



ARCUS

**KOMSBERG WEST WIND ENERGY FACILITY
ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)**

On behalf of

Komsberg Wind Farms (Pty) Ltd

APRIL 2016

**DEA Reference Number:
The Proposed Komsberg West Wind Energy Facility, Western Cape Province –
14/12/16/3/3/2/856**



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1 INTRODUCTION

1.1 Background to the project

Arcus Consultancy Services (Pty) Ltd. has been appointed by Komsberg Wind Farms (Pty) Ltd. to conduct the Environmental Impact Assessment (EIA) process as required by the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), as amended, for the proposed establishment of two wind energy facilities (WEFs), Komsberg East and West and their associated grid connections. The aim of the project is to generate electricity, which is likely to be sold through the Department of Energy's (DoE) Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). The WEFs will deliver electricity into the existing Eskom electricity grid via a high voltage grid connection. The proposed grid connections are undergoing two separate Basic Assessment processes.

This Environmental Management Programme (EMPr) is focussed on the Komsberg West Wind Energy Facility.

1.1.1 Site Location and Project Description

The majority of the study area is located in the Western Cape Province and a smaller portion of the study area, is located on the border of the Northern Cape Province, approximately 60km north of Laingsburg and 40km south east of Sutherland. The proposed sites lie adjacent to each other in the Moordenaars Karoo.

The study area covers a total area of approximately 10 967 hectares. The footprint of the proposed infrastructure would equate to less than one percent of the total area.

Part of the proposed site is located in the Laingsburg Local Municipal area, which forms part of the Central Karoo District Municipality in the Western Cape Province. A small portion of the site falls within the Northern Cape Province, within the Karoo Hoogland Local Municipality, which forms part of the Namakwa District Municipality. The main access route to the proposed site is via the R354 and the Komsberg and Moordenaars Karoo District Roads, approaching the study area from the west.

Currently, there is one occupied homestead located within the study area. The main land uses in the area are linked to livestock farming. The proposed site is made up of a number of farms which are zoned for Agricultural Use.

The proposed project comprises of one WEF and its associated grid connection. The WEF will have a maximum generation capacity of up to 275 megawatts (MW).

The Komsberg West WEF will consist of the following infrastructural components:

- Approximately 55 wind turbines each of between 2 MW and up to 5MW in capacity with a rotor diameter of up to 140m and a hub height of up to 120m;
- Foundations and hardstands (30m x 50m) associated with the wind turbines;
- Up to 8m wide internal access road to each turbine, the substation complex and the ancillary infrastructure, including underground cabling adjacent the roads. Road length would be up to approximately 40km in total;
- Medium voltage cabling between turbines and the substation, to be laid underground where practical;
- Overhead medium voltage cables between certain turbine strings or rows;
- A 100m x 150m on-site substation complex to facilitate stepping up the voltage from medium to high voltage to enable the connection of the wind farm to the national grid;

- An approximately 55km high voltage power line (132kV) from the on-site substation to the national grid at the Eskom Komsberg Main Transmission Substation;
- A 30m x50m operations and services workshop area/office building for control, maintenance and storage; and
- Temporary infrastructure including a site camp, lay down areas and a batching plant totalling 150m x100m in extent.

Refer to **Appendix 1** for the final layout plan which indicates the proposed locations of turbines.

1.2 Background to the Environmental Management Programme (EMPr)

An Environmental Management Programme for the proposed WEF is required in terms of the following documents:

- 2014 Regulations in terms of Chapter 5 of the National Environmental Management Act (1998, as amended).

1.3 Objectives of the EMPr

The aim of an EMPr is to facilitate appropriate environmental input during all phases of the project. To achieve this, the EMPr must make recommendations for the planning and design (pre-construction phase), specify the limitations the contractor must abide by during construction, detail the issues that should be taken cognisance of and indicate specific actions that must be undertaken so as to ensure that the environment is not unnecessarily damaged. The EMPr thus specifies the framework within which the contractor must carry out operations. An operational phase is also included to provide environmental guidance for the operational phase of the development.

In addition the EMPr provides a clear indication of the environmental management requirements of each of the role players involved during the construction phase of the development. Guidance for the implementation of the EMPr is provided including the management of method statements which are required to be implemented to achieve compliance with the Environmental Specifications. Corrective actions and penalties in the event of noncompliance with the EMPr are also defined.

No closure or decommissioning EMPr is provided since should the applicant decide to decommission the Wind Energy Facility at some future date, the act of decommissioning would likely trigger a requirement to undertake an Environmental Assessment, as would presently be the case in terms of activity 31 of Government Notice 983 of 2014. This Environmental Assessment would assess the impacts and opportunities of decommissioning in far greater detail than is possible at this time, and would likely include a specific decommissioning EMPr.

1.4 Expertise of the consultants responsible for the compilation of the EMPr.

Barry Wiesner	
Qualifications	MPHIL (Environmental Management) B.Th. (Missiology and Theological Ethics) HDE (Sec) Geography & Biblical Studies B.A. (Archaeology and Environmental & Geographical Science) Green Star SA Accredited Professional Member IAIA
Experience in years	14 years
Experience	Barry has extensive EIA, EMP and site experience working as an Environmental Control Officer at major construction sites and in conducting Environmental Audits, EIAs, BARs and the compilation of numerous Environmental Management Programmes (EMP).

	Recent contracts have included: Environmental Audits for Mothae Diamond mine, Lesotho; SMART Living Handbook for City of Cape Town; a review of the Construction Environmental Management Plan (CEMP) for the Coega Development Corporation in Port Elizabeth; EMP for Umhlanga Ridge New Town Centre; Scoping Report and the EIA for the establishment of Caledon Flight Park; Environmental Control Officer supervision and auditing of large construction sites (including One and Only Hotel and Spa, Grand West Casino, Worcester Casino, Tygerfalls, Cape Gate, the Helderberg Coastal Sewer and EMPs for Lesedi, Letsasti and Jasper Solar Energy Facilities'.
Ashlin Bodasing	
Qualifications	BA (Social Science)
Experience in Years	11 years
Experience	Ashlin Bodasing is the Team Leader at Arcus Consulting, located in Cape Town. Having obtained her Bachelor of Social Science Degree from the University of Kwa-Zulu Natal; she has over 9 years' experience in the environmental consulting industry in southern Africa. She has gained extensive experience in the field of Integrated Environmental Management, environmental impact assessments and public participation through her former employment at Parsons Brinckerhoff and WSP Consulting in South Africa. She has also been actively involved in a number of industrial and infrastructural projects, including electricity power lines and substations; road and water infrastructure upgrades and the installation of telecommunication equipment and as well green field coal mines, as well as renewable energy facilities, both wind and solar. Ashlin has major project experience in the development of Environmental Impact Assessments, Environmental Management Plans and the monitoring of construction activities. Her areas of expertise include project management, environmental scoping and impact assessments, environmental management plans, environmental compliance monitoring and environmental feasibility studies. Experience also includes International Finance Corporation Performance Standards and World Bank Environmental Guidelines environmental reviews. She has worked in Mozambique, Namibia, Botswana, Lesotho and Zimbabwe.
Emily Herschell	
Qualifications	MPhil (Architecture and Planning) BSc (Honours) (Environmental and Geographical Science) BSc (Environmental and Geographical Science and Zoology) Pr. Sci. Nat. – Environmental Scientist
Experience in Years	14 years
Experience	Emily Herschell is a Senior Environmental Consultant with extensive experience in applying the principles of Integrated Environmental Management (IEM), and in applying the EIA Regulations to a number of development projects and initiatives in Southern Africa. Emily has co-ordinated and managed environmental processes within both the public and private sectors and for national, multi-national and international companies. As a project manager, she has conducted a variety of environmental investigations and evaluations, directing projects through tendering, design, construction and operational phases. She has led teams of varying sizes, responsible for undertaking assignments including <i>inter alia</i> Environmental Impact Assessments, Strategic Environmental Assessments, Environmental Management Plans and Programmes, Waste Management Licensing, site selection and screening exercises.

1.5 Components of the EMPr

Section 1: Introduction	Provides background information regarding the site, the proposed development and the EMPr
Section 2: Implementation of EMPr	Provides details of the communication and organisational structures within which the EMPr will be implemented, responsibilities of key role players, and provides the terms of reference for the ECO.
Section 3: Environmental Management Specifications for the Pre-construction Phase	Provides environmental specifications for preconstruction phase

Section 4: Environmental Management Specifications for the Construction Phase	Provides all construction phase environmental management requirements applicable to the principal construction contractors, and their subcontractors.
Section 5: Environmental Management Specifications for the Operational Phase	Provides all operational phase environmental management requirements applicable to applicant and any sub-contractors.

Aspect Required for EMPs (EIA Regulations, 2014)	Applicable Section
<i>1. (1) An EMP must comply with section 24N of the Act and include— (a) details of— (i) the EAP who prepared the EMP; and (ii) the expertise of that EAP to prepare an EMP;</i>	Section 1.4
<i>(b) a detailed description of the aspects of the activity that are covered by the EMP as identified by the project description;</i>	Section 1.1.1
<i>(c) a description of the impact management objectives, including management statements, identifying the impacts that need to be avoided, managed and/or mitigated as identified through the environmental impact assessment process for all phases of the development including— (i) planning and design; (ii) pre-construction activities; (iii) construction activities; (iii) where relevant operation activities; and (iv) rehabilitation of the environment after construction and where applicable post closure;</i>	Sections 3, 4 and 5
<i>(d) a description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph (c);</i>	Sections 3, 4 and 5

<p><i>(e) a description of impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (c) and (d) will be achieved, and may include actions to —</i></p> <p><i>(i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;</i></p> <p><i>(ii) remedy the cause of pollution or degradation and migration of pollutants;</i></p> <p><i>(iii) comply with any prescribed environmental management standards or practices;</i></p> <p><i>(iv) comply with any applicable provisions of the Act regarding closure, where applicable;</i></p> <p><i>(v) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;</i></p>	<p>Sections 3, 4 and 5</p>
<p><i>(f) the method of monitoring the implementation of the impact management actions contemplated in paragraph (e);</i></p>	<p>Section 2 and 5.6</p>
<p><i>(g) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (e);</i></p>	<p>Section 2 and 5.6</p>
<p><i>(h) an indication of the persons who will be responsible for the implementation of the impact management actions;</i></p>	<p>Section 2 and 5.6</p>
<p><i>(i) the time periods within which the impact management actions contemplated in paragraph (e) must be implemented;</i></p>	<p>Section 2 and 5.6</p>
<p><i>(j) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (e);</i></p>	<p>Section 2 and 5.6</p>
<p><i>(k) a program for reporting on compliance, taking into account the requirements as prescribed by these Regulations;</i></p>	<p>Section 2 and 5.6</p>
<p><i>(l) an environmental awareness plan describing the manner in which—</i></p> <p><i>(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and</i></p> <p><i>(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment.</i></p>	<p>Section 4.5.13</p>

DEA Requirements	
<ul style="list-style-type: none"> • Alien invasive management plan. • Open space management plan. • Transport Management plan. • Re-vegetation and habitat management plan. • Plant rescue and protection management plan. • Stormwater management plan • Erosion management plan • Fire management plan 	Appendix 3.

2 IMPLEMENTATION OF THE EMPR

2.1 Introduction

This document describes mitigation measures in detail, and is partly prescriptive, identifying specific people or organisations to undertake specific tasks in order to ensure that impacts on the environment are minimised during the lifecycle of this project. The EMP is applicable to all works comprising the pre-construction, construction and operation of the Komsberg West WEF development. It is a living document implying that information gained during pre-construction, construction and operational activities and/or monitoring of procedures on site could lead to changes in the EMPr.

The appointed ECO (Environmental Control Officer) will monitor compliance with the EMPr and other Conditions of Approval as they relate to environmental matters. This EMPr gives direction and guidance to all responsible parties. The responsible parties are expected to co-operate closely to minimise or avoid unnecessary environmental impacts.

Non-compliance penalties are described in this EMPr and are thus to be included into the official contract documentation. The Contractor is obliged to inform the ECO immediately of events that may cause serious environmental damage or breach the requirements of the EMPr. The ECO in turn will immediately inform the project Engineer and Developer and, if necessary the Local, Provincial and or National Authority, of such events.

2.2 Roles and Responsibilities

The key role-players during the construction phase of the development, for the purposes of environmental management on site, include but are not limited to: the Developer, the project Engineer, the main Contractors (direct appointments including civil works contractor, turbine supply and operations contractor, building contractor and their Environmental Site Officers etc.) the Environmental Control Officer, and representatives of the relevant Authority/ies.

Details of the responsibilities of each of the key role-players have been provided in sections 2.2.1 to 2.2.5.

Lines of communication and reporting between the various parties are illustrated in Figure 1 below.

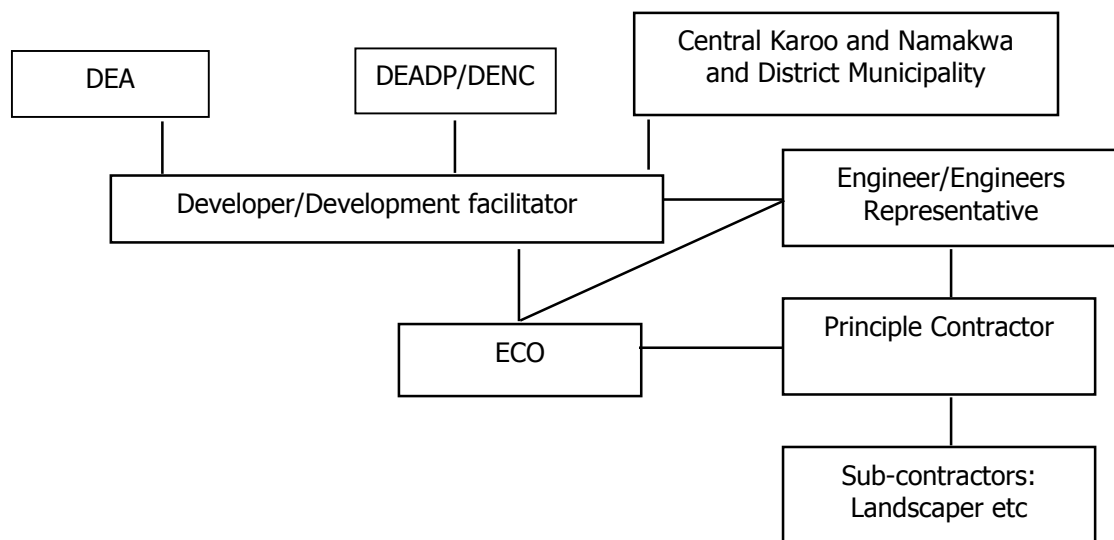


Figure 1: Typical communication and reporting structure.

2.2.1 The Developer

For the purpose of this document “the Developer” and its appointed facilitators, refers to those whom permission has been granted to proceed with the Komsberg Wind Farms (Pty) Ltd and who is thus ultimately responsible for compliance with all conditions of approval of the development or any aspect thereof by any authority.

With respect to the pre-construction phase of the development, the developer is to:

- Implement the recommendations outlined in the pre-construction EMP; and
- Implement as many recommendations as possible that will lessen the total environmental impact of the proposed development from the design stage, through to construction and ultimately the operational phase.

With respect to the construction phase of the Development, the Developer is to:

- Ensure that all relevant approvals and permits have been obtained prior to the start of construction activities on site;
- Ensure that the EMP has been approved by DEA prior to the start of construction activities on site;
- Ensure that DEA has been notified of the date on which construction activities will be starting, prior to commencement of the activity;
- Ensure that all conditions of approval have been complied with;
- Appoint all the required specialists to make input into the pre-construction/design phase (refer to section 3.1.2.2); and
- Appoint a suitably qualified or experienced environmental control officer prior to the start of construction activities on site, and for the duration of the construction phase.

With respect to the operational phase of the development, the developer is to:

- Ensure that operation of the WEF is undertaken in line with the requirements of the operational phase EMP; and

- Continuously seek to improve any negative environmental impacts which result from the operational phase.

2.2.2 The Project Engineer

For the purposes of this document, “The Engineer” refers to the engineer for the development, or any other person or group of people authorised by the Developer, to be responsible for the technical and contractual implementation of the works to be undertaken.

The responsibilities of the Engineer are to:

- Ensure that the requirements as set out in this EMPr and by the relevant Authorities are adhered to and implemented;
- Assist the ECO in ensuring that the conditions of the EMPr are being adhered to and promptly issuing instructions requested by the ECO, to the Contractor. All site instructions relating to environmental matters issued by the Engineer are to be copied to the ECO;
- Assist the ECO in making decisions and finding solutions to environmental problems that may arise during the construction phase;
- Review and approve construction method statements with input from the ECO;
- Order the removal of person(s) and/or equipment not complying with the specifications (as required by the ECO or otherwise);
- Issue of penalties for transgressions of Environmental Specifications; and
- Provide input into the ECO’s ongoing internal review of the EMPr.

2.2.3 The Contractor

For the purposes of this document “The Contractor” refers to any directly appointed (by the Developer) company or individual undertaking the implementation of the works.

The Contractor is to:

- Ensure implementation of all applicable Environmental Specifications, including all additional requirements related with approved method statements, during all works on site, failing which penalties, as outlined in the Environmental Specifications may be imposed by the ECO via the Engineer;
- Ensure that all of its sub-contractors’, employees, suppliers, agents or servants etc. are fully aware of the environmental requirements detailed in the Environmental Specifications;
- Must appoint a suitably qualified Environmental Site Officer (ESO);
- Liaise closely with the Engineer and the ECO and ensure that the works on site are conducted in an environmentally sensitive manner;
- Inform the Engineer as well as the ECO should environmental issues on site go wrong, e.g. dumping, pollution, littering and damage to vegetation; and
- Carry out instructions issued by the Engineer, on request of the ECO, required to fulfil his/her compliance with the CEMP.

2.2.4 The Environmental Control Officer (ECO)

During the construction phase of the project, the ECO is to:

- Ensure that the Contractor has a copy of the CEMP and all agreed method statements;

- Undertake weekly site inspections (frequency may change as required) to audit compliance of all parties with the requirements of the CEMP;
- Advise/recommend on actions or issues impacting on the environment to the Engineer, who shall issue any required Site Instructions to the Contractor;
- Environmentally educate and raise the awareness of the Contractor and his staff as to the sensitivity of the Site and to facilitate the spread of the correct attitude during works on Site;
- Review and approve construction/landscape method statements together with the Engineer/Landscape Architect;
- Assist the Contractor in finding environmentally responsible solutions to problems;
- Recommend to the Engineer the issuing of a penalty for any environmental damage caused on site, or non-compliance with the Environmental Specifications;
- Recommend to the Engineer the removal of person(s) and/or equipment not complying with the Specifications;
- Undertake photographic monitoring of the construction site;
- Keep records of all activities/ incidents on Site in a Site Diary concerning the environment;
- Complete temporary and permanent site closure checklists;
- Take immediate action on Site to stop works where significant and irreparable damage is being inflicted on the environment, and to inform the Engineer immediately of the occurrence and action taken; and
- Undertake a continual internal review of the EMP and make recommendations to the Engineer and Developer.

The ECO has the authority to recommend to the DEA that works be stopped, if in his/her opinion serious harm to, or impact on the environment is imminent, is likely to occur or has occurred and such actual or potential harm or impact is in contravention of the EMP, and which is, or may be, caused by construction, or related works.

Upon failure by the Contractor or contractor's employee to show adequate consideration to the environmental aspects of this contract, the ECO may recommend to the Engineer and the project management team to have the Contractor's representative or any employee(s) removed from the site or work suspended until the matter is remedied. No extension of time will be considered in the case of such suspensions and all costs will be borne by the Contractor.

The ECO shall keep a site diary in which events and concerns of environmental significance are to be recorded. The ECO will compile a monthly report of such events, concerns and general compliance of the Contractor with the construction phase of the EMP. This report will be submitted to the Engineer and if required, to the DEA, the DEADP and the Central Karoo District Municipality. The ECO is also required to attend regular site meetings of the project management team to report on environmental issues and minute requirements.

The ECO will be responsible for the compilation of a final completion checklist for the project, completed when all construction works related to the project have been completed and the site has been cleared of all construction related debris, materials or equipment not forming part of the permanent works. This checklist will audit the Contractor's compliance with the construction phase of the EMP throughout the duration of the construction phase and this checklist, together with a final written report will be submitted to the DEA, the DEADP and the Central Karoo District Municipality in order to achieve "environmental closure" for the construction phase of the project.

2.3 Site meetings during construction phase

The ECO is required to attend regular site meetings of the project management team to facilitate the transfer of information and to update all parties on the environmental compliance of the project as a whole, and minute requirements.

The ECO will present a summary report outlining the main construction activities that relate to the environment, at this meeting.

The minutes of these meetings will form part of the construction phase of the EMPr records. These minutes will reflect environmental queries, agreed actions and dates of eventual compliance by the Contractor.

The following people should attend these meetings:

- Developer's Representative;
- Engineer;
- The ECO;
- Contractor(s) representative

2.4 Environmental education and awareness

The Contractor in consultation with the ECO shall arrange for a presentation to site staff to familiarise them with the environmental aspects of the construction phase of the EMPr within seven days from the commencement date of construction. This presentation should take cognizance of the level of education, designation and language preferences of the staff. General site staff would commonly receive a basic environmental awareness course highlighting general environmental "do's and don'ts" and how they relate to the site. Management on site e.g. site agents and foremen, who require more detailed knowledge about the environmental sensitivities on site and the contents and application of the construction phase of the EMPr document itself, will benefit from a separate presentation dealing with these issues. The ECO may call upon the services of a specialist environmental education translator should this be required.

The manner in which the environmental awareness is undertaken with site staff may vary depending on the sensitivity of the site, scale of the project and availability of an environmental site officer(ESO) appointed by the contractor, do conduct the awareness training during site inductions.

2.5 Method Statements

The Contractor shall provide Method Statements for approval by the ECO and the Engineer prior to work commencing on aspects of the project deemed or identified to be of greater risk to the environment and/or which may not be covered in sufficient detail in the construction phase of the EMPr, when called upon to do so by the Engineer or ECO.

A Method Statement is a "live document" in that modifications are negotiated between the Contractor and the ECO/project management team, as circumstances unfold. All Method Statements will form part of the construction phase of the EMPr documentation and are subject to all terms and conditions contained within the construction phase of the EMPr.

Note that a Method Statement is a 'starting point' for understanding the nature of the intended actions to be carried out and allows for all parties to review and understand the procedures to be followed in order to minimise risk of harm to the environment.

Changes to, and adaptations of Method Statements can be implemented with the prior consent of all parties.

A Method Statement describes the scope of the intended work in a step-by-step description in order for the ECO and the Engineer to understand the Contractor's intentions. This will enable them to assist in devising any mitigation measures, which would minimize environmental impact during these tasks.

For each instance where it is requested that the Contractor submit a Method Statement to the satisfaction of the Engineer and ECO, the format should clearly indicate the following:

- What - a brief description of the work to be undertaken;
- How - a detailed description of the process of work, methods and materials;
- Where - a description/sketch map of the locality of work (if applicable); and
- When - the sequencing of actions with due commencement dates and completion date estimates.
- Who – The person responsible for undertaking the works described in the Method Statement;
- Why – a description of why the activity is required.

All Method Statements are to be to the satisfaction of the ECO, Engineer and, where practical and deemed necessary, should be endorsed as being acceptable by the environmental representative of the Relevant Authority.

A list of some of the Method Statements that the Contractor may need to submit during the course of the construction contract has been provided in Section 4, along with an indication of those which the ECO may require the Contractor to provide prior to the start of works on site (refer to **Appendix 2** for a Method Statement Template).

2.6 ECO Site Diary Entries

The ECO will maintain a site diary that relates to environmental issues as they occur on site for record keeping purposes. Comments from this diary will form part of reports presented at site meetings by the ECO.

2.7 Site Memo Entries

Site memo's, stipulating recommended actions required to improve compliance with the construction phase of the EMP by the contractor, will be issued by the ECO to the Engineer, who in turn will ensure that the Contractor is informed of the said instruction.

Comments made by the ECO in the Site Memo book are advisory and all Site Instructions required may only be issued by the Engineer. Site Memo's will also be used for the issuing of stop work orders for the purposes of immediately halting any particular activity(ies) of the Contractor deemed to pose immediate and serious risk of unnecessary damage to the environment.

2.8 Legislative Framework

Obligations imposed by the EMP are legally binding in terms of environmental statutory legislation (i.e. the Environmental Authorization in terms of the National Environmental Management Act #107 of 1998, as amended) and in terms of amendments to the Particular Conditions of Contract that pertain to this project.

The requirements of this EMP do not release the Developer from the requirements of any legislation that may be applicable to the project.

A list of Legislation applicable to the project (although not limited to those listed) has been provided below for guidance:

- Constitution of the Republic of South Africa, 1996 (Act No. 108, 1996);
- National Environmental Management Act, 1998 (Act No. 107 of 1998);
- National Heritage Resources Act, 1999 (Act No. 25 of 1999);
- National Water Act, 1998 (Act No. 36 of 1998);
- Occupational Health and Safety Act, 1993 (Act No. 385 of 1993);
- Hazardous Substances Act, 1977 (Act No. 63 of 1977);
- Conservation of Agricultural Resources, 1983 (Act No. 43 of 1983);
- The Environment Conservation Act, 1989 (Act No.73 of 1989),
- The National Noise Control Regulations: GN R154 of 1992;
- Western Cape Provincial Noise Control Regulations: PN 200 of 2013;
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004);
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) – Threatened or Protected Species List;
- National Environmental Management: Waste Act, 2008 (Act No. 59, 2008);
- National Roads Act, 1998 (Act No. 7, 1998); and
- Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).

2.9 Dispute Resolution

Any disputes or disagreements between role players on Site (with regard to environmental management) will firstly be referred to the Engineer during the construction phase, or to a DENC environmental officer during the operational phase. If no resolution on the matter is possible then the matter will be referred to the DEA for clarification.

Where a dispute still persists this shall be referred for arbitration to a panel of persons consists of one specialist environmental consultant, one qualified engineer, one official of the DEA and one legal practitioner of no less than four years of experience in environmental issues whose decision by simple majority will be final and binding on the parties. This arbitration will be informal (“the informal arbitration”) and will be finalised within a period of 48 hours from the date of the declaration of a dispute, the purpose being to ensure that disagreements are rapidly resolved and thereby to limit any prejudice to the contractor or the other parties to this agreement in the construction process or during the operation of the development. In the event of a deadlock in the aforesaid panel, the legal practitioner forming part of the panel will have a casting vote.

2.10 Social Responsibility

The Developer and Contractors shall encourage and implement wherever possible the procurement of locally based labour, skills and materials.

2.11 Recycling

Wherever possible, materials used or generated by construction and operation shall be recycled. Containers for glass, paper and metals shall be provided separate to general waste bins. During construction, office and camp areas are particularly suited to this form of recycling process. Where possible and practical, such as at stores and offices, waste shall be sorted for recycling purposes. Recycling protocols shall sort materials into the following categories:

- Paper / cardboard

- Any packaging materials suitable for re-use
- Plastics
- Aluminium
- Metals (other than aluminium)
- Wood
- Organic waste
- Glass
- Clean Building Rubble

Recycling ensures that we do not waste valuable resources.

Recycling can also create employment opportunities.

3 PRE-CONSTRUCTION EMPR

3.1 Scope

This section covers the mitigation measures and recommendations that may be considered in the preconstruction and design stage of the project.

3.2 Application

This Specification covers the requirements for mitigating the impact on the environment during the detailed design phase of the Komsberg West WEF development.

3.3 Pre-Construction Requirements

3.3.1 Directives in respect of the micro-siting process

The preferred site layout must be finalised through a micro-siting process, which will include a detailed site assessment of the final site layout by various specialists. Relevant authorities will be given the opportunity to comment on the final design layout and this layout must be approved by the Department of Environmental Affairs (DEA). A method for finalising the design layout is outlined below.

3.3.2 Visual consideration for final design

- Avoid locating wind turbines and related structures on prominent elevations, especially peaks, which are important markers in the landscape and therefore visually sensitive.
- Avoid slopes steeper than 1:5 gradient, where possible, being highly sensitive. Slopes steeper than 1:10 require special measures in the siting of roads and structures to avoid visually unsightly cut and fill embankments, and possible erosion.
- Avoid cultural landscapes or valuable cultivated land, particularly because of the scarcity of the latter.
- Apply setbacks for wind turbines as indicated in the VIA report.
- Locate substations in unobtrusive, low-lying areas, away from roads and habitations, and screened by the topography if possible. Avoid ridgelines. Screen substation structures with earth berms and tree-planting if possible.
- Consolidate operations/ maintenance buildings and parking areas in unobtrusive areas to avoid the sprawl of buildings in the open landscape.

- Locate access roads in sympathy with the grain of the landscape and the contours, and avoid drainage courses. Keep roads as narrow as possible to minimise cut and fill on steeper slopes.

3.3.3 Final Site Assessment by specialists

As mentioned, a final walk-through of the site must be conducted by various specialists in order to determine whether additional mitigation measures or final layout changes are required based on Komsberg Wind Farms (Pty) Ltd's proposed refined layout. A list of specialists to be appointed by Komsberg Wind Farms (Pty) Ltd is provided below, together with an outline of tasks to be performed:

3.3.3.1 Botanical Specialist:

- Preconstruction walk-through of the development footprint to ensure that sensitive habitats and species can be avoided.
- The botanical specialist must prepare a short report at the conclusion of the micro-siting process summarizing their input into the process, including tasks performed and any recommendations or additional required mitigation measures for the construction phase.

3.3.3.2 Avifaunal Specialist

- The avifaunal specialist must review the detailed design of all pylons and power lines associated with the proposed development and confirm that they comply with the "bird friendly" design recommendations contained within the Ecological/Fauna and Flora Specialist Report contained within the Final EIR report.
- In the event that the avifaunal specialist identifies any areas of the detailed design that are not sufficiently bird friendly, the specialist must make relevant recommendations to the design team.
- The avifaunal specialist must prepare a brief report at the conclusion of the micro-siting process outlining their input into the process, and confirming that that final detailed design meets the relevant "bird friendly" criteria.

Comments and mitigation measures will be fed back to the Komsberg Wind Farms (Pty) Ltd team, who will make adjustments if required.

3.3.4 Final Layout Approval Process

Should a positive Environmental Authorisation be obtained, and after the findings of the specialist on-site walk-throughs which occurs after authorisation, a possibly refined site layout, together with the relevant specialist short reports mentioned within section 3.3.3 will be distributed to the following authorities, for their records and comment if necessary:

- Department of Environmental Affairs; and
- Any other department as detailed in the Environmental Authorisation.

This final detailed design layout, together with comments received from the above-mentioned authorities, will be submitted to the DEA for final approval. No works may proceed on site until such time as DEA approves the final site layout.

3.3.5 Permit Requirements

Activities undertaken during site preparation, construction and operation may require additional permits, over and above the Environmental Authorisation. Komsberg Wind Farms (Pty) Ltd is responsible for ensuring that they hold the necessary permits in order to comply

with national and local regulations. Additional possible permit requirements are described below.

3.3.5.1 Borrow Pits

A borrow pit refers to an open pit where material (soil, sand or gravel rock) is removed for use at another location. Komsberg Wind Farms (Pty) Ltd or their contractors may want to use 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, 2002 (No. 28 of 2002) (MPRDA). A mining permit must be obtained from the Department of Minerals and Energy prior to the establishment of borrow pits on the site.

3.3.5.2 Water Use

There are licensing procedures that need to be followed for particular "water uses". Water uses that may be of relevance to the development of the WEF 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.

Under the National Water Act, 1998 (Act No. 36 of 1998), either General Authorisation or a Water Use Licence must be applied for by Komsberg Wind Farms (Pty) Ltd.

3.3.5.3 Vegetation Search and Rescue

3.3.6 Under the Forests Act, 1998 (Act No. 84 of 1998) (NFA), a license must be applied for from the Department of Agriculture, Forestry and Fisheries (DAFF) for the removal or disturbance of any protected trees on the site, in terms of the List of Protected Tree Species promulgated under the NFA. Tender Documentation

- Komsberg Wind Farms (Pty) Ltd shall ensure that this EMP is included within the tender documents for all contractors tendering to undertake any aspects of the construction phase of the project.
- In the adjudication of any tenders to undertake any aspect of the construction or operation of the proposed project, Komsberg Wind Farms (Pty) Ltd (or Komsberg Wind Farms (Pty) Ltd s' agent in this regard) must ensure that the costs of compliance with the Environmental Management Programme have been adequately allowed for within the winning tender.

3.3.7 Additional Pre-construction requirements

- Notify all registered I&APs and key stakeholders of the Environmental Authorisation opportunity and appeal procedure.
- Notify DEA prior to commencement of construction.
- A health and safety plan must be developed prior to the commencement of construction to identify and avoid work related accidents.
- Komsberg Wind Farms (Pty) Ltd should endeavour to establish a recruitment and procurement policy which sets reasonable targets for the employment of South African and local residents /suppliers.

- A Code of Conduct must be developed for all workers (Komsberg Wind Farms (Pty) Ltd and contractors including their workers) directly related to the project. The objective of the code of conduct is to limit, where possible, potential social ills brought about by the construction and operation of the renewable energy facility.

4 CONSTRUCTION ENVIRONMENTAL SPECIFICATION

4.1 Scope

This Specification covers the requirements for controlling the impact on the environment of all construction activities for the Komsberg West WEF project. All construction activities shall observe the requirements of this specification, as well as any relevant environmental legislation and in so doing, shall be undertaken in such a manner as to minimize impacts on the natural and social environment.

4.2 Application

This Specification contains clauses that are generally applicable to the undertaking of civil engineering works in areas where it is necessary to impose pro-active controls on the extent to which the construction activities impact on the environment. The roles and responsibilities in terms of the application and implementation of this Specification have been outlined in Section 2 above.

4.3 Method Statements

Any Method Statement required by the Engineer or the Environmental Specification shall be produced within such reasonable time as the Engineer shall specify or as required by the Specification. The Contractor shall not commence the activity until the Method Statement has been approved and shall, except in the case of emergency activities, allow a period of two weeks for approval of the Method Statement by the Engineer. Such approval shall not unreasonably be withheld.

The Engineer or ECO may request a Method Statement for any activity they believe may impact on the environment. The Engineer in consultation with the ECO may also require changes to a Method Statement if the proposal does not comply with the Specification or, if in the reasonable opinion of the Engineer, the proposal may result in, or carry a greater than reasonable risk of damage to the environment in excess of that permitted by the Specifications.

Approved Method Statements shall be readily available on the site and shall be communicated to all relevant personnel. The Contractor shall carry out the Works in accordance with the approved Method Statement. Approval of the Method Statement shall not absolve the Contractor from any of his obligations or responsibilities in terms of the Contract.

The following Method Statements shall be provided by the Contractor and submitted to the Engineer and ECO at least seven working days before site establishment:

4.3.1 Site establishment

The location, layout and method of establishment of the construction camp (including all buildings, offices, lay down yards, vehicle wash areas, fuel storage areas, batching areas and other infrastructure required for the running of the project)

4.3.2 Vegetation clearing

Method of vegetation clearing during site establishment and disposal procedure for cleared material.

4.3.3 Topsoil/Sub soil stockpiling

Method of clearing topsoil/sub soil and location of topsoil/sub soil stockpiles including erosion protection.

4.3.4 Storm water management

Storm water is to be managed during the construction phase of the project. This should include erosion and sedimentation control measures. A storm water management plan is included in **Appendix 4**.

4.3.5 Solid Waste management

Expected solid waste types, quantities, methods of recycling to be employed, monitoring and record keeping procedures, staff responsible for the oversight of waste management and recycling and frequency of collection and disposal of the non-recycled component, as well as location of disposal sites.

4.3.6 Concrete mixing and batch plant

Location, layout and preparation of cement/ concrete mixing areas including, the methods employed for the mixing of concrete and particularly the containment of runoff water from such areas and the method of transportation of concrete.

4.3.7 Access and haul roads

Details, including a drawing, showing where and how the access points and routes will be located and managed, including traffic safety measures.

4.3.8 Hazardous substance (including fuel and oil)

Details of any hazardous substances / materials to be used, together with the transport, storage, handling and disposal procedures for the substances.

4.3.9 Contaminated water

Methods of minimizing, controlling, collecting and disposing of contaminated water.

4.3.10 Environmental incident reporting

Method and process to be followed in the event of an environmental incident on site.

4.3.11 Emergency response plan (to include fire prevention and response)

Emergency procedures for fire and accidental leaks and spillages of hazardous substances (including fuel and oil). Include details of risk reduction measures to be implemented, such as firefighting equipment, fire prevention procedures and spill kits (materials and compounds used to reduce the extent of spills and to breakdown or encapsulate hydrocarbons).

4.3.12 Other method statements

Other Method Statements required by the Engineer and ECO during the course of construction are to be provided by the Contractor a minimum of fourteen working days prior to commencement of the works or activities to which they apply (these activities may not commence on site before these Method Statements have been approved except in the case of emergency activities).

4.4 Site Establishment

4.4.1 Site Division

The Contractor shall restrict all his activities, materials, equipment and personnel to within the area specified, and shall restrict his activities to only those areas that are necessary to undertake the works.

A Method Statement detailing the layout and method of establishment of the construction camp (including all buildings, offices, lay down yards, vehicle wash areas, fuel storage areas, batching areas and other infrastructure required for the running of the project) shall be submitted.

Disturbed areas rather than pristine or intact landscape areas should preferably be used for the construction camp.

4.4.2 Site Demarcation

The Contractor shall erect and maintain permanent and/ or temporary fences of the type and in the locations directed by the Engineer. Such fences shall, if so specified, be erected before undertaking designated activities.

The construction camp, material stores and lay-down areas should be screened and sited as far as possible from the local roads.

Demarcate all areas to be cleared with construction tape or similar material. However caution should be exercised to avoid using material that might entangle fauna.

4.4.3 Site Clearance

4.4.3.1 Vegetation Clearance

Vegetation clearance should preferably be phased as required to work in certain areas, rather than clearing of the entire site initially. If this is not practical and the entire site is cleared at the start of the contract, it is to be stabilized immediately to control dust. Where ever possible, vegetation shall be trimmed rather than cleared.

Cleared vegetative material is not to be dumped anywhere other than an approved waste disposal site or an area as agreed to with the ECO.

Wherever possible and where the material is suitable, the material should be chipped for later use as mulch in landscaped areas or for stabilization purposes or it should be dumped at a green waste recycling depot for compost production.

Invasive alien plant species, which are removed from the site, are not to be chipped for mulch if they are in a seed bearing state. Such material is to be disposed of at a suitable waste disposal site. Wherever possible, suitable larger stumps should be made available to the local community as fire wood.

Plant material removed from the site is not to be burnt for disposal on site unless a burning permit has been obtained from the local authority.

Sensitive ecosystems in the vicinity of the areas of construction should be demarcated (e.g. using danger tape or droppers) prior to any construction activities, so that these can be avoided.

Removal of vegetation should be kept to a minimum, and cleared areas must be re-vegetated after clean-up. A detailed planting plan should be developed, in consultation with a landscaper and ecologist.

Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development

Clear demarcation during the construction phase of all undisturbed areas that are not within the direct footprint of the Renewable Energy Facility to ensure that there is no uncontrolled access by construction vehicles and labourers.

An alien control and monitoring programme must be developed to ensure that the site is cleared of alien plants (as listed under the Conservation of Agricultural Resources, 1983 Act 43 of 1983 - as amended/updated) and kept free from alien plants for the duration of the construction phase.

A low cover of vegetation should be left wherever possible within the construction footprint to bind the soil, prevent erosion and promote post-disturbance recovery of an indigenous ground cover.

4.4.3.2 Topsoil

Topsoil / top material shall be removed from all areas cleared of vegetation and retained for future landscaping use, where feasible. Top material should exclude litter, building rubble, alien plant material or any other waste.

All topsoil, and specifically any topsoil from areas which are likely to contain bulbs, must be stripped and stockpiled for re-use in rehabilitated areas. This will constitute at least a 300mm layer.

Topsoil shall be stored in areas demarcated by the ECO and Engineer and in piles not higher than 2 m, and may not be removed from site, or used for any purpose other than in the rehabilitation of the site post construction. The stockpiles shall not be compacted or disturbed, and shall be domed at the top to promote runoff. The period between the stockpiling of topsoil and its utilization shall be as short as possible, and ideally the topsoil should be transferred to its intended site of use immediately following site clearance and stockpiling. This would also avoid double handling.

Stockpiles that are to be stored for less than three months should be covered with shade-cloth or Geotech fabrics or similarly suitable material to prevent erosion. If stockpiles are to be stored for more than 3 months a protective vegetation layer must be established to cover topsoil stockpiles in order to protect them against erosion and desiccation. Vegetation may not consist of weeds, but must comprise grass or ground covers.

4.4.3.3 Water Courses, Drainage Lines and Ephemeral Pans

Where water course crossings are required, the engineering team must provide an effective means to minimise the potential upstream and downstream effects of sedimentation and erosion (erosion protection) as well minimise the loss of riparian vegetation (small footprint).

No vehicles to refuel or be maintained within drainage lines/ riparian vegetation.

4.4.4 Access Routes/ Haul Roads

The Contractor shall control the movement of all vehicles including that of his suppliers so that they remain on designated routes, are distributed so as not to cause an undue concentration of traffic and that all relevant laws are complied with. In addition, such vehicles shall be so routed and operated as to minimise disruption to regular users of the routes not on the Site. 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.

During construction, arrangements and routes for abnormal loads (if required) must be agreed in advance with the relevant authorities and the appropriate permit must be obtained for the use of public roads.

Access roads and routes should avoid sensitive environments as far as possible for the completion of the works.

4.5 General requirements

4.5.1 *Materials Handling and Storage*

The Contractor shall ensure that any delivery drivers are informed of all procedures and restrictions (including "no go" areas) required to comply with the Specifications. The Contractor shall ensure that these delivery drivers are supervised during off loading, by someone with an adequate understanding of the requirements of the Specifications.

Materials shall be appropriately secured to ensure safe passage between destinations. Loads including, but not limited to, sand, stone chip, fine vegetation, refuse, paper and cement, shall have appropriate cover to prevent them spilling from the vehicle during transit. The Contractor shall be responsible for any clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.

All manufactured and/ or imported material shall be stored within the Contractor's camp. All lay down areas outside of the construction camp shall be subject to the Engineer's approval.

All building materials should be stored away (at least 50m) from aquatic ecosystems and the areas banded appropriately such that there will be no runoff from these areas towards aquatic systems. All building materials should be removed after construction.

Ensure that lay-down and other temporary infrastructure is within low sensitivity areas, preferably previously transformed areas if possible.

4.5.2 *Fuel (Petrol and Diesel) and Oil*

All fuel is to be stored within a demarcated area in the Contractor's Camp. No refuelling of vehicles or machinery is to take place outside of this demarcated area unless authorised by the Engineer. The Engineer shall be advised of the area that the Contractor intends using for the storage of fuel.

The Contractor shall ensure that all liquid fuels (petrol and diesel) are stored in tanks with lids, which are kept firmly shut. Only empty and externally clean tanks may be stored on the bare ground. All empty and externally dirty tanks shall be sealed and stored on an area where the ground has been protected.

Tanks containing fuels shall be situated on a smooth impermeable surface (plastic or concrete) base with a bund (if plastic, it must have sand on top to prevent perishing) to contain any possible spills and prevent infiltration of fuel into the ground. The impermeable lining shall extend to the crest of the bund and the volume inside the bund shall be 110% x the total capacity of all the storage tanks.

The floor of the bund shall be sloped towards an oil trap or sump to enable any spilled fuel to be removed. A hydrocarbon absorption/remediation product approved by the ECO shall be installed in the sump to reduce the risk of pollution. Bulk fuel storage and banded areas shall have overhead cover to prevent rain from entering the banded area.

The Contractor shall keep fuel under lock and key at all times.

If fuel is dispensed from 200 litre drums, the proper dispensing equipment shall be used, and the drum shall not be tipped in order to dispense fuel. The dispensing mechanism of the fuel storage tank shall be stored in a waterproof container when not in use.

During fuel tanker delivery, the tanker driver must be present at all times during offloading of product. An emergency cut off switch must be installed to immediately stop fuel delivery should an accident occur. An anti-flash nozzle must be installed at the end of the vent pipe with a fuel dispenser equipped with an automatic cut off switch to prevent fuel tank overfills.

Vehicles using the temporary fuel storage tanker must be located on a concrete hard standing area for fuel containment.

No smoking shall be allowed in the vicinity of the stores. Symbolic safety signs depicting "No Smoking", "No Naked Lights" and "Danger" are to be provided, and are to conform to the requirement of SABS 1186. The volume capacity of the tank shall be displayed. The product contained within the tank shall be clearly identified; using the emergency information system detailed in SABS 0232 part 1. Any electrical or petrol-driven pump shall be equipped and positioned, so as not to cause any danger of ignition of the product.

Areas for storage of fuels and other flammable materials shall comply with standard fire safety regulations and may require the approval of the Municipal Fire Prevention Officer.

The Contractor shall ensure that there is adequate fire-fighting equipment at the fuel stores.

Where reasonably practical, plant shall be refuelled at a designated re-fuelling area or at the workshop as applicable. If it is not reasonably practical then the surface under the temporary refuelling area shall be protected against pollution to the reasonable satisfaction of the Engineer prior to any refuelling activities. The Contractor shall ensure that there is always a supply of appropriate material readily available to absorb/ breakdown and where possible be designed to encapsulate minor hydrocarbon spillage. The quantity of such materials shall be able to handle a minimum of 200l of hydrocarbon liquid spill. This material must be approved by the Engineer prior to any refuelling or maintenance activities.

4.5.3 Solid Waste Management

For the purposes of these Environmental Specifications, solid waste includes all debris and waste (e.g. litter, food waste, cable pieces, vegetation and tree stumps, building rubble, etc), including hazardous waste (e.g. oils) resulting from any demolition and construction activities on site.

The Contractor shall be responsible for the establishment of a waste control system (Waste Management Plan) that is acceptable to the Engineer and ECO, and a method statement is required in this regard. The contractor shall keep detailed records of all waste removed from site, together with proof of recycling or legal disposal at a registered landfill site (disposal certificates).

NO REFUSE OR WASTE MATERIAL WILL BE DISPOSED OF BY BURYING.

4.5.3.1 Refuse control

The Contractor shall provide labourers to clean up the Contractor's camp and working areas on a daily basis.

Litter and waste materials (excluding rubble and hazardous waste materials) shall be disposed of into scavenger- and weather-proof bins. The Contractor shall provide sufficient bins with lids on Site to store the waste produced on a daily basis. In order to facilitate recycling it is recommended that a number of bins be provided at each location, and that such bins be clearly marked according to the category of waste being recycled (e.g. paper,

metals, plastics, glass etc.) Bins shall not be allowed to become overfull and shall be emptied a minimum of once daily. The waste may be temporarily stored on Site in a central waste area that is weatherproof and scavenger-proof, and which the Engineer has approved. The Contractor shall then remove the refuse collected from the working areas, from Site at least once a week. Any refuse not being re-cycled must be disposed of at a registered waste disposal facility.

The Contractor shall ensure that waste and surplus food, food packaging and organic waste are not deposited by employees anywhere on the site except in refuse bins.

4.5.3.2 Empty cement bags

Empty cement bags must be collected from the construction area by the end of every day and before rain events and shall be stored in bins that are either placed under cover or have been fitted with lids. This prevents the bags getting wet and the cement powder leaching into the environment.

4.5.3.3 Hazardous waste

Petroleum, chemical, harmful and hazardous waste is to be stored in an enclosed and bunded area. The location of these sites is to be approved by the Engineer and the ECO. This waste shall be disposed of at a registered hazardous waste disposal site. The Contractor shall submit copies of receipts from such waste disposal sites to the Engineer and ECO as proof of proper disposal. Storage and disposal etc is also controlled through other relevant legislation which must be complied with e.g. Occupational Health & Safety Act.

4.5.3.4 Builders' rubble

The Contractor shall provide labourers to clean up the Contractor's camp and working areas of rubble generated in the course of construction work at least once a week.

Rubble shall be temporarily stockpiled in a waste skip or a central stockpile. Any rubble not being recycled (e.g. sent for crushing) or reused shall be removed from site to an approved landfill site as soon as it constitutes a practical load for removal and before temporary closure of the site. No plastics, shrink wrap, paint buckets or any other debris that does not constitute clean building rubble, shall be stored at such stockpile sites.

4.5.4 Ablution facilities

Washing, whether of the person or of personal effects, and acts of excretion and urination are strictly prohibited other than at the facilities provided.

Latrine and ablution facilities and first-aid services shall comply with the regulations of the local authority concerned and shall be maintained in a clean and sanitary condition to the satisfaction of the Engineer.

The Contractor shall provide suitable sanitary arrangements at the Contractor's Camp and approved points around the designated work area to allow easy access to all employees on site. No staff is permitted to commence with work on a site without suitable toilet facilities available for them. Sanitary facilities shall be located within 100 m from any point of work, but not closer than 50 m to any water body. One chemical toilet is to be provided on site for every 15-contract personnel at each working area. These toilets must have doors and locks and shall be secured to prevent them blowing over. Toilet paper shall be provided.

The Contractor shall ensure that suitable sanitation facilities are provided for or by all his sub-contractors on site.

Toilets are to be emptied prior to builders' holidays. The contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied and that the contents are removed from site. Discharge of waste from toilets into the environment and burial of waste is strictly prohibited.

The Contractor shall keep the toilets in a clean, neat and hygienic condition. If the Contractor fails to provide and/or maintain all site sanitation facilities in a clean and hygienic condition, the Engineer may order the Contractor to suspend any or all work on the site until these requirements are met. No payment shall be made for any delays or disruption of the Works caused thereby nor shall extensions of time be granted for such delays.

4.5.5 Eating Areas

The Contractor shall designate eating areas to the approval of the Engineer which shall be clearly demarcated. Sufficient bins, as specified in 4.5.4a shall be present in this area. Any cooking on Site shall be done on well-maintained gas cookers with fire extinguishers present.

4.5.6 Drinking water

The Contractor shall ensure that drinking water is available for all staff on site. If no potable water source is available on site then the Contractor shall import drinking water to the site.

4.5.7 Contaminated water

Potential pollutants of any kind and in any form shall be kept, stored, and used in such a manner that any escape can be contained and the water table not endangered. Water containing such pollutants as cements, concrete, lime, chemicals, fuels and hydrocarbons shall be contained and discharged into an impermeable storage facility for removal from the site or for recycling. This particularly applies to water emanating from concrete batching plants and concrete swills, and to runoff from fuel depots/workshops/truck washing areas.

Wash down areas shall be placed and constructed in such a manner so as to ensure that the surrounding areas are not polluted. The Contractor shall notify the Engineer immediately of any pollution incidents on Site.

If construction areas are to be pumped of water (e.g. after rains), this water must first be pumped into a settlement area, and not directly into a natural ecosystem.

A Method Statement shall be required for all wash areas where hydrocarbon and hazardous materials, and pollutants are expected to be used. This includes, but is not limited to, vehicle washing, workshop wash bays and paint equipment cleaning. Wash areas for domestic use shall ensure that the disposal of contaminated "grey" water is sanctioned by the Engineer.

4.5.8 Hazardous Substances

Hazardous chemical substances (as defined in the Regulations for Hazardous Chemical Substances) used during construction shall be stored in secondary containers. The relevant Material Safety Data Sheets (MSDS) shall be available on Site. Procedures detailed in the MSDS shall be followed in the event of an emergency situation.

If potentially hazardous substances are to be stored on site, the Contractor shall provide a Method Statement detailing the substances/ materials to be used, together with the storage, handling and disposal procedures of the materials.

No paint products and chemical additives and cleaners such as thinners and turpentine, may be disposed of on Site. Brush / roller wash facilities shall be established to the satisfaction of the Engineer. A Method Statement, approved by the Engineer, is required.

4.5.9 Site Structures

The Contractor shall supply and maintain adequate and suitable sheds for the storage of materials. Sheds for the storage of materials that may deteriorate or corrode if exposed to the weather shall be weatherproof, adequately ventilated and provided with raised floors.

All site establishment components (as well as equipment) shall be positioned to limit visual intrusion on neighbours and the size of the area disturbed. The type and colour of roofing and cladding materials to the Contractor's temporary structures shall be selected to reduce reflection. The contractors' camp shall be fenced with a fence height of at least 1.8m, and the camp area shall be screened via the attachment of shade cloth to the fence surrounding the site camp.

4.5.10 Lights

The Contractor shall ensure that any lighting installed on the site for his activities does not interfere with road traffic or cause a reasonably avoidable disturbance to the surrounding community or other users of the area.

If any parts of the site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs), which do not attract insects and which should be directed downwards.

4.5.11 Workshops, Equipment, Maintenance and Storage

Where practical, all maintenance of plant on Site shall be performed in the workshop. If it is necessary to do maintenance outside of the workshop area, the Contractor shall obtain the approval of the Engineer prior to commencing activities.

The Contractor shall ensure that in his workshop and other plant maintenance facilities, including those areas where, after obtaining the Engineer's approval, the Contractor carries out emergency plant maintenance, there is no contamination of the soil or vegetation. The workshop shall have a smooth impermeable floor either constructed of concrete or thick plastic covered with sufficient sand to protect the plastic from damage. The floor shall be bunded and sloped towards an oil trap or sump to contain any spillages of substances (e.g. oil). A Method Statement detailing the design and construction of the workshop must be submitted.

When servicing equipment, drip trays shall be used to collect the waste oil and other lubricants. Drip trays shall also be provided in construction areas for stationary plant (such as compressors) and for "parked" plant (such as scrapers, loaders, vehicles).

All vehicles and equipment shall be kept in good working order and serviced regularly. Leaking equipment shall be repaired immediately or removed from the Site.

The washing of equipment shall be restricted to urgent or preventative maintenance requirements only. All washing shall be undertaken in the workshop or maintenance areas, and these areas must be equipped with a suitable impermeable floor and sump/oil trap. The use of detergents for washing shall be restricted to low phosphate and nitrate containing and low sudsing-type detergents.

4.5.12 Noise

The Contractor shall limit noise levels (e.g. install and maintain silencers on machinery). When working in built-up areas, or any areas within audible distance of residents whether in urban, peri-urban or rural areas, the Contractor shall provide and use suitable and effective silencing devices for pneumatic tools and other plant that would otherwise cause a noise level exceeding 85 dB(A) during excavations and other work.

Appropriate directional and intensity settings are to be maintained on all hooters and sirens.

No amplified music shall be allowed on Site. The use of radios, tape recorders, compact disc players, television sets etc. shall not be permitted unless the volume is kept sufficiently low as to avoid any intrusion on members of the public within range. The Contractor shall not use sound amplification equipment on Site unless in emergency situations.

The Contractor's attention is drawn to the Noise Regulations as promulgated in terms of the Environment Conservation Act, 1989 (#73 of 1989) and relevant Local Authority bylaws.

4.5.13 Environmental Awareness Training

Environmental awareness training sessions shall be run for all personnel on site. Courses shall be run in the morning during normal working hours at a suitable venue provided by the Contractor. All attendees shall remain for the duration of the course and sign an attendance register on completion that clearly indicates participant's names, a copy of which shall be handed to the Engineer.

The environmental awareness training content must be approved by the ECO.

Environmental awareness training can be incorporated into the site inductions and presented by the ESO or Health and Safety Officer, with the approval of the ECO.

Environmental awareness training must occur within seven days of commencement of work on site.

Notwithstanding the specific provisions of this clause it is incumbent upon the Contractor to convey the sentiments of the EMP to all personnel involved with the works.

4.5.14 Contractor's Environmental Officer

The Contractor shall appoint an Environmental Officer who shall be responsible for undertaking a daily site inspection to monitor compliance with this Specification. The Contractor shall submit the name of the Contractor's Environmental Officer to the Engineer for his approval seven days prior to the date of the environmental awareness training course.

4.5.15 "No-Go Areas"

For work to be carried out in these areas, a method statement must be submitted.

Sensitive drainage areas near to the construction activities should demarcated as no-go areas.

4.5.16 Construction Personnel Information Poster

The Contractor shall erect and maintain information posters for the information of his employees depicting actions to be taken to ensure compliance with aspects of the Specifications. Such posters shall be erected at the eating areas and any other locations specified by the Engineer.

4.5.17 Fire Control

No fires may be lit on site. Any fires, which occur, shall be reported to the Engineer immediately. Smoking shall not be permitted in those areas where it is a fire hazard. Such areas shall include the workshop and fuel storage areas and any areas where the vegetation or other material is such as to make liable the rapid spread of an initial flame. In terms of the Atmospheric Pollution Prevention Act, burning is not permitted as a disposal method.

The Contractor shall appoint a Fire Officer who shall be responsible for ensuring immediate and appropriate actions in the event of a fire and shall ensure that employees are aware

of the procedure to be followed. The Contractor shall forward the name of the Fire Officer to the Engineer for his approval seven days prior to the date of the environmental awareness training course.

The Contractor shall ensure that there is basic firefighting equipment available on Site at all times.

4.5.18 Concrete and Cement work

Cement powder has a high pH. Spillage of dry cement powder and concrete slurry will affect both soil and water pH adversely. Careless handling of cement products resulting in spillage can have detrimental effects on the surrounding environment.

The permitted location of the batching plant (including the location of cement stores and sand and aggregate stockpiles) shall be indicated on the Site layout plan and approved by the ECO. A Method Statement indicating the layout and preparation of this facility is required in this regard.

Cement is to be stored in a secure weatherproof location to avoid contamination of the environment.

All runoff from batching areas shall be strictly controlled so that contaminated water does not enter storm water, or groundwater. Dagma boards and mixing trays should be used at all mixing and supply points. Cleaning of equipment and flushing of mixers shall not result in pollution of the surrounding environment:

Suitable screening and containment shall be in place to prevent windblown contamination associated with bulk cement silos, loading and batching.

All visible remains of excess concrete shall be physically removed to an approved Municipal waste site on completion of the plaster or concrete pour section and disposed of.

4.5.19 Emergency Procedures

The Contractor shall submit Method Statements covering the procedures for the following emergencies:

a) Fire

The Contractor shall advise the relevant authority of a fire as soon as one starts and shall not wait until he can no longer control it. The Contractor shall ensure that his employees are aware of the procedure to be followed in the event of a fire.

b) Accidental leaks and spillages

The Contractor shall ensure that his employees are aware of the procedure to be followed for dealing with spills and leaks, which shall include notifying the Engineer and the relevant authorities. The Contractor shall ensure that the necessary materials and equipment for dealing with spills and leaks is available on Site at all times.

Treatment and remediation of the spill areas shall be undertaken to the reasonable satisfaction of the Engineer.

In the event of a hydrocarbon spill, the source of the spillage shall be isolated, and the spillage contained. The area shall be cordoned off and secured.

4.5.20 Safety

The Contractor shall at all times observe proper and adequate safety precautions on the Site. Telephone numbers of emergency services, including the local firefighting service, shall be posted conspicuously in the Contractor's office near the telephone.

No unauthorised firearms are permitted on Site.

The Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) and in particular the requirements of the Construction Regulations issued in July 2003, must be complied with.

4.5.21 Security

With the possible exception of any security staff who may be required to stay overnight at the Contractor's Camp, no personnel will be permitted to live on site. Security staff must be provided with heating and cooking facilities (in order that they do not need to light fires) access to toilet facilities and communication equipment.

Any security lighting at the Contractor's Camp is to be placed in such a way as to not cause a nuisance to residents of the area and traffic on adjacent roads.

4.5.22 Community relations

The Contractor shall erect and maintain information boards in the position, quantity, design and dimensions specified. Such boards shall include contact details for complaints by members of the public in accordance with details provided by the Engineer.

All interactions with the surrounding community shall be undertaken in terms of the Community Engagement Plan developed by Komsberg Wind Farms (Pty) Ltd in terms of clause 2.6 of this document.

The Contractor shall keep a "Complaints Register" on Site. The Register shall contain all contact details of the person who made the complaint, and information regarding the complaint itself. All grievances raised shall be dealt with in accordance with the Komsberg Wind Farms (Pty) Ltd Grievance Procedure which is to be developed in accordance with clause 2.6 of this document.

4.5.23 Protection of Natural Features

The Contractor shall not deface, paint, damage or mark any natural features (e.g. rock formations) situated in or around the Site for survey or other purposes unless agreed beforehand with the Engineer. Any features affected by the Contractor in contravention of this clause shall be restored/ rehabilitated to the satisfaction of the Engineer.

The Contractor shall not permit his employees to make use of any natural water sources (e.g. springs, streams, and open water bodies) for the purposes of swimming, personal washing and the washing of machinery or clothes.

4.5.24 Protection of Flora and Fauna

Except to the extent necessary for the carrying out of the Works, flora shall not be removed, damaged or disturbed nor shall any vegetation be planted.

Trapping, poisoning and/ or shooting of animals is strictly forbidden by contractors and their labourers. No domestic pets or livestock are permitted on Site during the construction phase. Where the use of herbicides, pesticides and other poisonous substances has been specified, the Contractor shall submit a Method Statement.

During construction any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.

All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises as well as the Riverine Rabbit. Speed limits should apply within the facility as well as on the public gravel access roads to the site.

No protected tree species may be disturbed or removed without a license from the Department of Agriculture, Forestry and Fisheries (DAFF).

4.5.25 Erosion and Sedimentation Control

The Contractor shall take all reasonable measures to limit erosion and sedimentation due to the construction activities. Where erosion and/or sedimentation, whether on or off the Site, occurs despite the Contractor complying with the foregoing, rectification shall be carried out in accordance with details specified by the Engineer. Where erosion and/or sedimentation occur due to the fault of the Contractor, rectification shall be carried out to the reasonable requirements of the Engineer.

Any runnels or erosion channels developed during the construction period or during the maintenance period shall be backfilled and compacted. Stabilisation of cleared areas to prevent and control erosion shall be actively managed. Consideration and provision shall be made for various methods, namely, brush-cut packing, mulch or chip cover, straw stabilising (at a rate of one bale/square metre and rotorvated into the top 100 mm of the completed earthworks), watering, soil binders and anti-erosion compounds, mechanical cover or packing structures (e.g. Hessian cover).

Traffic and movement over stabilised areas shall be restricted and controlled, and damage to stabilized area shall be repaired and maintained to the satisfaction of the Engineer.

4.5.26 Aesthetics

The Contractor shall take reasonable measures to ensure that construction activities do not have an unreasonable impact on the aesthetics of the area.

4.5.27 Dust Control

The Contractor shall take all reasonable measures to minimise the generation of dust as a result of construction activities to the satisfaction of the Engineer and ECO. Dust control measures may include the stabilization of disturbed areas via the rotorvation of straw into the soil surface. In extreme instances, the use of specific dust suppressant additives such as "Dustex" may be necessary in order to limit dust generation from haul roads.

During high wind conditions, the Contractor shall comply with the Engineers instructions regarding dust suppression measures. The Engineer may request the temporary cessation of all construction activities where wind speeds are unacceptably high, and until such time as wind speeds return to acceptable levels.

4.5.28 Pollution

The Contractor shall take all reasonable measures to minimize any dust nuisance, pollution of streams and inconvenience to or interference with the public (or others) as a result of the execution of the Works. A method statement may be required in this regard as determined by the Engineer and ECO.

Washing of vehicles and machinery should take place within 50m from any watercourse. All machinery should be regularly checked for leaks. No runoff shall enter any watercourse.

4.5.29 Archaeology and Palaeontology

Colonial period heritage – that is buildings and historical sites of significance have been identified within the boundaries of the study area.

- Do not disturb and old stone kraals or ruins, do not remove stone from walls, or artefacts from the earth or earth surface.

- Do not demolish without HWC authorisation, ideally reuse old structures and cottages, care for the fabric but change it as little as possible.

During the construction phase a chance-finds procedure should be applied should substantial fossil remains such as vertebrate bones, teeth or trackways, plant-rich fossil lenses or dense fossil burrow assemblages be exposed by excavation or discovered within the development footprint. The responsible Environmental Control Officer should safeguard the fossils, preferably *in situ*, and alert the responsible heritage management authority (Heritage Western Cape for the Western Cape, SAHRA for the Northern Cape) so that appropriate action can be taken by a professional palaeontologist, at the developer's expense. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (e.g. stratigraphy, sedimentology, taphonomy) by a professional palaeontologist. Should a specialist confirm a genuine artefact and recommend further study of the area, work in the area of any artefact or fossil is to cease until further notice and the South African Heritage Resources Agency (SAHRA) is to be informed forthwith by the archaeologist. A maximum of 30 days should be set aside in the construction program for the recovery of archaeological material where/if discovered. The contact details for the SAHRA are as follows:

111 Harrington Street, Cape Town, 8001

P O Box 4637, Cape Town, 8000

Tel: (021) 462 4502

Fax: (021) 462 4509

Email: director@sahra.org.za

4.5.30 Working Hours

Working hours in terms of the planning approval shall be adhered to. If works are to take place outside of normal working hours, the ECO and the Engineer are to be notified and disturbance to the surrounding residents or land users is to be prevented. The Engineer will, where required, in turn notify the Relevant Authority of work done outside of normal working hours.

4.5.31 Excavation and Trenching

During excavation and trenching activities, care is to be taken to ensure that the stockpiling of top material is kept separate from sub-soils. Top material thus saved is to be replaced as top material and is to be the final layer when back-filling. The Contractor shall reinstate all working areas to the satisfaction of the Engineer.

Areas opened for trenching should be restricted to the minimum required to be worked in and closed up as soon as possible or as dictated by technical requirements such as length of pipe or cable, in order to prevent them from posing safety hazards to people, traffic and animals and to prevent rainwater erosion. Trenches shall be refilled to the same level as (or slightly higher to allow for settlement) the surrounding land surface to minimise erosion. Excess soil shall be stockpiled in an appropriate manner. No stockpiling must occur within 50 m of a water course.

In the event of material removed during trenching being excessive after backfilling or being unsuitable as overburden, the excess material must be removed from the construction site to a site agreed upon by the Engineer and, where applicable, the Local Authority.

4.6 Temporary Site Closure

If the Site is closed for a period exceeding one week, a checklist procedure shall be carried out by the Contractor in consultation with the ECO.

Contractor's Safety Officers (in terms of the Occupational Health and Safety Act) are to check, the Site and report to the Engineer regarding the following:

4.6.1 Fuels / flammables / hazardous materials stores:

- Ensure fuel stores as low in volume as possible;
- No leaks;
- Outlet secure / locked;
- Bund empty;
- Fire extinguisher serviced and accessible;
- Secure area from accidental damage e.g. vehicle collision;
- Emergency and Management telephone numbers to be available and displayed; and
- Adequate ventilation.

4.6.2 Other:

- All trenches and manholes secured;
- Fencing and barriers in place per the Occupational Health and Safety Act , 1993 (Act No. 85 of 1993);
- Notice boards applicable and secured;
- Security persons briefed and have facility for contact;
- Night hazards checked e.g. reflectors, lighting, traffic signage;
- Fire hazards identified – local authority notified of any potential threats e.g. large brush stockpiles, fuels etc;
- Pipe stockpile wedged / secured;
- Scaffolds secure; and
- Inspection schedule and log by security or contracts staff.

The ECO is to check and report to the Engineer regarding the following issues:

- Wind and dust mitigation in place e.g. straw, brush packs, irrigation;
- Slopes and stockpiles at stable angle;
- Landscape areas watering schedules & supply secured;
- Fuels/hazardous substances stores secure;
- Cement and materials stores secured;
- Toilets empty and secured;
- Refuse bins empty and secured (lids);
- Bunding clean and treated e.g. Spill Sorb or Enretech #1 powder;
- Drip trays empty & secure (where possible); and
- Structures vulnerable to high winds secure.

The Contractor is to ensure that all temporary closure requirements are met before leaving the Site.

4.7 Site Clean Up and Rehabilitation

4.7.1 Site Clean Up

The Contractor shall ensure that all temporary structures, equipment, materials, waste and facilities used for construction purposes are removed upon completion of the project. The site clean-up shall be to the satisfaction of the Engineer and the ECO.

4.7.2 Rehabilitation

Where appropriate, the contractor shall employ a suitably qualified person (a botanist with experience in restoration of Karooareas) to rehabilitate areas damaged by construction activities during the course of the project. The Contractor shall be responsible for rehabilitating areas identified by the ECO and the Engineer, or recommended by the aforementioned botanist. The Contractor's procedure for rehabilitation shall be approved by the ECO and the Engineer and, where required, the Local Authority environmental representative.

4.8 Penalties and Bonuses

Where the Contractor inflicts damage upon the environment or fails to comply with any of the Environmental Specifications contained within this EMP, he may be liable to pay a penalty for breach of the conditions of the Environmental Specifications which form part of the works contract.

The Contractor is deemed NOT to have complied with this Specification if:

- There is evidence of contravention of the Specification within the boundaries of the site, site extensions and haul/ access roads;
- Environmental damage ensues due to negligence;
- The Contractor fails to comply with corrective or other instructions issued by the Engineer within a specific time; or
- The Contractor fails to respond adequately to complaints from the public.

Penalties may be issued per incident and per individual for the Contractor's responsibility. The amount of the penalty shall be determined by the Engineer, in consultation with the ECO and Contractor prior to work starting on site. The Engineer shall inform the Contractor of the contravention and he shall notify the consulting quantity surveyor to deduct such a penalty from monies due under the Contract prior to the issuing of the monthly payment certificates.

Payment of any penalties in terms of the contract shall not absolve the offender from being liable from prosecution in terms of any law.

The following penalties (not an exclusive list) in addition to remedial costs incurred could attract penalties.

a.	An individual entering a "no-go" area by foot (without Engineer's/ ECO's permission)	R 500
b.	An individual failing to adhere to speed limit	R 500
c.	An individual driving a vehicle in a no-go area	R2000
d.	An individual driving any earthmoving plant in a no-go area	R2000 – R5000
e.	A plant operator ignoring a written warning to have an oil leak from his machinery repaired	R 1000
f.	An individual littering on site	R100
g.	An individual not making use of the ablution facilities	R500
h.	An individual making an illegal fire on site	R500 – R10 000

j.	An individual/contractor causing unnecessary damage to flora and fauna on site	R500 – R5000
j.	An individual/team wasting water	R500 – R5000

4.9 All monies collected through penalties can be held in an environmental fund by the Developer and can be used in the local development programs.. A summary page is to be included with the monthly payment certificates as a record of penalties issued to date. Tolerances

Environmental management is concerned not only with the final results of the Contractor's operations to carry out the Works but also with the control of how those operations are carried out. Tolerance with respect to environmental matters applies not only to the finished product but also to the standard of the day-to-day operations required to complete the Works.

It is thus required that the Contractor shall comply with the environmental requirements on an ongoing basis and any failure on his part to do so will entitle the Engineer to certify the imposition of a fine subject to the details set out in the Environmental Specification.

5 OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAMME (OEMP)

5.1 Scope

This Specification covers the requirements for controlling the impact on the environment of operational activities.

5.2 Aim and Purpose of the OEMP

This OEMP aims to provide Komsberg Wind Farms (Pty) Ltd and their contractors with the necessary tools to ensure that the potential impacts on the environment during the operation of the development are minimised. Moreover, it aims to ensure that the infrastructure is operated and maintained according to Best Practice. The OEMP aims to ensure that the development is maintained and operated in an environmentally sensitive and sustainable manner, and that the operation of the development does not result in reasonably avoidable environmental impacts.

The OEMP is a working document that may be amended to enhance its effectiveness for environmental control.

Therefore not all specifications and details are prescribed here but should be discussed and the best possible practicable application made by the responsible parties.

5.3 Application

The application and implementation of the Operational Environmental Management Plan (OEMP) shall be the responsibility of Komsberg Wind Farms (Pty) Ltd. Komsberg Wind Farms (Pty) Ltd is to appoint an Environmental Site Manager (ESM) to ensure that relevant requirements of the OEMP document are implemented, and that the site is suitably managed. Komsberg Wind Farms (Pty) Ltd may appoint a suitably qualified and experienced person from within the existing staff to fulfil the role of ESM.

Komsberg Wind Farms (Pty) Ltd may also form an Environmental Liaison Committee (ELC) to facilitate the implementation of the OEMP. If the ELC is formed, many of the responsibilities of Komsberg Wind Farms (Pty) Ltd may be delegated to the ELC. The ELC should consist of at the very least the following:

- Representative of Komsberg Wind Farms (Pty) Ltd;
- Environmental Site Manager; and
- Representative of the local authority.

Other members may include an external environmental control officer (ECO) or representatives from community based organisations or environmental groups.

Should Komsberg Wind Farms (Pty) Ltd sub-contract the running of the WEF to a third party, the OEMP must be part of the contract and must be binding.

The roles and responsibilities of each of the above-mentioned environmental management bodies have been detailed below:

5.3.1 Environmental Liaison Committee (ELC)

The ELC is a representative body of various key role players involved in development and environment-related organisations, which have a particular interest in the Komsberg West WEF development. Members of this committee will not remain constant, and may vary over time.

The ELC will play an advisory role, and provide a forum for democratic decisions regarding OEMP implementation during the operational phase of the development, as well as

periodically reviewing the OEMP in terms of its applicability to management requirements on site. They are to meet periodically to receive a report back on environmental management. This frequency may need to be reviewed following the first year of operation, but should not be less than twice a year.

All members of the ELC will be expected to attend the meetings, and are to provide the chairperson of the committee with a written apology if unable to attend. In such a case, the member will receive minutes of the meeting, and may be expected to respond to certain issues.

5.3.2 Komsberg Wind Farms (Pty) Ltd

The implementation of the OEMP, as well as the adherence to any conditions within the Environmental Authorization relating to the operational phase of the development, shall be the responsibility of Komsberg Wind Farms (Pty) Ltd.

Komsberg Wind Farms (Pty) Ltd will appoint an Environmental Site Manager and various specialists as required to ensure that the specifications of this document as they relate to general site management and maintenance, as well as environmental audits are suitably implemented on site.

5.3.3 Environmental Site Manager (ESM) (or internal role managed by SM)

A suitably qualified and trained individual appointed by Komsberg Wind Farms (Pty) Ltd prior to the operation of the WEF, will fulfil the role of the Environmental Site Manager (ESM). The primary roles and responsibilities of the ESM will be to:

- oversee the implementation of the EMP on site;
- visit the site on a monthly basis and advise on areas of environmental management, or compliance with the OEMP, requiring attention;
- visit the site more regularly during the first three months of operation, during which more frequent monitoring may be required for the establishment of certain programmes or aspects of environmental management;
- be called to site in the case of any emergency situation which may impact on the local environment;
- liaise with various specialists and the local authorities if required, regarding issues relating to environmental management;
- report on compliance with the OEMP specifications to the ELC/ Komsberg Wind Farms (Pty) Ltd;
- facilitate environmental audits and ensure that they are undertaken, as required;
- keep a comprehensive record of environmental management, issues of non-compliance and minutes of ELC meetings for audit purposes; and
- undertake any other tasks outlined in this document, on the behalf of Komsberg Wind Farms (Pty) Ltd.

5.3.4 Independent Environmental Control Officer (ECO)

Since provision has been made for the ESM to be an internal Komsberg Wind Farms (Pty) Ltd appointment, Komsberg Wind Farms (Pty) Ltd must employ an independent Environmental Professional with a post graduate degree in environmental studies and a minimum of five years of relevant experience to act as the independent environmental auditor for the site. The ECO is to be employed upon completion of the first year of operation, and is to perform an annual formal audit on the management plan, and its

implementation by the relevant parties for the duration for the operational phase of the project. Specific audit requirements are contained within section 5.6.5.

5.4 Financing for Environmental Management

The budget for the implementation of the OEMP shall come out of Komsberg Wind Farms (Pty) Ltd's operational budget. Komsberg Wind Farms (Pty) Ltd must review the OEMP and allocate the requisite funds to facilitate compliance. Since many of the items addressed in the OEMP relate to required preventative maintenance, operator legal compliance, and responsible environmental management, this cost should not represent significant additional expenditure.

5.5 Detailed Operational Environmental Specifications

5.5.1 Litter and Waste Management

A litter and waste management system must be established by Komsberg Wind Farms (Pty) Ltd. Litter and waste management should address the following:

5.5.1.1 Recycling

It is recommended that a recycling program be established for the site as a whole, but specifically for the administration and maintenance buildings and all site occupants. This may be achieved via an agreement with the waste management contractor for the site. Komsberg Wind Farms (Pty) Ltd must make adequate staff resources available to implement and manage the recycling program. Waste separation is best conducted at source, and the recycling waste storage area must at a minimum separate waste into the following categories:

- Paper products;
- Cardboard;
- Glass;
- Plastics; and
- Metals.

Recycling will involve greater effort, but offers the reward of environmentally sustainable practices and potential employment opportunities. The ELC/ Komsberg Wind Farms (Pty) Ltd should establish what recycling facilities are available within the broader area and determine a recycling program that can support any community efforts already underway.

5.5.1.2 Solid Waste

A distinction should be made between dry solid waste and wet solid waste. These should be separated and collected in different containers for storage at a central waste depot before removal to a recognised municipal waste facility.

All waste storage areas are to be kept in a clean and hygienic condition to prevent odours, spreading of litter, and scavengers.

The frequency of collection must be determined and specified by the ELC/ Komsberg Wind Farms (Pty) Ltd in this OEMP.

Refuse and litter management is to be monitored visually by the ESM. Findings are to inform changes in the waste management procedures to eliminate litter problems.

5.5.1.3 Hazardous Waste

Should any hazardous waste be generated by the WEF, this must be disposed of at a hazardous waste facility and adhere to any health and safety requirements for the storage, transport and disposal of hazardous waste.

5.5.2 Vegetation Management

All rehabilitated areas related with the development are to be maintained and be kept clear of invasive alien vegetation species, as listed under the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983 (as amended/updated)).

- The use of pesticides and herbicides is to be limited to a bare minimum and is to be strictly controlled, and limited to only biodegradable, natural substances. Application should be not prior to the imminent arrival of rain, or within at least 5 days after the passing of a significant rain event.
- On-site employees, farm workers and visitors to the site will be educated about the conservation of vegetation. This will include strict guidelines for remaining on existing roads while on site to avoid unnecessary destruction or damage to undisturbed and rehabilitated vegetation.
- Any cutting or clearing of vegetation shall be kept to the minimum necessary to facilitate the ongoing operation of the WEF.
- The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden by anyone expect landowners with the appropriate permits where required.

Alien Plant Management

- Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species.
- The recovery of the indigenous shrub/grass layer should be encouraged through leaving some areas intact through the construction phase to create a seed source for adjacent cleared areas.
- Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species may be a long-term problem at the site and a long-term control plan will need to be implemented. Problem woody species such as *Prosopis* are already present in the area and are likely to increase rapidly if not controlled.
- Regular monitoring for alien plants within the development footprint as well as adjacent areas, which receive runoff from the facility as there are also likely to be prone to invasion problems.
- Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.

5.5.3 Fauna

- Any potentially dangerous fauna such snakes or fauna threatened by the maintenance and operational activities should be caught by licensed snake handler/expert and removed to a safe location.
- The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden by anyone expect landowners with the appropriate permits where required.

- All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.
- If parts of the facility are to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside.
- If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects.

5.5.4 Soil Erosion

- Erosion management at the site should take place according to the Erosion and Rehabilitation Plan.
- All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.
- Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance.
- All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.
- All cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.

5.5.5 Watercourses

- During the operational phase, monitor culverts to see if erosion issues arise and if any erosion control is required.
- Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't form additional steps / barriers.

5.5.6 Maintenance of Development

This section refers to both internal and external maintenance of the centre.

- Komsberg Wind Farms (Pty) Ltd must monitor borehole usage, and any other specific parameters required by conditions of the Water Use Licence, and ensure adherence thereto.
- Komsberg Wind Farms (Pty) Ltd must notify the ESM of any external maintenance to be undertaken. Any significant structural maintenance should require compliance with the CEMP.
- The ESM must specify any additional environmental procedures necessary to prevent contamination of the environment.
- Komsberg Wind Farms (Pty) Ltd is responsible for notifying the maintenance contractor of the conditions.

5.5.7 Emergency Procedures

An appropriate and timeous response to emergency situations will ensure that the environmental consequences of such situations are managed and curtailed. Since the fire is seen as the most likely foreseeable emergency for the site, the emergency procedure for fire is provided below. In the event of a fire occurring, the requisite procedure shall be implemented. To ensure preparedness, all key staff on site shall be trained in terms of the requirements of this emergency procedure.

Komsberg Wind Farms (Pty) Ltd shall ensure that the fire control system is maintained according to the relevant SANS requirements.

Komsberg Wind Farms (Pty) Ltd shall ensure that all measures to avoid the risk of fire according to the Environmental Regulations for Workplaces promulgated by Government Notice No. R2281 of 16 October 1987, as amended, is adhered to.

Fire hydrants and hoses are to be visible.

5.5.7.1 Emergency procedure in the event of a fire:

- Contact relevant parties as well as local fire department and report the location and details of the fire;
- Alert other staff by calling "Fire";
- Attend to human life in danger and remove all combustible items in the vicinity (where possible), guide people away from danger area;
- If trained, personal to attempt to extinguish the fire without endangering life; and
- If uncertain or unable to extinguish the fire, leave the area and wait for assistance.

5.5.7.2 Emergency contact details

A list of emergency services contact numbers shall be posted on site. As a minimum, the following emergency services shall be included on the list:

- Environmental Department: 053 807 7416
- Fire Department: 10111
- Disaster Management: 107
- Ambulance Services: 10177
- South African Police Services: 10111

5.5.8 OEMP Review and Audit

5.5.8.1 OEMP Review

A schedule for the review of the OEMP should be established by the ELC/Komsberg Wind Farms (Pty) Ltd. It is recommended that the effectiveness of the OEMP be reviewed on an annual basis, and possibly bi-annually in the first year of operation.

Any proposed changes are to be submitted by the ESM to the DEA for approval prior to implementation.

Amendments or additions made to the document (with the approval of the relevant authorities) are to be included as annexure's, distributed to all relevant parties, and should be considered OEMP specifications to which all relevant parties are bound.

Results of environmental audits (see section 5.6.5.2) are to inform the ELC/Komsberg Wind Farms (Pty) Ltd of changes required to the EMP documentation.

5.5.8.2 OEMP Audit

Audits of the OEMP implementation in the development should be undertaken on a regular basis. Internal audits (by the ESM) should be done on a quarterly basis with an external audit conducted by an independent consultant undertaken as specified below.

An independent environmental auditor (ECO) is to be employed after the first year of operation, and annually thereafter, to perform a formal audit on the management plan, and its implementation by the relevant parties.

Each audit is to be based on site visits by the auditor as well as a review of any records of environmental management to be kept by the ESM. The audit must also determine whether the OEMP is adequately dealing with the range of environmental impacts on the site, i.e. whether the plan is still appropriate, or whether it needs to be extended.

The audit report is to include recommendations of changes required to the OEMP document, management practices etc to improve environmental management of the site. The results of this audit are to be submitted to the provincial and local environmental authority, and DEA.

5.6 Summary of Operational Specifications

In this section of the document, specifications for environmental management on site have been summarized to facilitate easy reference, and implementation.

This section clearly lays out the management requirements, who is responsible for undertaking the required actions, time frames within which they are required, as well as requirements for monitoring, or where applicable approval of the required action. Further details of how each of these actions is to be undertaken (where applicable) have been included in section 5.6. Relevant references to these details have been provided in the tables below.

Where Komsberg Wind Farms (Pty) Ltd has been identified as the responsible party, this should be read as Komsberg Wind Farms (Pty) Ltd, or a suitable individual/organisation employed by them to undertake such task. Where another party has been identified as responsible for undertaking a management action, they are to fulfil this requirement, although the Komsberg Wind Farms (Pty) Ltd will ultimately be held responsible for any requirements or specifications of this document which are not fulfilled.

Komsberg Wind Farms (Pty) Ltd holds the responsibility of ensuring that the action is undertaken according to the specifications of this document.

5.6.1 Visual Impacts

Management Objectives	Actions required	Responsible Party	Frequency/Time frame	Approval and Monitoring Procedures	Monitoring Party	Ref for further details
Minimize the visual impacts during the operation phase.	Signage related to the WEF must be discrete and confined to entrance gates.	Komsberg Wind Farms (Pty) Ltd	Throughout operation	Visual Monitoring / Photographic evidence	ESM	N/A
	The footprint of the maintenance facilities, as well as parking and vehicular circulation, should be clearly defined, and not be allowed to spill over into other areas of the site.	Komsberg Wind Farms (Pty) Ltd	Throughout operation	Visual Monitoring / Photographic evidence	ESM	N/A
	The maintenance and storage areas should be screened by buildings, walls, hedges and/or tree planting, and should be kept in a tidy state to minimise visual impact	Komsberg Wind Farms (Pty) Ltd	Throughout operation	Visual Monitoring / Photographic evidence	ESM	N/A

5.6.2 Litter, Waste & Effluent Management

Management Objectives	Actions required	Responsible Party	Frequency/Time frame	Approval and Monitoring Procedures	Monitoring Party	Ref. for further details
<i>Recycling</i>	Recycling programme to be established on site. To include cardboard, glass, plastic, paper, & metals	Komsberg Wind Farms (Pty) Ltd	Within first 3 months of operation	Visual inspection	ESM	5.5.1
	Separation/ deposition of suitable materials in recycling containers	Komsberg Wind Farms (Pty) Ltd Contracted cleaning service	On-going	Visual inspection, random monthly checks on recycling waste storage area	ESM	5.5.1

Management Objectives	Actions required	Responsible Party	Frequency/Time frame	Approval and Monitoring Procedures	Monitoring Party	Ref. for further details
	Emptying of recycling containers	Recycling companies / Waste Contractor, as arranged by Komsberg Wind Farms (Pty) Ltd	As required –Komsberg Wind Farms (Pty) Ltd/ELC to determine frequency	Visual inspection	ESM	5.5.1
<i>Refuse disposal</i>	Refuse agreement entered with Council or private contractor	Komsberg Wind Farms (Pty) Ltd	Prior to start of operation			5.5.1
	Provision of suitable waste disposal containers at operations and maintenance buildings	Komsberg Wind Farms (Pty) Ltd	Prior to start of operation	Visual inspection	ESM	5.5.1
	Temporary waste storage area to be weather proof to prevent dispersion of waste through eg. wind or rain	Komsberg Wind Farms (Pty) Ltd	Ongoing	Visual inspection	ESM	5.5.1
	Emptying of waste disposal containers	As arranged by Komsberg Wind Farms (Pty) Ltd	As required	Visual inspection	ESM	5.5.1
Prevention of Soil or groundwater pollution.	Any hydrocarbons or other hazardous substances stored on site must be stored in an impervious container, within a bunded area.	Komsberg Wind Farms (Pty) Ltd	Monthly Inspection	Visual Inspection	ESM	5.5.1
Management of hazardous substance spillage	Any spillage of hazardous substance to be reported to ESM and Council	Komsberg Wind Farms (Pty) Ltd	Immediately following spillage	Visual inspection of incident to evaluate potential threat for contamination of water course/ephemeral pan/ groundwater.	ESM	5.5.1
	Suitable mitigation actions to be recommended	ESM	As soon as required to prevent further damage	Report to Council/ relevant State Department.	ESM	5.6.1

Management Objectives	Actions required	Responsible Party	Frequency/Time frame	Approval and Monitoring Procedures	Monitoring Party	Ref. for further details
	Implementation of recommended actions	Komsberg Wind Farms (Pty) Ltd /ESM to coordinate	As required by recommended mitigatory actions	Visual inspection	ESM	5.5.1
	Detailed records kept of all such incidents	Komsberg Wind Farms (Pty) Ltd/ESM	Immediately following each incident	Report to appropriate level of government as required by legislation	ESM	5.5.1

5.6.3 Erosion Management / Loss of Topsoil

Management Objectives	Actions required	Responsible Party	Frequency/Time frame	Approval and Monitoring Procedures	Monitoring Party	Ref. for further details
Erosion Management	Bi-annual monitoring of erosion in the vicinity of the roads, buildings and other hard-standing surfaces to be conducted to ensure erosion sites can be identified early and remedied.	ESM	Before and after the rainy season	Visual inspection for erosion	ESM	5.5.4
	Determine cause of erosion	ESM	As required	Visual inspection for erosion	ESM	5.5.4
	Implementation of suitable repair and mitigation	Komsberg Wind Farms (Pty) Ltd, ESM	Within a month following request for mitigation by ESM	Visual inspection of mitigation measures to ensure that they are preventing further erosion	ESM	5.5.4

5.6.4 Vegetation Management

Management Objectives	Actions required	Responsible Party	Frequency/Time frame	Approval and Monitoring Procedures	Monitoring Party	Ref. for further details
Minimize unnecessary damage to or loss of vegetation	On-site employees, farm workers and visitors to the site will be educated about the conservation of vegetation. This will include strict guidelines for remaining on existing roads while on site to avoid unnecessary destruction or damage to undisturbed and rehabilitated vegetation.	Komsberg Wind Farms (Pty) Ltd	Ongoing	Erection of signage at the Admin Building and site entrance.	ESM	5.5.2
Vegetation management during general maintenance	Any cutting or clearing of vegetation shall be kept to the minimum necessary to facilitate the ongoing operation of the WEF.	Komsberg Wind Farms (Pty) Ltd	Ongoing	Visual Inspection.	ESM	5.5.2
Control of Alien Species	Alien control and monitoring programme must be developed to ensure that the site is kept free from alien plants.	Komsberg Wind Farms (Pty) Ltd	Bi-annually	Visual Inspection	ESM or botanist/horticulturalist if the ESM is not adequately skilled.	5.5.2

5.6.5 Maintenance of WEF

Management Objectives	Actions required	Responsible Party	Frequency/Time frame	Approval and Monitoring Procedures	Monitoring Party	Ref. for further details
Ensure compliance with conditions of water use licence	Monitor borehole usage, and any specific parameters required by the Water Use Licence, and ensure adherence thereto.	Komsberg Wind Farms (Pty) Ltd	Prior to operation/ ongoing	Borehole Water Use Licence/ Registration	Komsberg Wind Farms (Pty) Ltd/ESM	5.5.6

Management Objectives	Actions required	Responsible Party	Frequency/Time frame	Approval and Monitoring Procedures	Monitoring Party	Ref. for further details
Environmental management during general maintenance	Notify ESM of external maintenance to be undertaken	Komsberg Wind Farms (Pty) Ltd	Prior to starting work	Visual inspection of area	ESM	5.5.6
	Specify environmental procedures to prevent environmental contamination. CEMP (section 4 of this document) to be applicable to significant maintenance activities.	ESM	Prior to starting work	Visual monitoring of maintenance to ensure compliance with specification Reports of transgressions to ELC/ Komsberg Wind Farms (Pty) Ltd	ESM ESM	5.5.6
Minimize any traffic impact	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. All internal and access roads that will be used by Komsberg Wind Farms (PTY) Ltd during the operational phase of the project will be maintained by Komsberg Wind Farms (PTY) Ltd throughout the life of the Project.	Komsberg Wind Farms (Pty) Ltd	Throughout Operation of the facility	Permit if required	ESM	N/A

5.6.6 Electromagnetic Interference

Management Objectives	Actions required	Responsible Party	Frequency/Time frame	Approval and Monitoring Procedures	Monitoring Party	Ref. for further details
Prevent EMI effects	Appropriate mitigation measures for reducing noise in electronic systems may include the shielding, cancellation, filtering and suppression.	Komsberg Wind Farms (Pty) Ltd, with input from relevant specialist.	Throughout operation, but only if such impacts occur.	Installation reports	Komsberg Wind Farms (Pty) Ltd/ESM	N/A

5.6.7 Dust Minimization

Management Objectives	Actions required	Responsible Party	Frequency/Time frame	Approval and Monitoring Procedures	Monitoring Party	Ref. for further details
Prevention of excessive dust generation	Komsberg Wind Farms (Pty) Ltd to ensure that vehicles related to the WEF travelling on gravel roads should not exceed a speed of 40 km/h. Komsberg Wind Farms (Pty) Ltd to erect signage and undertake driver education in this regard.	Komsberg Wind Farms (Pty) Ltd.	Throughout operation.	Visual monitoring	Komsberg Wind Farms (Pty) Ltd/ESM	N/A

5.6.8 Emergency Procedures

Management Objectives	Actions required	Responsible Party	Frequency/Time frame	Approval and Monitoring Procedures	Monitoring Party	Ref. for further details
To ensure a reduced risk to human life and of damage if a fire were to take place	Fire control system to be maintained according to the relevant SANS requirements.	Komsberg Wind Farms (Pty) Ltd	As required by SANS requirements	Records of maintenance to be kept	Komsberg Wind Farms (Pty) Ltd/ESM	5.5.7

Management Objectives	Actions required	Responsible Party	Frequency/Time frame	Approval and Monitoring Procedures	Monitoring Party	Ref. for further details
	All measures to avoid the risk of fire according to the Environmental Regulations for Workplaces promulgated by Government Notice No. R2281 of 16 October 1987, as amended should be adhered to.	Komsberg Wind Farms (PTY) Ltd	As required	Maintenance records to be kept	Komsberg Wind Farms (Pty) Ltd	5.5.7
	Fire hydrants and hoses to be visible Emergency contact numbers always visible	Komsberg Wind Farms (Pty) Ltd	Prior to operation	Records of incidents to be kept	Komsberg Wind Farms (Pty) Ltd/ESM	5.5.7
	Ensure all site occupants adequately trained in evacuation and other procedures in the event of an emergency.	Komsberg Wind Farms (Pty) Ltd	As required	Records of emergency drills to be kept	Komsberg Wind Farms (Pty) Ltd/ESM	5.5.7

5.6.9 Audits and EMP Reviews

Management Objectives	Actions required	Responsible Party	Frequency/Time frame	Approval and Monitoring Procedures	Monitoring Party	Ref. for further details
Environmental Audit	Audit relevance of management plan and its implementation	Independent Environmental auditor (ECO)	Annually, commencing 1 year after start of operation.	Audit report to be presented to ELC, Komsberg Wind Farms (Pty) Ltd and the DEA if required.	ESM / Komsberg Wind Farms (PTY) Ltd to ensure that Independent Audit is undertaken.	5.5.8
	Recommend changes to OEMP/ implementation of OEMP required	Independent Environmental auditor (ECO)	Following each audit	Recommended changes discussed with ELC, Komsberg Wind Farms (Pty)) Ltd and the DEA.	ESM	5.5.8
Review of OEMP	Evaluate relevance of OEMP, and identify additional issues requiring management and changes recommended by auditor	Komsberg Wind Farms (Pty) Ltd, ELC	Annually and following each audit		ESM	5.5.8
	Submit proposed changes to local authority, and D:EA for approval	ESM	Prior to implementation	Obtain written approval from DEA	ESM	5.5.8
	Effect changes; include approved amendments as annexure to OEMP where appropriate	ESM	Within month of receipt of all approvals	Distribution of annexure/ amended OEMP to all relevant parties	ESM	5.5.8

APPENDIX 1 FINALLAYOUT PLAN

APPENDIX 2 METHOD STATEMENT TEMPLATE

METHOD STATEMENT

CONTRACT: **DATE:** _____

PROPOSED ACTIVITY (give title of method statement and reference number from the EMP):

WHAT WORK IS TO BE UNDERTAKEN (give a brief description of the works):

WHERE ARE THE WORKS TO BE UNDERTAKEN (where possible, provide an annotated plan and a full description of the extent of the works):

START AND END DATE OF THE WORKS FOR WHICH THE METHOD STATEMENT IS REQUIRED:

Start Date:

End Date:

HOW ARE THE WORKS TO BE UNDERTAKEN (provide as much detail as possible, including annotated maps and plans where possible):

Note: please give too much information rather than too little. Please ensure that issues such as emergency procedures, hydrocarbon management, wastewater management, access, individual responsibilities, materials, plant used, maintenance of plant, protection of natural features etc are covered where relevant

DECLARATIONS

1) RESPONSIBLE OFFICER (ECO/ ESO)

The work described in this Method Statement, if carried out according to the methodology described, is satisfactorily mitigated to prevent avoidable environmental harm:

(signed) (print name)

Dated:_____

2) PERSON UNDERTAKING THE WORKS (Contractor)

I understand the contents of this Method Statement and the scope of the works required of me. I further understand that this Method Statement may be amended on application to other signatories and that the ECO/ ESO will audit my compliance with the contents of this Method Statement. I understand that this method statement does not absolve me from any of my obligations or responsibilities in terms of the Contract.

(signed) (print name)

Dated:_____

3) EMPLOYER (i.e. Developer/ Owner/Project manager)

The works described in this Method Statement are approved.

(signed) (print name) (designation)

Dated:_____

APPENDIX 3 MANAGEMENT PLANS

1 ALIEN INVASIVE MANAGEMENT PLAN

1.1 Purpose of the Alien Invasive Management Plan

The purpose of the Alien Invasive Management Plan is to provide a framework for the management of alien and invasive plant species during the construction and operation of the Komsberg Wind Energy Facility. The broad objectives of the plan includes the following:

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

1.2 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, 1983 (Act No. 43 of 1983) (CARA), as amended in 2001, requires that land users clear *Declared Weeds* from their properties and prevent the spread of *Declared Invader Plants* on their properties.

Table 3 of CARA 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 land user 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.

1.2.1 Vulnerable Ecosystems and Habitats

Certain habitats and environments are more vulnerable to alien plant invasion and are likely to bear the brunt of alien plant invasion problems at the site. In addition, construction activities and changes in water distribution at the site following construction are also likely to increase and alter the vulnerability of the site to alien plant invasion.

Areas at the site which are likely to require specific attention include the following:

- Wetlands, drainage lines and other mesic areas;
- Cleared and disturbed areas such as road verges, crane pads and construction footprints etc.; and

- Construction camps and lay-down areas which are cleared or are active for an extended period.

1.2.2 Wetlands, drainage lines and other mesic areas

There are a relatively large number of drainage lines at the site as well as a smaller number of artificial wetlands. Disturbance within these areas can often result in alien plant invasion on account of the greater water and nutrient availability in this habitat. Although there are no turbines within such areas, numerous road crossings will be required. The disturbance footprint within such areas should be minimized and these areas should be checked for alien species more than the surrounding landscape.

1.2.3 Cleared and disturbed areas

Cleared and disturbed areas are clearly vulnerable to invasion on account of the lack of existing plant cover to resist invasion as well as the disturbance created during construction which promoted the germination and establishment of alien plant species.

1.2.4 Construction camps and laydown areas

Construction camps and lay down areas are either cleared of vegetation or prolonged activities in these areas result in negative impact on indigenous vegetation. In addition, repeated vehicle and human activity in these areas usually results in the import of alien plant seed on clothes, dirty vehicles or with construction machinery and materials

1.3 General Clearing and Guidance 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 pre-construction surveys of the development footprint. This may occur simultaneously to other required reaches and surveys. The clearing plan should then form part of the pre-construction reporting requirements for the site.

The plan should include a map showing the alien density & indicating dominant alien species in each area.

Lighter infested areas should be cleared first to prevent the build-up of seed banks.

Pre-existing dense mature stands ideally should be left for last, as they probably won't increase in density or pose a greater threat than they are currently.

Collective management and planning with neighbours may be required in the case of large woody invaders as seeds of 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.

1.4 Clearing Methods

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

However care should be taken that the clearing methods used do not encourage further invasion. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum. Fire is not a natural phenomenon in the area and fire should not be used for alien control or vegetation management at the site.

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. <http://www.dwaf.gov.za/wfw/Control/>.

1.5 Use of Herbicide 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 re-sprout. Where herbicides are to be used, the impact of the operation on the natural environment should be minimised by observing the following:

- Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.
- Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of 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.

1.6 Alien Plant Management Plan

1.6.1 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.

Construction Phase Action	Frequency
The ECO is to provide permission prior to any vegetation being cleared for development.	Daily
Clearing of vegetation should be undertaken as the work front progresses – mass clearing should not occur unless the cleared areas are to be surfaced or prepared immediately afterwards.	Weekly
Where cleared areas will be exposed for some time, these areas should 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. The use of manure or other soil amendments is likely to encourage invasion.	Weekly

Clearing of vegetation is not allowed within 32 m of any wetland, 80 m 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 allowing construction activities in these areas or as per the permits obtained to do so.	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 on areas disturbed by construction 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 DWAF Working for Water website.	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 and other sensitive areas should remain demarcated with appropriate fencing or hazard tape. These areas are no-go areas (this must be explained to all workers) that must be excluded from all development activities.	Daily

1.6.1.1 Monitoring Actions - Construction Phase

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

Monitoring Action	Indicator	Timeframe
Document alien species present at the site	List of alien species	Pre-construction
Document alien plant distribution	Alien plant distribution map within priority areas	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

1.6.2 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.

Operational Phase Action	Frequency
Surveys for alien species should be conducted regularly. Every 6 months for the first two years after construction and annually thereafter. All aliens identified should be cleared.	Every 6 months for 2 years and annually thereafter
Where areas of natural vegetation have been disturbed by construction activities, revegetation with indigenous, locally occurring species should take place where the natural vegetation is slow to recover or where repeated invasion has taken place following disturbance.	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	When necessary

using methods that leave the soil protected, such as using a weed-eater to mow above the soil level.	
No alien species should be cultivated on-site. If vegetation is required for aesthetic purposes, then non-invasive, water-wise locally-occurring species should be used.	When necessary

1.6.2.1 Monitoring Actions - Operational Phase

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

Monitoring Action	Indicator	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

1.6.3 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.

Decommissioning Phase Action	Frequency
All damaged areas shall be rehabilitated if the infrastructure is removed and the facility is decommissioned	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 3 years after rehabilitation.	Biannually

1.6.3.1 Monitoring Actions - Decommissioning Phase

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

Monitoring Action	Indicator	Timeframe
Monitor newly disturbed areas where infrastructure has been removed to detect and quantify any aliens that may become established for 3 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	Alien plant surveys and distribution map	Biannually for 3 years

for 3 years after decommissioning and rehabilitation		
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 3 years

2 OPEN SPACE MANAGEMENT PLAN

The objective of open space management is to restore, enhance and rehabilitate open spaces, improve climate change adaptations through the minimisation of biodiversity loss, and mitigate against environmental degradation. Management actions consider open spaces and natural areas as well as community perceptions of these.

In the context of the proposed WEF, the primary purpose of the open plan management plan is to:

- Minimise visual impact on the character of the area; and
- Maintain biodiversity within the area to ensure that no long-term negative impacts occur on the local environment.

The proposed WEF has the potential to impact negatively on the character of the area, as identified in the Visual Impact Assessment conducted during the EIA phase. The following actions must be implemented to minimise this visual impact:

- Grid connection route to avoid visually sensitive peaks, major ridgelines, scarp edges and slopes steeper than 1:5 gradient
- Substation to be sited in unobtrusive lower-lying areas, away from roads and habitations, and screened by berms and/or tree-planting where feasible.
- Operations and maintenance buildings and parking areas to be located in an unobtrusive area and consolidated to avoid sprawl of buildings in the open landscape.
- Access roads to be in sympathy with the contours, avoid steep 1:5 slopes and drainage courses, and kept as narrow as possible.
- Access and haul roads to use existing farm tracks as far as possible.
- Construction camp, stockpiles and lay-down area to be located out of sight of district roads, possibly in the vicinity of the proposed substation and O&M buildings.
- Disturbed areas rather than pristine or intact land to preferably be used for the construction camp. Construction camp and laydown areas to be limited in area to only that which is essential.
- Measures to control wastes and litter to be included in the contract specification documents.
- Provision to be made for rehabilitation/ re-vegetation of areas damaged by construction activities.

In order to maintain biodiversity the Alien Invasive, Plant Rescue and Protection and Re-vegetation and Habitat Management Plans must be adhered to.

In addition the following actions should be implemented by the Contractor and Project Company:

- Promote environmental awareness in all employees and sub-contractors and create an understanding of the environmental sensitivities of the project site;
- No waste, including organic matter may be disposed of anywhere on site, except in provided bins placed at convenient locations, especially during the construction period. Disciplinary actions should be taken against littering;
- Open spaces are to be kept free of alien plants and weeds;
- Indigenous plants may not be collected or removed from the site;
- Access to the facility should be strictly controlled;
- All visitors and contractors should be required to sign-in; and

- Signage at the entrance should indicate that disturbance to fauna and flora is strictly prohibited.

The following activities should not be permitted by anyone except the landowner or his representatives:

- No fires within the site;
- No hunting, collecting or disturbance of fauna and flora, except where required for the safe operation of the facility and only by the Environmental Officer on duty and with the appropriate permits and landowner permission;
- No driving off of demarcated roads; and
- No interfering with livestock.

2.1 Grazing Management

The development of the wind energy facility will not prevent the site from being used for its current landuse of extensive livestock production. Extensive livestock grazing is compatible with biodiversity maintenance provided that it is implemented according to the basic principles of sustainable grazing management.

3 TRANSPORT AND TRAFFIC MANAGEMENT PLAN

3.1 Traffic Management Plan

The objective of the traffic management plan is the prevention of incidents from the use of vehicles and disturbance of local traffic on public roads during the construction, operation and decommissioning phases of the proposed projects. Traffic volumes are most likely to increase during the construction phase. However, due to the remote location of the site, and the low volume of traffic on public roads in the area the impact is expected to be low.

Actions to be implemented by the Contractor and Project Company:

- Site-specific traffic plan to be developed and implemented during the detailed design phase prior to construction;
- Limit use of private cars by arranging mini bus transport service for workers;
- Monitor for overloading of vehicles;
- Use only well trained, suitably qualified and experienced drivers in possession of an appropriate and valid driver's license;
- All vehicles must be roadworthy and serviced regularly;
- Clear and visible signage must be placed on and around site, clearly demarcating safe entry and exit points;
- Require all drivers to abide by standard road and safety procedures on site;
- When travelling on public roads all speed limits and rules of the road must be adhered to; and
- Limit dust generation by applying dust suppressants and postponing dust generating activities during period of strong winds and enforcing a strict speed limit of 40 km/h on unpaved roads.

Monitoring actions to be conducted by the ECO:

- Maintain incidents/complaints register for community complaints; and
- Monitor dust generation and implementation of management actions detailed above.

3.2 Transport Management Plan

The Transport Management Plan aims to ensure the safe transportation of all components required for the construction of the proposed projects to the construction site. This includes the, turbines, substation transformers, electrical cables and pylon structures.

The following actions should be implemented by the developer and Contractor:

- Apply for all relevant permits for abnormal loads and route clearances with the relevant authorities prior to construction;
- Appoint a qualified specialist to conduct a detailed site-specific Transport Risk Assessment during the detailed design phase and prior to construction;
- Determine the pre-construction condition of the road immediately prior to construction by carrying out a condition assessment or from recent pavement management system condition assessments if available from the Provincial Authorities;
- Public notices regarding any planned abnormal load transports must be placed at the construction site to inform affected parties;
- Abnormal loads must conform with legal maximum dimensions, and vehicles carrying abnormal loads must display sufficient signage; and
- Any roads damaged during the transportation of components, or from other construction vehicles must be rehabilitated and returned to pre-construction conditions.

The ECO must conduct site audits and report non-compliance with the above-mentioned conditions.

4 REVEGETATION AND HABITAT REHABILITATION MANAGEMENT PLAN

The Revegetation and Habitat Rehabilitation Plan addresses the need to mitigate all impacts leading to disturbed vegetation, loss of species and/or agricultural potential, disturbed soil surfaces, and generally bare soils prone to erosion and further degradation on the proposed development site. The plan overlaps to some degree with the Erosion Management Plan (below), and for successful rehabilitation, it is imperative that this plan is at all times used in conjunction with other EMPs mentioned.

The objective of the plan is therefore to provide:

- Protocols for the removal, temporary storage and replanting of plant species of conservation concern
- Protocols for the rehabilitation of vegetative cover across the project area
- Tools for planning the rehabilitation work and responding to unforeseen events
- Guidelines on implementation and post-implementation tasks
- Criteria for evaluating rehabilitation success
- A summary of items to be included in the rehabilitation budget to ensure that there is sufficient allocation of resources on the project budget so that the scale of EMP-related activities is consistent with the significance of project impacts

The objective of rehabilitation and revegetation of the development area is:

- Preventing the loss of species either directly or through future extinction and minimising impacts of development on population dynamics of species of conservation concern.
- Preserving the natural configuration of habitats as part of ecosystems, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist.
- Preserving or re-creating the structural integrity of natural plant communities. Actively aid the improvement of indigenous biodiversity according to a desirable end state according to a previously recorded reference state. This reference state, if healthy, will be dynamic and able to recover after occasional disturbances without returning to a degraded state.
- Improving the ecosystem function of natural landscapes and their associated vegetation.
- Successful rehabilitation can only be achieved with:
 - A long-term commitment;
 - Practical, adaptive management; and
 - Viable goals of desired outcomes.

Prior to vegetation rehabilitation, all relevant stakeholders involved should be consulted to determine:

- What the rehabilitation is ultimately aiming for– rehabilitation of cropping/grazing lands or rehabilitation of indigenous vegetation, after soil erosion and storm water management is in place and Alien Invasive Plants (AIPs) have been cleared?
- A clear definition of incompatible and compatible vegetation on and in the immediate surroundings of the development must be defined and maintained as such. No tree or shrubs shall be allowed to grow to a height in excess of the horizontal distance of that tree or shrub from the nearest newly developed structure or to grow in such a manner as to endanger the development or its operation
- Who will take long-term ownership and hence responsibility for the rehabilitation and its subsequent monitoring and management? Continued monitoring of vegetation establishment and composition, as well as erosion detection will have to be coupled with continued follow-up maintenance of rehabilitation and erosion control from commencement of activity up to the decommissioning phase.

- The ultimate objective for rehabilitation should focus on the stabilisation of soil erosion, retaining agricultural potential of transformed areas and /or the establishment of a dense and protective plant cover and the maintenance of habitats to enable vegetation to persist and flourish on rehabilitated areas indefinitely, ultimately relying only on environmental resources.

4.1 Map and create management areas

The project infrastructure footprint area must be mapped and divided into management areas indicating:

- Current land cover;
- Roads and residential;
- Areas with AIPs, subdivided further into sparse/dense infestations;
- Transformed areas; and
- Untransformed indigenous vegetation.

For every one of the management areas, the project proponent or contractor, in consultation with the landowner, will have to decide what intervention will be necessary, desirable, and feasible to enable the development of the project and long-term sustainable maintenance of infrastructure. Thus for every management area there must be an operational outline on:

- what will happen there;
- what needs to be mitigated – including storm water- and erosion management;
- which management units need priority intervention/mitigation;
- how will this mitigation be done (method statements) including schedule of work;
- realistic and desirable end states including list of species that should be established to initiate rehabilitation after initial revegetation;
- approximate timeframes;
- monitoring protocol to evaluate success or failures of interventions;
- establish permanently marked transects and monitor with fixed-point photography who will be responsible for doing what how will different actions be integrated to achieve and maintain or improve the desirable end state of the environment of that management unit.

Special attention will have to be given to drainage zones, as these not only have very active morphodynamics, but are also distributors of seeds – both indigenous and of IAPs. Thus clearing a downstream invasion of aliens to enable maintenance of the development will be futile if the upstream IAPs are not cleared or at least aggressively controlled.

4.2 Setting realistic rehabilitation goals

Rehabilitation efforts typically aim at improving ecosystem function that consists of a series of processes, which can in the end be evaluated against a desired outcome or reference state of the vegetation and environment.

Attainable goals of rehabilitation on the project area should be possible and viable for at least the following:

- Stabilisation of soils;
- Stabilisation of riparian areas;
- Storm water reduction through management and wetland integrity; and
- Clearing of AIPs.

The degree to which AIPs can be cleared from the project area needs to be determined according to desirability, available project funding, personnel and project requirements.

Restoring and/or rehabilitating vegetative cover on non-transformed areas to obtain an acceptable vegetation cover that can be maintained or persists on its own indefinitely.

4.3 Remove or ameliorate the cause of degradation

This will include:

- Physical rehabilitation of topsoil where it has been removed.
- Topsoil on areas that have not been cultivated are considered as the upper 20 - 30 cm only. These contain the most important nutrients, micro flora and –fauna essential for nutrient cycling processes. Topsoils are also an important source of seeds.
- Subsoils and overburden substrata lack the above elements and will first have to be used for physical rehabilitation of landscapes as and where necessary, and then overlain with topsoils
- Stabilisation of topsoils and prevention of erosion – refer to the Erosion Management Plan.
- Removal of all invasive vegetation – refer to the Alien Invasive Management Plan.
- Where it is desirable to use brush or logs of the cleared vegetation for soil stabilisation, such material must be free of regenerative material – e.g. seeds or root suckers.

4.4 Initial Revegetation

Immediately after clearing of vegetation, the soil surface must be inspected for signs of erosion and stabilised as soon as possible. After completion of construction, such erosion stabilisation should preferably be with a cover of vegetation. A dense initial grass or other perennial cover will be desirable. The appropriate seed mix should be determined in consultation with an ecologist familiar with the area. The aim of the first vegetation cover is to form a protective, relatively dense indigenous layer to slow runoff, increase moisture infiltration into the soil, and gradually change the soil nutrient status in order for it to be more favourable for other desirable indigenous vegetation to become established.

4.5 Natural seed banks and improvement of plant structural and compositional diversity

It is expected that soil seed banks of indigenous vegetation will be present to initiate initial vegetation cover, but may not be sufficient to establish an acceptable cover of desirable species. After deciding which indigenous species should be re-introduced, seed should be ideally collected from site or an environmentally-matched site nearby.

Seed collection may be done throughout the year as seed ripens, but can also be restricted to summer, when a large amount of the perennial seed should have ripened. Seeds should be stored in paper or canvas bags dusted with insecticide, and sown at the onset of the rainy season.

Alternatively, slower-growing perennials may be raised from seed or cuttings in a nursery and then transplanted once established. It will be beneficial to investigate if community members would be able to create and maintain such a nursery, or if there are nurseries in the area, that raise indigenous flora from the area.

The final vegetation cover should resemble the original (non-encroached) vegetation composition and structure as far as practicable possible or permissible within each management unit.

For drainage areas:

First restore drainage line morphology following the guidelines of the Erosion Management Plan – without that ecological recovery cannot be initiated.

Determine if natural seed sources may be present further upstream.

If such upstream seed sources are still present, rehabilitation of riparian vegetation after soil erosion management will most likely occur naturally, PROVIDED that follow-up monitoring of the establishment of vegetation is carried out, and all invasive species eradicated as they emerge. This can only be achieved with a long-term commitment (> 5 years minimum).

Should no upstream seed resources be available, suitable species (as determined in consultation with an ecologist) should be sown or planted.

4.6 Monitoring and follow-up action

Throughout the lifecycle of the development, regular monitoring and adaptive management must be in place to detect any new degradation of ecosystems affected by the development, and remedy these as soon as detected.

During the construction phase, the ECO and contractor will be responsible for initiating and maintaining a suitable monitoring system. Once the development is operational, the project proponent will have to identify a suitable entity that will be able to take over and maintain the monitoring cycle and initiate adaptive management as soon as it is required. Monitoring personnel must be adequately trained.

The following are the minimum criteria that should be monitored:

- Composition and density of replanted vegetation, distinguishing between species introduced for initial revegetation only and species that are part of the pre-determined desirable end state;
- Associated nature and stability of surface soils;
- It is recommended that permanent transects are marked and surveyed annually according to the LFA technique¹ adapted to integrate both surface soil characteristics and the vegetation to be monitored;
- Re-emergence of AIPs;
- If noted, remedial action must be taken immediately according to Working for Water specifications;
- Nature and dynamics of riparian zones;
- Stability of riparian vegetation;
- Any form of bank erosion, slumping or undercutting; and
- Stability of channel form and width of streams – if this increases, it shows that vegetation on plains and/or riparian areas and upper drainage lines are not yet in a stable enough state to be fully functional in reducing excess runoff and the ecosystem overall is losing valuable resources.

4.7 Timeframes and duration

Rehabilitation will occur during construction, as areas for the re-application of topsoil and revegetation become available or where revegetation can be initiated after clearing of invasives or to stabilise erosion.

The initial revegetation period post construction is estimated to be over a period of 6 (minimum) to 12 months (maximum), or a time period specified by the Horticultural Landscape Contractor and ECO, particularly if planting of trees and shrubs occurs.

¹ Tongway and Hindley 2004.

The rehabilitation phase (including post seeding maintenance) should be at least 12 months (depending on time of seeding and rainfall) to ensure establishment of an acceptable plant cover is achieved (excluding invasive plant species or weeds).

If the plants have not established and the acceptable plant cover is not achieved within the specified maintenance period, maintenance of these areas shall continue until at acceptable plant cover is achieved (excluding alien plant species or weeds).

Additional seeding or planting may be necessary to achieve acceptable plant cover. Hydroseeding may have to be considered as an option in this case.

Any plants that die, during the maintenance period, shall be replaced by the Horticultural Landscape Contractor (at the Horticultural Landscape Contractor's cost if it was due to insufficient maintenance).

Succession of natural plant species should be encouraged.

Monitoring of rehabilitation success and follow-up adaptive management, together with clearing of emerging invasives shall be carried on until the decommissioning phase has been completed.

5 PLANT RESCUE AND PROTECTION MANAGEMENT PLAN

5.1 Purpose

The purpose of the plant rescue and protection plan is to implement avoidance and mitigation measures to reduce the impact of the development on listed and protected plant species and their habitats. Although this report identifies those species suitable for search and rescue at the site, it is important to note that a preconstruction walk-through of the site would also be important to refine the list of species identified for search and rescue, as well as locate such species prior to construction.

The objective of reusing plants on the project area is to prevent the loss of species either directly or through future extinction and minimising impacts of development on population dynamics of species of conservation concern.

Preserving the natural configuration of habitats as part of ecosystems, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist.

5.2 Effect of removing individual species of conservation concern

Species of conservation concern are declining either due to overexploitation or because their range of occupancy is limited and further infringed on by development. Most plant populations require a certain minimum number of individuals within a population or metapopulation to allow for sufficient genetic transfer between individuals. This prevents genetic erosion and hence weakening of the ability of individuals to persist in their environments. Similarly, where the distance between metapopulations is significantly increased due to fragmentation and the resultant loss of some populations, populations may suffer genetic decline due to restricted movement of pollen. Pollinators or other species that depend on a particular plant species for a specific microhabitat or food source may be equally affected because of the reduction of available resources. Therefore the aim of plant rescue actions are always to maintain as many individuals of a plant population in as close proximity to the original habitat as possible to minimise loss of individuals and fragmentation of populations to prevent the creation of future extinction debts of the development.

5.3 Plant Rescue and Protection

Successful plant rescue can only be achieved if:

- Species can be removed from their original habitat with minimal damage to the plant, especially the roots.
- All plants removed are safely stored and treated according to their specific requirements prior to being transplanted again.
- They are relocated into a suitable habitat and protected from further damage and all disturbances to aid their re-establishment.
- Timing of planting activities is planned with the onset of the growing season.
- Steps are taken where necessary to aid the initial establishment of vegetation, including occasional watering.

5.4 Time of Planting

All planting shall be carried out as far as is practicable during the period most likely to produce beneficial results (i.e. during the peak growing season), but as soon as possible after completion of a section of earthworks.

Drainage line rehabilitation preparation must be done during autumn, and planting of appropriate species in these areas should commence during early spring after the first rains.

5.5 Plant Search and Rescue

Prior to construction, once all the areas where topsoil will be removed or areas will be transformed have been demarcated, the ECO and contractor will be responsible to remove all bulbous species from the topsoil, as well as succulents and small indigenous shrubs that can be transplanted. These are to be kept in a raised, protected position in a designated area until they can be replanted again as part of the rehabilitation process.

6 STORMWATER MANAGEMENT PLAN

The objective of the storm water management plan (SWMP) is to prevent increased soil erosion, to contain any contaminated run-off and to avoid water logging and pollution. The Erosion Management Plan must therefore be seen in conjunction with the SWMP. Actions are listed below that will ensure that storm water is channelled in a controlled manner from roads and infrastructure towards natural drainage lines, without impeding natural surface flows.

- Develop and implement a site-specific storm water management plan during the detailed design phase of the projects and prior to construction;
- In the detailed design phase of the project minimise any water crossings and utilise existing roads wherever possible;
- Enforce 32 m construction buffers of all rivers, streams and waterbodies;
- Should new roads be required to cross any banks or channels these must be secured with erosion protection (i.e. gabions etc.);
- Monitor for erosion during the clearing of vegetation;
- Avoid hard-engineered surfaces (i.e. construct gravel roads and not asphalt roads wherever possible);
- Roads in steep areas must be equipped with side drainages and culverts that channel the run-off to natural drainage lines without gaining velocity and causing erosion;
- Construction camps and temporary ablution facilities must be located beyond the 1:100 year floodline;
- Stockpiles must be located on flat areas and protected from erosion;
- The substation site design must include side water outlets and an adequate slope to allow storm water run-off from the paved areas; and
- Prevent surface run-off from areas of potential contamination.

7 EROSION MANAGEMENT PLAN

7.1 Purpose

The purpose of the erosion management plan is to implement avoidance and mitigation measures to reduce the erosion potential and the likely impact of erosion associated with the construction and operational phases of the proposed facility. As part of the management plan, measures to protect hydrological features from erosion damage are included.

7.2 Scope and Limitations

This plan is intended at introducing measures aimed at 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 potential 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.

7.3 Background

7.3.1 Types of Erosion

Erosion comes in several forms, some of which are not immediately obvious. 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 meter into the air. Apart from loosening soil particles, the effect can also break soil aggregates apart and form a clay seal on the surface which resists infiltration and results in increased levels of runoff. This effect is most important when large areas of exposed soils are present. If the site is cleared, then this effect will play an important role as it results in the soil surface becoming sealed which reduces infiltration and increases runoff, leading to erosion.

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. This is likely to be an important erosion type at the site given the gently sloping nature of the site and the susceptible soils.

Rill Erosion

This is the removal of soil from the surface whereby small channels or rills up to 300 mm 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.

Wind Erosion

Wind erosion results from soil particles being picked up, bounced or moved by the wind. Wind erosion is primarily a problem in arid areas and may affect sands soils as well as fine-textured soils. Vegetation cover is usually an effective barrier to wind erosion, but large soils losses or degradation can occur in disturbed areas or on croplands.

7.3.2 Promoting Factors

Rainfall characteristics

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.

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 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 cover such as vegetation and mulch 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. In this regard it is important to note that many of the practices which are used to enhance rehabilitation potential are also useful in reducing erosion potential.

7.3.3 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;
- Progressively revegetate or stabilise disturbed areas; and
- Prevent damage to hydrological features such as drainage lines or wetlands, either within or adjacent to the site.

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.
9. Inspect and maintain control measures.

7.3.4 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 should be 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 unseasonal showers 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.
- 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.

7.4 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.

7.5 Runoff Concentration

The increase in hardened surfaces associated with roads, and other infrastructure will lead to a significant increase in volume and velocity of flow generated from these areas during large rainfall events.

Runoff from road surfaces is usually channelled off 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.

7.5.1 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. Should the access road to the site traverse any major drainage lines, the following principles should apply:

- 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;
- 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 and
- Monitoring Requirements.

7.5.2 Construction Phase

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

Monitoring Action	Indicator	Timeframe
Identify all river and drainage line crossings affected by the development	Map of sites of potential concern	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 or 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

7.5.3 Operational Phase

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

Monitoring Action	Indicator	Timeframe
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

8 FIRE MANAGEMENT PLAN

The National Veld and Forest Fires Act, 1998 (#101 of 1998) states that it is the landowner's responsibility to ensure that the appropriate equipment as well as trained personnel are available to combat fires.

Although fires are not a regular occurrence at the site, fires may occasionally occur under the right circumstances. Ignition risk sources in the area include the following:

- Lightning strikes;
- Personnel within the facility; and
- Infrastructure such as transmission lines.

8.1.1 Firebreaks

Extensive firebreaks are not recommended as a fire risk management strategy at the site. The site is very large compared to the extent of the infrastructure and the maintenance of firebreaks would impose a large management burden on the operation of the facility. In addition, the risk of fires is not distributed equally across the site and within many of the lowlands of the site, there is not sufficient biomass to carry fires and the risk of fires within these areas is very low.

Targeted risk management should rather be implemented around vulnerable or sensitive elements of the facility such as substations or other high risk components. Within such areas, the extent over which management action needs to be applied is relatively limited and it is recommended that firebreaks are created by mowing and that burning to create firebreaks is not used, as this in itself poses a risk of runaway fires.

Where such firebreaks need to be built such as around substations, a strip of vegetation 5 - 10 m wide can be cleared manually and maintained relatively free of vegetation through manual clearing on an annual basis. However, if alien species colonise these areas, more regular clearing should be implemented, in consultation with the landowner