre-Construction Planning Phase;
- Construction Phase; and
- Operational Phase.

Mitigation and compliance monitoring measures listed in this section must be implemented by RWP during the various phases of the project. These measures are based on best practice and specialist recommendations to minimise impacts on the Roggeveld site.

A separate document, containing Contractor Compliance Standards will be drafted in order to clearly identify the roles and responsibilities of contractors appointed during the various phases of the project. These standards should be included as part of the contract documentation between RWP and the contractor, and RWP is responsible for ensuring the Contractor Compliance Standards are fully implemented by the contractor.

12.1 PRE-CONSTRUCTION PLANNING PHASE

In order to ensure compliance with environmental legislation and best practice guidelines the following actions are applicable to the pre-construction planning phase for the wind farm. The persons responsible for implementation of the actions are listed in the table below, the majority of which are the responsibility of RWP.

Key activities during the pre-construction planning phase will include:

- Pre-construction monitoring
- Micro-siting of the turbines based on geotechnical and detailed site checks by archaeologist and ecologist
- Notification of DEA of any changes to the final turbine layout and additional mitigation / management measures, where needed;
- Drafting of subsidiary plans, policies and procedures;
- Developing with the contractor the following:
    - A Site Layout Plan
    - Method Statements

These activities are described in more detail in the matrix below.

Table 10.1 PRE-CONSTRUCTION PLANNING PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
1.	Stakeholder engagement	Notify all registered Interested and Affected Parties of Environmental Authorisation.	1.1	Notify all registered I&APs and key stakeholders of the Environmental Authorisation opportunity and appeal procedure.	Notices sent to relevant parties on the stakeholder database. List of those to whom it was sent on file	EIA Consultant	Within 12 days from the issuing of the Environmental Authorisation.
2	Permit Requirements	Ensure compliance with legal and other permitting requirements.	2.1	Ensure that all relevant legal requirements have been met.	Permits	RWP	Prior to construction
3	Finalisation of EMPr and Contractor Compliance Standards	Update EMPr with EA conditions and other mitigation measures from monitoring	3.1	Incorporate additional mitigation measures specified by DEA in the EA into the EMPr and Contractor Compliance Standards.	EMPr and Contractor Compliance Standards	RWP and Environmental Consultant	Prior to construction
4	Notification to DEA: Director of Compliance Monitoring	Ensure that DEA are notified of commencement date.	4.1	Notify DEA prior to commencement of construction.	Proof of Communication	RWP	14-days in advance of commencement of construction or as required by DEA.
		Keep DEA informed of any aspects of non-compliance with EMPr or EA	4.2	Notify DEA with reasons if any provisions of the EMPr or EA cannot be implemented, and provide alternative	DEA notification	RWP	Prior to construction
		Keep DEA informed of current contact details of applicant	4.3	Notify DEA of any change of contact details of the applicant	DEA notification	RWP	Prior to construction
		Provide Site Layout Plan to DEA	4.4	Submit the detailed Site Layout Plan to DEA prior to construction (see section 5.1 below)	DEA notification	RWP and Environmental Consultant	Prior to construction
		Keep DEA informed of contact details of ECO	4.5	Submit the name and contact details of the appointed ECO prior to construction	DEA notification	RWP	Prior to construction
		Submit copies of all permits to DEA if requested	4.6	Copies of all permits and written approvals obtained by relevant authorities (as required) should be submitted to DEA and shall include but not necessarily limited to: • Removal of protected plants	DEA notification	RWP	Prior to construction

Table 10.1 PRE-CONSTRUCTION PLANNING PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
				• Non-interference with aerodrome communications (from SACAA) • Permit to transport abnormal loads (Road Traffic Act) • Approval from SAHRA relating to disturbance of heritage features			
5.	Site Layout Plan	Ensure detailed site layout minimises environmental and social risks and complies with EMPr	5.1	Prepare a detailed Site Layout Plan that demarcates the following: • Turbine positions, lay down areas, cables, substation locations, roads, etc • Borrow pits, spoil heaps, cut and fill areas • No Go areas, including sensitive features such as ridges, drainage lines, vegetation patches • Stormwater drainage measures • Waste disposal and storage areas • Offices, works areas and ablutions • Cement/concrete batching • Storage of materials and equipment • Vehicle maintenance and storage	Site Layout Plan	RWP	Prior to construction
6.	Subsidiary plans	Develop Subsidiary Plans to minimises environmental and social risks	6.1	The following subsidiary plans will be required prior to construction: • Health and Safety Plan • Transport Study • HIV Policy and Awareness Plan • Rehabilitation Plan • Policy for assessing all damages and losses • Community Development Trust • Recruitment Policy • Procurement Policy • Code of Conduct	Subsidiary plans	RWP	Prior to construction

Table 10.1 PRE-CONSTRUCTION PLANNING PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
				• Grievance Procedure These are referred to below, where relevant.			
7.	Health and Safety	Ensure the health and safety of site personnel during construction.	7.1	A Health and Safety Plan must be developed prior to the commencement of construction to identify and avoid work related accidents. This shall include: • Safety zones from residences, roads, right of way • Buffer zone to minimise electromagnetic interference with communication (eg microwave, radio and television transmissions) • Chemical ablution facilities • Approval from the South African Civil Aviation Authority that the wind farm will not interfere with the performance of aerodrome radio Communication, Navigation and Surveillance equipment. Such approval must be submitted to the Director of Environmental Impact Evaluation.	Health and Safety Documentation Site Layout Plan	RWP	Prior to construction
			7.2	Turbines must be spaced in accordance with minimum standards for minimising safety risks, with turbines at least a turbine and a half's length from each other.	Site Layout Plan		
8	Socio-Economic Impact: Community Development	Enhance benefits associated with the Community Development Trust	8.1	Establish a Community Development Trust for the advancement of local development needs; specifically at the farm and local municipality levels.	Community Development Trust As per DoE minimum requirements	RWP	Prior to and during operation.
			8.2	Projects would be identified in collaboration with the land owners, their farm workers and			

Table 10.1 PRE-CONSTRUCTION PLANNING PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
				the local municipality to improve their general living conditions and access to better living standards.			
			8.3	Projects will be identified in collaboration with the local Municipality and community representatives to ensure alignment with the key needs identified through the Integrated Development Planning process.			
			8.4	Ensure projects are aligned with RWP's policies.			
9	Procurement of Services and Tender Procedures	Ensure that procurement of local, regional and national services is maximised	9.1	Establish a procurement policy which sets reasonable targets for the procurement of goods and services from South African residents /suppliers, particularly local residents as far as possible.	Procurement policy	RWP	Prior to construction
			9.2	Procurement should advertise tenders in local newspapers and through the local municipality.	Local and national advertisements		
			9.3	Procurement processes should identify and invite bids from local suppliers, where appropriate.	Invited bids from local suppliers		
			9.4	Adopt transparent adjudication process for local suppliers.	Demonstrate transparent process of adjudicating tenders		
10.	Employment & Recruitment	Ensure that employment of local people is maximised	10.1	Work closely with relevant local authorities, community representatives and organisations to ensure that the use of local labour and is maximised and stipulate this as part of contractors contract.	Meeting minutes	RWP	Prior to construction

Table 10.1 PRE-CONSTRUCTION PLANNING PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
			10.2	All skill requirements to be communicated to the local communities via appointed people prior to the commencement of the construction phase.	Meeting minutes / advertisements		
			10.3	Work closely with the wind turbine suppliers to provide the requisite training to the workers.	Training material and records of training		
			10.4	Ensure that the appointed project contractors and suppliers have access to Health, Safety, Environmental and Quality training as required by the project.			
11.	Social Ills and disruption	To limit, where possible, social ills brought about by the construction and operation of the renewable energy facility	11.1	Develop an induction programme, including a Code of Conduct, for all workers.	Code of Conduct	RWP	Prior to construction
			11.2	All workers will agree to the Code of Conduct and be aware that contravention of the Code could lead to dismissal.	Code of Conduct		
			11.3	A grievance procedure will be established whereby complaints are recorded and responded to.	Grievance Procedure		
			11.4	A HIV Policy and Awareness Plan must be developed and implemented.	HIV Policy		
			11.5	Ensure contractor does not undertake recruitment of casual labour to be done at the project site (to avoid workers camping and queuing at the site)			
12.	Disruption to and loss of agricultural land	Minimise disruption to agricultural activities and loss of agricultural land	12.1	All directly affected and neighbouring farmers will be able to lodge grievances with RWP using the Grievance Procedure.	Code of Conduct	RWP	Prior to construction

Table 10.1 PRE-CONSTRUCTION PLANNING PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
			12.2	RWP to design the infrastructure layout in a manner that limits the footprint of the facility and all associated infrastructure.	Grievance Procedure		
			12.3	RWP to plan construction activities to minimise disruption of farming practices eg notifying farmers in advance of site clearance to allow prior harvesting for instance.	Site Layout Plan		
13.	Property Prices and Desirability of Property	Minimise the negative impacts on property prices.	13.1	Design site layout in a manner that limits the footprint of the facility and all associated infrastructure.	Site Layout Plan	RWP	Prior to construction
			13.2	Prepare a site Rehabilitation Plan that will be implemented post construction and as part of the decommissioning phase.	Rehabilitation Plan		
			13.3	All directly affected and neighbouring farmers will be able to lodge grievances with RWP using the Grievance Procedure.	Grievance Procedure		
14.	Traffic Impact	Minimise negative effects associated with the increase in traffic.	14.1	A Transport Study must be undertaken at least three months prior to construction to determine the most appropriate route from port to site.	Transport Study	RWP	Prior to construction
			14.2	RWP will develop a Traffic Management Plan including strict controls over driver training, vehicle maintenance, speed restrictions, appropriate road safety signage, and vehicle loading and maintenance measures.	Traffic Management Plan		
			14.3	RWP will develop a policy and procedure for assessing all damages and losses (e.g. damage to property, injury or death of people or	Policy		

Table 10.1 PRE-CONSTRUCTION PLANNING PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
				livestock) resulting from project vehicles.			
			14.4	All necessary transportation permits will be applied for at this stage and obtained from the relevant authorities, including permits for abnormal loads. Oversee development of permits required by contractors.	Permits		
15.	Damage or Destruction of Heritage Resources	Avoid damage or destruction of cultural heritage aspects	15.1	A field survey must be undertaken, informing the micro-siting of turbines in the final layout design prior to construction.	Site Layout Plan	RWP	Prior to construction
			15.2	A policy of minimal intervention should be adopted. Abandoned buildings must be made no-go areas for construction crews.	Photographs and ECO report		
			15.3	Although some roads would require upgrading, the re-use of existing farm tracks is desirable.			
			15.4	Any use of buildings of heritage value and identified in the heritage report contained in the EIA will be subject to approval by heritage and planning authorities.	Approval from heritage and planning authorities		
			15.5	• Mitigation of the colonial archaeology should involve a final walk down of the proposed route of the road alignment in the Ekkraal Valley. Heritage resources should be identified and flagged and avoided during construction activities. • Should the layout change from the one herewith submitted, Substations should not be built in prominent positions or within sight of historic farms. These areas should be avoided for power line routes			

Table 10.1 PRE-CONSTRUCTION PLANNING PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
				where possible. • Mitigation of the built environment should involve micro siting turbine positions and associated infrastructure to avoid placing turbines or infrastructure directly over built environment features and buildings or bisecting coherent settlement complexes.			
16.	Waste and effluent	Prevent soil and/or groundwater contamination from waste and effluent.	16.1	A suitable area for waste skips must be selected, away from water courses, and included in the site layout plan.	Waste Management Plan	RWP	Prior to construction
17.	Soil compaction and erosion	Minimise soil compaction and erosion	17.1	Roads should be upgraded where possible and only essential roads should be built e.g. between turbines.	Site Layout Plan	RWP	Prior to construction
18.	Loss of Vegetation	Minimise impacts associated with vegetation loss	18.1	Contract an ecologist to undertake additional site assessments to confirm presence of unique or priority species of concern in the development footprint *(See section 3)*	Appropriate contractor for monitoring	RWP	Prior to construction
			18.2	Avoid, if possible, placement of turbines in areas of High or Very High Sensitivity, or in areas where significant impacts on listed or priority species may arise	Site Layout Plan		
			18.3	Define and select a road alignment that minimises impacts on areas classified as Very High Sensitivity. In addition, the preferred road alignment should be assessed by a botanist before construction to ensure that rare, protected or endangered species are not impacted by the road and any alternative deviations or routes are identified.			

Table 10.1 PRE-CONSTRUCTION PLANNING PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
			18.4	Laydown areas and other infrastructure requirements should be minimised and sites selected with the assistance of a botanist to ensure they are sited in areas with lowest conservation value and/or where listed species are absent.			
			18.5	Undertake botanical surveys during pre-construction planning to confirm the feasibility of search and rescue of rare plant species that may occur in the wind farm footprint, and the identification of areas earmarked for construction disturbance containing plants that can be relocated and used for rehabilitation			
		Minimise vegetation impacts related to location and use of borrow pits	18.7	Alternative sources of aggregate should be considered and should include the option of sourcing aggregate from nearby borrow pits (of similar soil and vegetation type ie quartzite) in preference to opening new quarries on the Roggeveld site. Consideration should be given to the option of several smaller borrow pits versus one or two large ones. The primary goal should be to use as much rock material from turbine foundations in preference to opening new borrow pits and to limit the quantity required from new borrow pits.			
			18.8	Where importing aggregate is not feasible, several borrow pit locations should be selected based on the technical requirements of the project and an appropriately qualified botanist/ecologist should visit the sites to assess the site options.			

Table 10.1 PRE-CONSTRUCTION PLANNING PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
			18.9	Borrow pit sites should be carefully selected to avoid rare edaphic habitats such as quartz or gravel patches which often contain rare dwarf succulents.			
19.	Faunal Impacts	Minimise impacts to onsite fauna	19.1	Consideration could be given to liaising with research institutions to undertake long-term monitoring of fauna *(See section 3)*	Site Layout Plan	RWP	Prior to construction
20.	Disturbance of bat habitat and collision	Mitigate the potential impact on bats	20.1	Keep road development and off road vehicle use to a minimum and upgrade existing roads rather than developing new road infrastructure.	Site Layout	RWP	Prior to construction
			20.2	Minimise blasting requirements and coordinate blasting events to minimise the number of events required.			
			20.3	All project infrastructure, i.e. turbines, substation and masts etc, should be located away from water bodies, cave roosts or any areas considered to be of high bat conservation importance that may be found during pre-construction monitoring.			
			20.4	Avoid the placement of turbines in the valleys between the ridges.			
21.	Disturbance of avifauna habitat and collision	Mitigate the potential impact on avifauna	21.1	On-site demarcation of 'no-go' areas should be identified during pre-construction monitoring to minimise disturbance impacts associated with the construction of the facility	Final turbines selected	RWP	Prior to construction
			21.2	Burying all power lines between turbines underground (as proposed); and increasing visibility of all overhead power lines			

Table 10.1 PRE-CONSTRUCTION PLANNING PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
22.	Visual Impacts	Minimise visual impacts	22.1	On-site infrastructure should be grouped together as far as possible	Site Layout Plan and building designs	RWP	Prior to commencement of construction.
			22.2	The design of the buildings must be compatible in scale and form with buildings of the surrounding area, preferably using the regional Karoo architectural style. All yards and storage areas to be enclosed by masonry walls;			
			22.3	Signage related to the enterprise must be discrete and confined to the entrance gates. No other corporate or advertising signage, particularly billboards, will be permitted.			
			22.4	The mitigation measures contained in the Visual Impact Assessment report must be considered by the developer to determine what mitigation (if any) is practical and feasible for the development of the project. The following recommendations are to be considered: • The location of wind turbines should ideally avoid prominent landscape features in the region. The design of the current proposal makes use of ridgelines to obtain maximum benefit of the wind. However, the major high points / peaks along the ridgeline should be avoided, and therefore a few of the proposed turbines should be relocated, as indicated in the VIA report. • A minimum visual buffer zone of 2.5km for the wind turbines along the R354 Arterial Road has previously been recommended. The SEA currently in the			

Table 10.1 PRE-CONSTRUCTION PLANNING PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
				drafting by the CSIR indicates an exclusion buffer of 2km. The nearest turbines in the current proposal are 1.07, 1.09 and 1.30km from the R354. Mitigation would be to relocate a few proposed turbines as indicated in orange in the VIA report. • Wind turbines should be concentrated in large groups or lines where possible, and scattered turbines avoided to minimise visual clutter in the landscape. Therefore 2 of the turbines in the south-east should be relocated, as indicated in the VIA report. • A visual buffer of 500m for the wind turbines from district roads and farmsteads is recommended, as currently proposed. • A visual buffer of 500m is recommended for the substation and O&M buildings from the R354, local roads and farmsteads, as currently proposed. • The substation and O&M buildings to be grouped together, as currently proposed. • The substation transformers, which have a high degree of visual intrusion, to be screened by buildings and tree planting where possible. • The design of the buildings to be compatible in scale and form with buildings of the surrounding area, preferably using the regional Karoo architectural style. All yards and storage areas to be enclosed by masonry walls. • The navigation lights on the wind turbines to be fitted with reflectors so that the lights are not visible from below.			

12.2 CONSTRUCTION PHASE

In order to ensure compliance with environmental legislation requirements and NEMA best practice the following actions are applicable to the construction phase and are the responsibility of RWP. Standard construction phase compliance standards that need to be implemented by the contractor are contained in Section 5.

Table 10.2 **CONSTRUCTION PHASE**							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
1.	Compliance with EMPr and ROD	Confirm RWP commitment to adherence to EMPr and Contractor Compliance Standards	1.1	Ensure that the EMPr; Contractor Compliance Standards and EA are available at the site throughout construction and implemented by the contactor.	Copy of signed EMPr and EA with subcontractor	RWP	Prior to construction
		Auditing of compliance with EMPr and Environmental Authorisation	1.2	An audit report must be undertaken by an independent auditor at the end of the construction and rehabilitation phase, and shall be submitted to DEA.	Audit report and proof of submission to DEA	RWP	End of Construction
			1.3	The audit report shall indicate the date of the audit, name of auditor; and outcome of audit in terms of compliance with the environmental authorisation and conditions of the EMPr.			
2.	Health and Safety	Ensure the health and safety of subcontractors and site users	2.1	A Health and Safety Plan must be developed prior to the commencement of construction to identify and avoid work related accidents. This plan must be adhered to by the appointed construction contractors and meet Occupational Health and Safety Act (OHSAct), Act 85 of 1993, requirements.	Signed Health and Safety Plan	RWP	During construction
			2.2	Potentially hazardous areas must be clearly demarcated (i.e. unattended foundation excavations).	Signage		
			2.3	Appropriate Personal Protective Equipment (PPE) must be worn by all construction personnel. This shall include the use of ear protection in areas where the 8-hour ambient noise levels exceed 75dBA.	Signed Health and Safety Plan		

Table 10.2 **CONSTRUCTION PHASE**							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
3.	Dust and emissions	Limit fugitive dust and exhaust emissions	3.1	Dust abatement / suppression should be implemented especially during windy conditions and in areas prone generation of airborne dust . This shall include wetting of road surfaces and covering of stockpiled and transported materials.	ECO records Grievance procedure documentation/logbook	RWP	During construction
			3.2	Vehicles travelling on unpaved or gravel roads must not exceed a speed of 40 km/hr.			
			3.3	As fas as possible, stockpiles of dusty materials must be enclosed or covered by suitable shade cloth or netting to prevent escape of dust during loading and transfer from site.			
			3.4	Vehicles are to be kept in good working order and serviced regularly to minimise emissions.			
			3.5	All directly affected and neighbouring farmers and local residents must be able to lodge grievances with RWP using the Grievance Procedure regarding dust emissions that could be linked to the project.			
4.	Noise pollution	Avoid disturbing surrounding land-users	4.1	Vehicles must to adhere to speed limits on site, and not exceed 40km/hr	Signage on site	RWP	During construction
			4.2	A grievance procedure will be established whereby complaints are recorded and responded to.	Grievance procedure logbook		
5.	Vegetation loss	Prevent unnecessary disturbance and damage to natural vegetation and topsoil loss	5.1	Minimise extent of vegetation clearing to absolute minimum and demarcate areas of sensitive vegetation as no go areas during construction.	Onsite observation and record	RWP	During construction
			5.2	Unless otherwise agreed to with ecology specialist, exclude construction activities from areas mapped as Very High Sensitivity, as well as wetlands and drainage lines, quartz and gravel patches and rock pavements (small areas (10's of meters)			

Table 10.2 **CONSTRUCTION PHASE**							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
				of flat rock-sheet) that are found to contain rare and endemic species). These areas should also be considered as No-Go areas.			
			5.3	Roads which must traverse drainage lines should be built in a manner which does not disrupt the natural flow of water in the drainage line and also does not promote bank erosion.			
			5.4	Revegetation of road verges on steep slopes, temporary lay down areas and other impacted areas is strongly recommended and should be undertaken in accordance with a Rehabilitation Plan. However, any rehabilitation that takes place should be restricted to transplanting plants from areas that will be permanently lost into areas that need to be rehabilitated or protected from erosion. No plants should be brought onto the site for rehabilitation purposes. Such measures would also reduce the fragmentation effects of the development and encourage the natural spread of fires at the site.			
			5.5	Furthermore, given the undifferentiated nature of the shallow soils on the ridge, the potential for natural revegetation of borrow pits should be maximised by back-filling them with natural rock and soil, contouring appropriately to avoid steep slopes, and revegetating with plants removed from other construction areas on the Roggeveld ridge.			
			5.6	Where unique plants are found with potential for translocation the ECO or botanist should liaise with Kirstenbosch Gardens or other nurseries to investigate the potential of translocating some species into horticultural collections or collecting seed of some of the rare or uncommon species.			
			5.7	Educate all contractors as to the importance of the undisturbed conservations areas and prohibitions on fires, and collection of plant material.			
6.	Traffic Impact	Mitigate traffic impacts	6.1	The traffic management plan will be adhered to including adherence to speed limits and 'rules of the road'.	Traffic Management Plan	RWP	During construction

Table 10.2 **CONSTRUCTION PHASE**							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
			6.2	During construction, arrangements and routes for abnormal loads must be agreed in advanced with the relevant authorities and the appropriate permit must be obtained for the use of public roads.			
			6.3	Schedule delivery of turbines outside of peak traffic hours, if any and where possible.			
			6.4	Notify affected farm owners of date and time of turbine delivery to minimise effects on farm activities.	Proof of notification of farmers		
			6.5	All directly affected and neighbouring farmers and local residents will be able to lodge grievances with RWP using the Grievance Procedure regarding dangerous driving or other traffic violations that could be linked to the project.	Grievance Procedure		
7.	Damage or Destruction of Heritage Resources	Minimise damage to cultural heritage interests	7.1	Cuttings for the access roads should be inspected by a suitably qualified palaeontologist, as it would be an economical transect for representative sampling.	ECO report and photographs	RWP	Prior to and throughout construction
			7.2	Trenches and excavations should be inspected by a palaeontologist and a report submitted to HWC and SAHRA.	Palaeontologist Report and HWC Response		
			7.3	Any substantial excavations, such as borrow pits opened for road making, providing material for berms, footings of turbines or any other construction, similarly need to be checked by a qualified palaeontologist for material of potential scientific importance.			
			7.4	Should any human burials, archaeological or palaeontological materials (fossils, bones, artefacts etc.) be uncovered or exposed during earthworks or excavations, they must immediately be reported to Heritage Western Cape and/or SAHRA as required and the appropriate process followed.	Palaeontologist Report and HWC Response		
			7.5	A policy of minimal intervention should be adopted.	Site Layout Plan		

Table 10.2 **CONSTRUCTION PHASE**							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
				Abandoned buildings must be made no-go areas for construction crews.			
			7.6	• Should any human burials, archaeological or palaeontological materials (fossils, bones, artefacts etc.) be uncovered or exposed during earthworks or excavations, they must immediately be reported to Heritage Western Cape. The developers, site managers, and any operators of excavation equipment, need to be alerted to this possibility. If fossil material is encountered, the palaeontologist must be given sufficient time and access to resources to recover at least a scientifically representative sample for further study. If it cannot be studied immediately, the costs of housing the material should be borne by the developers. In the event of human bones being found on site, SAHRA must be informed immediately and the remains removed by an archaeologist under an emergency permit. This process will incur some expense as removal of human remains is at the cost of the developer. Time delays may result while application is made to the authorities and an archaeologist is appointed to do the work. • The sensitive reuse of vacant buildings is encouraged (as long as advice is sought on heritage sensitivities) as this will help sustain them.	Palaeontological Report	Palaeontologist	Adhoc
8.	Socio-cultural issues	Minimize impacts associated with influx of jobseekers.	8.1	RWP code of conduct developed prior to the construction phase must be adhered to.	Code of conduct must be available on site.	RWP	During construction
			8.2	The HIV Policy and Awareness Plan developed prior to the commencement of construction must be adhered to by RWP employees.	HIV policy must be available on site.		
			8.3	The construction workers (from outside the area) should be allowed to return home on a regular basis to visit their families; the contractor should make the necessary arrangement to facilitate these visits.	Health & Safety Report	Contractor	
9.	Faunal Impacts	Mitigate impacts on	9.1	Poaching or hunting should be strictly forbidden and control	ECO Report and	RWP	During construction

Table 10.2 **CONSTRUCTION PHASE**							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
		fauna		poaching by banning dogs on site and enclosing worker compounds.	photographic evidence		
			9.2	Fauna must have 'right of way' on the roads. Slow moving animals such as tortoises which may be in the way, should be placed at the side of the road in the direction the animal was seen travelling.			
			9.3	All vehicles must stick to designated and prepared roads and a speed limit (up to 40 km/hr – lower for heavy vehicles) must be enforced.	Road signage and ECO reports & grievance logs		
			9.4	No harvesting or collecting of plants, seeds, animals or their parts to be allowed.	Worker training & awareness records		
			9.5	No fires must be allowed at the site, other than within demarcated areas within a defined camp area with adequate provision for fire control.			
			9.6	No dogs or other pets allowed at the site.			
			9.7	All staff at the site to remain within the compound at night.			
			9.8	Poaching or hunting must be strictly forbidden.			
			9.9	The construction camp and other temporary storage areas must be fenced-off to reduce human-wildlife interactions.			
			9.10	It should be mandatory for staff of RWP to attend an environmental briefing and training session with respect to the guidelines outlined in this EMPr.	Training material and records of training		
10.	Bird Habitat Loss: Destruction, Disturbance and Displacement	Minimise disturbance to birds	10.1	Containing the construction footprint to a bare minimum, and similarly maintaining noise disturbance to a minimum – the latter with particular reference to blasting on the ridge-top associated with foundation excavations.	ECO Report	RWP	During blasting

Table 10.2 **CONSTRUCTION PHASE**							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
			10.2	Ideally, blasting should not be conducted during the breeding seasons of affected priority species and the number of blasting events required should be minimized by synchronizing multiple, neighbouring blasts into as few events as possible			
11	Bat Disturbance and Displacement	Minimise disturbance to birds	11.1	Blasting near identified bat areas should be minimised (if it cannot be avoided) during early summer (November/ December), during the peak breeding season and during the coldest winter months (June/ July/ August) when bats go into a state of prolonged torpor and may not be able to escape and disperse.	ECO Report	RWP	Blasting
			11.2	If any caves with substantial bat roosts are identified during pre-construction moitoring works, a buffer of at least 500m should be maintained around the caves, with little or no development occurring within this buffer			
12.	Visual Impacts	Minimise visual impacts	12.1	The extent of the construction camp and stores should be limited in area to only that which is essential;	ECO Report	RWP	Throughout construction
			12.2	Disturbed areas rather than pristine or intact landscape areas should preferably be used for the construction camp.			
			12.3	Measures to control wastes and litter should be included in the contract specification documents;			
			12.4	Provision should be made for rehabilitation/ re-vegetation of areas damaged by construction activities and not required during operation of the wind farm.	Evidence in contract specification documents.		
			12.5	Borrow pits for the construction (which would be identified in the detailed civil engineering phase), would be subject to permits from the relevant authorities. Borrow pits on the site would be rehabilitated and re-vegetated according to the botanist's recommendations.	ECO Reports		

Table 10.2 **CONSTRUCTION PHASE**							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
13.	Waste and effluent	Minimise impacts due to waste and effluent production	13.1	All waste must be separated into skips for recycling, reuse and disposal.	ECO Report	RWP	Throughout construction
			13.2	Vegetative material must be kept on site and mulched after construction to be spread over the disturbed areas to enhance rehabilitation of the natural vegetation.			
			13.3	Effluent from temporary staff facilities must be collected in storage tanks, which must be emptied by a sanitary contractor.			
			13.4	Effluent from concrete washings from the on-site batching plant must be contained within a bunded area.			
			13.5	All solid and liquid waste materials, including any contaminated soils, must be stored in a bunded area and disposed of by a licensed contractor.			
			13.6	Effluent and stormwater run-off must be discharged away from any water courses.			
			13.7	Steel off-cuts must be re-used or recycled, as far as possible.			
			13.8	Materials that cannot be re-used or recycled must be placed in a skip and removed from site to a licensed municipal disposal site.			
14.	Spoil Material	Reuse spoil material where possible and minimize the impacts of spoil material that cannot be reused.	14.1	A Spoil Management Plan must be developed prior to the commencement of construction and implemented to identify and avoid spoil material related impacts.	Signed Spoil Management Plan	RWP	During Construction
			14.2	The purpose of the SMP is to: • identify the environmental management issues associated with the sourcing, handling, transportation, stockpiling, disposal and reuse of spoil and fill material; • document and describe the systems and procedures developed to mitigate environmental impacts; and • ensure site personnel are aware of the environmental obligations and work procedures.			

Table 10.2 **CONSTRUCTION PHASE**							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
			14.3	The objectives of the SMP are to: • establish procedures and criteria for spoil/fill material handling, transportation and movement, stockpiling, reuse and disposal; • protect the environment by preventing or minimising adverse impacts in relation to air quality, noise, contamination and local amenity; • ensure that appropriate environmental systems and controls are implemented during material management activities; • achieve sustainable use of resources by maximising the reuse of earthen materials generated on site; and • mitigation of environmental impacts of other road construction activities by prioritising the reuse of surplus spoil in ways that mitigate these other activities (e.g. use in noise • mounds or to achieve flatter embankment batter slopes).			

12.3 OPERATIONAL PHASE

In order to ensure compliance with environmental legislation requirements and recommendations specified by specialists during the EIA process, the following generic and specific requirements are applicable during the operational phase of the Roggeveld Wind Farm. It is likely that DEA will require a separate operational EMPr prior to the start of operation which should be informed by pre-construction and construction monitoring results and other new information from geotechnical studies or technological improvements. The operational mitigation and monitoring measures specified here provide a foundation for further development of the Operational EMPr.

Table 10.3 OPERATIONAL PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
1.	Visual impacts	Minimize the visual impacts during the operation phase.	1.1	Signage related to the wind farm must be discrete and confined to entrance gates. No advertising will be permitted.	Photographic evidence	RWP	Throughout operation
			1.2	Footprint of the facilities, as well as parking and vehicular circulation, should be clearly defined.			
2.	Health and Safety	Maintain health and safety standards	2.1	Regular maintenance of turbines and all other infrastructure must be undertaken to ensure optimal functioning and reducing the chance of gearbox failure.	Inspection records	RWP	Throughout operation
			2.2	Regular inspections of the turbine foundations, towers, blades, spinners and nacelle must be undertaken in order to check for early signs structural fatigue.			
3.	Dust and emissions	Limit fugitive dust and exhaust emissions.	3.1	Vehicles travelling on unpaved or gravel roads should not exceed a speed of 40 km/hr.	Signage	RWP	Throughout operation
4.	Waste and Effluent	Prevent soil and groundwater pollution	4.1	Used oil stored on site must be stored in an impervious container, within a bunded area.	Photographic evidence	RWP	Throughout operation
			4.2	General waste must be removed from site by a licensed contractor.	Waste manifest documents		
			4.3	Areas disturbed during construction will be re-vegetated with	Photographic evidence		

Table 10.3 OPERATIONAL PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
				indigenous vegetation to prevent erosion.			
5.	Traffic	Minimise traffic impacts	5.1	During operation, if abnormal loads are required for maintenance, the appropriate arrangements will be made to obtain the necessary transportation permits and the route agreed with the relevant authorities to minimise the impact of other road users.	Permits	RWP	Throughout operation
			5.2	All internal and access roads that will be used by RWP during the operational phase of the project will be maintained by RWP throughout the life of the project.	Inspection reports		
6.	Damage or Destruction of Heritage Resources	Minimise damage to cultural heritage interests	6.1	A policy of minimal intervention should be adopted. Abandoned buildings must be made no-go areas for workers.	Relevant Policy	RWP	Throughout operation
7.	Loss of Topsoil, Soil Compaction and Erosion	Minimise erosion	7.1	Long-term monitoring to be undertaken (see *Section 3*).	Monitoring reports and photographic evidence	RWP	Biannually
			7.2	Temporary laydown areas will be re-vegetated with indigenous vegetation.			
			7.3	Erosion control measures should be initiated as soon as signs of erosion problems become apparent.			
			7.4	Should any erosion develop which cannot be remedied by simple erosion control measures, then the services of a rehabilitation and erosion control consultant with experience in semi-arid zones should be brought in to provide guidance.			
8.	Loss of Vegetation	Minimise impacts associated with loss of vegetation	8.1	Minimise requirement for vegetation clearing and soil disturbance	EO reports	RWP	Throughout operation
			8.2	Since nutrient-poor soils are an important characteristic of most fynbos soils, it is recommended that fill and construction material is sourced locally at the site and specifically that no shale or mudstone from below the ridges is used on the quartzite ridges. The use of a different substrate would			

Table 10.3 OPERATIONAL PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
				inhibit natural vegetation recovery as well as facilitate the spread of alien plants at the site.			
			8.3	Natural re-vegetation of disturbed areas such as road verges should be encouraged. Seed of indigenous species collected on site could be used to revegetate cleared areas.			
			8.4	No foreign plant material should be brought onto the site, this specifically includes such items as hay bales.			
			8.5	All alien plants observed at the site should be removed on a regular basis. Monitoring checks for alien plants and alien clearing if required should be conducted on a quarterly basis.	EO Reports		
			8.6	Alien species should be controlled in the appropriate manner as determined by a botanist as incorrect control measures can exacerbate invasion problems. Clearing methods should aim to keep disturbance at a minimum.			
			8.7	A Fire Management Policy and guidelines will be developed to ensure that the operation of the Wind Farm is compatible with the long-term fire ecology of the site.	Fire Management Policy		
9.	Fauna	Minimise impacts to fauna on site	9.1	Poaching or hunting should be strictly forbidden and control poaching by banning dogs on site and enclosing worker compounds.	EO reports and photographic evidence	RWP	Throughout operation
			9.2	Fauna must have 'right of way' on the roads. Slow moving animals such as tortoises which may be in the way, should be placed at the side of the road in the direction the animal was seen travelling.			
			9.3	All vehicles must stick to designated and prepared roads and a speed limit (up to 40 km/hr) must be enforced.			
			9.4	No harvesting or collecting of plants, seeds, animals or their parts to be allowed.			

Table 10.3 OPERATIONAL PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
			9.5	It should be mandatory for staff of RWP to attend an environmental briefing and training session with respect to the guidelines outlined in this EMPr.	Training material and records of training		
10.	Bird Habitat Loss: Destruction, Disturbance and Displacement	Minimise disturbance to birds	10.1	Minimizing the disturbance impacts associated with the operation of the facility, by scheduling maintenance activities to avoid disturbance in sensitive areas (identified during monitoring)	Maintenance schedules	RWP	Throughout operation
11.	Birds: Avian collisions	Loss of habitat-disturbance or destruction and monitor potential injury to avifauna and fatalities	11.1	Implementing a birdmonitoring programme during the operational phase (see *Section 3*) and findings of the proposed monitoring schedule should be implemented.	Monitoring reports	RWP	Initial 12 to 24 month period at which time whether or not additional monitoring is required.
			11.2	Lighting on the turbines to kept to a minimum (but in line with aviation regulations), coloured red or green and intermittent.	Inspection reports		
			11.3	Maximisation of turbine visibility: The best means to mitigate bird collisions in wind farms is to make structures – towers, rotor blades and above ground power lines - more visible both by day and by night.			
			11.4	Avoidance of ridge saddles Birds of many species, including the Vulnerable Ludwig's Bustard, often use saddles (the lowest areas along ridge sections) when crossing ridges, especially when this requires them to fly into headwinds. The risk of collision mortalities can be mitigated by leaving a 100 m gap between successive turbines across the five saddles designated from monitoring observations.			
			11.5	Avoidance of ridge rims Most of the ridges do not end abruptly but curve relatively gently into steeper sloped lower hillsides. Birds use updraughts on windward slopes to hover or idle over the			

Table 10.3 OPERATIONAL PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
				upper slopes and often rise abruptly to heights that could bring them into the turbine collision risk zone. This potential cause of mortality, which could especially impact Verreaux's Eagles, Rock Kestrels and White-necked Ravens, can be mitigated by siting turbines along the centre of ridges. At such sites they will be sufficiently away from the ridge rim whichever side the wind is blowing from.			
			11.6	Avoidance of eagle nests To minimise the risk of disturbance to, and collision mortality risk of, Verreaux's Eagles no turbines should be located nearer than 1.3 km from the established nesting area.			
			11.7	Night illumination There are several broad benefits from night-time movement. The birds: avoid avian predators whilst in unfamiliar situations; benefit from more favourable temperature or wind conditions; and minimise loss of daylight time for feeding			
12.	Bat disturbance habitat loss	Limit loss of bat habitat	12.1	Maintenance activities should be kept within the immediate vicinity of the turbines and associated infrastructure.	EO Report		
			12.2	A Site Maintenance and Rehabilitation Plan must be implemented to restore disturbed areas and maintain bat habitat.			
13.	Bat collisions and barotrauma	Monitor fatalities	13.1	Long-term operational phase bat monitoring to be undertaken	Monitoring reports	RWP	Initial 12 to 24 month period at which time whether or not additional monitoring is required.
			13.2	A register must be maintained of injuries to bats, complaints or queries received as well as any action taken.	Register of collisions/ injured bat species		
			13.3	Undertake feasible mitigation measures identified informed by monitoring.			
			13.4	The correct placement of wind farms and of individual turbines can significantly lessen the impacts on bat fauna in			

<table>
<tr><th colspan="6">Table 10.3 OPERATIONAL PHASE</th></tr>
<tr><th colspan="2">Activity</th><th rowspan="2">Objective</th><th colspan="2">Actions to be undertaken to Mitigate Environmental Impact</th><th rowspan="2">Parameters for Monitoring</th><th rowspan="2">Responsibility</th><th rowspan="2">Frequency / Timing</th></tr>
<tr><th>#</th><th>Description of Activity</th><th>#</th><th>Commitment / Actions Required / Key Controls</th></tr>
<tr><td></td><td></td><td></td><td></td><td>an area, and should be considered as the preferred option for mitigation. The tables below are based on the passive data collected. They infer mitigation be applied during the peak activity periods and times, and when the advised wind speed and temperature ranges are prevailing (considering conditions in which 80% of bat activity occurred). A maximum curtailment cut in speed of 10 m/s is applied to scenarios where the data implies more than >10 m/s as a mitigation cut in speed.

Bat activity at the first point of contact with blades needs to be considered.

The times of implementation of mitigation measures is preliminarily recommended (considering more than 80% bat activity) as follows:

<table>
<tr><th></th><th>Terms of mitigation implementation</th></tr>
<tr><td rowspan="2">Winter peak activity (times to implement curtailment/ mitigation)</td><td>None</td></tr>
<tr><td>N/A</td></tr>
<tr><td>Environmental conditions in which turbines are allowed to operate without any mitigation</td><td>N/A</td></tr>
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Table 10.3 OPERATIONAL PHASE								
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**			**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**				
				Spring peak activity (times to implement curtailment/ mitigation)	Late October to late November • Time of sunset to midnight • 01:30 to 03:00			
				Environmental conditions in which turbines are allowed to operate without any mitigation	**Turbines 26 - 29, 31 - 46, 54, 55, 57, 58 - 60:** Above 9 m/s at 15 m agl; Below 10°C			
				Summer peak activity (times to implement curtailment/ mitigation)	Early December to mid-January Time of sunset to midnight			
				Environmental conditions in which turbines are allowed to operate without any mitigation	**Turbines 26 - 29, 31 - 46, 54, 55, 57, 58 - 60:** Above 7 m/s at 15 m agl; Below 16.5°C			
				Autumn peak activity (times to implement curtailment/	Month of March Time of sunset to 23:00			

Table 10.3 OPERATIONAL PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
				mitigation)			
				Environmental conditions in which turbines are allowed to operate without any mitigation: **Turbines 26 - 29, 31 - 46, 54, 55, 57, 58 - 60:** Above 8.5 m/s at 15 m agl; Below 17.5°C			
				Where mitigation by location is not possible, other options that can be utilised include curtailment, blade feathering, blade lock, acoustic deterrents or light lures. The following terminology applies: » **Curtailment:** Curtailment is defined as the act of limiting the supply of electricity to the grid during conditions when it would normally be supplied. This is usually accomplished by locking or feathering the turbine blades. » **Cut-in speed:** The cut-in speed is the wind speed at which the generator is connected to the grid and producing electricity. For some turbines, their blades will spin at full or partial RPMs below cut-in speed when no electricity is being produced. » **Feathering or Feathered:** Adjusting the angle of the rotor blade parallel to the wind, or turning the whole unit out			

Table 10.3 OPERATIONAL PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
				of the wind, to slow or stop blade rotation. Normally operating turbine blades are angled almost perpendicular to the wind at all times. » **Free-wheeling:** Free-wheeling occurs when the blades are allowed to rotate below the cut-in speed or even when fully feathered and parallel to the wind. In contrast, blades can be "locked" and cannot rotate, which is a mandatory situation when turbines are being accessed by operations personnel. » **Increasing cut-in speed:** The turbine's computer system (referred to as the Supervisory Control and Data Acquisitions or SCADA system) is programmed to a cut-in speed higher than the manufacturer's set speed, and turbines are programmed to stay locked or feathered at 90° until the increased cut-in speed is reached over some average number of minutes (usually 5 – 10 min), thus triggering the turbine blades to pitch back "into the wind" and begin to spin normally and producing power. Blade locking or feathering that render blades motionless below the manufacturers cut in speed, and not allow free rotation without the gearbox engaged, is more desirable for the conservation of bats than allowing free rotation below the manufacturers cut in speed. Acoustic deterrents are a developing technology and will need investigation closer to time of wind farm operation.			

Table 10.3 OPERATIONAL PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
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				Light lures refer to the concept where strong lights are placed on the periphery (or only a few sides) of the wind farm to lure insects and therefore bats away from the turbines. The long term effects on bat populations and local ecology of this method is unknown. Habitat modification, with the aim of augmenting bat habitat around the wind farm in an effort to lure bats away from turbines, is not recommended. Such a method can be adversely intrusive on other fauna and flora and the ecology of the areas being modified. Additionally it is unknown whether such a method may actually increase the bat numbers of the broader area, causing them to move into the wind farm site due to resource pressure. Currently the most effective method of mitigation, after correct turbine placement, is alteration of blade speeds and cut-in speeds under environmental conditions favorable to bats. A basic "6 levels of mitigation" (by blade manipulation or curtailment), from light to aggressive mitigation: 1. No curtailment (free-wheeling is unhindered below **manufacturers** cut in speed so all momentum is retained, thus normal operation). 2. Partial feathering (45 degree angle) of blades below **manufacturers** cut-in speed in order to allow the free-wheeling blades half the speed it would have had without feathering (some momentum is retained below the cut in speed).			

Table 10.3 OPERATIONAL PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
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				3. 90 Degree feathering of blades below **manufacturers** cut-in speed so it is exactly parallel to the wind direction as to minimize free-wheeling blade rotation as much as possible without locking the blades. 4. 90 Degree feathering of blades below **manufacturers** cut-in speed, with partial feathering (45 degree angle) between the **manufacturers'** cut-in speed and **mitigation** cut-in conditions. 5. 90 Degree feathering of blades below **mitigation** cut in conditions. 6. 90 Degree feathering throughout the entire night. It is recommended that curtailment mitigation initiates at Level 3 for the months, times and weather conditions outlined in the table above, then depending on the results of the post construction mortality monitoring the mitigation can be either relaxed or intensified up to a maximum intensity of Level 5. This is an adaptive mitigation management approach that will require changes in the mitigation plan to be implemented immediately and in real time during the post construction monitoring. Information gathered during the preconstruction assessment of Roggeveld Phase 2 will also inform proposed mitigation measures, affected turbines, and times of implementation and the initial level of curtailment to be used.			
14.	Tourism Impacts	Enhance tourism impacts	14.1 14.2	Work with the Local Municipality and local tourism organisations to raise awareness about the wind farm. Information brochures and posters will be made available at the local libraries to provide more information about the wind farm. These should be presented in the appropriate	Brochures and posters	RWP	Throughout operation

Table 10.3 OPERATIONAL PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
				languages to maximise the benefits.			
15.	Electromagnetic Interference	Prevent EMI effects	15.1 15.2	Should EMI be shown to be a problem, mitigation measures might include the replacement of receiving aerial installations, replacement by satellite dishes or the provision of a private transmitter. RWP have committed to correct any EMI problems should they be shown to be the cause of the wind farm.	Installation reports	RWP	Throughout operation
16.	Shadow flicker	Assess potential shadow flicker impacts	16.1	A shadow flicker study will be undertaken if the final layout results in turbines being located within 10 blade diameters of any dwellings or buildings within which people work.	Shadow flicker study	RWP	Throughout operation
17.	Notification of landowners	Inform landowners on maintenance activities	17.1	Landowners should be informed at least 48 hours in advance of scheduled maintenance activities to ensure that provision can be made to avoid conflicting land uses and to ensure access to the site (eg relocate grazing animals form the area)	Notification of landowners	RWP	Prior to maintenance activities.

12.4 DECOMMISSIONING PHASE

A detailed decommissioning and rehabilitation plan should be developed prior to decommissioning of the Wind Farm. This plan should include, but should not be limited to, conditions regarding removal of infrastructure, management of waste and/or contaminated soil, dust suppression and re-vegetation.

13 GENERAL CONTRACTOR COMPLIANCE STANDARDS

The following Contractor Compliance Standards have been drafted for use by any Contractors appointed by RWP during the construction of the Roggeveld Wind Farm. Guidelines for Contractors developed for the Cape Metropolitan Council by Ninham Shand (2002) and relevant to the expected construction phase of wind farm were extracted and modified as the basis for this schedule of Contractor Compliance Standards. The Contractor appointed will use these as a basis for guiding all construction activities, however, these must be revised on appointment of a Contractor and industry standards/ requirements must also be considered. RWP will retain overall responsibility during all stages of any construction activity and ensure that all construction activities are in compliance with the EMPr. The contractors shall with due care and diligence execute and complete the works in accordance with the provisions of the Contractor Compliance Standards and any other requirements set out by RWP.

Identification of targets helps to identify the desired outcome of implementing the management measure can assist in deriving an audit report.

Table 11.1: 13 GENERAL CONTRACTOR COMPLIANCE STANDARDS: PRE-CONSTRUCTION PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
1.	EMPr and Contractor Compliance Standards legally binding on contractor	Contractor compliance with EMPr	1.1	Contractor requirement to implement the EMPr and Contractor Compliance Standards is legally binding through the contract with RWP. Contractor to keep copy of EMPr and Contractor Compliance Standards on site and to provide ECO with a copy.	EMPr provisions relevant to contractor	Contractor	Prior to construction
2.	General Environmental Protection- Method Statements	Contractor activities comply with approved method statements to minimise impacts to the environment	2.1	The contractor shall prepare the following method statements: • **Access routes**: Location of proposed access routes, rehabilitation of temporary access routes • **Blasting (if required)**: details of all methods and logistics • **Camp establishment**: layout and preparation; method of installing fences for no go areas; working areas and construction camp areas • **Cement/concrete batching (if applicable)**: Location, layout, and preparation of cement/concrete batching facilities including methods employed for mixing concrete and management of run off water • **Contaminated water**: including containment of runoff and disposal of polluted water • **Dust control methods** • **Clearance of vegetation**: method during site establishment • **Earthworks**: method for control of erosion during bulk earthwork operations, and method of undertaking earthworks, including hand excavation and spoil management • **Emergency**: response to possible emergencies on site • **Environmental awareness**: logistics for environmental awareness for contractors' employees and management staff • **Fire and hazardous substances**: handling and storage of hazardous wastes; emergency spillage procedures and compounds to be used; emergency procedures for fire; use of herbicides and other poisonous substances; • **Fire and fuel spills**: methods of refuelling vehicles; methods for cleaning up fuel spills; refuelling of construction vehicles • **Rehabilitation**: methods for disturbed areas, and revegetation after construction is complete • **Solid waste management**: solid waste control and removal of waste from the site • **Sources of material**: details of materials to be imported to the site	Method statements	Contractor	Prior to construction

Table 11.1: 13 GENERAL CONTRACTOR COMPLIANCE STANDARDS: PRE-CONSTRUCTION PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
				• **Traffic safety measures**: entry and exit off public roads			
3.	Health and Safety	Ensure the health and safety of site personnel during construction.	3.1 3.2	A Health and Safety Plan developed by RWP must be adhered to. Buffer zones around roads, houses, and any other structures must be observed.	Health and Safety Documentation and Method Statements Final Site Layout Plan	Contractor	Prior to construction
4.	Construction site layout plan	General environmental protection	4.1	The contractor shall provide input into the Site Layout Plan to be presented to the DEA by RWP for approval prior to starting construction activities. This plan shall take account of provisions of the EMPr and this Contractor Compliance Standards and shall demarcate the different works areas including: • Turbine positions, lay down areas, cables, substation locations, roads, etc. • All buildings and structures including:; contractors' camp and lay down areas, site offices, laboratory, fuel stores, toilets and ablutions, construction materials stores, vehicle and equipment stores, wash bays and solid waste storage and disposal sites • Works areas such as batching plants (if required) • Roads and access routes • Gates and fences • Essential services (permanent and temporary water, electricity and sewage and substation) • Rubble and waste rock storage and disposal sites • Firebreaks • Excavations and trenches, borrow pits, rubble and waste rock storage and disposal sites and topsoil stockpiles. • Features and plants to be conserved. • No Go areas (e.g. ecological sensitive areas, and cultural heritage site)	Layout plan shows different work areas. Plan approved by DEA	Contractor and ECO	Prior to construction
5.	Procurement and Tender	Ensure that procurement of local, regional and national services is maximised:	5.1 5.2 5.3	Establish a Procurement Policy which sets reasonable targets for the procurement of goods and services from South African residents /suppliers, particularly local residents as far as possible. Procurement should advertise tenders in local newspapers. Procurement processes should identify and invite bids from local suppliers where appropriate.	Procurement Policy Local and national advertisements Invited bids from local	Contractor	Throughout construction

Table 11.1: 13 GENERAL CONTRACTOR COMPLIANCE STANDARDS: PRE-CONSTRUCTION PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
			5.4	Adopt transparent adjudication process for local suppliers.	suppliers Demonstrate transparent process of adjudicating tenders		
6.	Employment & Recruitment	Ensure that employment of local people is maximised	6.1	No employment will take place at the entrance to the site. Only formal channels for employment will be used.	Recruitment Policy	Contractor	Prior to construction
			6.2	All skill requirements to be communicated to the local communities via appointed people prior to the commencement of the construction phase.	Evidence of recruitment		
			6.3	Work closely with the wind turbine suppliers to provide the requisite training to the workers.	Training material and records of training		
			6.4	Ensure that the appointed project contractors and suppliers have access to Health, Safety, Environmental and Quality training as required by the project.			
7.	Good community relations	Minimise raised expectations in local community and limit social disruption	7.1	Information boards: containing background information on the construction activity and the relevant contact details for complaints shall be erected near the entrance to the site.	Large info board erected at the site and correct information provided (contact details)	Contractor	Prior to construction
			7.2	Notification of onset of construction: Notify Employer, relevant authorities and local community in writing as well as verbally of the onset of construction activities, including contact details for complaints.	Proof of notification of onset of construction to RWP, relevant authorities and local community		
			7.3	Community liaison assistants to inform the local community members of the recruitment process and onset of construction and schedule.	Recruitment records of community liaison assistance		
8.	Social Ills and disruption	To limit, where possible, social ills brought about by the construction and operation of the renewable energy facility	8.1	Develop an induction programme, including a Code of Conduct, for all workers. All workers will agree to the Code of Conduct and be aware that contravention of the Code could lead to dismissal.	Code of Conduct	Contractor	Prior to construction
			8.2	HIV Policy and Awareness Plan developed by RWP must be adhered to.	HIV Policy and Awareness Plan		
9.	Traffic Impact	Minimise negative effects associated with the	9.1	All necessary transportation permits will be applied for at this stage and obtained from the relevant authorities, including permits for	Permits	Contractor	Prior to construction

Table 11.1: 13 GENERAL CONTRACTOR COMPLIANCE STANDARDS: PRE-CONSTRUCTION PHASE							
Aspect		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Aspect**		**#**	**Commitment / Actions Required / Key Controls**			
		increase in traffic.		abnormal loads.			
10.	Damage or Destruction of Cultural Heritage Interests	Avoid damage or destruction of cultural heritage aspects	10.1 10.2	Construction work must not commence until turbines have been micro-sited and final positions are fixed and checked Adhere to buffers around sensitive features set out in the EMPr.	Archaeological study and approval	Contractor	Prior to construction
11.	Waste and effluent	Prevent soil and/or groundwater contamination from waste and effluent.	11.1	A suitable area for waste skips must be selected, away from water courses, and included in the site layout plan.	Waste Management Plan	Contractor	Prior to construction
12.	Loss of Vegetation	Minimise impacts associated with vegetation loss	12.1 12.2 12.3 12.4 12.5	Ensure that infrastructure and construction activities are confined to previously disturbed areas as far as possible. Avoid the development of new roads where possible to minimise impact to natural vegetation. Temporary construction lay-down areas should be sited on croplands, preferably in flat areas. Restricting service roads and underground cabling for the turbines to previously disturbed lands, avoiding natural vegetation. Prior to construction, the exact layout of the turbines and associated lay-down areas must be inspected by an ecologist and if necessary adjusted to avoid unnecessary impact.	Final Site Layout Plan	Contractor	Prior to construction
13.	Faunal Impacts	Minimise impacts to onsite fauna	13.1	Measures to minimise habitat loss listed above should be implemented to minimise impacts to fauna.	As above	Contractor	Prior to construction

CONSTRUCTION PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
1.	Compliance with EMrP	Confirm contractors commitment to adherence to EMPr.	1.1 1.2 1.3	Ensure that the EMPr and Environmental Authorisation are available at the site during installation. Ensure that equipment is in place to meet EMPr requirements and Contractor Compliance Standards. Signed commitment from subcontractors to compliance with EMPr and Contractor Compliance Standards.	Copy of signed EMPr and Environmental Authorisation. Checklist of EMPr requirements Copy of signed EMPr with subcontractor	Contractor	Outset of construction
2.	Health and Safety	Ensure the health and safety of subcontractors and site users	2.1 2.2 2.3 2.4	A Health and Safety Plan developed by RWP must be adhered to by the appointed construction contractors and meet Occupational Health and Safety Act (OHSAct), Act 85 of 1993, requirements. Potentially hazardous areas must be clearly demarcated (i.e. unattended foundation excavations). Appropriate PPE must be worn by all construction personnel. No smoking to be allowed near the fuel storage area and notices depicting "No Smoking", "No Naked Lights" and "Danger" to be erected at the fuel storage site.	Signed Health and Safety Plan Signage ECO Reports Signed Health and Safety Plan	Contractor ECO Contractor	During construction
3.	General environmental damage	Environmental awareness training of workers	3.1 3.2 3.3 3.4	The contractor will be required to employ a full-time ECO at the construction site until rehabilitation is complete. The contractor or his representative (e.g. ECO) shall provide training and guidance to site workers before commencing work on relevant components of the EMPr, including any new site workers taken on during the course of work. Workers shall understand the dos and don'ts of working on the site and controls on causing environmental damage. This should include notification of regulations on harvesting wild fauna and flora from the surrounding area, damage to cultural heritage, littering, use of formal latrines, sexual engagement with locals, etc. Information posters should be put up in worker eating areas depicting typical prohibited activities that should be complied with on and off site.	ECO on site full-time Proof of training of workers / Signed attendance register Information posters displayed in social areas on site	ECO Contractor	Prior to construction

CONSTRUCTION PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
4.	Construction area maintenance	General Environmental Protection	4.1	Construction area to be kept neat and clean at all times.	Camp clean and neat	Contractor	During construction
			4.2	Refuse and waste storage to be positioned away from buildings.	Refuse stored away from buildings		
			4.3	Drip trays to be inspected and emptied daily and closely monitored during rain events.	Drip trays emptied daily & monitored		
5.	Access roads	General environmental protection and control of nuisances	5.1	Access to the site and works area shall use existing roads or tracks wherever possible.	ECO Report	Contractor and appointed engineer	During construction
			5.2	Induction and training shall include the use of permitted roads and highlight prohibition of making new tracks.	Proof of training of workers / Signed attendance register		
			5.3	All temporary access roads shall be rehabilitated to the satisfaction of the Engineer.	ECO Report		
			5.4	Erect and maintain marker pegs or painted stones along the boundaries of work areas, access roads or tracks to prevent unauthorised movement outside designated areas.	Site pegged and marked		
			5.5	Mud and sand deposited onto public roads shall be cleared regularly.	Site well maintained		
			5.6	Upgrading of access roads should limit activities as far as possible within the existing confines of the road	Deviations of road alignment avoided		
			5.7	Implement dust control measures where windblown dust can create a nuisance.	Dust control implemented & no grievances noted		
			5.8	The contractor shall repair any damage caused to the existing access road as a result of construction activities.	No damage visible and any damage repaired		
			5.9	Install and maintain appropriate traffic warning signs.	Traffic warning signs		
			5.10	Trained and equipped flagmen shall be used in the event that construction activities (e.g. delivery of abnormal loads) may create a traffic hazard on public roads.	Flagmen contracted for turbine delivery		
6.	Fencing and site access	Minimise impacts to human health and safety	6.1	Access to the site should be off-limits to the public at all times.	Site suitably fenced	Contractor	Throughout construction
			6.2	Fencing shall be maintained throughout construction.	Public access restricted.		

CONSTRUCTION PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
			6.3	Temporary fencing shall be removed and loose wire removed from the site.			
7.	Fire protection	Fire prevention.	7.1	No fires are allowed around the construction area.	Adequate fire fighting equipment with the contractor	Contractor	During construction
			7.2	Adequate fire fighting equipment must be available on site and maintained in good working order.			
			7.3	Welding, gas cutting or cutting of metal will only be permitted in an area designated as safe by the contractor.			
			7.3	Smoke free areas should be declared and appropriate signage erected.	Appropriate signage		
8.	Damage or Destruction of Cultural Heritage Interests	Minimise damage to cultural heritage interests	8.1	Ensure that trenches and excavations are checked by a palaeontologist.	ECO reports	Palaeontologist	Prior to and throughout construction
			8.2	No turbines located in areas of high sensitivity.	Final turbine micro-siting	Contractor	
			8.3	Heritage Western Cape and SAHRA to be notified immediately if a burial/human remains is uncovered during the construction of the wind farm.	Minutes/ communications		
			8.4	Workers access to old farmhouses should be forbidden in order to minimise vandalism.	ECO reports		
			8.5	The construction activities will be undertaken in accordance with a schedule that will be developed by RWP.	Construction schedule		
9.	Refuse, waste (refers to all solid waste, including installation debris, timber, cans etc.) and effluent	Limit the potential for site pollution and the accumulation of waste materials on site. Prevent soil and/or groundwater contamination from waste and effluent.	9.1	Minimise, reduce, reuse and recycle waste material where possible. All waste must be separated into clearly marked skips for recycling, reuse and disposal.	Waste manifest documents Relevant documentation for waste disposal must be prepared and filed (e.g. certificates of safe disposal). Visual inspection of site- ECO Report.	Contractor	Throughout construction
			9.2	Steel off-cuts will be re-used or recycled, as far as possible.			
			9.3	Vegetative material will be kept on site and mulched after construction to be spread over the disturbed areas to enhance rehabilitation of the natural vegetation.			

CONSTRUCTION PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
			9.4	All solid and liquid waste that cannot be reused or recycled will be placed in a skip and must be removed off site and disposed of at a licensed municipal disposal site. Any hazardous waste must be removed by a licensed waste disposal operator.			
			9.5	Disposal of any waste and/or construction debris by burning or burying to be forbidden.			
			9.6	The skips shall be kept in a sheltered place and covered to prevent contents blowing out.			
			9.7	Effluent and stormwater run-off will be discharged away from any water courses (e.g. drainage lines). Effluent from construction site offices and staff facilities will be collected in storage tanks, which will be removed by a licensed sanitary contractor.			
			9.8	Effluent from the batching plant (if applicable) will be contained within a bunded area and not be allowed to drain into water courses. Effluent will be recycled or removed.			
			9.9	Effluent from temporary staff facilities will be collected in storage tanks, which will be emptied by a sanitary contractor.			
10.	Solid waste management	Limit the potential for site pollution and the accumulation of waste materials on site.	10.1	The contractor shall set up a solid waste control and removal system in accordance with the Waste Method Statement.	ECO Reports	Contractor and ECO	During construction
			10.2	Bins shall be emptied on a daily basis and shall not be left in an overflowing state.			
			10.3	Waste and litter shall be disposed of in scavenger and weatherproof bins stored in a fenced and covered area.			
			10.4	Waste shall be collected and removed from the site at least once a week			
			10.5	Hazardous waste to be separated from general waste stream.			
			10.6	Waste disposed of in suitable landfill site to be confirmed and approved by the regulatory authority.			
			10.7	Workers must clean up the contractor's camp and work areas once a			

CONSTRUCTION PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
				week.			
			10.8	If recycling facilities available, the contractor is encouraged to separate waste into glass, paper and tins and dispose of these at recycling depots.			
			10.9	No waste, including plastic waste, is to be burned on site			
11.	Pollution controls from ablution facilities	Minimise environmental impacts from toilet facilities for temporary workers	11.1	Adequate ablution facilities must be provided for staff.	Adequate toilets provided with toilet paper	Contractor and ECO	During construction
			11.2	Excretion or urination will be prohibited other than at provided facilities.	Site layout plan		
			11.3	Facilities for washing hands to be provided as part of or immediately next to all toilet facilities.	Toilets kept clean and no sign of sewage spills		
			11.4	Toilet facilities to be situated at least 50m away from water courses or drainage lines.			
			11.5	Discharge of waste from toilets and burial of waste is strictly prohibited.			
			11.6	Ensure no spillage occurs when toilets cleaned or emptied.			
			11.7	Portable toilets shall be properly secured to prevent toppling in wind.			
			11.8	At least 1 toilet per 20 workers to be provided.			
			11.9	Toilets to be maintained in hygienic state and serviced and emptied regularly. Toilet paper to be provided.			
12.	Concrete Works	Prevent contamination of soil and groundwater through management of concrete	12.1	If concrete is to be batched on site the following measures apply:	Waste documentation and visual inspection of site-ECO Report	Contractor	During construction
			12.2	Excess or spilled concrete or aggregate to be confined within the work area and then removed to a licensed landfill site.			
			12.3	Concrete to be mixed on mortar boards or in bunded area, away from drainage channels and water courses.			
			12.4	Visible remains of the mixing of concrete, either solid or from			

CONSTRUCTION PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
				washings, to be physically removed and disposed of as waste at a licensed landfill site.			
13.	Earthworks	Minimise impact of earthworks on general environment	13.1	All earthworks shall be undertaken in such a manner so as to minimise the extent of any impacts caused by such activities and shall be limited to demarcated areas.	ECO Report	Contractor and appointed engineer	During construction
			13.2	No earthworks equipment shall be allowed outside demarcated areas unless permitted by the engineer.			
14.	Impact on Surface and Groundwater	Minimise impacts on surface and groundwater	14.1	Soil stockpiles will be protected from wind or water erosion through placement, vegetation or appropriate covering.	Site inspection and photographic evidence	Contractor	Throughout construction phase
			14.2	Proper drainage controls such as culverts, cut-off trenches will be used to ensure proper management of surface water runoff to prevent erosion.			
			14.3	Cleared or disturbed areas will be rehabilitated as soon as possible to prevent erosion.			
			14.4	Fuel, oil and used oil storage areas will have appropriate secondary containment (ie bunds).			
			14.5	Spill containment and clean up kits will be available onsite and clean-up from any spill will be appropriately contained and disposed of to a licensed landfill by a licensed operator.			
			14.6	Construction vehicles and equipment will be serviced regularly and provided with drip trays, if required.			
			14.7	Workshop areas will be lined to prevent subsurface ingress of contaminants and drainage from these areas will not be allowed to drain into water courses.			
			14.8	Works including foundations for the turbine and substation will be a minimum of 20 m from any watercourse.			
15.	Loss of Topsoil, Soil Compaction and Erosion	Minimise erosion and loss of topsoil	15.1	Restrict removal of vegetation and soil cover to the development footprint.	Site inspection and photographic evidence- ECO Report	Contractor	Throughout construction phase

CONSTRUCTION PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
			15.2	Implement soil conservation measures such as stockpiling top soil for remediation of disturbed areas. Topsoil storage should be as brief as possible and rehabilitation areas must be fenced off to protect plants until plant communities are adequately developed.			
			15.3	Proper drainage controls such as culverts, cut-off trenches will be used to ensure proper management of surface water runoff to prevent erosion.			
			15.4	Soil stockpiles should be vegetated or appropriated covered to reduce soil loss as a result of wind or water to prevent erosion.			
			15.5	Disturbed areas will be rehabilitated as soon as possible to prevent erosion.			
			15.6	Construction vehicles will remain on designated and prepared roads.			
			15.7	Work areas will be clearly defined and demarcated to avoid unnecessary disturbance of areas outside the development footprint.			
			15.8	Construction vehicles will remain on designated and prepared roads.			
16.	Dust and emissions	Limit fugitive dust and exhaust emissions.	16.1	Vehicles travelling on gravel roads should not exceed a speed of 40km/hr.	Site inspections	Contractor	During construction
			16.2	Where appropriate, dust abatement measures should be implemented to restrict airborne dust, especially during windy conditions.			
			16.3	Containers for dusty materials will be enclosed or covered by suitable tarpaulins / nets to prevent escape of dust during loading and transfer from site.			
			16.4	Where necessary, stock piles of soil must be covered by suitable shade cloth or netting to prevent erosion, fugitive dust and to prevent the escape of dust during loading and transfer from site.			
			16.5	Vehicles are too kept in good working order and serviced regularly to minimise emissions.	Service records.		
			16.6	Any complaints received from neighbours or site users must be reported to the RWP Project Manager and measures must be taken to	Grievance procedure documentation/logbook		

CONSTRUCTION PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
				limit dust.			
17.	Noise pollution	Avoid disturbing surrounding land-users.	17.1	Vehicles and equipment used on site must be in good condition and serviced regularly.	Service and maintenance records for equipment and vehicles.	Contractor	During construction
			17.2	Mechanical equipment with lower sound power levels must be selected to ensure that permissible occupation noise-rating limit of 85 dBA is not exceeded.	ECO Report		
			17.3	Construction workers and personnel must wear hearing protection equipment when the 8-hour ambient noise levels exceed 75dBA.			
			17.4	Vehicles must to adhere to speed limits on site, and not exceed 40km/hr.	Signage on site		
18.	Vegetation loss	Prevent unnecessary disturbance and damage to natural vegetation and topsoil loss.	18.1	Subcontractors are to use existing roads and tracks as far as possible and construction vehicles must stick to the designated and prepared roads.	Photographic evidence ECO report	Contractor	Throughout construction
			18.2	Topsoil must be set aside to facilitate re-vegetation.	Site inspection		
			18.3	No vegetation should be collected for fire wood or other uses.			
			18.4	During construction in areas classified as high sensitivity areas, a botanist or ecologist will be consulted to ensure micro-siting of turbines minimises damage to or loss of sensitive flora.	Final Site Layout Plan	Ecologist or botanist RWP	
			18.5	Clear demarcation during the construction phase of all undisturbed sensitive areas that are not within the direct footprint of the wind farm to ensure that there is no uncontrolled access by construction vehicles and labourers.	Signage	Contractor	
			18.6	Rehabilitation or ecological restoration during and after the construction phase will be undertaken with indigenous plants with input from a botanist with experience in restoration of semi- arid areas.	Rehabilitation reports	Contractor	
			18.7	Remove alien vegetation from disturbed areas.	ECO Report	Contractor	
			18.8	Distribution of the unusual Aloe species encountered at the site should be mapped and all individuals treated with caution until such time as		Ecologist	

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				its identity can be confirmed. Until the identity of the species is confirmed, the species and habitats should be removed or impacted. Should the Aloe prove to be a previously unknown species, then the area where the species is found to occur should receive an increased level of conservation protection.			
			18.9	Borrow pits, if required, should be constructed in previously disturbed areas and restricted to areas of quartzite rather than the sandstone-dominated areas to the southeast of the site;			
			18.10	Soil disturbance should be kept to an absolute minimum.			
			18.11	Where vegetation loss will occur before construction a qualified botanist is to ensure that rare, protected or endangered species are not being impacted by the road and if necessary identify alternative routes or relocate plants to a similar nearby environment.			
			18.12	All contractors must undertake training provided by RWP to educate them on the importance of the undisturbed conservations areas.	Training attendance records		
19.	Bird Habitat Loss Destruction, Disturbance and Displacement	Minimise impacts on birds	19.1	Habitat loss and disturbance can be mitigated during the construction phase by on-site demarcation of 'no-go' areas.	Photographic evidence ECO Report	Contractor	Throughout construction
20.	Bat Habitat Loss: Destruction, Disturbance and Displacement	Mitigate impacts on bats	20.1	Minimise blasting requirements and coordinate blasting events to minimise number of events required.	Site Layout Plan	Contractor	Throughout construction
			20.2	Caution should be taken to ensure construction footprints are kept to an absolute minimum, including storage of materials, stockpiling etc.	Site Layout Plan		
			20.3	Construction activities should avoided as far as possible during early summer (November to February) when it is peak bat breeding season and young bats may not be able to leave the roost.	ECO Report		
			20.4	Construction activities (particularly blasting) should be minimised during the coldest winter months (June/ July/ August), when bats go into a state of prolonged torpor and may not be able to escape the roost.			
			20.5	Should any caves be identified on site during pre-construction bat monitoring, a buffer of at least 500 m should be implemented around	Monitoring records		

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				such as cave, with no development occurring within this buffer zone			
21.	Traffic Impact	Mitigate traffic impacts	21.1	The Traffic Management Plan will be adhered to including adherence to speed limits and 'rules of the road'.	Traffic Management Plan and ECO reports	Contractor	During construction
22.	Socio-cultural issues: Influx of job seekers	Minimize impacts associated with influx of jobseekers and labour. .	22.1	RWP code of conduct and HIV Policy developed by RWP must form part of contractual agreement and must be adhered to. .	Code of conduct and HIV policy must be available on site.	Contractor	During construction
			22.2	No recruitment of workers shall be permitted at the site	Employment records	Contractor	During construction
			22.3	The construction workers (from outside the area) should be allowed to return home over the weekends or on a regular basis to visit their families; the contractor should make the necessary arrangement to facilitate these visits.	Employment records	Contractor	During construction
23.	Loss of Agricultural Land	Minimise loss to agricultural land	23.1	Ensure compliance with construction plans and worker 'Code of Conduct' developed by RWP.	Photographic evidence and ECO report	Contractor	During construction
			23.2	Any damage to vegetation will be rehabilitated in accordance with mitigation proposed for the rehabilitation of natural vegetation.			
			23.3	Ensure that the gates are closed at all times and that any damage to the infrastructure is repaired immediately or compensated for.			
			23.4	Animals will be able to continue grazing on the land between the wind turbines; the area should be treated as one of the grazing camps.			
			23.5	Any damage to vegetation will be rehabilitated in accordance with mitigation proposed for the rehabilitation of natural vegetation.			
24.	Faunal Impacts	Mitigate impacts on fauna	24.1	During construction in areas classified as high sensitivity areas, an ecologist should be consulted to ensure micro-siting of turbines minimises damage to or loss of sensitive habitat.;	ECO reports and photographic evidence	Ecologist	During construction
			24.2	Clear demarcation during the construction phase of all undisturbed sensitive areas that are not within the direct footprint of the wind energy facility to ensure that there is no uncontrolled access by construction vehicles and labourers.		Contractor	
			24.3	All vehicles must stick to designated and prepared roads.			

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			24.4	Temporary construction lay-down or assembly areas should be sited on transformed areas as far as possible.			
			24.5	Rapid regeneration of plant cover must be encouraged by setting aside topsoil during earthmoving and replacing onto areas where the re-establishment of plant cover is desirable to prevent erosion.			
			24.6	Control poaching by banning dogs on site and enclosing worker compounds.			
			24.7	Fauna must have 'right of way' on the roads. Slow moving animals such as tortoises which may be in the way, should be placed at the side of the road in the direction the animal was seen travelling.			
			24.8	All vehicles must stick to designated and prepared roads and a speed limit (up to 40 km/hr) must be enforced.			
			24.9	No fires should be allowed at the site anywhere other than within demarcated areas within the compound.			
			24.10	No dogs or other pets belonging to the contractor should be allowed at the site.			
			24.11	All staff at the site should remain within the compound at night.			
			24.12	No harvesting or collecting of plants, seeds, animals or their parts should be allowed.			
			24.13	Poaching or hunting should be strictly forbidden.			
			24.14	Littering should be strictly forbidden and waste generated by staff or at the compound should be disposed of in an appropriate manner, preferably off-site.			
			24.15	The compound and other temporary lay-down areas should be fenced-off to reduce human-wildlife interactions.			
			24.16	All chemical, fuel and oil spills should be cleaned up in the appropriate manner.			

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			24.17	It should be mandatory for all contractors to attend an environmental briefing and training session with respect to the guidelines outlined in the EIR and this EMPr.	Training material and records of training		
25.	Visual Impacts	Minimise visual impacts	25.1 25.2 25.3	Measures to control wastes and litter should be included in the contract specification documents and contractor must agree to these. Rehabilitate/ re-vegetate areas damaged by construction activities where required. Borrow pit for the construction phase , will be subject to permits from the relevant authorities. Borrow pits on the site are to be rehabilitated and re-vegetated according to the botanist's recommendations.	ECO report	Contractor Botanist	Throughout construction
POST CONSTRUCTION PHASE							
Activity		**Objective**	**Actions to be undertaken to Mitigate Environmental Impact**		**Parameters for Monitoring**	**Responsibility**	**Frequency / Timing**
#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
1.	Temporary site closure	General environmental protection	1.1	During temporary site closure ensure: <u>Fuels and flammables</u>: • Fuel is stored in low volumes • No leak, outlet secure / locked and adequate ventilation present • Bund is empty • Fire extinguishers serviced and accessible • Area secured from accidental damage, e.g. vehicle collision • Emergency contact numbers are displayed. • Safety office checks the stores prior to closure of the site <u>Safety</u> • All trenches secured and fencing and barriers in place • Notice boards applicable and secured • Emergency and management contact details displayed • Security persons briefed and have facility for contact. • Fire hazards identified and precautions taken to limit risks e.g. wood stockpiles, fuels • Inspection schedule and log by security or contracts staff <u>Erosion</u> • Wind and dust mitigation in place • Slopes and stockpiles at stable angle • Re-vegetated areas watering schedule in place	Temporary site closure complies with the specified provisions.	Contractor	During any temporary site closures

CONSTRUCTION PHASE							
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#	**Description of Activity**		**#**	**Commitment / Actions Required / Key Controls**			
				<u>Water contamination and pollution</u> • Cement and material stores secured • Refuse bins and toilets emptied and secured • Bunds clean and treated • Drip trays empty and secure • All structures secured against wind damage			
2.	Permanent Construction site closure	General environmental protection	2.1	All equipment, storage containers, temporary fencing, temporary services, fixtures and solid waste shall be removed from site at the end of construction. Specific measures include: • Clear and completely remove from site all equipment, storage containers, temporary fencing, temporary services, fixtures and any other temporary works. • Ensure that all access roads utilised during construction are returned to a usable state and/or a state no worse than prior to construction. • Clear the site of all inert waste and rubble, including surplus rock, foundations and batching plant aggregates (if applicable). • Remove from site all domestic waste and dispose of in the approved manner at a registered waste disposal site.	ECO Report	Contractor	Following permanent site closure