



# ARCUS

An ERM Group Company

## VOLUME I

### ENVIRONMENTAL MANAGEMENT PROGRAMME for the DARLING 1B WIND ENERGY FACILITY, WESTERN CAPE PROVINCE

On behalf of

**DARLING WIND POWER (PTY) LTD**

MAY 2023

DFFE REFERENCE: 14/12/16/3/3/1/2342

DRAFT FOR PUBLIC COMMENT

VERSION 2.0



Prepared By:




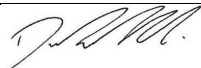



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**QUALITY MANAGEMENT SYSTEM**

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<b>Signature</b>			
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## DEVELOPMENT DETAILS

<b>DFFE EMPr Reference:</b>	<b>To be Confirmed</b>
<b>DFFE Reference:</b>	14/12/16/3/3/1/2342
<b>Arcus Reference:</b>	4982 Darling 1B WEF Final EMPr
<b>Title:</b>	Environmental Management Programme for the Darling 1B Wind Energy Facility, Western Cape Province
<b>EAP:</b>	Ashlin Bodasing - Arcus Consultancy Services South Africa (Pty) Ltd, 2019 Ashlin Bodasing - Arcus Consultancy Services South Africa (Pty) Ltd, 2022
<b>Consultant:</b>	Aneesah Alwie - Arcus Consultancy Services South Africa (Pty) Ltd, 2022
<b>Project Developer (Applicant):</b>	Darling Wind Power (Pty) Ltd
<b>Report Status:</b>	<u>Draft of Final EMPr and Site Layout for comment</u> Version 2.0 – Submission in Compliance with Conditions 17, 18, 19 and 20 of the Environmental Authorisation

## PUBLIC PARTICIPATION DETAILS

This Environmental Management Programme (EMPr) has been updated based on the relevant conditions in the Environmental Authorisation (EA) and final design layouts of the development.

**Invitation to Comment:** Members of the public, local communities, and stakeholders are invited to comment on this final EMPr which is available for public review and comment at the following locations.

Location	Physical Address
<b>Hard Copy / CD Copy Location</b>	
Yzerfontein Municipality	46 Main Road, Yzerfontein, 7351
<b>Electronic Copy Locations</b>	
Arcus Website	<a href="https://www.erm.com/">https://www.erm.com/</a>
Electronic Transfer	I&APs can request for copies to be shared via a One Drive folder.
<b>Comment Submission</b>	
Contact Person	Ashlin Bodasing
Company	Arcus Consultancy Services South Africa (Pty) Ltd
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Via E-mail	<a href="mailto:darling@arcusconsulting.co.za">darling@arcusconsulting.co.za</a>
Via Online Portal	<a href="#">Darling Aida Form</a>

Following the 30-day public consultation period, the Final EMPr including the Final Site Layout, will be submitted to the Department of Forestry, Fisheries and the Environment for approval prior to commencement of any activity.

## **Glossary of Terms**

**Construction Phase:** The activities pertaining to the preparation for and the physical construction of the proposed development

**Contractor:** Persons/organisations contracted by the Developer to carry out parts of the work for the proposed project

**Engineer / Project Director (PD):** Person/organisation appointed by the Developer to oversee the work of all consultants, sub-developers, contractors, residents and visitors.

**Environment:** The environment is defined as the surroundings within which humans exist and that are made up of – the land, water and atmosphere of the earth; micro-organisms, plant and animal life; any part or combination of (i) and (ii) and the interrelationships among and between them; and the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

**Environmental and Social Manager (ESM) also known as the Environmental Control Officer (ECO):** Person/organisation appointed by the Developer who will provide direction to the Principal Agent concerning the activities within the Construction site. The ECO will also be responsible to liaise with the independent auditor who will conduct an environmental audit during the construction phase of the project according to the provisions of the Environmental Management Programme.

**Independent Auditor:** The person or entity who will conduct an environmental audit during the construction phase of the project according to the provisions of the Environmental Management Programme and Environmental Authorisation.

**Environmental Management Programme (EMPr):** The EMPr is a detailed plan for the implementation of the mitigation measures to minimise negative environmental impacts during the life-cycle of a project. The EMPr contributes to the preparation of the contract documentation by developing clauses to which the contractor must adhere for the protection of the environment. The EMPr specifies how the construction of the project is to be carried out and includes the actions required for the Post-Construction Phase to ensure that all the environmental impacts are managed for the duration of the project's life-cycle.

Therefore the EMPr will be a working document, which will be reviewed when necessary, or if required by the authorities. A revision will be done once the detailed design of the proposed development has been completed.

**Operational Phase (Post Construction):** The period following the Construction Phase, during which the proposed development will be operational.

**Pre-Construction Phase:** The period prior to commencement of the Construction Phase, during which various activities associated with the preparation for the Construction Phase: detailed final designs, micro siting, etc. will be undertaken.

**Rehabilitation:** Rehabilitation is defined as the return of a disturbed area to a state which approximates the state (where possible) which it was before disruption. Rehabilitation for the purposes of this specification is aimed at post-reinstatement revegetation of a disturbed area and the insurance of a stable land surface. Revegetation should aim to accelerate the natural succession processes so that the plant community develops in the desired way, i.e. promote rapid vegetation establishment.

**Site Manager:** The person, representing the Contractor, responsible for all the Contractor's activities on the site including supervision of the construction staff and activities associated with the Construction Phase.

**Project Area:** This refers to the authorised area for the proposed development to take place. Farm portions numbers are outline in the EMPr.

**Local Community:** People residing or present in the region and near the construction activities, including the owners and/or managers of land affected by construction, workers on the land, and people in nearby towns and villages.

**Public:** Any individual or group concerned with or affected by the Project and its consequences, including the local community, local, regional, and national authorities, investors, workforce, customers, consumers, environmental interest groups, and the general public.

**Construction Area / Site:** The land on which the Project is to be located. It includes the site, construction campsite, access roads and tracks, as well as any other area affected or disturbed by construction activities. The EMPr (particularly the specifications for rehabilitation) is relevant for all areas disturbed during construction.

**Access Roads and Tracks:** All newly established roads and tracks, and areas cleared or driven over to provide access to/from the construction areas, and for the transportation of the construction workforce, equipment and materials.

**Environmental Impact:** The effect of an activity on the environment, whether desirable or undesirable. Undesirable or negative environmental impacts will result in damage and/or pollution of, or detriment to the environment, or in danger to the public, whether immediate or delayed.

**Environmental Incident:** An unexpected or sudden occurrence related to the Project, including major emissions, spills, fires, explosions, floods or erosion leading to serious or potentially serious negative environmental impacts.

**Fugitive Dust:** Can be defined as natural and/or human-associated dust becoming airborne due to the forces of wind or human activity.

**Fauna and Flora / Plants and Animals:** Any individual or group of micro-organisms, plants or animals.

**General Waste and Construction Rubble** It includes waste paper, board, cardboard, benign organic and domestic waste and uncontaminated construction debris such as used bricks, wood, waste concrete, unused subsoil and rubble from excavations or demolished structures.

**Heritage Sites and Artefacts:** Heritage sites and artefacts can be defined as any object or site of cultural, historical, archaeological or palaeontological significance found in or on the land. Historical objects are objects older than 50 years with architectural, historical, scientific, cultural, social, spiritual, linguistic, technological or aesthetic value. For example: buildings or parts thereof, graves or burial sites, milestones, numismatic objects (i.e. coins and beads), and military objects.

**Archaeological objects** include material remains resulting from human activity which are older than 100 years and which are in a state of disuse, such as tools, artefacts, human and hominoid remains and artificial features and structures.

**Palaeontological objects** include any fossilised remains of animals or plants.

**Hazardous Substances:** Substances which are potentially dangerous and may affect human and/or environmental health. This would be because of the substances' inherent chemical and physical composition, which could be toxic, poisonous, flammable, explosive, carcinogenic or radioactive. Hazardous waste includes, but is not limited to: human excrement, the by-products and wastes associated with the use of hazardous substances (i.e. used fuel, oil, lubricants and solvents), as well as items such as spent batteries, old oil filters, light bulbs, tyres, circuit boards, etc. which requires special collection and handling. When left abandoned, even substances such as scrap metal, wire, tins, broken glass and plastic could be harmful to people, wild and domestic animals. For example: plastic could be ingested by animals; people and animals could be injured by broken glass or metal objects; and animals could get trapped in drums, tins and bottles or get entangled in plastic or metal wiring. Even if buried, such objects may become exposed over time due to wind erosion, scavengers or future human activities. Because of the sensitive nature of the area, these substances are all regarded as 'hazardous waste' for the purposes of this EMP.

**Hydrological Features:** Hydrological features include, but are not limited to:

- wetlands;
- open water;
- vegetated drainage channels;
- subterranean water;
- marine environments;
- estuarine environments.

**Life Support Systems:** Life support systems include, but are not limited to: an ecological system in which its outputs are vital for sustaining specialised habitats; an ecological system in which its outputs are vital for sustaining human life (e.g. water purification).

**Mitigation:** Environmental management measures designed to avoid, limit or remedy undesirable environmental impacts.

**Monitoring:** Structured observation, measurement and evaluation of environmental data over a period of time to assess the efficiency of environmental mitigation and rehabilitation measures.

**Rehabilitation:** Measures implemented to restore a damaged Environment.

**Sensitive Sites:** Environmentally sensitive sites include, but are not limited to:

- Areas with high conservation value due to the presence of important plant specimens, pristine habitats, high biodiversity, important water resources or heritage features and artefacts;
- Areas particularly prone to erosion once disturbed (i.e. steep slopes);
- Vulnerable areas with low potential for rehabilitation / slow rate of recovery (i.e. rock outcrops, steep slopes); and
- Areas in close proximity of sensitive receptors, such as farm homesteads, viewpoints or tourist stopovers.

**Specialised habitats:** Specialised habitats include, but are not limited to, areas which are:

- Priority breeding habitats;
- Refuge areas;
- Vital for species survival (important for, part, or all of its life cycle);
- Essential for species performance;
- Cryptic habitats, etc.

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## 1 INTRODUCTION

Darling Wind Power (Pty) Ltd ('DWP' – the Developer), received environmental authorisation (EA) to develop the Proposed Darling 1B Wind Energy Facility (D1B WEF) and decommission the operational Darling National Demonstration Wind Farm (existing D1 WEF), located near the town of Darling and Yzerfontein, in the Western Cape Province.

The EA includes approval for the construction of two turbines, a Battery Energy Storage System (BESS), associated infrastructure, and the staged decommissioning of the existing operational Darling National Demonstration Wind Farm (existing D1 WEF), here-on referred to as 'the development'. The development site is located on Portion 3 of Farm Slang Kop No. 552, approximately 9.5 km east of Yzerfontein and 13 km north-west of the town of Darling and is located near the junction of the R315 and R27 on the west coast of the Western Cape, South Africa. The existing Darling National Demonstration Wind Farm is located on the same property and access to the development is via the R315 (Figure 1).

This Environmental Management Programme (EMPr) for the development represents the updates to the previous EMPr submitted with the Final Basic Assessment Report (Arcus, 2019) and is prepared as part of the requirements of the EIA Regulations promulgated under the National Environmental Management Act, 1998 (Act 107 of 1998), as amended. The EMPr outlines measures to be implemented in order to minimise adverse environmental degradation associated with the various phases of the development. It serves as a guide for the contractor and the construction workforce on their roles and responsibilities concerning environmental management on site, and it provides a framework for environmental monitoring throughout the life cycle of the development, i.e., from Design phase until after Decommissioning phase.

This document must be seen as dynamic, and be updated when and if required, throughout the lifecycle of the project.

### 1.1 Details of the Developer and the Environmental Assessment Practitioner

<b>Details of the Developer (Applicant)</b>	
<b>Project Applicant</b>	Darling Wind Power (Pty) Ltd
<b>Company Registration</b>	2004/012258/07
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<b>Environmental Assessment Practitioner</b>	
<b>EAP</b>	Ashlin Bodasing
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<b>Qualifications</b>	Bachelor of Social Science (Geography and Environmental Management)
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**Table 1-1: EMPr Authors and Co-authors**

<b>Final EMPr Process Management Team</b>		
Ashlin Bodasing	Arcus Consultancy Services SA (Pty) Ltd	Technical Director and EAP
Aneesah Alwie	Arcus Consultancy Services SA (Pty) Ltd	Consultant
<b>Development Specialist Team</b>		
Johann Lanz	Independent Consultant	Geology, Soils and Agriculture Specialist
Dr Brian Colloty	EnviroSci	Freshwater and Wetlands Specialist
Dr Owen Davies	Arcus Consultancy Services SA (Pty) Ltd	Terrestrial Ecological Specialist (Flora and Fauna)
		Avifauna Specialist (Birds)
Jamie Pote	Independent Consultant	Ecology Peer Review
Tyron Clark	The Biodiversity Company	Avifaunal Peer Review
Jonathan Aronson <sup>1</sup>	Camissa Sustainability Consulting	Bats Specialist
Mark Hodgson	Arcus Consultancy Services SA (Pty) Ltd	Bats Specialist
Monika Moir	Independent Consultant	Bats Peer Review
Alan Moore	Arcus Consultancy Services Ltd	Noise Specialist
Morné De Jager	Enviro Acoustic Research	Noise Peer Review
Quinton Lawson and Bernard Oberholzer	Qarc and BOLA	Visual and Landscape Specialist
John Gribble	ACO Associates	Cultural Heritage, Archaeology and Palaeontology Specialist
Tony Barbour	Tony Barbour Environmental Consulting and Research	Socio-Economic Specialist
Mandy Jablonksi (nee Westwood) and Victor de Abreu	SMEC	Traffic Specialist

<sup>1</sup> Jonathan Aronson has subsequently left Arcus.

## 1.2 Purpose and Aims of this Document

An EMPr for the proposed development is required in terms of the Appendix 4 of the National Environmental Management Act, 1998 (Act 107 of 1998), EIA Regulations of 2014 (GNR 326), as amended.

According to the Western Cape's Department of Environmental Affairs and Development Planning (DEA&DP) Guideline for Environmental Management Plans (Lochner 2005), the *over-arching objectives of an EMPr is (1) to ensure compliance with regulatory authority stipulations and guidelines, (2) to ensure sufficient allocation of resources on the project budget, (3) to verify environmental performance through information on impacts as they occur, (4) to respond to changes in project implementation not considered in the EIA, (5) to respond to unforeseen events and (6) to provide feedback for continual improvement in environmental performance.*

The aim of this EMPr is to achieve the above objectives by:

- Defining the environmental management objectives to be realised during the life of the project, in order to enhance benefits and minimise adverse environmental impacts;
- Describing detailed actions needed to achieve these objectives, and mechanisms that address changes in the project implementation, emergencies and unexpected events;
- Clarifying institutional structures, roles, communication and reporting processes;
- Describing the link between the EMPr and associated legislated requirements; and
- Describing requirements for record keeping, reporting, review and auditing.

The purpose of the EMPr is to:

- Encourage good management practices through planning and commitment to environmental issues;
- Define how the management of the environment is reported and performance evaluated;
- Provide rational and practical environmental guidelines to:
  - Minimise disturbance of the natural environment;
  - Prevent pollution of land, air and water;
  - Protect indigenous flora and fauna;
  - Prevent soil erosion and facilitate re-vegetation;
- Comply with all applicable laws, regulations, standards and guidelines for the protection of the environment;
- Adopt the best practicable means available to prevent or minimise adverse environmental impacts;
- Identify and mitigate against any potential impact on ecology;
- Describe all monitoring procedures required to identify impacts on the environment; and
- Train employees and contractors with regard to environmental obligations.

This EMPr will be updated to include inputs from interested and affected parties (I&APs) during the public review and comment period before final approval from the DFFE. Moreover, it should be considered critical that the EMPr be updated to include site-specific information and specifications as required throughout the life-cycle of the facility - this will ensure that project activities are planned and implemented taking into account a changing environment and sensitive environmental features.

**Table 1-2: Content of the EMPr in terms of the NEMA and Appendix 4 of the EIA Regulations of December 2014 (as amended)**

Appendix 4 Requirements NEMA, 1998 (Act No. 107 of 1998)		EMPr Reference
<i>(1) An EMPr must comply with section 24N of the Act and include-details of</i>		
<i>(a)</i>	<i>(i) the EAP who prepared the EMPr; and (ii) the expertise of the EAP to prepare an EMPr, including a curriculum vitae;</i>	Section 1.1
<i>(b)</i>	<i>A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;</i>	Section 3
<i>(c)</i>	<i>a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitives of the preferred site, indicating any areas that should be avoided, including buffers;</i>	Figure 3
<i>(d)</i>	<i>a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment processed for all phased of the development including- (i) planning and design; (ii) pre-construction activities; (iii) construction activities; (iv) rehabilitation of the environment after construction and where applicable post closure; and (v) where relevant, operation activities;</i>	Section 4 - 27
<i>(f)</i>	<i>a description of proposed impact management actions, identifying the manner in which the impact management outcomes and contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to- (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) comply with any prescribed environmental management standards or practices; (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and (iv) comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable;</i>	Section 4 - 27
<i>(g)</i>	<i>the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);</i>	Section 4 - 27
<i>(h)</i>	<i>the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);</i>	Section 4 - 27
<i>(i)</i>	<i>an indication of the persons who will be responsible for the implementation of the impact management actions;</i>	Section 4 - 27
<i>(j)</i>	<i>the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;</i>	Section 4 - 27
<i>(k)</i>	<i>the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);</i>	Section 4 - 27
<i>(l)</i>	<i>a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;</i>	Section 4 - 27
<i>(m)</i>	<i>an environmental awareness plan describing the manner in which- (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and</i>	Section 4 - 27

Appendix 4 Requirements NEMA, 1998 (Act No. 107 of 1998)		EMPr Reference
(n)	any specific information that be required by the competent authority.	Section 4 - 27

## 2 BASIC ASSESSMENT PROCESS

The application process for the proposed development commenced in 2020 and received EA in 2021. In the BA report, potential environmental impacts were evaluated according to their extent, duration, intensity and magnitude. The EMPr was developed and updated based on the findings and recommendations of the environmental assessments and Conditions of the EA for the development. The proposed Final Site Layout (Figure 2) and an Environmental Sensitivity Map (Figure 3) is attached to this EMPr.

### 2.1 Specialist Summary of Findings

#### *Soils and Agricultural Potential Impact*

The agricultural potential of the site was marginal for cultivation. The low rainfall and high evaporation, in combination with sandy soils that have low water holding capacity, was a significant limitation to agricultural production. As a result, the entire site was deemed unsuitable for viable and sustainable crop production.

The agricultural impact of the development was assessed as **low** because the amount of agricultural land that is excluded from agricultural use by the development is minimal; any reduction in agricultural production and employment is highly unlikely, and the land does not have high agricultural value.

#### *Freshwater and Wetlands (Aquatic)*

Although a variety of aquatic features were identified within the study area the overall impact on the aquatic environment was assessed as **low** significance after mitigation. This was based on the fact that the proposed structures will be located within disturbed areas, and making use of existing access roads that already have suitable crossings. Thus, no new or additional impacts are anticipated on the wetlands or delineated watercourses.

#### *Terrestrial Ecology*

Large portions of the site, particularly the eastern portion, was assessed as having a **low** ecological sensitivity as they are primarily highly transformed through agricultural or sand mining activities. These areas present an opportunity for development. Furthermore, the current level of invasion of alien plant species on the development site and the severe degradation and transformation of natural vegetation is high. Therefore, the combined effects of alien removal and propagation of native, endemic and endangered species, to rehabilitate transformed areas, would offset any potential negative ecological impact of the development and potentially improve the ecosystem functioning and connectivity on the site.

#### *Avifauna*

After one year of pre-construction monitoring, activity and abundance of priority species and red data species were generally found to be high on the proposed development site. This activity was highest in the western portion of the development site which contains certain features such as Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs), natural vegetation and a hill-slope utilised by various species, notably Black Harrier and Great White Pelican. It was determined that the impacts to small passerines was likely to be low as the abundances of small passerines was found to be relatively low, with a relatively low diversity of species recorded.

The small size of the development combined with their placement, adjacent to the existing operational Wind Turbine Generators (WTGs) and in the far eastern portion of the development site, makes it unlikely that the development will have a significantly higher impact on avifauna than currently exists on the site.

While only limited interpretations could be made from the carcass search programme conducted on the existing D1 WEF, the existing facility did not appear to have a significant negative impact on the avifauna in the area.

Furthermore, it was considered that the proposed decommissioning of the existing WTGs may reduce the impact on the site through the reduction of obstacles on the landscape and the higher minimum blade tip height of the Darling 1B WEF, will likely further reduce the current risk of impact to small passerines and species that forage low to the ground such as Black Harrier.

As no turbines will be placed within no-go or high sensitivity areas and power line connections will be buried, and with the implementation of mitigation measures proposed, the **likelihood of the development posing a significant negative impact on avifauna in the area was reduced to acceptable levels.**

### ***Bats***

The existing D1 WEF was assessed as having high impact to bats. This high impact is likely driven by the small turbines size, with blades that sweep down to 18 m above the ground. Bat activity and bat species diversity are lower towards ground level relative to heights between 40 m and 100 m (Arcus, unpublished data). Therefore, the majority of bats flying in the vicinity of the turbines at the existing Darling WEF are very likely to encounter collision with the existing turbine blades.

The turbines proposed for the Darling 1B WEF will be significantly larger than the existing four turbines. The hub heights will be up to 165 m high and the rotor diameters will be up to 160 m, thus the minimum blade sweep of the new turbines will be higher than the existing turbines. The minimum blade sweep heights for the proposed turbines will be 35 m above the ground.

The impacts assessed for the development will be **low** to negligible after mitigation. The cumulative impacts associated with the decommissioning of the existing Darling WEF are predicted to ultimately have a high positive impact when they are completely removed but will persist as negative impacts until such time.

The infrastructure footprint of the development will likely be sufficiently low, including cumulatively, relative to the remaining habitat and resources available for bats in the region. Therefore, the impacts of roost disturbance and/or destruction, habitat modification and displacement would not result in unacceptable levels of impacts to bats.

Acceptable limits for bat mortality have been managed by avoiding the placement of turbines in habitats that are important to bats. The application of buffers will reduce mortality risk, as will the design of the turbines which have blades that would not sweep down lower than 85 m from the turbine hub and in doing so will reduce the diversity of species and numbers of individual bats encountering the turbine blades.

### ***Noise***

Noise due to the construction and operation of the proposed development was determined at the closest and therefore most noise-sensitive property. The predicted noise levels were assessed against a number of criteria incorporating South African and international guidance and was assessed as **low** with mitigation for each phase of the development, and cumulative impacts were limited to the operational phase only.

### ***Heritage, Archaeology and Palaeontology***

A Notice to Intent (NID) Application was submitted to Heritage Western Cape (HWC) in February 2021. In response to the NID application, HWC (09 March 2021) notified the applicant that “**there is no reason to believe that the proposed expansions of the Darling Wind Energy Facility on Portion 3 of Farm Slang Kop 552 will impact on heritage resources.**” “However, should any heritage resources, including evidence of graves and human burials, archaeological material and paleontological material be discovered during the construction of the D1B WEF, all works must be stopped immediately and Heritage Western Cape must be notified without delay”.

### *Visual / Landscape*

It was assessed that the visibility of the two proposed wind turbines is limited from some viewpoints because of view shadows created by Moedmaag Hill and by the hilly topography generally.

As four wind turbines have already been established on the site, the locality has already become a *bona fide* wind facility site. With two proposed wind turbines, this would remain a comparatively small wind farm in visual terms, considering the eventual decommissioning of the existing four turbines. In addition, the site can be returned to its original state if and when the development is decommissioned.

The overall visual impact significance of the proposed development was calculated as high. However, given that only two wind turbines are proposed, and that the existing four turbines would be decommissioned, coupled with that fact that the site is already considered a wind facility, the visual impact significance would more likely be **medium**. The BESS and O&M buildings and internal access roads would be of low visual significance after mitigation. The cumulative visual impact significance of the development is expected to be **low** because of the small size of the wind farm in comparison to wind farms being proposed elsewhere, such as the larger proposed Slangkop and Moyeng Energy wind farms nearby and others proposed elsewhere in the local area.

### *Social*

The development represents an investment in clean, energy infrastructure. Given the negative environmental and socio-economic impacts associated with a coal-based energy economy and the challenges created by climate change, this represents a significant positive social benefit for society as a whole.

The socio-economic findings indicated that the development will create employment and business opportunities for locals during both the construction and operational phase. The opportunities during the operational phase will however be limited due to the small size of the facility. The significance of all the potential negative impacts with mitigation were assessed as **low**, and can be effectively mitigated if the recommended mitigation measures are implemented.

### *Traffic*

The generated peak hour trips during all phases of development are expected to remain **negligible** on the surrounding transport network and no permanent road traffic mitigation measures was identified.

The highest numbers of trips are expected during the construction of two new wind turbines and the decommissioning of 4 existing turbines. As the construction and decommissioning phases for the proposed wind turbines and decommissioning of the existing turbines are short-term, the cumulative impacts of heavy vehicles on the road infrastructure are within the normal design limits of provincial roads and should have negligible effects on the rehabilitation of provincial roads.

The existing site access point has previously been used for construction vehicles during the development of the existing Darling Facility and existing access points are therefore deemed to be suitable for similar use during the various phases of the current development.

### ***Overall Specialist Summary***

The development will have limited negative impact on the surrounding environment. **Identified impacts can be mitigated to acceptable levels, based on specialist assessment, and are generally of low negative, and high to low positive significance** (see Summary tables provided in Section 6, 7 and 9 of this EMPr).

The majority of potential impacts identified to be associated with the construction and operation of the development are anticipated to be localised and restricted to the development site. The impacts of the staged decommissioning of the existing Darling 1 WEF are also localised and will not cause any adverse effect to the environment as long as mitigation measures are adhered to. It has been assessed that the decommissioning of the existing facility will have a positive impact.

The potentially sensitive areas / environmental features that have been identified include:

- Wetlands and watercourses;
- Sensitive vegetation (such as the Ecological Support Areas and Critical Biodiversity Areas);
- Dwellings and Buildings located around the development site; and
- Bird and Bat species of conservation concern.

## **2.2 EMPr Update**

Condition 15 of the EA (DFFE Reference 14/12/16/3/3/1/2342), established that the EMPr was not approved and should be amended to include measures as dictated by the final site lay-out map and micro-siting, and the provisions of the EA. The EA does not specifically include recommendations for specialists to conduct a site walkthrough prior to the finalisation and approval of the site layout.

In the final avifaunal impact assessment report the avifauna specialist included mitigation measures regarding site walk-through as below:

- *"Prior to construction, the avifaunal specialist should conduct a site walkthrough, covering the final infrastructure (e.g. road, substation, offices, turbine positions etc.) to identify any nests/breeding/roosting activity of sensitive species (e.g. Blue Crane). The results of which may inform the final construction schedule, including abbreviating construction time, scheduling activities around avian breeding and/or movement schedules, and lowering levels of associated noise. Following the specialist site walkthrough, any additional sensitive zones and no-go areas (e.g. nesting sites of Red Data species) are to be designated by the specialist who should advise on an appropriate buffer, within which construction activities may not occur during key breeding times;*

The following mitigation measure was also included:

- *The construction Phase ECO, the onsite Environmental Manager, and the client's representative on site (e.g. the resident engineer) must be trained by an avifaunal specialist to identify the potential priority species and Red Data species as well as the signs that indicate possible breeding by these species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of Red Data species (e.g. Blue Crane), and such efforts may include the training of construction staff (e.g. in Toolbox talks) to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the Red Data species are confirmed to be breeding (e.g. if a nest site is found),*

*construction activities within 500 m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed;"*

For the finalisation and approval of the EMPr and site layout, the avifaunal specialist, Dr Owen Davies, reviewed the final site layout, which informed the final Avifauna Management and Monitoring Plan (Section 24). It was the specialist opinion that a site walkthrough for pre-construction phase was not required as the layout of the development did not change significantly from what was assessed to the final version for approval.

A statement by the avifaunal specialist, Dr Owen Davies, has been included (Appendix E), to ensure the negative impact of avifauna disturbance is kept low during construction, the construction Phase ECO, the onsite Environmental Manager, and the client's representative on site (e.g. the resident engineer) must be trained by an avifaunal specialist, to identify potential priority species and Red Data species as well as the signs that indicate possible breeding by these species. Following the pre-construction / design phase, the appointed ECO / representative should do a walkthrough of the final turbine positions to confirm that no breeding is taking place within the development site.

The ecological specialist provided a recommendation in the final biodiversity impact assessment report regarding site walk-through as below:

- *Existing roads should be utilised where possible, where this is not possible no new roads or infrastructure should be placed within natural vegetation before a preconstruction walk-through of the final layout is conducted during the flowering season by a botanical specialist. The results of the walk-through survey of the final layout should provide an indication of the number of individuals of each listed species that are likely to be impacted by the proposed development, identify permits which may be required to proceed with the development and indicate which individuals may require 'Search and Rescue'. A 'Search and Rescue' plan for relevant plant species identified during the walk-through survey must be established prior to construction if necessary.*

A statement by the ecological specialist, Dr Owen Davies, has been included (Appendix F), which confirms that the site walk-through would only be required if there were any deviations to the position of infrastructure assessed. The specialist undertook a desk-based review of the final site layout and confirmed that no walkthrough or further mitigation is required. The plant species identified during the assessment survey is provided in Appendix F. As no protected species were identified on site, there is no requirement for the permit application or for a search and rescue plan to be implemented.

The implementation of the mitigation measures and conditions contained in the Environmental Management Programme Report (this document) is compulsory to ensure the least impact to the environment during all phases of the development.

### **3 THE DARLING 1B WEF DEVELOPMENT**

Section 3.1 presents the co-ordinates and technical details of the Darling 1B WEF layout as approved in the EA, and Section 3.2 presents the co-ordinates and technical details of the final Darling 1B WEF layout.

#### **3.1 The Darling 1B WEF Specifications as per the EA**

Table 3.1 and 3.2 below provides the co-ordinates and technical details of the development as authorised in the Darling 1B WEF EA.

***Table 3-1: Co-ordinates of the Darling 1B WEF Site and Infrastructure Locations as approved in the EA***

<b>Darling 1B Farm / Site Boundary: Farm Slang Kop 522, Portion 3</b>				
<b>Feature</b>	<b>Map Label</b>	<b>Location</b>	<b>Latitude</b>	<b>Longitude</b>
Darling 1B Site Boundary	1	North East Corner	-33.3141	18.262389
Darling 1B Site Boundary	2	South East Corner	-33.337197	18.271081
Darling 1B Site Boundary	3	Bend Point	-33.3367	18.264503
Darling 1B Site Boundary	4	Bend Point	-33.339219	18.251753
Darling 1B Site Boundary	5	Bend Point	-33.333483	18.251464
Darling 1B Site Boundary	6	Bend Point	-33.334072	18.240781
Darling 1B Site Boundary	7	Bend Point	-33.3352	18.241142
Darling 1B Site Boundary	8	Bend Point	-33.340714	18.244231
Darling 1B Site Boundary	9	South West Corner	-33.340836	18.243597
Darling 1B Site Boundary	10	Bend Point	-33.335339	18.240481
Darling 1B Site Boundary	11	Bend Point	-33.334172	18.239553
Darling 1B Site Boundary	12	Bend Point	-33.334178	18.239244
Darling 1B Site Boundary	13	Bend Point	-33.333922	18.239225
Darling 1B Site Boundary	14	Bend Point	-33.333342	18.248483
Darling 1B Site Boundary	15	Bend Point	-33.332403	18.248433
Darling 1B Site Boundary	16	Bend Point	-33.330225	18.238969
Darling 1B Site Boundary	17	North West Corner	-33.325258	18.238644

<b>Darling 1B Application Site</b>				
<b>Feature</b>	<b>Map Label</b>	<b>Location</b>	<b>Latitude</b>	<b>Longitude</b>
Application Site	1	North East Corner	-33.3141	18.262389
Application Site	18	South East Corner	-33.322011	18.265425
Application Site	19	Bend Point	-33.330783	18.241425
Application Site	16	South West Corner	-33.330225	18.238969
Application Site	17	North West Corner	-33.325258	18.238644

<b>Darling 1B Proposed Turbines</b>				
<b>Feature</b>	<b>Map Label</b>	<b>Location</b>	<b>Latitude</b>	<b>Longitude</b>
Proposed Turbine	WTG 02	Centre Point	-33.319783	18.256989
Proposed Turbine	WTG 01	Centre Point	-33.317353	18.261319

<b>Darling 1 Turbines (to be decommissioned)</b>				
<b>Feature</b>	<b>Map Label</b>	<b>Location</b>	<b>Latitude</b>	<b>Longitude</b>
Existing Turbine (to be decommissioned)	WTG 520	Centre Point	-33.318081	18.25695
Existing Turbine (to be decommissioned)	WTG 521	Centre Point	-33.31725	18.258633
Existing Turbine (to be decommissioned)	WTG 522	Centre Point	-33.316467	18.260317
Existing Turbine (to be decommissioned)	WTG 523	Centre Point	-33.315683	18.261983

<b>Darling 1B Infrastructure</b>				
<b>Feature</b>	<b>Location</b>	<b>Latitude</b>	<b>Longitude</b>	
Existing Windhoek Substation	Centre Point	-33.32615	18.239286	
BESS Option 2 - Preferred Alternative	Centre Point	-33.319819	18.251911	
BESS Option 1 - Alternative 1	Centre Point	-33.321739	18.249358	
BESS Option 3 - Alternative 2	Centre Point	-33.319467	18.253064	
Laydown Option 1 - Preferred Alternative	Centre Point	-33.323283	18.257831	
Laydown Option 2 - Alternative 1	Centre Point	-33.322181	18.257717	

<b>Darling 1B Roads and Cable Networks</b>				
<b>Feature</b>	<b>Map Label</b>	<b>Location</b>	<b>Latitude</b>	<b>Longitude</b>
Proposed Roads and Cables Network	A	Start	-33.31735	18.261314
	B	Middle	-33.320589	18.25115
	C	End	-33.326219	18.239225
Roads Upgrade	A	Start	-33.332933	18.262252
	B	Middle	-33.323924	18.258218
	c	End	-33.315941	18.262061

**Table 3-2: Technical Details of the Darling 1B WEF as per the EA**

<b>Technical Component</b>	<b>Component Detail</b>
<b>Location</b>	
Holder of the authorisation (also referred to as the Developer / Applicant)	Darling Wind Power (Pty) Ltd
Location of the site	Portion 3 of Farm Slang Kop No. 552, Swartland Local Municipality, West Coast District Municipality, Western Cape Province

21 Digit SG Code	C046000000005200003
Site Access	Via the R315
Surface area to be covered (including associated infrastructure such as roads)	Typically, the amount of surface area covered by the turbine and associated infrastructure such as roads is approximately less than 3 % of the total site area.
<b>Onshore Wind Turbine Electricity Generators</b>	
Number of WTG	Up to 2 turbines
Hub Height from ground level	up to 165 m
Blade Length	up to 80 m
Rotor Diameter	up to 160 m
Structure height (Tip Height)	Maximum 245 m
Generation capacity of the facility as a whole at delivery points	Two (2) wind turbine generators (WTGs) with a capacity of up to 6.5 MW each and a total capacity of up to 13 MW.
Structure orientation	Conventional three bladed horizontal axis wind turbine generator mounted on a single vertical tower structure.
<b>Laydown and Hardstand Areas</b>	
Area occupied by both permanent and construction laydown areas	<ul style="list-style-type: none"> <li>- Temporary turbine construction laydown and storage areas of approximately 4 500m<sup>2</sup> per turbine.</li> <li>- A construction laydown/staging area of approximately 2 500m<sup>2</sup> which will also accommodate the operation and maintenance (O&amp;M) buildings.</li> <li>- Permanent footprint area dimensions to be determined based on final layout, including roads, turbine hardstand areas, O&amp;M buildings and battery pad.</li> </ul>
Operations and maintenance buildings (O&M building) with parking area	Part of the 2 500m <sup>2</sup> construction laydown area.
<b>Site access and Internal roads / tracks</b>	
Site Access	Via the R315
Length of internal roads	To be determined based on final layout.
Width of internal roads	Internal roads with a width of up to 10 m, providing access to the turbines, BESS and laydown areas, including turning circle/bypass areas of up to 20 m at some sections during the construction phase. As such, the roads and cables will be positioned within a 20 m wide corridor. Existing roads will be upgraded wherever possible, although new roads will be constructed where necessary.
<b>Grid Connection</b>	
Facility Connection	The existing Windhoek Substation

Capacity of existing on-site substation	11/66 kV
Area occupied by inverter transformer stations/substations	Not part of this application. There is an existing substation that the turbines will connect into.
Proximity to grid connection	Between 2 – 3 km via medium voltage underground cabling, proposed parallel to the existing cable network.
<b>Other</b>	
Height of fencing	Up to 2 metres high
Type of fencing	Stock proof palisade / diamond mesh / galvanized steel

### 3.2 The Final Darling 1B WEF Specifications For Approval

The final site layout (Figure 2) has been refined based on the Applicants Engineering team site walkthroughs.

The co-ordinates of the wind turbines, permanent and temporary areas, as well as the access roads have all been finalised. Upon approval of the final layout and this EMPr by the DFFE, if any changes are made to the layout or EMPr this must be submitted to the DFFE for approval.

Table 3.3 and 3.4 below provides the co-ordinates and technical details of the final development layout, that is being submitted for approval.

**Table 3-3: Co-ordinates of the Final Darling 1B WEF Site and Infrastructure Locations**

<b>Darling 1B Farm / Site Boundary: Farm Slang Kop 552, Portion 3 (remain unchanged)</b>				
<b>Feature</b>	<b>Map Label</b>	<b>Location</b>	<b>Latitude</b>	<b>Longitude</b>
Darling 1B Site Boundary	1	North East Corner	-33.3141	18.262389
Darling 1B Site Boundary	2	South East Corner	-33.337197	18.271081
Darling 1B Site Boundary	3	Bend Point	-33.3367	18.264503
Darling 1B Site Boundary	4	Bend Point	-33.339219	18.251753
Darling 1B Site Boundary	5	Bend Point	-33.333483	18.251464
Darling 1B Site Boundary	6	Bend Point	-33.334072	18.240781
Darling 1B Site Boundary	7	Bend Point	-33.3352	18.241142
Darling 1B Site Boundary	8	Bend Point	-33.340714	18.244231
Darling 1B Site Boundary	9	South West Corner	-33.340836	18.243597
Darling 1B Site Boundary	10	Bend Point	-33.335339	18.240481
Darling 1B Site Boundary	11	Bend Point	-33.334172	18.239553
Darling 1B Site Boundary	12	Bend Point	-33.334178	18.239244
Darling 1B Site Boundary	13	Bend Point	-33.333922	18.239225
Darling 1B Site Boundary	14	Bend Point	-33.333342	18.248483
Darling 1B Site Boundary	15	Bend Point	-33.332403	18.248433

<b>Darling 1B Farm / Site Boundary: Farm Slang Kop 552, Portion 3 (remain unchanged)</b>				
<b>Feature</b>	<b>Map Label</b>	<b>Location</b>	<b>Latitude</b>	<b>Longitude</b>
Darling 1B Site Boundary	16	Bend Point	-33.330225	18.238969
Darling 1B Site Boundary	17	North West Corner	-33.325258	18.238644

<b>Darling 1B Application Site (updated)</b>				
<b>Feature</b>	<b>Map Label</b>	<b>Location</b>	<b>Latitude</b>	<b>Longitude</b>
Application Site	1	North East Corner	-33.3141	18.262389
Application Site	18	South East Corner	-33.322011	18.265425
Application Site	19	Bend Point	-33.324363	18.256183
Application Site	20	Bend Point	-33.323480	18.255764
Application Site	21	Bend Point	-33.324150	18.253750
Application Site	22	Bend Point	-33.325950	18.254677
Application Site	23	Bend Point	-33.330783	18.241425
Application Site	16	South West Corner	-33.330225	18.238969
Application Site	17	North West Corner	-33.325258	18.238644

<b>Darling 1B Proposed Turbine Locations (updated)</b>				
<b>Feature</b>	<b>Map Label</b>	<b>Location</b>	<b>Latitude</b>	<b>Longitude</b>
Proposed Turbine	WTG 01	Centre Point	-33.3175694	18.2607888
Proposed Turbine	WTG 02	Centre Point	-33.319783	18.256989

<b>Darling 1 Turbines (to be decommissioned) (remain unchanged)</b>				
<b>Feature</b>	<b>Map Label</b>	<b>Location</b>	<b>Latitude</b>	<b>Longitude</b>
Existing Turbine (to be decommissioned)	WTG 520	Centre Point	-33.318081	18.25695
Existing Turbine (to be decommissioned)	WTG 521	Centre Point	-33.31725	18.258633
Existing Turbine (to be decommissioned)	WTG 522	Centre Point	-33.316467	18.260317
Existing Turbine (to be decommissioned)	WTG 523	Centre Point	-33.315683	18.261983

<b>Darling 1B Infrastructure (remain unchanged)</b>			
<b>Feature</b>	<b>Location</b>	<b>Latitude</b>	<b>Longitude</b>
Existing Windhoek Substation	Centre Point	-33.32615	18.239286
BESS Location	Centre Point	-33.319819	18.251911
Laydown Area	Centre Point	-33.323283	18.257831

<b>Darling 1B Roads and Cable Networks</b>				
<b>Feature</b>	<b>Map Label</b>	<b>Location</b>	<b>Latitude</b>	<b>Longitude</b>
Proposed Cable Network	A	Start	-33.317456	18.260972
	B	Middle	-33.320561	18.251000
	C	End	-33.326219	18.239225
Existing Roads	D	Start	-33.318705	18.256264
	E	Middle	-33.317014	18.2598
	F	End	-33.315911	18.262086
Roads Upgrade	G	Start	-33.332933	18.262252
	H	Middle	-33.323924	18.258218
	I	End	-33.318700	18.256263
	J	Start	-33.323952	18.258097
	K	Middle	-33.324722	18.255122
	L	End	-33.326616	18.255444
New Roads	M	Start	-33.318694	18.262480
	N	Middle	-33.3179	18.26151
	O	End	-33.31685	18.26035
	P	Start	-33.318697	18.256264
	Q	Middle	-33.321422	18.249197
	R	End	-33.326219	18.239225
	S	Start	-33.326756	18.259397
	T	Middle	-33.326950	18.257383
	U	End	-33.326613	18.255447

**Table 3-4: Technical Details of the Darling 1B WEF**

<b>Component</b>	<b>Description / Dimensions Authorised</b>	<b>Final Description / Dimensions</b>
<b>Developer</b>	Darling Wind Power (Pty) Ltd	Darling Wind Power (Pty) Ltd
<b>Location of the site</b>	Portion 3 of Farm Slang Kop No. 552, Darling, Western Cape Province	Portion 3 of Farm Slang Kop No. 552, Swartland Local Municipality, West Coast District Municipality, Western Cape Province

Component		Description / Dimensions Authorised	Final Description / Dimensions
<b>Number of Turbines</b>		2 turbines to be constructed and 4 turbines to be decommissioned.	2 turbines to be constructed and 4 turbines to be decommissioned.
<b>Site Access</b>		Via the R315	Via the R315
<b>Hub Height from ground level</b>		Up to 165 m	120 m
<b>Blade Length</b>		Up to 80 m	80 m
<b>Rotor Diameter</b>		Up to 160 m	160 m
<b>Generation Capacity</b>		Up to 6.5 MW per turbine = 13 MW total	3.6 MW per turbine = 7.2 MW total
<b>Area occupied by inverter transformer stations/substations</b>		D1B WEF will connect into the existing Windhoek Substation.	D1B WEF will connect into the existing Windhoek Substation.
<b>Voltage level of the existing on-site substation</b>		11 / 66 kV	11 / 66 kV
<b>Area occupied by both permanent and construction laydown areas</b>	<b>Temporary turbine construction laydown and storage areas.</b>	Approximately 4 500 m <sup>2</sup> per turbine	4 500 m <sup>2</sup> per turbine
	<b>Construction laydown/staging area which will also accommodate the operation and maintenance (O&amp;M) buildings</b>	Approximately 2 500 m <sup>2</sup> total	2 500 m <sup>2</sup> total
	<b>Permanent footprint area dimensions, including roads, turbine hardstand areas, O&amp;M buildings and battery pad.</b>	Permanent footprint area dimensions to be determined based on final layout.	15 000 m <sup>2</sup> total
<b>Operations and maintenance buildings (O&amp;M building) with parking area</b>		Part of the 2 500 m <sup>2</sup> construction laydown area.	Part of the 2 500 m <sup>2</sup> construction laydown area.
<b>Length of internal roads</b>		Approximately 6 km in total. Final length will be determined based on final layout.	6 km in total.

Component	Description / Dimensions Authorised	Final Description / Dimensions
<b>Width of internal roads</b>	Internal roads with a width of up to 10 m, providing access to the turbines, BESS and laydown areas, including turning circle/bypass areas of up to 20 m at some sections during the construction phase. As such, the roads and cables will be positioned within a 20 m wide corridor. Existing roads will be upgraded wherever possible, although new roads will be constructed where necessary.	Internal roads with a width of 10 m, providing access to the turbines, BESS and laydown areas, including turning circle / bypass areas of 20 m at some sections during the construction phase. As such, the roads and cables will be positioned within a 20 m wide corridor. Existing roads will be upgraded and new roads will be constructed.
<b>Proximity to grid connection</b>	Between 2 – 3 km via medium voltage underground cabling, proposed parallel to the existing cable network.	Between 2 – 3 km via medium voltage underground cabling, parallel to the existing cable network.
<b>BESS capacity</b>	Up to 50 MWh	Up to 50 MWh
<b>BESS Area</b>	5 000 m <sup>2</sup> , including foundation, battery modules, internal roads, a temporary construction laydown area and a firebreak	5 000 m <sup>2</sup> , including foundation, battery modules, internal roads, a temporary construction laydown area and a firebreak.
<b>BESS array height</b>	Up to 6 m	6 m maximum.
<b>Height of fencing</b>	2 metres high.	2 metres high.
<b>Type of fencing</b>	Stock proof palisade / diamond mesh / galvanized steel	Stock proof palisade

The proposed project will comprise components as described below.

### 3.2.1 Turbines

Two turbines will be constructed for operation. The turbines will be placed on steel and concrete foundations which will each occupy an area of up to 25 m by 25 m in total (which includes the maximum total area that may need to be disturbed during construction of the foundation) and be typically up to 5 m deep and may include concrete and steel plinths depending on local ground conditions.

Once construction is complete, much of the foundation area will be rehabilitated.

Furthermore, the existing four turbines will undergo staged decommissioning once the two new turbines are in operation.

### 3.2.2 Hard Stand Areas

Each turbine requires a hard stand area adjacent to the turbine foundation. This provides a flat, stable base on which to lay down the turbine components for assembly and erection and to site the two cranes necessary to lift the tower sections, nacelle and rotor into place.

A hard stand area of 4 500 m<sup>2</sup> will be established adjacent to each turbine position. This will be used to provide a platform for cranes to operate during construction (and

unscheduled maintenance), as well as a clear area to lay out turbine components prior to erection.

The crane hard stand area will be kept post construction in order to allow for use of similar cranes, should major components need replacing during the operational phase of the development.

### **3.2.3 Laydown Areas**

Temporary infrastructure would include a site camp, laydown areas and a batching plant. Additional temporary laydown areas will be required for equipment and component storage during construction across the site. These areas will be levelled and compacted and used for component storage.

### **3.2.4 Electrical Cabling and Onsite Substation**

The electricity from the turbines will be transferred via a 11 kV electrical network to the existing on-site 66 kV Windhoek Substation. Cabling will be laid underground from the turbine positions to the existing substation and will run parallel to the existing road network. The existing on-site Windhoek Substation will house electrical infrastructure such as transformers and switching gear to enable the energy to be transferred into the existing national grid. The operations and maintenance building including parking will be 2 500 m<sup>2</sup>.

Underground cabling will link the turbines to each other and to the on-site substation. Detailed construction and trenching specifications will depend on the ground conditions encountered during construction. Typically, cables would be laid in accordance with the relevant standards and also as per manufacturer's installation manuals. To minimise ground disturbance, cables will be routed along the side of the access tracks where practicable.

### **3.2.5 Access**

The turbine locations will be accessed via an upgrade to the existing road network on the development site. These access roads will be 6 km in total and up to 20 m wide. Internal roads with a width of 10 m and a turning radius of 20 m are required in order to accommodate construction / decommissioning vehicles. Such roads are required to facilitate access for the cranes and abnormal load deliveries of turbine components.

Existing farm access roads will be upgraded and utilised, as will existing watercourse crossings. Some of the aggregate required for the construction of the on-site tracks may be sourced from cut and fill operations during construction from within the development site with additional material imported from permitted quarries as required.

### **3.2.6 Compound**

The existing Darling on-site office compound, which includes a site office, parking and an operation and maintenance facility including a control room will be used during the construction and operation of the Darling 1B WEF.

### **3.2.7 Ancillary Equipment**

In addition to the key components outlined above, the WEF will also require:

- Meteorological masts;
- Security fencing; and
- CCTV monitoring equipment.

The ancillary equipment of the existing Darling 1 WEF will accommodate the requirement for the Darling 1B WEF. No new equipment will be installed.

## 4 COMPLIANCE WITH THE EA

This section of the EMPr indicates compliance with the conditions (Table 4.1) and notes specific conditions (Section 4.2 – 4.8) of the EA, dated 26 October 2021 (DFFE Ref. 14/12/16/3/3/2/1029/1 and 14/12/16/3/3/2/1029/1/AM3), for which action is required on behalf of the Applicant and its Contractors/staff.

### 4.1 Compliance with the Conditions of the EA in the EMPr

**Table 4-1: Compliance with the Conditions of the EA in the EMPr**

EA Condition No.	EMPr Reference
<p>14. A copy of the final site layout map must be made available for comments by registered Interested and Affected Parties and the holder of this environmental authorisation must consider such comments. Once amended, the final development layout map must be submitted to the Department for written approval prior to commencement of the activity. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g. roads. The layout map must indicate the following:</p> <ul style="list-style-type: none"> <li>- Position of wind turbines and associated infrastructure;</li> <li>- All supporting onsite infrastructure e.g. roads (existing and proposed);</li> <li>- The location of sensitive environmental features on site e.g. CBAs, heritage sites, wetlands, drainage lines etc. that will be affected;</li> <li>- Buffer areas; and</li> <li>- All "no-go" areas.</li> <li>- The above map must be overlain with a sensitivity map and a cumulative map which shows neighbouring renewable energy developments and existing grid infrastructure.</li> </ul>	<p>Figure 2 - 4 of the EMPr reflects the final site layout for approval. The figures also provide the following:</p> <ul style="list-style-type: none"> <li>• All biodiversity information.</li> <li>• Representation where existing infrastructure will be used and / or will be upgraded for use.</li> <li>• Position of wind turbines and associated infrastructure.</li> <li>• Supporting infrastructure.</li> <li>• Location of sensitive environmental features.</li> <li>• Buffer areas and No-go areas.</li> <li>• Cumulative map.</li> </ul> <p>All figures will be made available for review and comment to registered I&amp;APs for a period of 30 days. Following the public comment period, the figures will be updated based on any comments and submitted to the Department with this Final EMPr for written approval.</p>
<p>15. The Environmental Management Programme (EMPr) submitted as part of the BAR dated August 2021 is not approved and must be amended to include measures as dictated by the final site layout map and micro-siting and the provisions of this environmental authorisation. The EMPr must be made available for comments by the registered interested and affected parties and the holder of this environmental authorisation must consider such comments. Once amended, the final EMPr must be submitted to the Department for written approval prior to the commencement of the activity. Once approved the EMPr must be implemented and adhered to.</p>	<p>The EMPr has been updated (Version 2) to include measures as a result of the micro-siting and specialist desk top review of the final layout. This EMPr will be made available to registered I&amp;APs for review and comment for the required 30 period, after which the EMPr will be updated with any additional requirements and submitted to the Department for approval.</p>
<p>16. The EMPr amendment must include the following:</p>	
<p>16.1 The requirements and conditions of this authorisation.</p>	<p>Section 4 of this EMPr informs where updates have been made accordingly with the conditions of the authorisation.</p>

EA Condition No.	EMPr Reference
16.2 All recommendations and mitigations measures recorded in the BAR.	Section 4 of this EMPr informs where updates have been made accordingly with the recommendations and measures as recorded in the BAR (Arcus, 2021).
16.3. All mitigation measures as listed in the specialists reports must be included in the EMPr and implemented.	The EMPr includes the recommendations and measures as recorded in the specialists basic impact assessment reports (2020/2021).
16.4. The final site layout map.	Refer to Appendix B: Figure 2
16.5. Alien invasive management plan to be implemented during the construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.	Section 13 - Alien Invasive Management Plan
16.6. A plant rescue and protection plan which allows for the maximum transport of conservation important species from areas to be transformed. The plan must be compiled by a vegetation specialist familiar with the site in consultation with the ECO and be implemented prior to the commencement of construction.	Section 14 - Plant Rescue and Protection Plan Section 16 - Open Space Management Plan
16.7. A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of the construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.	Section 15 - Revegetation and Habitat Rehabilitation Plan
16.8. A traffic management plan for site access roads to ensure no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimise impacts on local commuters, e.g., limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built up areas so as not to disturb existing retail and commercial operations.	Section 17 - Traffic Management Plan Section 18 - Transportation Management Plan
16.9. A construction and operational avifauna and bat monitoring plan.	Section 24 - Avifauna Management Plan Section 25 - Bat Management Plan
16.10. A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with the applicable regulations and prevent off site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not	Section 20 - Stormwater Management Plan

EA Condition No.	EMPr Reference
to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off.	
16.11. An erosion management plan for the monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.	Section 21 - Erosion Management Plan
16.12. An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportations, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.	Section 22 - Fuel Storage Measures
16.13. A fire management plan to be implemented during the construction and operational phases.	Section 23 - Fire Management Plan
16.14. Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams, and their catchments, and other environmental sensitive areas from construction impacts include the direct and indirect spillage of pollutants.	Section 22 - Fuel Storage Measures
16.15. An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.	See Appendix B: Figure 3
16.16. A map combining the final layout map superimposed (overlain) on the environmental sensitivity map. This map must reflect the proposed location of the turbines as stated in the BAR and this authorisation.	See Appendix B: Figure 3
17. Once approved, the EMPr must be implemented and adhered to. It shall be seen as a dynamic document and shall be included in all contract documentation when approved.	
18. Changes to the approved EMPr must be submitted in accordance with the EIA Regulations applicable at the time.	
19. The Department reserves the right to amend the approved EMPr should any impacts that were not anticipated or covered in the BAR be discovered.	

#### 4.2 Frequency and Process of Updating the EMPr

- Condition 20: The EMPr must be updated where the findings of the environmental audit reports, contemplated in Condition 31 below, indicate insufficient mitigation of environmental impacts associated with the undertaking of the activity, or insufficient levels of compliance with the environmental authorisation or EMPr.
- Condition 21: The updated EMPr must contain recommendations to rectify the shortcomings identified in the environmental audit report.
- Condition 22: The updated EMPr must be submitted to the Department for approval together with the environmental audit report, as per Regulation 34 of GNR. 982, as amended. The updated EMPr must have been subjected to a public participation

process, which process has been agreed to by the Department, prior to submission of the updated EMPr to the Department for approval.

- Condition 23: In assessing whether to grant approval of an EMPr which has been updated as a result of an audit, the Department will consider the processes prescribed in Regulation 35 of GNR. 982. Prior to approving an amended EMPr the Department may request such amendments to the EMPr as it deems appropriate to ensure that the EMPr sufficiently provides avoidance, management, and mitigation of environmental impacts associated with the undertaking of the activity.
- Condition 24: The holder of the authorisation may apply for an amendment of an EMPr, if such amendment is required before an audit is required. The amendment process is prescribed in Regulation 37 of GN R.982, as amended. The holder of the authorisation must request comments on the proposed amendments to the impact management outcomes of the EMPr or amendments to the closure objectives of the closure plan from potentially interested and affected parties, including the competent authority, by using any of the methods provided for in the Act for a period of at least 30 days.

### 4.3 Monitoring

- Condition 25: The holder of the authorisation must appoint an experienced Environmental Control Officer (ECO) for the construction phase of the development that will have the responsibility to ensure that the mitigation/ rehabilitation measures and recommendations referred to in this environmental authorisation are implemented and to ensure compliance with the provisions of the approved EMPr.
- Condition 26: The ECO must be appointed before the commencement of any authorised activities.
- Condition 27: Once appointed, the name and contact details of the ECO must be submitted to the Director: Compliance Monitoring of the Department at [Directorcompliance@environment.gov.za](mailto:Directorcompliance@environment.gov.za).
- Condition 28: The ECO must keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
- Condition 29: The ECO must remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site is ready for operation.

### 4.4 Recording and Reporting to the Department

- Condition 30: All documentation e.g., audit /monitoring/compliance reports and notifications, required to be submitted to the Department in terms of this environmental authorisation, must be submitted to the Director: Compliance Monitoring of the Department at [Directorcompliance@environment.gov.za](mailto:Directorcompliance@environment.gov.za).
- Condition 31: The holder of the environmental authorisation must for the period during which the environmental authorisation and EMPr remain valid, ensure that the project compliance with the conditions of the environmental authorisation and the EMPr are audited and the at the audit reports are submitted to the Director: Compliance Monitoring of the Department at [Directorcompliance@environment.gov.za](mailto:Directorcompliance@environment.gov.za).
- Condition 32: The frequency of auditing and of submission of the environmental audit reports must be per the frequency indicted in the EMPr, taking into account the processes for such auditing as prescribed in Regulation 34 of GNR. 982.
- Condition 33: The holder of the environmental authorisation must, in addition, submit environmental audit reports to the Department within 30 days of completion of the construction phase (i.e., within 30 days of site handover) and a final environmental audit report within 30 days of completion of rehabilitation activities.
- Condition 34: The environmental audit reports must be compiled in accordance with Appendix 7 of the EIA Regulations, 2014, as amended, and must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance

with the environmental authorisation conditions as well as the requirements of the approved EMPr.

- Condition 35: Records relating to monitoring and auditing must be kept on site and made available for inspection to any relevant and competent authority in respect of this development.

#### 4.5 Notification to Authorities

- Condition 36: A written notification of commencement must be given to the Department no later than fourteen (14) days prior to the commencement of the activity. Commencement for the purpose of this condition includes site preparation. The notice must include a date on which it is anticipated that the activity will commence, as well as a reference number.

#### 4.6 Operation of the Activity

- Condition 37: A written notification of operation must be given to the department no later than fourteen (14) days prior to the commencement of the activity operational phase.

#### 4.7 Site closure and decommissioning

- Condition 38: Should the activity ever cease or become redundant, the holder of the authorisation must undertake the required actions as prescribed by legislation at the time and comply with all relevant legal requirements administered by any relevant and competent authority at that time.

#### 4.8 Specific Environmental Authorisation Conditions

Conditions 39 – 57 in the EA, dated 05 November 2021 (DFFE Ref 14/12/16/3/3/1/2342 and 14/12/16/3/3/1/2342/AM1) (Appendix D), are specific to the Darling 1B WEF and must be implemented and adhered to.

**Table 4-2: Specific EA Conditions to be implemented for the Darling 1B WEF**

EA Condition No.	Condition in the EA	Status	EMPr Reference
Turbine position			
39.	No turbines must be constructed within any designated no-go areas.	Complete.	Figure 3
40.	Turbines placed in areas of high sensitivity areas must be fitted with Radar Assisted Shutdown on Demand (RASOD) or similar technology and a single blade must be painted (red or preferably black in accordance with latest research) pending approval from the South African Civil Aviation Authority.	Complete.	The final layout of the Darling 1B WEF turbines are outside of High Sensitivity Areas. Should any changes be made to the final layout post approval of this Final EMPr and Layout, the Condition must be adhered to.
41.	If one or more Great White Pelican or Black Harrier carcasses are located and determined likely to have resulted from wind turbine generator (WTG) collisions in any sensitivity area over the lifespan of the facility then those WTGs likely	To be adhered to.	Refer to Section 8 and Section 24 of this EMPr.

EA Condition No.	Condition in the EA	Status	EMPr Reference
	to have been responsible must be fitted with appropriate mitigation measures (such as RASOD or suitable technology that may be available at the time and to be determined by an avifaunal specialist) to reduce the likelihood of more collisions occurring at that WTG.		
42.	If one or more Great White Pelican or Black Harrier carcasses are located and determined likely to have resulted from turbine collisions after the implementation of shut-down-on-demand systems or similar technology then a curtailment strategy must be determined by an avifaunal specialist in consultation with relevant parties and implemented for those WTGs likely responsible for the mortalities.	To be adhered to.	Refer to Section 8 and Section 24 of this EMPr.
43.	A carcass search programme must be developed and implemented for birds as a minimum during the first three years of operation followed by year 5, 10, 15, 20 and 25, in line with the applicable South African monitoring guidelines.	To be adhered to.	Refer to Section 8 and Section 24 – 25 of this EMPr.
44.	Blade feathering up to the cut-in speed to prevent blades spinning in low wind speeds, from sunset to sunrise in all seasons except winter must be used.	To be adhered to.	Refer to Section 8 and Section 25 of this EMPr.
45.	Acoustic monitoring at height and ground level must be undertaken once the first turbine has been erected.	To be adhered to.	Refer to Section 8 and Section 25 of this EMPr.
46.	The footprint of the development must be limited to the areas required for actual construction works and operational activities.	To be adhered to.	Figure 2 Refer to Section 7 – 9 of this EMPr.
47.	Areas outside of the footprint, including sensitive areas and buffer areas, must be clearly demarcated (using fencing and appropriate signage) before construction commences and must be regarded as “no-go” areas.	To be adhered to.	Refer to Section 7 – 8 of this EMPr.
48.	All areas of disturbed soil must be reclaimed using only indigenous grass and shrubs. Reclamation activities shall be undertaken according to the EMPr.	To be adhered to.	Refer to Section 9 and Section 15 of this EMPr.

EA Condition No.	Condition in the EA	Status	EMPr Reference
49.	Topsoil from all excavations and construction activities must be salvaged and reapplied during reclamation.	To be adhered to.	Refer to Section 9 and Section 15 of this EMPr.
50.	An integrated waste management approach must be implemented that is based on waste minimisation and must incorporate reduction, recycling and re-use options where appropriate. Where solid waste is disposed of, such disposal shall only occur at a landfill licensed in terms of section 20(b) of the National Environmental Waste Act, 2008 (Act 59 of 2008).	To be adhered to.	Refer to Section 19 of this EMPr.
51.	The holder of this authorisation must take note that no temporary site camps will be allowed outside the footprint of the development area as the establishment of such structures might trigger a listed activity defined in the Environmental Impact Assessment Regulations.	Complete and must be adhered to.	Figure 2 of this EMPr.
52.	Borrow materials must be obtained only from authorised and permitted site. Permits must be kept on site by the ECO.	To be adhered to.	Refer to Section 7 of this EMPr.
53.	Should any archaeological sites, artefacts, palaeontological fossils or graves be exposed during construction work, work in the immediate vicinity of the find must be stopped, Heritage Western Cape (HWC) must be informed and the services of an accredited heritage professional obtained for an assessment of the heritage resources.	To be adhered to.	Refer to Section 7 – 8 of this EMPr.
54.	All declared aliens must be identified and managed in accordance with the Conservation of Agricultural Resources Act, 1993 (Act No. 43 of 1983). There should be an alien species monitoring and eradication program to prevent of these problem plants for the duration of the operation.	To be adhered to.	Refer to Section 8 and Section 13 – 14 of this EMPr.
<b>General</b>			
55.	The recommendations of the EAP in the BAR dated August 2021 and the specialist studies attached must be adhered to. In the event of any	Complete.	This EMPr includes all recommendations of the EAP and specialists and must be adhered to.

EA Condition No.	Condition in the EA	Status	EMPr Reference
	conflicting mitigation measures and conditions of the Environmental Authorisation, the specific condition of this Environmental Authorisation will take preference.		Refer to Section 6 of this EMPr.
56.	A copy of this environmental authorisation, the audit and compliance monitoring reports, and the approved EMPr, must be made available for inspection and copying- 56.1. at the site of the authorised activity; 56.2. to anyone on request; and 56.3. where the holder of the environmental authorisation has a website, on such publicly accessible website.	To be adhered to.	Refer to Section 6 of this EMPr.
57.	National government, provincial government, local authorities or committees appointed in terms of the conditions of this authorisation or any other public authority shall not be held responsible for any damages or losses suffered by the holder of the authorisation or his/her successor in title in any instance where construction or operation subsequent to construction be temporarily or permanently stopped for reasons of non-compliance by the holder of the authorisation with the conditions of authorisation as set out in this document or any other subsequent document emanating from these conditions of authorisation.	Acknowledged.	Refer to Section 6 of this EMPr.

## 5 LEGAL FRAMEWORK

The Darling 1B WEF, in terms of the NEMA, 1998, EIA Regulations, 2014, as amended, has been approved for the following listed activities.

**Table 5-1: The NEMA,1998 EIA Regulations 2014, as amended, listed activities authorised for the Darling 1B WEF**

Listing Notices 1 - 3 07 April 2017	Listed Activity	Project Description
Listing Notice 1 GN R 327 Activity 1	<i>The development of facilities or infrastructure for the generation of electricity from a renewable resource where (i) the electricity output is more than 10 megawatts but less than 20 megawatts</i>	The WEF will consist of two wind turbines for electricity generation with a capacity of more than 10 MW but less than 20 MW.

<b>Listing Notices 1 - 3 07 April 2017</b>	<b>Listed Activity</b>	<b>Project Description</b>
<b>Listing Notice 1 GN R 327 Activity 12</b>	<i>The development of- (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs (a) within a watercourse; (c) if no development setback exists within 32 m of a watercourse, measured from the edge of a watercourse.</i>	Infrastructure, such as the existing access road which will be upgraded at the current crossings (NBA2018_Rivers), are proposed within 32 m of a watercourse. The cumulative footprint of all proposed infrastructure within 32 m of a watercourse may likely exceed 100 square metres.
<b>Listing Notice 1 GN R 327 Activity 19</b>	<i>The infilling or depositing of any material of more than 10 cubic metres into or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse.</i>	The construction of the infrastructure associated with the WEF, e.g., the access road which is planned to be upgraded, would include the excavation of soil in watercourses / drainage line areas (NBA2018_Rivers), and infilling / deposition which may exceed 10 cubic metres.
<b>Listing Notice 1 GN R 327 Activity 24</b>	<i>The development of a road - (ii) with a reserve wider than 13,5 meters or where no reserve exists where the road is wider than 8 meters</i>	Internal roads will be constructed and will be approximately 10 m in width, including turning circles and bypass areas of up to 20 m.
<b>Listing Notice 1 GN R 327 Activity 27</b>	<i>The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation</i>	The area to be cleared for the wind turbines and associated infrastructure, such as hardstand areas, laydown areas and BESS will involve the clearance of more than 1 hectare of indigenous vegetation but less than 20 hectares.
<b>Listing Notice 1 GN R 327 Activity 28</b>	<i>Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: - (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.</i>	Construction of the proposed development will change the land use from agriculture to mixed - agriculture. The proposed development is outside an urban area and has a footprint that will exceed 1 ha.
<b>Listing Notice 1 GN R 327 Activity 31</b>	<i>The decommissioning of existing facilities, structures or infrastructure for – (v) any activity regardless the time the activity was commenced with, where such activity: (a) is similarly listed to an activity in (i) or (ii) above; and (b) is still in operation or development is still in progress.</i>	Staged decommissioning of the four existing turbines is proposed once the new turbines are operational.
<b>Listing Notice 1 GN R 327</b>	<i>The expansion of facilities or structures for the generation of</i>	The additional two turbines will expand the electricity output by more than 10 MW and the footprint

<b>Listing Notices 1 - 3 07 April 2017</b>	<b>Listed Activity</b>	<b>Project Description</b>
<b>Activity 36</b>	<i>electricity from a renewable resource where – (i) The electricity output will be increased by 10 megawatts or more; (ii) regardless the increased output of the facility, the development footprint will be expanded by 1 hectare or more</i>	will be expanded by more than 1 ha.
<b>Listing Notice 1 GN R 327 Activity 48</b>	<i>The expansion of- (i) Infrastructure or structures where the physical footprint is expanded by 100 square metres or more; where such expansion occurs- (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.</i>	The existing road infrastructure which is 32 m of a watercourse (NBA2018_Rivers), will be upgraded and therefore requires an expansion. The cumulative footprint of all proposed development expansion within 32 m of a watercourse will exceed 100 square metres.
<b>Listing Notice 1 GN R 327 Activity 56</b>	<i>The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre- (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.</i>	Existing farm access roads will need to be widened and lengthened. These roads may have no road reserve and may likely be wider than 8 m in some parts, to accommodate turning circles.
<b>Listing Notice 3 GN R324 Activity 4</b>	<i>The development of a road wider than 4 metres with a reserve less than 13,5 metres i. Western Cape ii. Areas outside urban areas; (aa) Areas containing indigenous vegetation</i>	Internal and external access roads will be constructed over indigenous vegetation, which are wider than 4 m. The site falls outside of an urban area and part of it falls within a CBA 1 and ESA 1 and 2.
<b>Listing Notice 3 GN R324 Activity 12</b>	<i>The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (i) Western Cape (ii) Within critical biodiversity areas identified in bioregional plans;</i>	The proposed development will require the clearance of natural vegetation in excess of 300 m <sup>2</sup> in areas of natural vegetation. Parts of the site fall within CBA 1 and ESA 1 and 2.
<b>Listing Notice 3 GN R324 Activity 14</b>	<i>The development of— (ii) infrastructure or structures with a physical footprint of 10 square metres or more;</i>	Infrastructure associated with the wind turbines will be constructed / developed within 32 m of a watercourse. The proposed site is within a CBA 1 and ESA 1 and 2.

Listing Notices 1 - 3 07 April 2017	Listed Activity	Project Description
	<p>where such development occurs—</p> <p>(a) within a watercourse;</p> <p>(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;</p> <p>i. Western Cape</p> <p>i. Outside urban areas:</p> <p>(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans</p>	<p>The access road infrastructure will be upgraded resulting in a footprint of more than 10 square meters or more within the watercourse (NBA2018_Rivers) and ESA 2.</p> <p>Any new cabling will be built underground along the internal road network where feasible to avoid any further crossings of vegetation and watercourses on the proposed site.</p>
<p><b>Listing Notice 3</b> <b>GN R324</b> <b>Activity 18</b></p>	<p>The widening of a road by more than 4 metres or the lengthening of a road by more than 1 kilometre</p> <p>i. Western Cape</p> <p>ii. Areas outside urban areas;</p> <p>(aa) Areas containing indigenous vegetation</p>	<p>Existing roads will be widened by more than 4 m and lengthened by more than 1 km in areas containing indigenous vegetation within ESAs and CBAs to provide access during construction.</p>
<p><b>Listing Notice 3</b> <b>GN R324</b> <b>Activity 23</b></p>	<p>The expansion of—</p> <p>(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more;</p> <p>where such expansion occurs—</p> <p>(a) within a watercourse;</p> <p>(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;</p> <p>(i) Western Cape</p> <p>i. Outside urban areas:</p> <p>(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans</p>	<p>Infrastructure associated with the wind turbines will be expanded within 32 m of a watercourse. The proposed site is within a CBA 1 and ESA 1 and 2.</p> <p>The access road infrastructure will be upgraded resulting in a footprint of more than 10 square meters or more within the watercourse (NBA2018_Rivers) and ESA 2.</p> <p>Any new cabling will be built underground along the internal road network where feasible to avoid any further crossings of vegetation and watercourses on the proposed site.</p>

## 6 ENVIRONMENTAL MANAGEMENT PROGRAMME

This section forms the core of the EMP and outlines the specific mitigation measures for those key impacts identified for the development of the Darling 1B WEF.

### 6.1 Environmental Awareness and Compliance

The philosophy that has been used for the compilation of this management programme is derived from the principles of the NEMA, 1998 (Act No. 107 of 1998) which states that

development must be socially, economically and environmentally sustainable. Sustainable development requires that:

- The disturbance of ecosystems and loss of biodiversity are avoided (minimised or remedied).
- Pollution and degradation of the environment are avoided or minimised and remedied.
- Waste is avoided or minimised and re-used or re-cycled where possible and otherwise disposed of in a responsible manner.
- A risk averse and cautious approach is applied.
- Negative impacts on the environment and on people's environmental rights be anticipated, and, prevented and where they cannot altogether be prevented, are minimised and remedied.

The Act makes provision that anyone who causes pollution or degradation of the environment is responsible for preventing impacts occurring, continuing or recurring and for the costs of repair of the environment.

### **6.1.1 Legally Binding Documents**

A copy of the EA (Appendix D), the audit and compliance monitoring reports, and the approved EMPr, must be made available for inspection and copying-

- At the site of the authorised activity;
- To anyone on request; and
- Where the holder of the EA has a website, on such publicly accessible website.

## **6.2 Roles and Responsibilities for Good Environmental Management**

The developer, together with the each appointed contractor will be responsible for environmental management on site during all phases of the development. Specific roles and responsibilities are highlighted below.

### ***Environmental Manager - Developer Representative***

- Review and approve final EMPr prior to authorisation by the DFFE.
- Review and approve any EMPr updates or amendments post approval of the EMPr.
- Ensure environmental requirements are integrated into the project plans, method statements and tender processes.
- Support the site environmental control officer (ECO) during the construction phase, to ensure implementation of the EMPr.
- Follow up and close out all environmental incidents and non-conformances.
- Appoint a suitably qualified independent ECO during the construction phase.

### ***Environmental Control Officer - Principal Contractor Representative***

An independent ECO will work along-side the Environmental Site Officer (ESO) to conduct the required inspections of the construction activities and EMPr implementation throughout the construction phase. After each monthly inspection, the ECO will produce a monitoring report that will be submitted to Developer / Applicant, the DFFE, and any other person(s) if required. Relevant sections of the minutes of customary (monthly) site meetings will be attached to the monitoring report.

The ECO will be responsible for overseeing the implementation of the EMPr during the construction and operations phases, and for monitoring, reviewing and verifying compliance of the ESO and contractor with the EMPr, record-keeping and updating of the EMPr as and when necessary.

The ECO will:

- Be fully knowledgeable with the contents of the EMPr.
- Be fully knowledgeable with the contents of all relevant environmental legislation and ensure compliance with them.
- Ensure that the contents of the EMPr are communicated to the contractor, all site staff, and the contractor and /or site manager are made aware of the contents of the EMPr, through presentations and discussions.
- Ensure that compliance to the EMPr is monitored by regular and comprehensive inspection of the site and surrounding areas.
- Report on any incidents of non-compliance and ensure mitigation measure are implemented as soon as practical.

**During *construction*, the ECO will be responsible for the following:**

- Meeting on site with the Construction Manager and ESO prior to the commencement of construction activities to confirm the construction procedure and designated activity zones.
- Ensuring that daily / weekly (depending on the extent of construction activities, at any given time) monitoring of site activities take place by the ESO to ensure adherence to the specifications contained in the EMPr. The ESO should use a monitoring checklist that is to be prepared by an independent environmental assessment practitioner (EAP) at the start of the construction phase.
- Preparation of the monitoring report based on the site visits and feedback by the ESO.
- Conducting an environmental inspection on completion of the construction period and signing off the construction process with the Construction Manager and ESO.
- Ensuring that the ESO maintains an Incidents Register and Complaints Register on site.

**During *operation*, the Environmental Control Officer will be responsible for:**

- Overseeing the ESO during the implementation of the EMPr for the operation phase.
- Ensure that the necessary environmental monitoring takes place as specified in the EMPr.
- Update the EMPr and ensure that records are kept of all monitoring activities and results.
- Ensuring that the ESO maintains an Incidents Register and Complaints Register on site.

**During *decommissioning*, the Environmental Control Officer will be responsible for:**

- Overseeing the ESO during the implementation of the EMPr for the decommissioning phase.
- Conducting an environmental inspection on completion of decommissioning and "signing off" the site rehabilitation process.

***Environmental Site Officer***

The ECO must appoint a nominated representative of the contractor as the Environmental Site Officer (ESO). The independent ESO is required to be on site at all times and will conduct the required inspections of the construction activities and ensure implementation of the EMPr throughout the construction phase. After each inspection, the ESO is required to submit a completed monitoring checklist to the ECO.

The ESO will be responsible for ensuring the implementation of the EMPr during the construction and operations phases by the contractor and providing feedback to the ECO regarding the compliance of the contractor with the EMPr and any updates required to the EMPr as and when necessary.

The ESO will:

- Be fully knowledgeable with the contents of the EMPr.

- Be fully knowledgeable with the contents of all relevant environmental legislation and ensure compliance with them.
- Ensure that the contents of the EMPr are implemented by the contractor, all site staff.
- Ensure that compliance to the EMPr is monitored by regular and comprehensive inspection of the site and surrounding areas.
- Report on any incidents of non-compliance to the ECO and ensure mitigation measures are implemented as soon as practical.

### ***Contractor***

An independent contractor be responsible for the implementation of the EMPr in accordance with the requirements of the EA.

The Contractor will:

- Be fully knowledgeable with the contents of the EMPr.
- Ensure that the contents of the EMPr are understood by all site staff.
- Report on any incidents of non-compliance to the ESO and ensure mitigation measures are implemented as soon as practical.

### ***Environmental Auditor***

The Developer must appoint an Independent Environmental Auditor. The independent Auditor is required to undertake bi-monthly (every two months) site visits to conduct the required inspections of the compliance with the EA and EMPr during the construction and post construction phase of the activities. After each inspection, the auditor is required to submit an environmental audit report to the DFFE.

The Environmental Site Officer will be responsible for ensuring compliance of the EA and EMPr providing feedback to the ECO regarding the compliance and any updates required to the EMPr as and when necessary.

The Auditor will:

- Be fully knowledgeable with the contents of the EMPr.
- Be fully knowledgeable with the contents of all relevant environmental legislation and monitoring compliance with them.
- Submit reports to the DFFE.

## **6.3 Frequency for Auditing of Compliance and Submission of Reports**

The developer must, for the period during which the EA and EMPr remain valid, ensure that compliance of the EA and EMPr are audited by an Independent Auditor. The Auditor will arrange for inspections of the activities and EMPr implementation throughout the construction and post construction phase. After each inspection, the auditor will produce an environmental audit report that will be submitted to the client, DFFE, Western Cape Department of Environmental Affairs and Development Planning (DEA&DP), and any other stakeholder as required. The monitoring reports, recommended to be produced by the ECO must be appended to the audit reports for submission.

The frequency of auditing and submission of the environmental audit reports must be on a bi-monthly (once every two months) basis, or what is deemed necessary in consultation with the ECO during times of heavy earth works and vegetation clearing, to ensure compliance with all aspects of the EA and EMPr.

## **6.4 Training and Induction of Employees**

The ECO has a responsibility to ensure that all personnel involved in the project are aware of and are familiar with the environmental requirements for the project. The EMPr shall be

part of the terms of reference (ToR) for all contractors, sub-contractors and suppliers. All Contractors have to give some assurance that they understand the EMPr and that they will undertake to comply with the conditions therein. All senior and supervisory staff members shall familiarise themselves with the full contents of the EMPr. They shall know and understand the specifications of the EMPr and be able to assist other staff members in matters relating to the EMPr.

The ECO and / or ESO must ensure that all staff working on site have an environmental induction. The presentation can include the following topics;

- What is meant by "Environment"?
- Why the environment needs to be protected and conserved.
- How construction activities can impact on the environment.
- What can be done to militate against such impacts?.
- Awareness of emergency and spills response provisions.
- Social responsibility during construction e.g. being considerate to local residents.

A detailed environmental management and training program must be developed. The purpose of this is to ensure that all staff and workers understand what is required of them. The main components of the program can incorporate the following:

- Concept of sustainability and the reasons for good environmental management and practice.
- Potential environmental impacts.
- Mitigation measures.
- Establishing a chain of responsibility and decision making.
- Specific training requirements of certain staff, and the potential hazardous associated with the job.
- Methodologies to be used for field sampling.
- Training in the use of field equipment.
- Training in identification of non-compliance situations and procedures to be followed in such instances.
- Reporting requirements.
- Healthy and Safety.
- Fire management.
- HIV/AIDS.

## **6.5 Complaints Register and Environmental Incidents Book**

Any complaints received from the community must be brought to the attention of the ECO / ESO, who will respond accordingly.

The following information will be recorded:

- Time, date and nature of the complaint;
- Response and investigation undertaken; and
- Actions taken and by whom.

All complaints received will be investigated and a response (even if pending further investigation) will be given to the complainant within 7 days.

All environmental incidents occurring on the site will be recorded. The following information will be provided:

- Time, date, location and nature of the incident; and
- Actions taken and by who.

## 6.6 Construction Environmental Monitoring

In order to facilitate communication between the Environmental Manager, the ECO (and the ESO), it is vital that a suitable chain of command is structured that will ensure that the ECO's recommendations have the full backing of the project team before being conveyed to the Contractor. In this way, penalties as a result of non-compliances with the EMPr may be justified as failure to comply with instruction from the highest authority.

## 6.7 Dealing with Non Compliance with the EMPr

There may be difficulties encountered with carrying out the mitigation measures within the EMPr, this may result in non-compliance with the EMPr. It may be possible that the contractor and or the developer put in place procedures to motivate staff members to comply with the EMPr and to deal with non-compliance. The developer must make this known to the contractor at the earliest stage possible, even during the tender phase. When dealing with non-compliance, the following process is recommended to take place:

- A notice of transgression should be issued to the transgressor;
- It must be documented in a designated register; and
- It must be reported in a monthly report and made available to I&APs and DFFE upon request.

National government, provincial government, local authorities or committees appointed in terms of the conditions of this authorisation or any other public authority shall not be held responsible for any damages or losses suffered by the holder of the authorisation or his/her successor in title in any instance where construction or operation subsequent to construction be temporarily or permanently stopped for reasons of non-compliance by the holder of the authorisation with the conditions of authorisation as set out in this document or any other subsequent document emanating from these conditions of authorisation.

## 6.8 EMPr Amendments and Instructions

No EMPr amendments shall be allowed without the approval of the DFFE. Amendments may be possible, following discussions with the relevant ECO, who may propose EMPr amendments on behalf of the developer or issue EMPr instructions, corrective actions, remediation or rehabilitation. These correction actions must be completed within the specified timeframes.

## 7 DESIGN PHASE / PRE-CONSTRUCTION PHASE MITIGATION MEASURES

**The objectives of the pre-construction phase are:**

- To promote environmental awareness.
- To define roles and responsibilities for environmental management.
- To ensure suitable environmental training and induction to all contractors, sub-contractors and labourers.
- To ensure that all legal obligations and contractual conditions have been met prior to commencing of construction.
- To ensure that the facility design responds to the identified environmental constraints and opportunities.
- To implement effective communication methods and practices.

### 7.1 Mitigation Measures for Legal Compliance

- Appoint an independent ECO.
- Appoint an internal ESO to oversee day to day environmental activities.

- Staff should be educated as to the need to refrain from indiscriminate waste disposal and/or pollution of local soil and water resources and receive the necessary safety training.
- The contractor must ensure conditions described in the environmental authorisation are adhered to.
- Confirm with ESO / ECO, suitable sites for the construction camps (equipment and batching etc.) and storage areas for materials. All construction equipment must be stored within this construction camp and all associated oil changes etc. (no servicing) must take place within this camp.
- Unskilled labourers should be drawn from the local market where possible.
- Environmental awareness training for site personnel, concerning the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artefacts.
- The Contractor, together with the ESO shall ensure that the training and capabilities of the Contractor's site staff are adequate to carry out the designated tasks. Training developed by the Contractor and ESO must be approved by the ECO.
- Site personnel operating light, and heavy duty equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks.
- No operator shall be permitted to operate critical items of mechanical equipment without having been trained by the Contractor and certified competent by the Project Manager.
- Before construction begins, all areas to be developed must be clearly demarcated with fencing, by a qualified surveyor.
- No construction camps are allowed on site. No workers are allowed to stay overnight in the construction area.
- The developer is to compile and implement a grievance mechanism procedure for the public.
- The contractor to develop a Construction Site Traffic Management Plan – this will be in the form of a site layout, showing the flow of traffic during the construction phase taking into consideration existing land users.
- Once the final layout plan has been approved the appointed responsible engineers must produce a storm water management plan for the site, during the construction and operational phases of the project. An effective SWMP will include bunds and ditches, where it is required - that is at all points of disturbance where water accumulation might occur. The system must effectively collect and safely disseminate any run-off water from all hardened surfaces and it must prevent any potential down slope erosion.
- A floral rehabilitation programme should be established prior to operation. The programme must address the rehabilitation of the existing habitats as well as the rehabilitation of areas disturbed during construction and decommissioning and investigate the potential of rehabilitating previously transformed or degraded areas. This rehabilitation programme must be approved by the relevant government departments and the relevant permits must be obtained for the handling/transport/propagation of protected species.
- If the destruction of natural vegetation is unavoidable, a habitat rehabilitation programme should be established before operation and following decommissioning. The programme must address the rehabilitation of the existing habitats as well as the rehabilitation of areas disturbed during construction and investigate the potential of rehabilitating previously transformed or degraded areas. This rehabilitation programme must be approved by the relevant government departments and the relevant permits must be obtained for the handling/transport/propagation of protected species.
- A health and safety plan must be drawn up to ensure worker safety.

- Develop a Project Layout and Access Plan to show the intended use of the area. The plan shall clearly indicate and/or describe the location and details of:
  - Servitudes.
  - Areas and routes to be cleared – including the size / width of the cleared areas.
  - The construction campsite and rest areas to be used during construction.
  - Waste disposal sites to be used during construction.
  - Sources of construction materials.
  - Power supply during construction.
  - Existing roads and tracks to be used as transportation routes, and routes to gain access to construction areas.
  - New tracks deemed necessary to provide access to construction activities.
  - Any informal residential structures found within the property.
  - Affected land use, 1:50 year floodlines.
  - Sensitive areas.

Following the selection of turbine to be used for the project, the developer has updated the layout plan / site development plan, this together with the following management plans are being submitted to the DFFE for approval:

- Traffic Management Plan – this plan includes the necessary arrangements to transport all equipment and infrastructure to site, including the necessary road transport permits.
- A Bird and Bat Monitoring and Management Plan.

Should any telephone communication lines require moving this will have to be facilitated and approved by Telkom.

## **7.2 Permit Requirements**

Activities undertaken during site preparation, construction and operation may require additional permits, over and above the Environmental Authorisation. Darling Wind Power (Pty) Ltd is responsible for ensuring that they hold the necessary permits in order to comply with national and local regulations. Additional permit requirements which may be required are described below.

### **7.2.1 Borrow Pits**

A borrow pit refers to an open pit where material (soil, sand or gravel rock) is removed for use at another location. Darling Wind Power (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. Licenced borrow pits will be used to source material. There is an existing quarry on site which will be used, if possible.

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.

### **7.2.2 Water Use License**

There are licensing procedures that need to be followed for particular “water uses” under the National Water Act, 1998 (Act No. 36 of 1998). Water uses that may be of relevance to the development 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.

*It is understood that the development will not require a water use authorisation.*

### **7.2.3 Heritage, Archaeology and Palaeontology**

Should any heritage resources, including evidence of graves and human burials, archaeological material and paleontological material be discovered during the execution of the activities above, all works must be stopped immediately and Heritage Western Cape must be notified without delay.

*Notification of heritage resources must be made to the Heritage Western Cape (HWC) should this be discovered during construction. No permit is required from HWC for commencement of the construction.*

### **7.2.4 Vegetation Search and Rescue**

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.

*As no protected species were identified on site, there is no requirement for this permit application.*

## **7.3 Method Statements**

Prior to construction the developer must ensure that the contractor supply the following method statements:

- Vegetation clearing.
- Cement mixing.
- Hazardous waste management.
- Emergency preparedness and response.
- Hazardous spills clean up.
- Topsoil stockpiling management.
- Laydown area management.
- Hazardous materials management.

## **7.4 Policies and Plans to be produced Prior to Construction Commencing for IFC Requirements**

The requirements below are not specifically required for the approval of this EMP, this is required for the developer should the project require funding. The project developer will need to develop these policies.

- Project Environmental and Social Management System Framework
- Project Environmental, Health and Safety and Social Policy
- Project Labour Policy
- Project Drug and Alcohol Policy
- Project Smoking Policy
- Project Code of Conduct
- Project Security Policy
- Project Grievance Mechanism for Workforce, and Takeholders and Communities
- Project Labour and Working Conditions Policy
- Project Stakeholder Engagement Plan

## 7.5 Site Establishment

The object of site establishment is to ensure that an appropriate site is selected for the construction camp/site office and that the site office is managed in an environmentally responsible manner with minimal impact on the environment.

The optimised site layout (including the location of construction camps and laydown areas) must be finalised through a micro-siting process, which will include a detailed site assessment of the final site layout by various specialists as stipulated in the EA and this EMP. As this has been completed, refer to Section 2, the layout is now being subject to a comment and review period, after which it will be submitted to the DFFE for approval.

### 7.5.1 Mitigation Measures

Before establishing the construction office areas, carefully plan the layout and develop a Construction Site Office Plan<sup>2</sup>. The Construction Site Office Plan shall provide a description of the site and shall show, on a reasonably scaled map, the intended use of the site. Indicate and/or describe the location, size / quantity / capacity and design of:

- Access routes.
- Ablution facilities (including details on the handling of sewage and wastewater).
- On-site waste management facilities (waste containers, etc.).
- Design of bunds and other structures for containment of hazardous substances.
- Fencing.
- Water storage and supply.
- Power supply (for cooking, space heating, lighting, etc.).
- Fire extinguishers, first aid kit and any other relevant safety equipment.
- Other structures and buildings (offices, storerooms, workshops, etc.).
- Other storage areas and stockpiles (i.e. topsoil, construction materials, equipment, etc.).
- Location of areas to be rehabilitated upon completion of the construction period, providing measures to be used for rehabilitation.

#### **The following must also be undertaken:**

- An area within the site must be demarcated for a construction site office, which will include storage area. This area must be fenced off.
  - It is understood that the site office of the existing Darling Facility will be used.
- Site establishment shall take place in an orderly manner and all required amenities shall be installed at the lay down area before the main workforce move onto site.
- The construction camp shall have the necessary ablution facilities with chemical toilets at commencement of construction.
- During the pre-construction phase, the temporary construction camps and laydown areas must be located outside of the water courses (including the 45 m buffer).
- The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed other than in supplied facilities.
- The Contractor shall supply waste collection bins and all solid waste collected shall be disposed of at a registered landfill.
- Potable water for use by on site workers must be made available on a daily basis at the site office and the working areas on site.
- A certificate of disposal shall be obtained by the Contractor and kept on file. Where a registered waste site is not available close to the construction site, the Contractor shall provide a method statement with regard to waste management.

<sup>2</sup> To form part of the Project Layout and Access Plan.

- The disposal of waste shall be in accordance with all relevant legislation. Under no circumstances may solid waste be burnt or buried on site.
- Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes topics such as no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.
- 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.
- Any roads damaged during the transportation of components, or from other construction vehicles must be rehabilitated and returned to pre-construction conditions.

## **7.6 Siting, Establishing and Management Materials**

- Choice of location for storage areas must take into account prevailing winds, distances to water bodies, general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary.
- Mitigation measures as provided in this EMPr must be adhered to during site establishment.
- Storage areas must be designated, demarcated and fenced.
- Storage areas must be secure so as to minimize the risk of crime. They must also be safe from access by children / animals etc.
- Fire prevention facilities must be present at all storage facilities.
- Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage area(s).
- These pollution prevention measures for storage must include a bund wall high enough to contain at least 110% of any stored volume, and this must be sited away from drainage lines on site with the approval of the Engineer.
- Any water that collects in the bund must not be allowed to stand and must be removed immediately and the hydrocarbon digestion agent within must be replenished.
- All legal compliance requirements with respect to fuel storage and dispensing must be met.
- All fuel storage tanks (temporary or permanent) and associated facilities must be designed and installed in accordance with the relevant oil industry standards, SANS codes and other relevant requirements.
- Areas for storage of fuels and other flammable materials must comply with standard fire safety regulations<sup>3</sup>.
- Flammable fuel and gas must be separated from all welding workshops, assembly plants and loading bays where ignition of gas by an accidental spark may cause an explosion or fire.
- The tank must be erected at a safe distance from buildings, boundaries, welding sites and workshops and any other combustible or flammable materials.

<sup>3</sup> <https://www.nfast.co.za/gallery/fire%20extinguisher%20regulations.pdf>

- Symbolic safety signs depicting “No Smoking”, “No Naked Flames” and “Danger” are to be prominently displayed in and around the fuel storage area.
- The capacity of the tank must be clearly displayed and the product contained within the tank clearly identified.
- There must be adequate fire-fighting equipment at the fuel storage and dispensing area or areas.
- The storage tank must be removed on completion of the construction phase of the project.
- All such tanks to be designed and constructed in accordance with the national standard for storage tanks, i.e., ISO 16961:2015 and a recognised international standard code if required.
- The rated capacity of tanks must provide sufficient capacity to permit expansion of the product contained therein by the rise in temperature during storage.
- Only empty and externally clean tanks may be stored on the bare ground. All empty and externally dirty tanks must be sealed and stored in an area where the ground has been protected.
- Any electrical or petrol-driven pump must be equipped and positioned so as not to cause any danger of ignition of the product.
- If fuel is dispensed from 200 litre drums, the proper dispensing equipment must be used.
- The drum must not be tipped in order to dispense fuel. The dispensing mechanism of the fuel storage tank must be stored in a waterproof container when not in use.
- All waste fuel and chemical impregnated rags must be stored in leak-proof containers and disposed of at an approved hazardous waste site.
- The amounts of fuel and chemicals stored on site must be minimised.
- Storage sites must be provided with bunds to contain any spilled liquids and materials.
- These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources.
- Clear signage must be placed at all storage areas containing hazardous substances / materials.
- Material Safety Data Sheets (MSDSs) shall be readily available on site for all chemicals and hazardous substances to be used on site. Where possible, the available MSDSs must additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes.
- Storage areas containing hazardous substances / materials must be clearly signed.
- Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures.
- Any hazardous waste handling on site must be undertaken by experienced staff. No mixing of hazardous and general waste should be permitted.
- A suitable Waste Disposal Contractor must be employed to remove waste oil. These wastes must only be disposed of at licensed landfill sites designed to handle hazardous wastes.
- The contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training.
- All excess cement and concrete mixes are to be contained on the construction site prior to disposal off site.
- Any spillage, which may occur, shall be investigated and immediate action must be taken.

### **7.6.1 Site Clearance**

- Vegetation clearance must 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. Wherever 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 must be chipped for later use as mulch in landscaped areas or for stabilization purposes or it must 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 must be made available to the local community as firewood.
- 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 must be demarcated (e.g. using danger tape or droppers) prior to any construction activities, so that these can be avoided.
- Removal of vegetation must be kept to a minimum, and cleared areas must be re-vegetated after clean-up. A detailed planting plan must 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
- Demarcate all areas to be cleared with construction tape or similar material. However, caution must be exercised to avoid using material that might entangle fauna.
- An alien control and monitoring program must be developed to ensure that the site is cleared of alien plants (as listed under the Conservation of Agricultural Resources 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 must be left wherever possible within the construction footprint to bind the soil, prevent erosion and promote post-disturbance recovery of an indigenous ground cover.

### **7.6.2 Topsoil**

Topsoil / top material shall be removed from all areas cleared of vegetation and retained for future landscaping use, where feasible. Top material must 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 rehabilitation. This will constitute at least a 300 mm 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 must 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 must 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. If possible, the stockpile must be kept moist in order to maintain the vitality of the vegetation. Vegetation may not consist of weeds, but must comprise of grass or ground covers.

## 8 CONSTRUCTION PHASE MITIGATION MEASURES

The following sections form the core of the EMPr during the construction phase of the development. The major sources of potential impacts include, the turbine footprint construction, the construction of infrastructure, the construction of roads and bridges, and vehicle operation, and spillages.

### The objectives of the construction phase are:

- To promote environmental awareness.
- To define roles and responsibilities for environmental management.
- To ensure that the contractor complies with all mitigation measures during the construction period.

### 8.1 Potential Construction Phase Impacts

The following impacts are likely to occur during the construction of the development. Specific mitigation measures for each impact is presented below.

- The accidental, negligent, or deliberate spillage or inappropriate disposal of hazardous substances could result in air, soil and water pollution and may affect the health and well-being of people, plants and animals.
- Excessive noise could be made by the construction activity which would affect neighbouring communities.
- Potential damage to the soil structure, soil compaction and loss of soil fertility.
- Loss of the vegetation cover and increased erosion risks.
- Dust related problems.
- Safety hazards to the public, workers and animals in the area.
- Disturbance to local hydrology from construction activities.
- Pollution of surface water bodies
- Dust can be a nuisance to the construction workforce and to the public and can negatively affect the growth and recovery rate of plants. Potential sources of fugitive dust include, but are not limited to:
  - Demolition of concrete foundations and existing buildings;
  - Grading / movement of soil;
  - Transportation and unloading of construction materials;
  - Vehicular movement over unsurfaced roads and tracks; and,
  - Wind erosion of stockpiles.
- Construction activities will result in the exposure of the soil to erosive factors, i.e. wind and water, and the compaction of the soil in other areas;
- Illegal poaching and collection of animals and plant material.
- Loss of established indigenous and exotic habitat
- Unnecessary trampling of vegetation and harm to animals.
- Degradation of the scenic quality due to the major earthworks and any unsightly structures.
- Damage or loss of important cultural, historical or pre-historical sites and artefacts.
- Damage to existing roads and tracks, power lines, pipelines, etc.
- Dangerous conditions near road.
- Trespassing and illegal access onto land.

The following is not allowed on site:

- No poaching of any animals or harvesting of any flora;

- No construction camp, for workforce accommodation is allowed on site; contractors are to ensure suitable housing for staff outside of the proposed development footprint.
- No cooking or fires allowed on site; and
- No alcohol or drugs are allowed on site.

Table 8.1 below presents a summary of the potential impacts as assessed by specialists for the construction phase of the WEF.

Recommended persons as provided in Table 8.2 below should take responsibility for the implementation and monitoring to ensure that all operational mitigation measures outlined in this document, and all revisions thereof, are complied with.

**Table 8-1: Summary of Construction Phase Potential Impacts and Significance Rating**

Potential Impacts: Construction Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
<b>Soils and Agricultural Potential Impact</b>							
Loss of Agricultural land use	L	M	L	Negative	L	L	H
<i>With Mitigation</i>	<i>L</i>	<i>M</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Soil Degradation	L	M	M	Negative	M	M	H
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
<b>Freshwater &amp; Wetlands (Aquatic)</b>							
Loss of riparian system, wetlands and disturbance of watercourses	M	M	M	Negative	M	M	H
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Disruption of any hydrological regimes and or movement corridors	M	M	M	Negative	M	M	H
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Localised surface water quality	M	M	M	Negative	M	L	H
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
<b>Terrestrial Ecology</b>							
Impact on Flora	L	M	L	Negative	L	L	H
<i>With Mitigation</i>	<i>L</i>	<i>M</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Impact on Fauna	L	M	L	Negative	M	M	H
<i>With Mitigation</i>	<i>L</i>	<i>M</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Impact of Ecological Processes	L	L	L	Negative	M	M	H

Potential Impacts: Construction Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
<b>Avifauna</b>							
Destruction of habitat	L	M	L	Negative	L	L	H
<i>With Mitigation</i>	<i>L</i>	<i>M</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Disturbance / Displacement	L	L	M	Negative	L	L	M
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>M</i>
<b>Bats</b>							
Roost disturbance / destruction	L	L	M	Negative	L	L	H
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Habitat Modification and Displacement	L	L	M	Negative	L	L	H
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
<b>Noise</b>							
Construction Noise	M	L	M	Negative	L	L	H
<i>With Mitigation</i>	<i>M</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
<b>Visual / Landscape</b>							
Visual Intrusion	M	L	M	Negative	M	H	H
<i>With Mitigation</i>	<i>M</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>M</i>	<i>H</i>	<i>H</i>
<b>Social</b>							
Job creation	M	L	M	<b>Positive</b>	M	M	H
<i>With Mitigation</i>	<i>H</i>	<i>L</i>	<i>H</i>	<b>Positive</b>	<b>M</b>	<i>H</i>	<i>H</i>

Potential Impacts: Construction Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Safety risk for farmers and farming infrastructure	M	L	M	Negative	M	M	H
<i>With Mitigation</i>	<i>M</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Risk of potential fires	M	L	M	Negative	M	M	H
<i>With Mitigation</i>	<i>M</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Noise, dust, waste and safety impacts	M	L	M	Negative	M	M	H
<i>With Mitigation</i>	<i>M</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Productive farmland	M	L	M	Negative	M	M	H
<i>With Mitigation</i>	<i>M</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
<b>Traffic</b>							
Traffic on routes	M	L	L	Negative	L	L	M
<i>With Mitigation</i>	<i>M</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>M</i>

**Table 8-2: Design and Construction Phase Impact Management**

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
<b>Route Clearing</b>		
Off-road driving and the creation of new tracks, other than those described during Project Layout and Access Plan, are prohibited and will be regarded as unwanted tracks or unwarranted disturbed areas. All unwanted tracks or unwarranted disturbed areas shall be properly rehabilitated	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
<b>Creating New Road Paths</b>		
Carefully plan the route and have it clearly marked out so that drivers exactly know where to drive.	Site engineer/ site contractor ESO to monitor	Upon commencement Monthly checks
Establish the track by simply driving over the ground if there are no obvious obstacles (i.e. large rocks, high plants or rough terrain).	Site engineer/ site contractor ESO to monitor	During site establishment
Keep tracks as narrow as possible and only drive on marked out routes (as per the Layout and Access Plan).	Site engineer/ site contractor ESO to monitor	Throughout construction Monthly checks
No bulldozers will be used in bush clearing outside of the construction footprint. Only inflatable tyre earthmoving equipment must be used to reduce damage to vegetation.	Site engineer/ site contractor ESO to monitor	Throughout construction Monthly checks
If obstacles are far enough apart, divert the track around obstacles. Only obstacles that could interfere with the safe construction and operation of the development need to be removed.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Where possible, remove obstacles by hand. Shrubs are to be cut or crushed rather than being completely uprooted in areas where landscaping or rehabilitation will be undertaken on completion of the construction. Leave vegetation in place wherever possible, especially around the perimeter of the site to provide screening and habitat. Indigenous plants can be planted to replace alien vegetation.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Only undertake earthworks in an area if it is unavoidable, and keep the size of platforms as small as possible.	Site engineer/ site contractor ESO to monitor	During site establishment
Sensitive sites within the construction area must be demarcated to avoid accidental destruction of sensitive areas. The workforce must be made aware of these areas, and why they are sensitive.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
		Monthly checks
All pipe culverts must be removed and replaced with suitably sized box culverts, where road levels are raised.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Approach road embankments especially where large cut and fill areas will be required must be rehabilitated during the construction process, to minimise erosion.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Suitable stormwater management systems must be installed and monitored during the first few months of use. Any erosion / sedimentation must be prevented.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
<b>Impacts on vegetation and listed or protected plant species resulting from construction activities</b>		
Construction of infrastructure to be concentrated on transformed and degraded areas such as agricultural fields and the sand mine where possible.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Site access should be controlled and no unauthorised persons should be allowed onto the site.	ESO to monitor	Throughout construction Monthly checks
Existing roads should be utilised where possible, where this is not possible no new roads or infrastructure should be placed within natural vegetation without approval by specialist.	Site engineer/ site contractor ESO to monitor Specialist	Upon commencement Throughout construction Monthly checks
All construction vehicles should adhere to clearly defined and demarcated roads, no off-road driving should be allowed.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
A comprehensive and effective alien eradication programme should be implemented on the site to improve the current state of natural vegetation before the spread of aliens reduces the ecological value of these areas any further.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
A floral rehabilitation programme should be established before operation. The programme must address the rehabilitation of the existing habitats as well as rehabilitation of previously transformed or degraded areas. This rehabilitation programme must be	Botanical Specialist Developer / Contractor	Post construction

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
approved by the relevant government departments and the relevant permits must be obtained for the handling / transport / propagation of protected species.		
<b>Alien Plant Invasion Risk</b>		
Wherever excavation is necessary, topsoil must be set aside and replaced after construction to encourage natural regeneration of the local indigenous species.	Site engineer/ site contractor ESO to monitor	Upon commencement Monthly checks Post construction
The recovery of the indigenous grass layer must be encouraged through leaving some areas intact through the construction phase to create a seed source for adjacent cleared areas.	Site engineer/ site contractor ESO to monitor	Upon commencement Monthly checks Post construction
Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
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.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Regular alien clearing must be conducted using the best-practice methods for the species concerned. The use of herbicides must be avoided as far as possible.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
<b>Agricultural land use</b>		
Reduce the agricultural footprint by utilising existing farm roads for the turbine access roads wherever possible, and ensuring that these roads do not unnecessarily divide up cultivated land so that parts of it are effectively cut-off from viable cultivation.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Requirement to check and confirm that the finalised road layout does not cause unnecessary fragmentation and loss of cultivated land.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
<b>Increased Erosion Risk and Soil Degradation</b>		

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
The integrity of the contour bank system of erosion control must be restored, so that the system as a whole is functioning effectively.	Site engineer/ site contractor ESO to monitor	Upon commencement Monthly checks Post construction
New roads should be constructed in a way to reduce erosion caused by water runoff and be the minimum width necessary.	Site engineer/ site contractor ESO to monitor	Upon commencement Monthly checks Post construction
Implement an effective system of storm water run-off control using bunds and ditches, where it is required - that is at all points of disturbance where water accumulation might occur. The system must effectively collect and safely disseminate any run-off water from all hardened surfaces and it must prevent any potential down slope erosion.	Site engineer/ site contractor ESO to monitor	Upon commencement Monthly checks Post construction
Any erosion or runoff of sediment towards the river should be reported to the ECO and steps should be taken to prevent erosion from continuing.	Site engineer/ site contractor ESO to monitor	Upon commencement Monthly checks Post construction
If an activity will mechanically disturb the soil below surface in any way, then any available topsoil must first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.	Site engineer/ site contractor ESO to monitor	Upon commencement Monthly checks Post construction
<b>Disturbance, transformation, loss of habitat and direct fauna mortality</b>		
Any fauna directly threatened by the construction activities should be reported to and removed to a safe location by the ECO or other suitably qualified person.	Site engineer/ site contractor ESO to monitor ECO to implement	Upon commencement Monthly checks Post construction
The collection, hunting or harvesting of any plants at the site should be strictly forbidden. Personnel should not be allowed to wander off the demarcated construction site.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Perimeter fences must be permeable to allow for the movement of tortoises and no electrification of the fence should occur within 30 cm of the ground level to reduce the potential for fauna to be electrocuted.	Site engineer/ site contractor ESO to monitor	Upon commencement Monthly checks

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
A comprehensive and effective alien eradication programme should be implemented on the site to improve the available habitat quality before the spread of aliens reduces the ecological value of these areas any further.	Site engineer/ site contractor ESO to monitor ECO to implement	Upon commencement Monthly checks Post construction
The alien plant species monitoring and eradication programme is to be implemented throughout the lifetime of the project and continue for at least two years following the completion of decommissioning activities or until a cover of indigenous species has returned to the areas disturbed during decommissioning.	Site engineer/ site contractor ESO to monitor ECO to implement	Upon commencement Monthly checks Post construction
All hazardous materials should be stored in the appropriate manner to prevent contamination of the site.	Site engineer/ site contractor ESO to monitor ECO to implement	Upon commencement Monthly checks
Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
All construction vehicles should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such as snakes and tortoises.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
No excavated trenches or holes should be left open for extended periods as fauna may fall in and become trapped.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
<b>Loss of rare, endemic or protected species</b>		
All alien plant re-growth, which is currently high within the greater region must be monitored and should it occur, these plants must be eradicated within the project footprints and especially in areas near the proposed crossings.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
<b>Loss of functional habitat within the site and near any of the required crossing upgrades</b>		
All alien plant re-growth must be monitored and should it occur, these plants must be eradicated within the project footprints and especially in areas near the proposed crossings.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
Approach road embankments especially where large cut and fill areas will be required must be rehabilitated during the construction process, to minimise erosion.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
<b>Avifaunal Habitat Destruction</b>		
Environmental Control Officers to oversee activities and ensure that the EMPr is implemented and enforced.	ECO to implement Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
High traffic areas and buildings such as offices, batching plants, storage areas etc. should where possible be situated in areas that are already disturbed.	ECO to implement Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Temporary construction facilities and laydown areas should where possible be situated in areas that are already disturbed.	ECO to implement Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
Existing roads and farm tracks should be used where possible.	Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
The minimum footprint areas of infrastructure should be used wherever possible, including road widths and lengths.	ECO to implement Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks
No turbines should be constructed in no-go areas, while associated infrastructure should be avoided where possible in these areas.	ECO to implement Site engineer/ site contractor ESO to monitor	Upon commencement Throughout construction Monthly checks

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and to this end a habitat restoration plan is to be developed by a specialist and included within the CEMP.	ECO to implement ESO to monitor Site engineer/site manager	Post Construction
<b>Avifaunal Disturbance and Displacement</b>		
The construction Phase ECO and ESO, the onsite Environmental Manager (Contractor), and the client's representative on site (e.g. the resident engineer) are to be trained by an avifaunal specialist to identify Red Data and priority bird species as well their nests and any signs that indicate possible breeding. If any nests or breeding locations for these species are located, an avifaunal specialist is to be contacted for further instruction.	Developer to implement ECO / ESO to monitor Site engineer/site manager Avifaunal Specialist	Prior to commencement
During audits/site visits, concerted efforts must be made to continue looking out for breeding activities of Red Data and priority bird species, and such efforts may include the training of construction staff (e.g. in Toolbox talks) to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the Red Data species are confirmed to be breeding (e.g. if a nest site is found), construction activities within 500 m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed.	Developer to implement ECO / ESO to monitor Site engineer/site manager Specialist	Throughout construction Monthly checks
All trenches and any temporary holes dug must be filled as soon as possible and checked daily to ensure that no ground dwelling species (e.g. Blue Crane chicks) have fallen in the holes and trapped inside.	ECO to implement ESO to monitor Site engineer/site manager	Throughout construction Daily checks by site engineer/site manager
<b>Bat Roost disturbance and/or destruction</b>		
Avoid construction activities near roosts. Buildings must be buffered by 200 m, inside which no construction activities may take place.	ECO to implement ESO to monitor Site engineer/site manager	Upon commencement Monthly checks
<b>Bat Habitat Modification and Displacement</b>		
No turbines, or blade intrusion, within 200 m of drainage areas.	ECO to implement ESO to monitor Site engineer/site manager	Upon commencement Monthly checks

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
Blade feathering must be used up to the cut-in speed to prevent blades spinning in low wind speeds, from sunset to sunrise in all seasons except winter.	ECO to implement ESO to monitor Site engineer/site manager	Upon commencement Monthly checks
Acoustic monitoring at height and ground level must be undertaken once the first turbine has been erected.	ECO to implement ESO to monitor Site engineer/site manager	Upon commencement Monthly checks
During construction laydown areas and temporary access roads should be kept to a minimum in order to limit direct vegetation loss and habitat fragmentation. Construction should, where possible, be situated in areas that are already disturbed.	ECO to implement ESO to monitor Site engineer/site manager	Upon commencement Monthly checks
Limit the removal of vegetation, particularly indigenous trees, as far as possible.	ECO to implement ESO to monitor Site engineer/site manager	Upon commencement Monthly checks
Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken.	ECO to implement ESO to monitor Site engineer/site manager	Post construction
Bats should be prevented as far as possible from entering any possible artificial roost structures (e.g. roofs of buildings, road culverts and wind turbines) by ensuring that they are sealed in such a way as to prevent bats from entering. If bats colonise infrastructure, a suitably qualified bat specialist should be consulted before any work is undertaken on that infrastructure or attempting to remove bats. Ongoing maintenance and inspections of buildings and road culverts must be carried out to ensure no access to bats or actively roosting bats.	Developer to implement ECO / ESO to monitor Site engineer/site manager Specialist	Upon commencement Throughout construction Monthly checks
<b>Loss of riparian systems and water courses</b>		
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 (crossing must have a small footprint).	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
No vehicles to refuel within drainage lines/ riparian vegetation.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
		Monthly checks
During the operational phase, monitor culverts to see if erosion issues arise and if any erosion control is required.	ECO to monitor Site engineer/site manager	monthly
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.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
<b>Impact on riparian systems and Increase in sedimentation and erosion within the development footprint</b>		
Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
<b>Impact on localized surface water quality</b>		
Strict use and management of all hazardous materials used on site.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
It is advised that an ECO, with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas within aquatic environment, using selected species.	ECO to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.).	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
Containment of all contaminated water by means of careful run-off management on the development site.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
Strict control over the behaviour of construction workers.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
Working protocols incorporating pollution control measures (including approved method statements by the contractor) must be strictly enforced.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
<b>Visual disturbance, noise and dust resulting from construction activities, including heavy machinery and truck transport and Visual effect of haul roads, stockpiles, batching plant and construction camp</b>		
Construction camp, stockpiles and laydown areas to be located in visually unobtrusive areas, not visible from the R27 and R315, if possible.	ECO to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction Monthly checks
<b>Heritage, Archaeology and Palaeontology</b>		
Should any heritage resources, including evidence of graves and human burials, archaeological material and paleontological material be discovered during the execution of the activities above, all works must be stopped immediately and Heritage Western Cape must be notified without delay.	Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
<b>Creation of local employment, training, and business opportunities</b>		
Where reasonable and practical the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. Due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
Where feasible, efforts should be made to employ local contractors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
Before the construction phase commences the proponent should meet with representatives from the SLM to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
The local authorities, relevant community representatives and local farmers must be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
Where feasible a training and skills development programmes for local workers must be initiated prior to the initiation of the construction phase.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
The recruitment selection process must seek to promote gender equality and the employment of women wherever possible.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
The proponent should liaise with the SLM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
Where possible, the proponent, in conjunction with the SLM, local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
<b>Risk to safety, livestock, farm infrastructure and farming operations</b>		
The proponent must enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase proven to be associated with the construction activities for the WEF will be compensated for. The agreement must be signed before the construction phase commences.	ECO / Development to implement Site engineer/site manager ESO to monitor	Prior to construction Throughout construction
Contractors appointed by the proponent should provide daily transport for workers to and from the site wherever possible This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
The proponent should consider the option of establishing a MF that includes local farmers and develop a Code of Conduct for construction workers. This committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
The proponent should hold contractors liable for compensating farmers in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners. The agreement should also cover losses and costs associated with fires caused by construction workers or construction related activities.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
The contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
The contractors appointed by the proponent must ensure that construction workers who are found guilty of trespassing, stealing livestock and/or damaging farm infrastructure are dismissed and charged. This must be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
The housing of construction workers on the site must be strictly limited to security personnel.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
<b>Increased incidence of fires</b>		
The proponent must enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase proven to be associated with the construction activities for the WEF will be compensated for. The agreement must be signed before the construction phase commences.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
The contractor must provide adequate firefighting equipment on-site.	ECO / Development to implement Site engineer/site manager ESO to monitor	Upon commencement Throughout construction
Contractor must ensure that open fires on the site for cooking or heating are not allowed except in designated areas.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
The contractor must ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
high wind conditions when the risk of fires is greater. In this regard special care must be taken during the high risk dry, windy winter months.		
The contractor must provide fire-fighting training to selected construction staff.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
No construction staff, with the exception of security staff, to be accommodated on site over night.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
As per the conditions of the Code of Conduct, in the event of a fire proven to be caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor must also compensate the firefighting costs borne by farmers and local authorities.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
<b>Potential dust and safety impacts and damage to road surfaces associated with movement of construction related traffic to and from the site</b>		
The transport of components to the site along the R27 should be planned to avoid weekends and holiday periods.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
The contractor must inform local farmers and representatives from the district and local municipality Tourism of dates and times when abnormal loads will be undertaken.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
The contractor must ensure that damage caused by construction related traffic to the gravel public roads and local, internal farm roads is repaired on a regular basis throughout the construction phase. The costs associated with the repair must be borne by the contractor.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis <sup>4</sup> , adhering to speed limits and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.	Site engineer/site manager	Throughout construction

<sup>4</sup> Treated effluent (non-potable) water must be used for wetting of roads and construction areas

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
	ESO to monitor	Monthly checks
The contractor must ensure that all workers are informed that no waste can be thrown out of the windows while being transported to and from the site. Workers who throw waste out windows should be fined.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
The contractor must be required to collect waste along access roads on a weekly basis.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
Waste generated during the construction phase must be transported to the local permitted landfill site.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
EMPr measures (and penalties) must be implemented to ensure farm gates are closed and speed limits are adhered to at all times.	Site engineer/site manager ESO to monitor	Throughout construction Monthly checks
Impact on Farmland due to Construction Related Activities		
The footprint areas for the establishment of individual wind turbines should be clearly demarcated prior to commencement of construction activities. All construction related activities should be confined to the demarcated area and minimised where possible.	Developer to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks
All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., must be rehabilitated at the end of the construction phase. The rehabilitation plan must be informed by input from soil scientist and discussed with the local farmer.	Site engineer/ site manager ECO to implement Specialist ESO to monitor	Post construction
The implementation of a rehabilitation programme must be included in the terms of reference for the contractor/s appointed.	Site engineer/ site manager ECO to implement	Preconstruction
The implementation of the Rehabilitation Programme must be monitored by the ECO.	Site engineer/ site manager ECO to implement	Post construction

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
	ESO to monitor	
All workers must receive training / briefing on the reasons for and importance of not driving in undesignated areas.	Site engineer/ site manager ECO to implement	Preconstruction
EMPr measures (and penalties) must be implemented to strictly limit all vehicle traffic to designated roads and construction areas. Under no circumstances must vehicles be allowed to drive into the veld.	Developer to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks
Disturbance footprints must be reduced to the minimum.	Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks
Compensation should be paid by the developer to farmers that suffer a permanent loss of land due to the establishment of the WEF. Compensation should be based on accepted land values for the area.	Developer to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks
<b>General Construction Mitigation Measures</b>		
Potable toilets must be supplied to the workforce in areas of activity. One toilet per 15-20 workers must be implemented. Females must have separate toilets. A licenced contractor must be appointed by the contractor to provide this facility, and ensure that wastes are correctly disposed of. Servicing must take place on a weekly basis, proof of which must be retained on site by the contractor.	Developer to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks
Waste skips must be provided in areas of construction activity as well as within the lay down areas, along with waste bins. Wastes must be separated into the following categories: <ul style="list-style-type: none"> <li>• General waste, compactable and non-compactable</li> <li>• Waste paper recycling</li> <li>• Scrap metal</li> <li>• Globes and fluorescent tubes</li> <li>• Rubber waste</li> <li>• Medical waste</li> <li>• Chemical waste</li> </ul>	Developer to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
<ul style="list-style-type: none"> <li>Hazardous waste</li> </ul>		
<b>Health and Safety</b>		
Implementation of safety measures, work procedures and first aid must be implemented on site.	ECO to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks
Workers must be thoroughly trained in using potentially dangerous equipment.	ECO to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks
Contractors must ensure that all equipment is maintained in a safe operating condition.	ECO to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks
A safety officer must be appointed.	ECO to implement	Pre-construction
A record of health and safety incidents must be kept on site.	ECO to implement Site engineer/ site manager ESO to monitor	Pre-construction Throughout construction Monthly checks
Any health and safety incidents must be reported to the project manager immediately.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Workers have the right to refuse work in unsafe conditions.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
The contractor must ensure that all construction workers are well educated about HIV/AIDS and the risks surrounding this disease. The location of the local clinic where more information and counselling is offered must be indicated to workers.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Material stockpiles or stacks, such as, pipes must be stable and well secured to avoid collapse and possible injury to site workers / local residents	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
An STI and HIV/AIDS awareness campaign must be launched, which is not only directed at construction workers but also at the community as a whole.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
Condoms must be distributed by placing them at centrally located points and by ensuring that construction workers and community members are aware of the availability and location of condoms. The distribution of condoms must be approached with the necessary cultural sensitivity.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Access at the construction site must be controlled to prevent sex workers from either visiting and/or loitering at the construction camp.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Ensure that the local community communicate their expectations of construction workers' behaviour with them.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Personal Protective Equipment (PPE) must be made available to all construction staff and their usage must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn were necessary i.e. dust masks, ear plugs etc.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
No person is to enter the site without the necessary PPE.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Pre-construction, construction and operation activities must be undertaken during daylight working hours between the hours of 07:00 – 17:00 on weekdays and 07:00 – 13:00 on Saturdays. No activity will be allowed on Sundays.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
The workforce is to be provided with sufficient potable water and under no circumstances are they to use untreated water from the local watercourses for drinking.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
<b>Noise</b>		
Construction activities should be should be limited to 06:00- 18:00 Monday to Saturday, with no work on Sundays or public holidays or agreed with the local municipality.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Deliveries of turbine components, plant and materials by Heavy Goods Vehicle (HGV) to site should only take place by designated routes and within times agreed with the relevant authorities.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
The site contractors should be required to employ the best practicable means of reducing noise emissions from plant, machinery and construction activities, as described in BS 5228 Noise Standards.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Noise generated must comply with the Western Cape Noise Control Regulations (Provincial Notice 200/2013).	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
Where practicable, the work programme should be phased, which would help to reduce the combined effects arising from construction operations.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Where necessary and practicable, noise from fixed plant and equipment should be contained within suitable acoustic enclosures or behind acoustic screens.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
All sub-contractors appointed by the main contractor should be formally and legally obliged, and required through contract, to comply with all environmental noise conditions.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Where practicable, night time working should not be carried out. Local residents should be notified in advance of any night-time construction activities likely to generate significant noise levels, e.g. turbine erection.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
Any plant and equipment normally required for operation at night (18:00 - 06:00), e.g. generators, should be silenced or suitably shielded to ensure that the night-time lower threshold of 45 dB, LAeq would not be exceeded at the nearest noise-sensitive developments.	Site engineer/ site manager ESO to monitor	Throughout construction Monthly checks
<b>Increase traffic on the routes and access points to site</b>		
<p>Produce a Traffic Management Plan which must include the following mitigation measures:</p> <ul style="list-style-type: none"> <li>• The arrival and departure of construction vehicles should be staggered during off-peak periods to have a distributed effect over low volume traffic periods.</li> <li>• All vehicles with abnormal loads should have exemption permits as required by the National Road Traffic Act 93 of 1996.</li> <li>• The Project Manager and Site Safety Officer during construction and decommissioning should ensure correct signage and safety precautions are in place for vehicles and pedestrians on-site and at the site access. These may include warning signs, construction vehicle signage and flagmen.</li> <li>• Unpaved roads must be watered to lesson dust generation and routine maintenance on road surface to maintain condition.</li> <li>• Vehicles transporting materials that can be blown away and cause dust must be securely covered and adhere to speed limits.</li> </ul>	ECO to implement Site engineer/ site manager ESO to monitor	Prior to construction Throughout construction Monthly checks

<b>Potential Impact and Management Actions</b>	<b>Responsibility for Implementation and Monitoring</b>	<b>Frequency of Monitoring</b>
<ul style="list-style-type: none"><li>Community participation/stakeholder involvement at every stage of the project is recommended to allow the community to be informed before the start of site activities.</li></ul>		

## 8.2 Post Construction

- Once construction has been completed on site and all excess material has been removed, the storage area shall be rehabilitated. If the area was badly damaged, re-seeding shall be done and fencing in of the area shall be considered if livestock/faunal species specific to the area may subsequently have access to such an area.
- Such areas shall be rehabilitated to their natural state. Any spilled concrete shall be removed and soil compacted during construction shall be ripped, levelled and re-vegetated.
- If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface
- Only designated areas must be used for storage of construction materials, soil stockpiles, machinery and other equipment.
- Specific areas must be designated for cement/concrete mixing/ batching plants. Sufficient drainage for these plants must be in place to ensure that soils do not become contaminated.
- The construction camp must be kept clear of litter at all times.
- Spillages within the construction camp need to be cleaned up immediately and disposed of in the hazardous skip bin for correct disposal.
- All remaining material including building rubble and waste are to be removed from the site.
- All areas disturbed must be managed to ensure efficient drainage.
- The area designated for the deposition of spoil material is to be levelled and shaped to ensure the efficient drainage of the site. Under no circumstances is general or hazardous waste to be disposed of at this site.

### 8.2.1 Infrastructure

- Disassemble all temporary infrastructure units and remove components from the working areas and contractors camp. This will include storage structures and containers, water storage container, power supply, workers accommodation, sewage systems.
- Drain all potable chemical toilets, being careful not to spill the contents. Transfer the waste to an appropriate disposal site.
- Drain all waste water and sewage associated with temporary ablution facilities and transfer the waste to an appropriate disposal site to be identified by the contractor.
- Disassemble all fencing around the camp and either sell, suction or donate to the local community or transfer the waste components to a disposal site or the contractor's base.
- Do not leave any components, waste or infrastructure units within the working area and camp unless specifically required for the operation and maintenance phases and as agreed by the ECO.

### 8.2.2 Contaminated Substrate and Pollution Control Structures

- Excavate all areas of contaminated substrate, transfer the contaminated substrate to an appropriate disposal site and treat the affected areas.
- Remove all plastic linings used for pollution control and transfer to an appropriate disposal site.
- Break up all concrete structures that have been created and remove concrete waste to an appropriate disposal site.

### 8.2.3 Waste

- Remove all remaining construction materials from the camp and working areas and either sell, auction, donate to the local community or transfer the waste components to a disposal site or the contractor's base.
- Remove all construction debris, litter and domestic waste from the camp and working areas and transfer to an appropriate disposal site.
- Remove all waste receptacles from the camp and working areas and either sell, auction, donate to the local community or transfer the waste components to a disposal site or the contractor's base.

## 9 OPERATIONAL PHASE MITIGATION MEASURES

Once the construction and commissioning of the WEF is completed the project becomes operational. During the operation and maintenance of the WEF (including the normal operation of the turbine itself) a certain amount of disturbance results. An operational WEF will normally have various day to day activities occurring on site, such as (but not limited to) security control, routine maintenance, road clearing/cleaning, grass/bush cutting and clearing.

### **The objectives of the operation phase are:**

- To promote environmental awareness.
- To define roles and responsibilities for environmental management.
- To ensure that the mitigation measures proposed for the operational phase of the WEF is implemented and conducted appropriately.
- To ensure that the recommended monitoring programmes are implemented accordingly.

The main impacts associated with the operation phase of the WEF relate to birds and bats. A bird and bat specialist must be appointed to undertake the operational phase monitoring as per the EA and according to the applicable bird and bat guidelines at the time of commercial operations. Section 26 and 27 provides a guide to the plan required to be implemented.

### 9.1 Potential Operation Phase Impacts

Table 9.1 below provides a summary of the potential impacts of the operation of the WEF, as assessed by specialists.

Recommended persons as provided in Table 9.2 below should take responsibility for the implementation and monitoring to ensure that all operational mitigation measures outlined in this document, and all revisions thereof, are complied with.

**Table 9-1: Summary of Operational Phase Impacts**

Operational Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
<b>Soils and Agricultural Potential Impact</b>							
Increased financial security for farming operations	L	M	L	<b>Positive</b>	L	M	H
<i>With Mitigation</i>	<i>L</i>	<i>M</i>	<i>L</i>	<i>Positive</i>	<i>L</i>	<i>M</i>	<i>H</i>
<b>Freshwater &amp; Wetlands (Aquatic)</b>							
Localised surface water quality	M	M	M	Negative	M	L	H
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Increase in surface water runoff on downstream riparian form and function	M	M	M	Negative	M	M	H
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
<b>Terrestrial Ecology</b>							
Impacts on Flora	L	M	L	Negative	L	L	H
<i>With Mitigation</i>	<i>L</i>	<i>M</i>	<i>L</i>	<i>Positive</i>	<i>M</i>	<i>M</i>	<i>H</i>
Impacts on Fauna	M	L	L	Negative	M	M	M
<i>With Mitigation</i>	<i>M</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Impacts on Ecological Processes	L	M	L	Negative	L	L	H
<i>With Mitigation</i>	<i>L</i>	<i>M</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
<b>Avifauna</b>							
Collision with turbine blades and / or towers	M	M	H	Negative	L	L	M
<i>With Mitigation</i>	<i>M</i>	<i>M</i>	<i>H</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>M</i>
Disturbance / Displacement	L	M	M	Negative	L	L	H

Operational Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
<i>With Mitigation</i>	<i>L</i>	<i>M</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Disruption of Local Bird Movement Patterns	<i>M</i>	<i>M</i>	<i>M</i>	Negative	<i>L</i>	<i>L</i>	<i>L</i>
<i>With Mitigation</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>L</i>
<b>Bats</b>							
Collision with turbine blades	<i>L</i>	<i>M</i>	<i>M</i>	Negative	<i>M</i>	<i>H</i>	<i>H</i>
<i>With Mitigation</i>	<i>L</i>	<i>M</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
<b>Noise</b>							
Operational Day and Night-Time Noise	<i>M</i>	<i>H</i>	<i>L</i>	Negative	<i>L</i>	<i>L</i>	<i>H</i>
<i>With Mitigation</i>	<i>M</i>	<i>H</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
<b>Visual / Landscape</b>							
Visual intrusion and Change to Sense of Place	<i>M</i>	<i>H</i>	<i>H</i>	Negative	<i>H</i>	<i>H</i>	<i>H</i>
<i>With Mitigation</i>	<i>M</i>	<i>H</i>	<i>H</i>	<i>Negative</i>	<i>H-M</i>	<i>H</i>	<i>H</i>
Visual intrusion for BESS	<i>L</i>	<i>H</i>	<i>M</i>	Negative	<i>M</i>	<i>H</i>	<i>H</i>
<i>With Mitigation</i>	<i>L</i>	<i>H</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>H</i>	<i>H</i>
<b>Social</b>							
Establishment of RE Infrastructure	<i>M</i>	<i>M</i>	<i>M</i>	<b>Positive</b>	<i>M</i>	<i>M</i>	<i>H</i>
<i>With Mitigation</i>	<i>M</i>	<i>M</i>	<i>M</i>	<b>Positive</b>	<i>M</i>	<i>H</i>	<i>H</i>
Job Creation	<i>L</i>	<i>M</i>	<i>L</i>	<b>Positive</b>	<i>L</i>	<i>H</i>	<i>H</i>
<i>With Mitigation</i>	<i>L</i>	<i>M</i>	<i>L</i>	<b>Positive</b>	<i>L</i>	<i>H</i>	<i>H</i>
Income generated for Affected Landowners	<i>L</i>	<i>M</i>	<i>L</i>	<b>Positive</b>	<i>L</i>	<i>L</i>	<i>H</i>

Operational Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
<i>With Mitigation</i>	<i>L</i>	<i>M</i>	<i>M</i>	<i>Positive</i>	<i>M</i>	<i>H</i>	<i>H</i>
Visual Impacts	M	M	L	Negative	L	M	H
<i>With Mitigation</i>	<i>M</i>	<i>M</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>M</i>	<i>H</i>
Property Values and Operations	M	M	L	Negative	L	M	H
<i>With Mitigation</i>	<i>M</i>	<i>M</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Tourism	M	M	L	Negative	L	L	H
<i>With Mitigation</i>	<i>M</i>	<i>M</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>

**Table 9-2: Operational Phase Impact Management**

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
<b>Terrestrial Ecology</b>		
Disturbed areas such as road verges, turbine pads and substation perimeters must be monitored to detect the establishment of alien species and those species should be eradicated before they spread.	ECO to implement Operational Manager	Throughout operation Seasonal Checks
The use of herbicides for the control and eradication of alien grasses should be done in accordance with an alien eradication programme to reduce unintended ecological impacts.	ECO to implement Operational Manager	Throughout operation Seasonal Checks
Speed limits on gravel roads should be kept to a minimum (30 km/h) to reduce the production of dust and avoid collisions with susceptible species such as snakes and tortoises.	Operational Manager	Throughout operation
Site access should be controlled and no unauthorised persons should be allowed onto the site.	Operational Manager	Throughout operation
Any fauna directly threatened by the operational activities should be reported to and removed to a safe location by the ECO or other suitably qualified person.	ECO to implement Operational Manager	Throughout operation
The collection, hunting or harvesting of any animals at the site should be strictly forbidden.	Operational Manager	Throughout operation
All hazardous materials should be stored in the appropriate manner to prevent contamination of the site.	Operational Manager	Throughout operation
Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill	Operational Manager	Throughout operation
If any parts of the facility are to be fenced, the fence should be permeable to allow for the movement of tortoises and no electrification of the fence should occur within 30 cm of the ground level to reduce the potential for fauna to be electrocuted	ECO to implement Operational Manager	Throughout operation
Any erosion or runoff of sediment towards the river should be reported to the ECO and steps should be taken to prevent erosion from continuing	ECO to implement Operational Manager	Throughout operation
No fires to be lit outside of designated areas.	Operational Manager	Throughout operation

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
A controlled burn should be conducted in natural vegetation, where possible, and be conducted in accordance with legislative requirements and an alien eradication programme to prevent aliens from out-competing natural vegetation post-burn.	ECO to implement Operational Manager	Throughout operation
<b>Avifauna</b>		
Develop and implement a carcass search programme for birds as a minimum during the first three years of operation followed by year 5, 10, 15, 20 and 25, in line with the applicable South African monitoring guidelines.	ECO to implement Operational Manager	Prior to operation
The hierarchy of sensitivity zones identified should be considered where possible with preferential placement of turbines in areas low sensitivity, medium sensitivity and high sensitivity respectively.	ECO to implement Operational Manager	Throughout operation
If one or more Great White Pelican or Black Harrier carcasses are located and determined likely to have resulted from turbine collisions in any sensitivity area then those turbines likely to have been responsible must be fitted with appropriate measures (such as RASOD or similar technology that may be available and determined by an avifaunal specialist) to reduce the likelihood of more collisions occurring at that turbine.	ECO to implement Operational Manager	Throughout operation
If one or more Great White Pelican or Black Harrier carcasses are located and determined likely to have resulted from turbine collisions after the implementation of shut-down-on-demand systems or similar technology then a curtailment strategy must be determined by an avifaunal specialist in consultation with relevant parties and implemented for those turbines likely responsible for the mortalities.	ECO to implement Operational Manager	Throughout operation
Develop and implement a minimum 12 month post-construction bird activity monitoring program that mirrors the pre-construction monitoring surveys completed by Arcus and is in line with the applicable South African post-construction monitoring guidelines. This program must include thorough and ongoing nest searches and nest monitoring. The results of this monitoring and the carcass searches should advise the need for any additional ongoing activity monitoring or nest surveys beyond the 12 month period.	ECO to implement Operational Manager	Prior to operation
Conduct frequent and regular review of operational phase monitoring data (activity and carcass) and results by an avifaunal specialist. This review should also establish the requirement for continued monitoring studies (activity and carcass) throughout the operational and decommissioning phases of the development.	ECO to implement Operational Manager Specialist	Throughout operation

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
The above reviews should strive to identify sensitive locations at the development including turbines and areas of increased collisions with power lines that may require additional mitigation.	ECO to implement Operational Manager Specialist	Throughout operation
The Operational Environmental Management Plan (OEMP) must be implemented, which gives appropriate and detailed description of how operational and maintenance activities must be conducted to reduce unnecessary disturbance. All contractors are to adhere to the OEMP and should apply good environmental practice during all operations.	ECO to implement Operational Manager	Throughout operation
The on-site WEF manager (or a suitably appointed Environmental Manager) must be trained by an avifaunal specialist to identify the potential priority species and Red Data species as well as the signs that indicate possibly breeding by these species. If a priority species or Red Data species is found to be breeding (e.g. a nest site is located) on the operational Wind Farm, the nest/breeding site must not be disturbed and an avifaunal specialist must be contacted for further instruction.	ECO to implement Operational Manager Specialist	Throughout operation
Lighting on turbines to be of an intermittent and coloured nature rather than constant white light to reduce the possible impact on the movement patterns of nocturnal migratory species. Lighting of the turbines is must adhere to the requirements of the SACAA.	ECO to implement Operational Manager	Throughout operation
<b>Bats</b>		
If mortality does occur, the level of mortality must be considered by a bat specialist to determine if this is at a level where further mitigation needs to be considered. Mitigation options may include using ultrasonic deterrents, raising the cut-in speeds of turbines and turbine blade feathering. Any operational minimization strategy (i.e. curtailment) must be targeted during specific seasons and time periods for specific turbines coincident with periods of increased bat activity.	ECO to implement Operational Manager Specialist	Throughout operation
Operational acoustic monitoring and carcass searches for bats must be performed, based on best practice available at the time (i.e., two years initially) to monitor bat mortality and bat activity. Acoustic monitoring must include monitoring at height (i.e., such as on the turbine) and at ground level.	ECO to implement Operational Manager Specialist	Throughout operation
Carcass searching must be undertaken daily (excluding weekends and public holidays) in all seasons except winter for two years as per current best practise.	ECO to implement Operational Manager Specialist	Daily for two years

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
<p>Daily carcass searching at the D1 WEF (until decommission is completed) and once the Darling 1B turbines are operational to take place on the road and pads (excluding weekends and public holidays) in all seasons except winter. The observed bat fatality at the D1 WEF must be evaluated on a monthly basis to estimate fatality and to determine if the blade feathering implemented at all four turbines is successful in reducing bat fatalities. If blade feathering fails to reduce bat fatality at the D1 WEF, the cut-in speed must be raised, and this process of adaptive mitigation repeated until a curtailment level is reached where bat fatalities are acceptable based on best practise and expert judgement and until all D1 WEF turbines are decommissioned.</p>	<p>ECO to implement Operational Manager Specialist</p>	<p>Daily as required. Monthly</p>
<p>Estimated bat fatality must be evaluated against best practise thresholds and more stringent curtailment (e.g., raised cut-in speeds) and/or acoustic deterrents used if thresholds are exceeded. Note that the thresholds were not developed for small scale WEFs thus expert judgement must be used to evaluate the thresholds to determine if they are logical. The carcass search data must be assessed each month to determine the observed and estimated fatality rate.</p>	<p>ECO to implement Operational Manager Specialist</p>	<p>Daily as required. Monthly</p>
<p>Pre-construction and operational monitoring bat data to feed into the SANBI bird and bat toolkit. Monthly carcass searching reports to be submitted to the SABAAP.</p>	<p>ECO to implement Operational Manager Specialist</p>	<p>Daily as required. Monthly</p>
<p>As new information becomes available with regard to successful mitigation strategies tested, this information must feed into the adaptive management plan.</p>	<p>ECO to implement Operational Manager Specialist</p>	<p>Throughout operation</p>
<p>Bats must be prevented from entering any possible artificial roost structures (e.g. roofs of buildings, road culverts and wind turbines) by ensuring that they are sealed in such a way as to prevent bats from entering. If bats colonise WEF infrastructure, a suitably qualified bat specialist must be consulted before any work is undertaken on that infrastructure or attempting to remove bats. Ongoing maintenance and inspections of buildings must be carried out to ensure no access to bats or actively roosting bats</p>	<p>ECO to implement Operational Manager</p>	<p>Throughout operation</p>
<p>Where lights need to be used such as at the substation and elsewhere, these must have low attractiveness for insects such as low pressure sodium and warm white LED lights (Rydell 1992; Stone 2012). High pressure sodium and white mercury lighting is attractive to insects (Blake et al. 1994; Rydell 1992; Svensson &amp; Rydell 1998) and must not be used as far as possible.</p>	<p>ECO to implement Operational Manager</p>	<p>Throughout operation</p>
<p><b>Visual / Landscape</b></p>		

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
Avoid / minimise any additional adverse visual effects on site features and adjacent routes or receptors other than that which has already been assessed.	ECO to implement Operational Manager	Throughout operation
<b>Social</b>		
Implement a skills development and training programme aimed at maximizing the number of employment opportunities for local community members.	Developer to implement Operational Manager	Throughout operation
Maximise opportunities for local content, procurement and community shareholding.	Developer to implement Operational Manager	Throughout operation
The proponent, in consultation with the SLM, should investigate the options for the establishment of a Community Development Trust.	Developer to implement Operational Manager	Pre-operation
(Where reasonable and practical) the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. Due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.	Developer to implement Operational Manager	Throughout operation
Where feasible, efforts should be made to employ local contractors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria.	Developer to implement Operational Manager	Throughout operation
The local authorities, relevant community representatives and local farmers should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project.	Developer to implement Operational Manager	Throughout operation
The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.	Developer to implement Operational Manager	Throughout operation
Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information.	Developer to implement Operational Manager	Pre-operation
The SLM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.	Developer to implement Operational Manager	Throughout operation
Implement agreements with affected landowners with regards to the generation of additional income which represents a significant benefit and reduces the risks to their	Developer to implement	Throughout operation

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
livelihoods posed by droughts and fluctuating market prices for sheep and farming inputs, such as feed etc	Operational Manager	
<b>Noise</b>		
Noise due to the operation of the development is not to exceed 45 dB, LAeq,T at any occupied residential dwelling present at the time of this consent. In the event that the development is found to exceed this level, a suitable scheme of mitigation will be employed to ensure noise levels are reduced to 45 dB, LAeq,T or less.	Developer to implement Operational Manager	Throughout operation

## 10 BESS RISK ASSESSMENT AND MANAGEMENT PLAN

### 10.1 High-Level BESS Risk Assessment

The risks associated with Lithium-ion (Li-ion) and Redox Flow technology, are typically well researched and documented. The main concerns relating to a BESS are fire hazards (from toxic and flammable gasses) and the potential for a condition known as *'thermal runaway'*. Thermal runaway occurs in situations where an increase in temperature changes the conditions in a way that causes a further increase in temperature, often leading to a destructive result. As far as general environmental risks, the main concerns are surrounding the disposal of the batteries at end of their life.

This section will attempt to address the risks associated with onsite use of BESS for the D1B WEF, and the resultant Risk Assessment is presented in Table 10.1 below. To do this, the EAP looked at several potential situations which could result in a possible detrimental environmental hazard. These are:

1. The actual risks associated with the delivery, connection, operation, maintenance, disconnection and disposal of the batteries.
2. The likelihood of these actual risks occurring.
3. The significance of the impacts should these risks take place.
4. Appropriate and practical mitigation measures and/or management actions to reduce likelihood of the risk occurring and/or the impact.

A comprehensive operations and maintenance programme is necessary to ensure that all management and mitigation measures are included in the EMP and adopted and implemented as well as to ensure that all monitoring and protective devices are in good working order.

Regular inspections should be undertaken to ensure the battery systems are not overheating or showing signs of malfunction. Annual thermographic scanning can help ensure the BESS is operating within normal parameters.

Where a BESS does not meet its performance requirements, and where repairs do not solve a problem which exists, and where change in the BESS does not lead to a profitable alternative business solution, the BESS is said to have reached its End-of-Life (EoL). Following an EoL shutdown procedure a BESS would be de-installed, disassembled, removed from the site and transported. Further, its components would be reused and/or recycled.

For decommissioning the energy storage system, the appropriate technical guidelines from the manufacturer should be consulted. Before the actual decommissioning, the BESS system needs to be checked for hazardous substances and a risk assessment should be performed considering safety and/or environmental risks which might occur during the decommissioning activities (e.g., fire hazards, electric shocks and poisonous effects on the environment). Depending on the safety and/or environmental risks identified and on the type of BESS equipment, local authorities should be consulted or informed about the decommissioning activities.

For recycling, it is advised to consult a specialized organization in waste treatment to the extent that all materials, also non-hazardous are disposed of correctly and preferably recycled. Several materials which commonly are found in modern batteries or redox flow batteries are environmentally hazardous and regulated and thus should be disposed of according to regional government requirements, such as directive 2006/66/EC of the European parliament and of the council, also known as the Batteries Directive.

This high-level risk assessment must be replaced with a detailed technology specific risk assessment once the final equipment suppliers have been identified during the detailed design and procurement stage. The technology specific risk assessment should be undertaken or provided by the battery supplier once identified.

**Table 10-1: High-Level BESS Risk Assessment**

Possible Risk	Likelihood of occurrence	Resultant Impact	Management / Mitigation
<b>General leakage:</b> - Leakage of Coolant - Leakage of Electrolyte	<b>Low</b>	- On site fires. - Electrical failure. - Potential spillage of electrolytes or refrigerant - Soil contamination - Groundwater contamination	- Latest BESS technologies to be used as far as possible. - BESS installation is to adhere to the appropriate international standards and South African National Standard (SANS) requirements. - Training of all staff and employees on how to handle spillages, fires and electrocutions. - Records kept for well managed operations and maintenance.
<b>Mishandling:</b> - Batteries incorrectly connected - Batteries left disconnected - Short circuits - Forced discharged - Venting of Electrolyte - Punctured/Crushed or damaged modules and battery casing	<b>Low</b>	- On site fires. - Electrical failure - Electrocution - Potential spillage of electrolytes or refrigerant - Vented gasses - Staff and personal injury - Contaminated Runoff - Soil and microbe contamination - Groundwater seepage - Downstream effects on the current terrestrial ecosystem.	- In case of a spillage of hazardous chemicals where contamination of soil occurs, depending on the degree of contamination, excavation and removal to a hazardous waste disposal site might be necessary. If the spillage is widespread, a specialist will need to be immediately appointed to deal with the issue, the DFFE and Western Cape Province Pollution and Chemicals Management Directorate must be notified, and the notification process stipulated in the National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (GN 331, 2 May 2014) should be followed. - Implementation of spill handling and management in line with the EMP. - Demarcate all no-go and sensitive areas. - Avoid the placement of batteries near watercourses and sensitive features. - Material Safety Data Sheets (MSDS) Records to be kept, as well as incidents reporting register. - Source batteries from reputable suppliers, and batteries to arrive on site pre-assembled in suitable containers. - Battery inspection prior to installation.
<b>Thermal Runaway:</b> - Thermal and/or Mechanical failure in one or more battery cells	<b>Low</b>	- On site fires. - Electrical failure	- Maintenance. - Latest BESS technologies to be used as far as possible.

Possible Risk	Likelihood of occurrence	Resultant Impact	Management / Mitigation
<ul style="list-style-type: none"> <li>- Overheating</li> <li>- Short circuiting</li> </ul>		<ul style="list-style-type: none"> <li>- Potential spillage of electrolytes or refrigerant</li> <li>- Downstream effects on the current terrestrial ecosystem.</li> </ul>	<ul style="list-style-type: none"> <li>- Appropriate battery design and venting control.</li> <li>- Source from reputable manufacturers.</li> <li>- Safe and appropriate storage in line with the above and the EMPr. Safe handling which must include battery inspection prior to installation.</li> <li>- Should electrolyte solutions be stored on site, these should be stored away from incompatible materials such as all peroxides, such as hydrogen peroxide; chemicals that react with acid to generate a gaseous product, such as carbonate and bicarbonates, sulfites and bisulfites; strong reducing agents, such as alkaline metals (Li, Na, K) and alkaline earth metals (Be Mg Ca, Sr, Ba); reactive metals such as aluminum and zinc, all hydrides (such as LiAlH<sub>4</sub>, NaBH<sub>4</sub>), and some carbides (such as CaC<sub>2</sub>).</li> <li>- Development and implementation of Thermal Management Plan prior to installation/construction.</li> </ul>
<p><b>Limited Employee Training and Experience:</b></p> <ul style="list-style-type: none"> <li>- Device Monitoring Failure (SCADA)</li> <li>- Poor incidents reporting</li> <li>- Poor first responders training</li> <li>- Distance to nearest fire station and response time.</li> </ul>	<b>Low</b>	<ul style="list-style-type: none"> <li>- Time lag for first respondent</li> <li>- Inability to contain spillage</li> <li>- Fire</li> <li>- Electrocution</li> <li>- Damage to exiting/surrounding infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>- During the construction phase the proposed project, first responders from the nearest major center (such as fire fighters and paramedics) must be given appropriate training on dealing with any emergency situation that may occur as a result of the operation of BESS. Such training must be provided by the technology suppliers or an appointed service provider.</li> </ul>
<p><b>Inappropriate Storage</b></p> <ul style="list-style-type: none"> <li>- Hydrocarbon Spill</li> <li>- Leaked battery pack coolant</li> <li>- Leaked refrigerant</li> <li>- Leaked cell electrolyte</li> <li>- Rapid heating of individual cells</li> <li>- Fires</li> </ul>	<b>Low</b>	<ul style="list-style-type: none"> <li>- On site fires.</li> <li>- Electrical failure</li> <li>- Electrocution</li> <li>- Potential spillage of electrolytes or refrigerant</li> <li>- Vented gasses</li> <li>- Staff and personal injury</li> <li>- Contaminated Runoff</li> <li>- Soil and microbe contamination</li> <li>- Groundwater seepage</li> </ul>	<ul style="list-style-type: none"> <li>- Solid State Li-Ion technologies to be preferred where possible.</li> <li>- Training of all staff and employees on how to handle spillages, fires and electrocutions.</li> <li>- In terms of appropriate design measures, the holder of the EA must identify a secondary containment facility, which is to be constructed with a capacity of at least 110% of the largest storage tank's capacity and the off-loading point must be located in the bunded area to ensure that any potential spill during the off-loading of the electrolyte solutions is contained.</li> <li>- Records kept for well managed operations and maintenance.</li> <li>- Bunding of containers.</li> </ul>

Possible Risk	Likelihood of occurrence	Resultant Impact	Management / Mitigation
		<ul style="list-style-type: none"> <li>- Downstream effects on the current terrestrial ecosystem.</li> </ul>	<ul style="list-style-type: none"> <li>- Implementation of spill handling and management in line with the EMP which ensures that run-off and dirty water does not mix with electrolyte spill.</li> <li>- Containment areas to be sloped towards a sump.</li> <li>- All drains to be covered.</li> <li>- Demarcate all no-go and sensitive areas.</li> <li>- Avoid the placement of batteries near watercourses and sensitive features.</li> <li>- MSDS Records to be kept, as well as incidents reporting register.</li> <li>- The batteries should be placed in a well-ventilated area, include vents (where necessary and applicable) and appropriate PPE (appropriate gloves, safety glasses/face shield, appropriate clothing) should be worn when handling the electrolyte solutions.</li> <li>- Source batteries from reputable suppliers.</li> <li>- The transport vehicle should be identified with symbols.</li> <li>- Transport schedule and map must be implemented and kept on each drivers person, with a copy kept in the admin offices on site.</li> <li>- Battery inspection prior to installation.</li> </ul>
<p><b>Inappropriate disposal at the end of life</b></p> <ul style="list-style-type: none"> <li>- Landfill Disposal</li> <li>- Heavy Metal Pollution</li> </ul>	<p><b>Medium</b></p>	<ul style="list-style-type: none"> <li>- Potential scenario of fluids from the batteries leaking into environment. The release of such chemicals through leaching, spills or air emissions can harm communities, ecosystems and food production.</li> <li>- The potentially toxic materials contained in batteries means that they are classified as hazardous materials in terms of NEM:WA. There are only a few licensed hazardous waste sites in South</li> </ul>	<ul style="list-style-type: none"> <li>- The recycling of batteries and their potential use as e-waste.</li> <li>- Disposal at a licensed hazardous waste site.</li> <li>- Prior to construction of the D1B WEF, and BESS, the holder of the EA is to develop a dedicated Battery Recycling Programme to be adopted on-site.</li> <li>- Records of disposal at a licensed facility must be kept.</li> </ul>

Possible Risk	Likelihood of occurrence	Resultant Impact	Management / Mitigation
		Africa and recycling of batteries and e-waste has been identified as a sure way of improving the lifespans of such sites.	

## 11 CUMULATIVE PHASE

Darling 1B WEF would be visually prominent in the local area, being located on the slopes of Moedmaag hill, and close to two important arterial routes with scenic significance in the region. However, even though the overall visual impact significance of the proposed development was calculated as high - medium, the actual significance could be slightly lower after mitigation, considering the decommissioning of the existing 4 D1 turbines.

A good opportunity exists in for the rehabilitation of existing degraded vegetation to occur. The following potentially positive ecological impacts of a development in this area have been identified: As many of the threats listed for both vegetation types include the encroachment and invasion by alien plant species as well as agricultural practices, a concerted alien eradication and removal programme would significantly benefit the remaining natural vegetation on the site. Similarly, as most of the site identified as Swartland Granite Renosterveld (Critically Endangered) has already been transformed by agricultural activities, a rehabilitation programme of these areas would be highly desirable as so little of this vegetation type remains intact in the area. The alien removal and rehabilitation of natural areas would improve the linking of existing fragments, facilitate the movement of animals through biodiversity corridors and improve the functioning of ecosystem processes.

Cumulative impacts are high as a result of bat mortality at the operational D1 WEF, which is immediately adjacent to proposed D1B WEF on the same land parcel. Once the existing D1 WEF turbines have been decommissioned, cumulative impacts associated with bat mortality from collision with turbines are expected to decrease. This will create a high positive impact on the bat community in the region as bat fatalities are expected to decrease as well as the potential cumulative impact to bats.

## 12 DECOMMISSIONING PHASE

**The objectives of the decommission phase are:**

- To promote environmental awareness.
- To define roles and responsibilities for environmental management.
- To ensure that the mitigation measures proposed for the decommissioning phase of the WEF is implemented and conducted appropriately.
- To ensure that the recommended management plans are implemented accordingly.

As the existing WEF is being decommissioned, a decommissioning plan must be produced by the ECO. The plan must include details on the decommissioning and dismantling of the WEF, taking in consideration the potential environmental impact associated with it. Environmental monitoring plans must be produced to ensure no pollution occurs during this phase. The plan must include the steps that will be taken to rehabilitate the area after the WEF is dismantled, as well as recycling options of the equipment and structures. Recommendations for consideration for the decommissioning plan is provided below. This phase will be applicable to the Darling 1B WEF once it will be ready for decommissioning following its operational life cycle and a decommissioning plan must be produced once the turbines are ready to be decommissioned.

Decommissioning ultimately requires the removal of wind turbine infrastructure and includes the restoration of the site as closely as possible to its original state.

### 12.1 Decommissioning and Restoration Plan Recommendations

A Decommissioning and Restoration Plan (DRP) should be considered to ensure that habitat and ecosystem restoration is achievable once the Wind Farm has ceased operating.

According to the *Scottish Natural Heritage Commissioned Report: Research and Guidance on restoration and decommissioning of onshore wind farms*, a logical sequence for decommissioning planning and execution of construction activities were reviewed and some of what are suggested below:

- De-energising the site, usually involves initially high voltage (HV) disconnection in the event of re-energizing of the site followed by low voltage (LV) disconnection of the affected turbines.
- Handing over the site responsibility to an experienced Contractor and management of Operator access and site setup.
- Decommissioning of structures, likely to be the reverse of the installation procedure, such as:
  - Stripping out of turbine internals and removal of transformer;
  - Controlled dismantling of turbines (blades, nacelle, tower);
  - Removal of turbine base and backfilling void;
  - Removal of cables (whole or partial) and making good trenches (throughout);
  - Removal of crane pads (whole or partial) and backfilling/landscaping;
  - Removal of Sub-station and associated buildings (when applicable);
  - Removal of access tracks (whole or partial) and associated water crossings, passing areas etc. Working from end point towards exit point;
  - Reinstating watercourses and /or removing watercourse crossings;
  - Final landscaping (seeding) and making good remaining borrow pits etc;
  - Make good public road junctions, if required;.
  - Providing 'as-built' documentation including residual risks to Landowner and Planning Authority; and
  - Monitoring and maintaining the site to achieve the end-use requirement.

#### ***12.1.1 Soil Conservation and Management:***

Completely removing wind turbine infrastructure is likely to require a rock-based backfill into the voids left behind. Decommissioning plans have proposed options that involve the removal of turbine materials to a depth of approximately 1 m below ground level followed by surface restoration of topsoil. This approach needs to be considered carefully as it may not always be ecologically feasible. Using large quantities of off-site rock or soil for backfill could have detrimental impacts especially if the backfill's chemical composition is significantly different from that found in the natural, baseline (receiving) soil environment of the site. A recommendation would be to avoid using large quantities of backfill that do not match the receiving environment's baseline soil profile.

Other direct and indirect impacts on soil properties that may occur during construction and decommissioning phases that should be avoided include:

- Sealing soil by covering it with impermeable materials that may alter the soil's chemical and biological properties and could have adverse impacts on drainage characteristics;
- Contaminating soil through accidental spillage / use of chemicals;
- Compacting soil with heavy machinery;
- Mixing topsoil with subsoil, resulting in reduced soil quality; and
- Indirect effects on water quality – increase in dissolved organic carbon and presence of suspended soils.

Before any decommissioning and restorative design work takes place, an in-depth assessment of the available soil on site, along with soil-forming resources from the restorative layers should be carried out. It is important to understand a site's soil characteristics and their influence on habitats so that communities that are re-established are likely to sustain themselves in the long run.

Agricultural restoration would need at least a thin layer of topsoil, while semi-natural environments often require low nutrient substrates and woodland restorative planting needs a minimum depth of 1 m of suitable material.

Imported soils should match the chemical and nutrient composition of the receiving soil profile and should be free of invasive and undesired seedlings / propagules. Using imported peat or soils may result in the need for resowing if the material does not contain a viable seed bank of local provenance. Reseeding techniques will inevitably be needed as materials that were side-casted during the initial construction phase will not contain enough viable seeds to regenerate the whole restoration area. Other soil-forming materials can be used in the absence of sufficient topsoil, peat, and appropriate seed bank levels as long as soils and/or soil substitutes are aligned with the site's target ecosystem.

### **12.1.2 Vegetation Restoration**

The objective of habitat restoration (see Section 15 of this EMP) is to minimize degradation of the ecological resource and promote the re-establishment of a functional ecosystem. Decommissioning plans that involve significant disturbance of habitats (complete removal of infrastructure) require a longer recovery period in environments less resilient to disturbance (peatlands or species-rich grasslands). Habitat restoration techniques must consider the ease that different habitats can be restored and the likely success of this restoration.

### **12.1.3 Options for End-of-life Infrastructure**

Generally, the turbine would be dismantled at ground level and transported away from the site for recycling, reuse, or disposal. The decommissioning of the turbine structure should have a minimal environmental impact. Costs are driven by haulage and craneage charges.

Installed wind turbines consist of four sections: the rotor, nacelle, tower, and foundation. It is important to know what materials were used in the construction of the turbines as this will provide insight into best practices for appropriate disposal methods.

Materials commonly used in the construction of turbines are:

- Rotor – Blades, Blade hub, Nose cone, Resin, fiberglass, cast iron.
- Nacelle – Bed frame, Main shaft, Transformer, Generator, Gearbox, Nacelle cover, Steel, Silica, copper, steel, fiberglass, resin.
- Tower - Steel, Concrete (very uncommon).
- Foundation – Footing, Ferrule, Concrete, iron, steel.

Other material to be decommissioned are discussed below.

- Transformer - There are limited recycling options, and is therefore recommended to be removed from site for disposal or be used by others. It would be a low cost to the decommissioning plan.
- Crane Pads can be retained, regraded and then covered. Original soils must be managed to be reused for restoration. Costs involved are Low to Medium. Recycling options would be to use on-site as backfilling voids.
- Tracks and roads can be left in situ if suitable and if not hindering on any other risks such as visual, hydrology. For reinstatement, original topsoil and appropriate seed layer must be used.
- Substations can be removed from site and materials can be separated and reused. Cables made from copper material can be recycled offsite.

Turbine foundations consist of reinforced concrete gravity structures or reinforced concrete bases supported on piles. The removal of a base will involve breaking apart the reinforced concrete. The concrete is recommended to be broken into smaller sections with steel

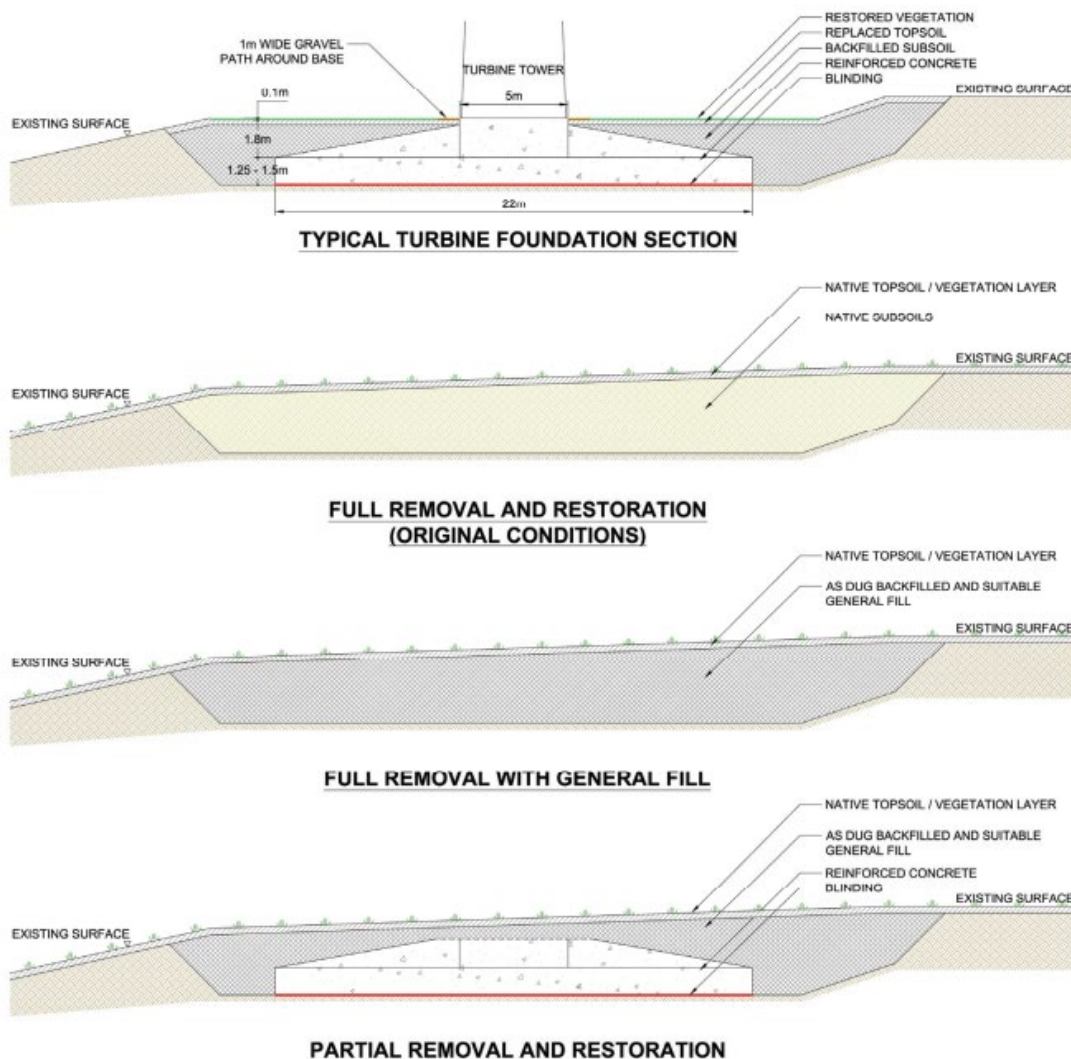
cutting equipment, hydraulic breakers, excavators, and dump trucks for their removal. It is suggested that the removal of a concrete base could take a week if only the top layer of 1 meter is removed. Should reinforced concrete be processed on-site to remove steel (for recycling purposes) and create a granular or rubble concrete material, it can be used for further construction (tracks, hardstandings) if appropriate to the site. Processed or unprocessed reinforced concrete can be removed from site and be reused or recycled.

Alternatively, reinforced concrete can under normal circumstances remain *in situ* as an inert material. Concrete is inherently durable unless attacked by soils containing sulphates or low pH and other aggressive agents. The risk of rebar corrosion is low in buried concrete due to the low risk of carbonation and low levels of oxygen. Where ground conditions pose a chemical risk, it is likely that the concrete would have been designed to be resistant to acidic or alkaline conditions. Site-specific risks should be assessed in the DRP as the base has been *in situ* for 15 years.

Retaining the base *in situ* can be considered as there is a relatively low environmental risk associated with reinforced concrete. The noise, ground disturbance, and costs of excavating, processing, and transporting along with associated carbon emissions may create a larger environmental impact than leaving the base *in situ*.

Removing the concrete base without backfilling would leave a sizeable void that could pose a health and safety hazard or an unwanted feature in the visual landscape. The void would need to be filled with appropriate material as discussed in the soil conservation section.

Turbine bases supported on concrete piles are more difficult to remove. Leaving such piles *in situ* should not create an environmental hazard but it may be prone to oxidizing and staining or contamination. This is due to the depth of cover between concrete and reinforcement in the piles may be less than in gravity bases.



**Plate 12-1: Turbine foundation decommissioning alternatives**

#### 12.1.4 Reuse of Turbines

Ideally, sending off material to a landfill should be avoided or used as a last resort. There is the option of reusing wind turbine infrastructure where feasibly possible. For developing countries, buying second-hand wind turbines serve as an opportunity to gain experience with renewable energy and allow for profit from technology transfer with low capital expenditure. Wind turbines could be sold, or their materials (mainly comprised of steel, copper, and electronics) can be recycled or reused where possible.

Turbine blades are slightly more difficult to recycle as they're made primarily from fiberglass, a composite material. Cutting the blades into smaller, manageable sizes on site is achievable, but transporting the materials off-site is costly. There are limited recycling options for composite materials. Most recycling activities for composite materials are limited to down cycling (converting waste into products of lesser quality or reduced functionality).

## 12.2 Potential Decommissioning Phase Impacts

Table 12.1 below provides a summary of the potential impacts of the decommissioning of the WEF, as assessed by specialists.

Recommended persons as provided in Table 12.2 below should take responsibility for the implementation and monitoring to ensure that all operational mitigation measures outlined in this document, and all revisions thereof, are complied with.

**Table 12-1: Summary of Decommissioning Phase Impacts**

Decommissioning Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
<b>Soils and Agricultural Potential Impact</b>							
Soil Degradation	L	M	M	Negative	M	M	H
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
<b>Freshwater and Wetlands (Aquatic)</b>							
Loss of riparian system, wetlands and disturbance of watercourses	M	M	M	Negative	M	M	H
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Disruption of any hydrological regimes and or movement corridors	M	M	M	Negative	M	M	H
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Localised surface water quality	M	M	M	Negative	M	L	H
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Loss of riparian system, wetlands and disturbance of watercourses	M	M	M	Negative	M	M	H
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Increase in surface water runoff on downstream riparian form and function	M	M	M	Negative	M	M	H
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
<b>Terrestrial Ecology</b>							
Impact on Flora	L	M	L	Negative	M	H	H
<i>With Mitigation</i>	<i>L</i>	<i>M</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Impacts on Fauna	L	M	L	Negative	L	L	H

Decommissioning Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
<i>With Mitigation</i>	<i>L</i>	<i>M</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Impacts on Ecological Processes	L	L	M	Negative	M	H	H
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
<b>Avifauna</b>							
Disturbance and Displacement	L	L	M	Negative	L	L	M
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
<b>Bats</b>							
Roost disturbance / destruction	L	L	M	Negative	L	L	H
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
Habitat Modification and Displacement	L	L	M	Negative	L	L	H
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
<b>Noise</b>							
Decommissioning Noise	M	L	M	Negative	L	L	H
<i>With Mitigation</i>	<i>M</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
<b>Visual</b>							
Visual intrusion and Change to Sense of Place	M	H	H	Negative	M	H	H
<i>With Mitigation</i>	<i>L</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>
<b>Social</b>							
Loss of jobs and income	M	M	L	Negative	L	M	H
<i>With Mitigation</i>	<i>M</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>H</i>

Decommissioning Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Job Creation	L	M	L	<b>Positive</b>	L	H	H
<i>With Mitigation</i>	<i>L</i>	<i>M</i>	<i>L</i>	<i>Positive</i>	<i>L</i>	<i>H</i>	<i>H</i>
<b>Traffic</b>							
Traffic on routes	M	L	L	Negative	L	L	M
<i>With Mitigation</i>	<i>M</i>	<i>L</i>	<i>L</i>	<i>Negative</i>	<i>L</i>	<i>L</i>	<i>M</i>

**Table 12-2: Decommissioning Phase Impact Management**

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
<b>Terrestrial Ecology</b>		
Site access must be controlled and no unauthorised persons are to be allowed onto the site.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Any fauna directly threatened by the decommissioning activities should be reported to and removed to a safe location by the ECO or other suitably qualified person.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
The collection, hunting or harvesting of any plants at the site should be strictly forbidden. Personnel should not be allowed to wander off the demarcated decommissioning site.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
All hazardous materials should be stored in the appropriate manner to prevent contamination of the site.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
All heavy machinery and vehicles should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such as snakes and tortoises.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
No excavated trenches or holes should be left open for extended periods as fauna may fall in and become trapped.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Existing roads should be used to prevent erosion and damage caused by vehicles.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
The alien plant species monitoring and eradication programme is to be implemented throughout the lifetime of the project and continue for at least two years following the	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning Two years post decommission

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
completion of decommissioning activities or until a cover of indigenous species has returned to the areas disturbed during decommissioning.		
The habitat and floral rehabilitation programme should include that areas disturbed or cleared during the decommissioning phase be revegetated with appropriate indigenous vegetation associated with the vegetation type affected.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Any roads that will not be rehabilitated should have appropriate erosion and runoff control features in place.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Any erosion or runoff of sediment deposition should be monitored for at least two years following decommission and appropriate steps should be taken to prevent erosion from continuing.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning Two years post decommission
A controlled burn should be conducted in natural vegetation, where possible, and be conducted in accordance with legislative requirements and an alien eradication programme to prevent aliens from out-competing natural vegetation post-burn.	ECO to implement ESO to monitor Site engineer/ site manager	As required.
<b>Avifauna</b>		
The appointed ECO / ESO must be trained by an avifaunal specialist to identify the potential priority species and Red Data species (e.g., Blue Crane) as well as the signs that indicate possible breeding by these species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of Red Data species, and such efforts may include the training of construction staff (e.g., in Toolbox talks) to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the Red Data species are confirmed to be breeding (e.g., if a nest site is found), activities within 500 m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed.	ECO to implement ESO to monitor Specialist Site engineer/ site manager	Throughout Decommissioning
<b>Bats</b>		
<p>Roost disturbance and/or destruction as well as disturbance during the decommissioning phase of the existing Darling 1 WEF and the proposed D1B WEF would only cause a minor and possibly negligible impact to bats given the small scale of the project and are not assessed further. Provided decommissioning activities are restricted to daylight hours, the impacts to bats are predicted to be negligible.</p> <p>However, the decommissioning the existing Darling 1 turbines will have a cumulative positive impact on the bat community in the region. Given the current high impact to bats of these turbines, it stands to reason that removing this impact would have a high positive impact. However, it is understood that the client will decommission the</p>		

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
turbines using a staged process and not all at once. Thus, the positive impact will successively increase with each successive turbine removed but a low positive impact will occur with the removal of the first turbine. While the three turbines remain operational, a high negative impact will remain.		
<b>Visual</b>		
Wind turbines and building structures should be removed at the end of the life of the project.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Platforms and access roads, no longer required, should be ripped and regraded.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Disturbed areas should be stabilised and returned to pasture, crops or natural veld to visually blend with the surroundings.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
<b>Social</b>		
The proponent should ensure that retrenchment packages are provided for all staff retrenched when the existing Darling 1 WEF is decommissioned (if required) and when the D1B WEF is decommissioned.	Developer to implement ECO to monitor Site engineer/ site manager	Throughout Decommissioning
All structures and infrastructure associated with the proposed facility/ies should be dismantled and transported off-site on decommissioning.	Developer to implement ECO to monitor Site engineer/ site manager	Throughout Decommissioning
The proponent should investigate the option of establishing an Environmental Rehabilitation Trust Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Trust Fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 20-year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure. Alternatively, the funds from the sale of the WEF as scrap metal should be allocated to the rehabilitation of the site.	Developer to implement ECO to monitor Site engineer/ site manager	Throughout Decommissioning
<b>Traffic</b>		

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
<p>Produce a Traffic Management Plan which must include the following mitigation measures:</p> <ul style="list-style-type: none"> <li>• The arrival and departure of vehicles should be staggered during off- peak periods to have a distributed effect over low volume traffic periods.</li> <li>• All vehicles with abnormal loads should have exemption permits as required by the National Road Traffic Act 93 of 1996.</li> <li>• The Project Manager and Site Safety Officer during decommissioning should ensure correct signage and safety precautions are in place for vehicles and pedestrians on-site and at the site access. These may include warning signs, construction vehicle signage and flagmen.</li> <li>• Unpaved roads must be watered to lesson dust generation and routine maintenance on road surface to maintain condition.</li> <li>• Vehicles transporting materials that can be blown away and cause dust must be securely covered and adhere to speed limits.</li> <li>• Community participation/stakeholder involvement at every stage of the project is recommended to allow the community to be informed before the start of site activities.</li> </ul>	<p>Developer to implement ECO to monitor Site engineer/ site manager</p>	<p>Throughout Decommissioning</p>
<b>Noise</b>		
<p>Decommissioning activities shall be limited to times agreed with the local municipality.</p>	<p>ECO to implement ESO to monitor Site engineer/ site manager</p>	<p>Throughout Decommissioning</p>
<p>Delivery / removal of turbine components, plant and materials by Heavy Goods Vehicle (HGV) to Site shall only take place by designated routes and within times agreed with the relevant authorities.</p>	<p>ECO to implement ESO to monitor Site engineer/ site manager</p>	<p>Throughout Decommissioning</p>
<p>The site contractors should be required to employ the best practicable means of reducing noise emissions from plant, machinery and construction activities. Measures should be employed if deemed necessary by the Environmental Compliance Officer in line with BS</p>	<p>ECO to implement ESO to monitor Site engineer/ site manager</p>	<p>Throughout Decommissioning</p>

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites <sup>5</sup> guidance and when working within 2 km of a Noise Sensitive Receptor.		
Noise generated must comply with the Western Cape Noise Control Regulations (Provincial Notice 200/2013).	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Where deemed necessary by the ECO in line with H&S requirements, noise from fixed plant and equipment should be contained within suitable acoustic enclosures or behind acoustic screens.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
All sub-contractors appointed by the main contractor will be formally and legally obliged, and required through contract, to comply with all environmental noise conditions.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Where practicable, night time working will not be carried out. Local residents shall be notified in advance of any night-time construction activities likely to generate significant noise levels, e.g., turbine breakdown.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Any plant and equipment normally required for operation at night (19:00 - 07:00), e.g., generators, shall be silenced or suitably shielded to ensure that the night-time lower threshold of 45 dB, LAeq shall not be exceeded at the nearest noise-sensitive developments.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
<b>Freshwater and Wetlands</b>		
The layout planning has taken cognisance of the aquatic sensitivity layer, to avoid these areas (towers) or where access is required, cross such areas using the existing tracks / roads or where the impacts would be low or can easily be mitigated.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
All alien plant re-growth, which is currently low within the greater region must be monitored and should it occur, these plants must be eradicated within the project footprints and especially in areas near the proposed crossings.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Strict use and management of all hazardous materials used on site in line with the specific material safety data sheets, e.g., fuels must be stored within a contained / bunded site with the necessary and spill kits available.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning

<sup>5</sup> BSI, 2009. Code of practice for noise and vibration control on construction and open sites. Noise.

Potential Impact and Management Actions	Responsibility for Implementation and Monitoring	Frequency of Monitoring
Any stormwater within the site must be handled in a suitable manner, i.e., trap sediments, and reduce flow velocities.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
No stormwater runoff must be allowed to discharge directly into any water course along roads, and flows should thus be allowed to dissipate over a broad area covered by natural vegetation.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Stormwater in the substation and BESS must be managed using appropriate channels and swales when located within steep areas or have steep embankments	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Strict management of potential sources of pollution (e.g., litter, hydrocarbons from vehicles & machinery, cement during construction, etc.).	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Containment of all contaminated water by means of careful run-off management on the development site.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Strict control over the behaviour of construction workers, with regard littering, use and storage of chemicals.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning
Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Environmental Management Programme (EMPr) for the project and strictly enforced.	ECO to implement ESO to monitor Site engineer/ site manager	Throughout Decommissioning

## 13 ALIEN INVASIVE MANAGEMENT PLAN

### 13.1 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 Darling 1B WEF. 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.
- Promote the natural re-establishment and planting of indigenous species in order to retard erosion and alien plant invasion.

### 13.2 Problem Outline

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

In addition, the Conservation of Agricultural Resources Act (Act 43 of 1983), as amended in 2001, requires that land users clear *Declared Weeds* from their properties and prevent the spread of *Declared Invader Plants* on their properties.

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

- Category 1 - These plants must be removed and controlled by all land users. They may no longer be planted or propagated and all trade in these species is prohibited.
- Category 2 – These plants pose a threat to the environment but nevertheless have commercial value. These species are only allowed to occur in demarcated areas and a 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.

### 13.3 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.
- Construction camps and lay-down areas which are cleared or are active for an extended period.

### ***13.3.1 Wetlands, drainage lines and other mesic areas***

There are a relatively large number of drainage lines at the site as well as a number of artificial wetlands. Disturbance within these areas often results 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 must be minimized and these areas must be checked for alien species more than the surrounding landscape.

### ***13.3.2 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.

### ***13.3.3 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.

## **13.4 General Clearing and Guidance Principles**

Alien control programs are long-term management projects and must include a clearing plan which includes follow up actions for rehabilitation of the cleared area. Alien problems at the site must be identified during pre-construction surveys of the development footprint. This may occur simultaneously to other required reaches and surveys. The clearing plan must then form part of the pre-construction reporting requirements for the site.

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

- Lighter infested areas must be cleared first to prevent the build-up of seed banks.
- Pre-existing dense mature stands ideally must 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 must be monitored and documented to keep track of which areas are due for follow-up clearing.

## **13.5 Clearing Methods**

- Different species require different clearing methods such as manual, chemical or biological methods or a combination of both.
- However care must be taken that the clearing methods used do not encourage further invasion. As such, regardless of the methods used, disturbance to the soil must be kept to a minimum. Fire is not a natural phenomenon in the area and fire must not be used for alien control or vegetation management at the site.
- The best-practice clearing method for each species identified must 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/>.

## **13.6 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 must 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 must 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 must be selected that will have the least effect on non-target vegetation.
- Coarse droplet nozzles must be fitted to avoid drift onto neighbouring vegetation.
- The appropriate health and safety procedures must also be followed regarding the storage, handling and disposal of herbicides.

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

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

### 13.7 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 must be undertaken as the work front progresses – mass clearing must 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 must be protected with packed brush, or appropriately battered with fascine work. Alternatively, jute (Soil Saver) may be pegged over the soil to stabilise it.	Weekly
Cleared areas that have become invaded can be sprayed with appropriate herbicides provided that these are such that break down on contact with the soil. Residual herbicides must not be used.	Weekly
Although organic matter is frequently used to encourage regrowth of vegetation on cleared areas, no foreign material for this purpose must be brought onto site. Brush from cleared areas must 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 allowed construction activities in these areas	Weekly
Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment.) Stockpiles must be checked regularly and any weeds emerging from material stockpiles must be removed.	Weekly
Alien vegetation regrowth on areas disturbed by construction must be controlled throughout the entire site during the construction period.	Monthly

Construction Phase Action	Frequency
The alien plant removal and control method guidelines must 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 must remain demarcated with appropriate fencing or hazard tape. These areas are no-go areas (this must be explained to all workers) that must be excluded from all development activities.	Daily

### 13.7.1 Monitoring Actions - Construction Phase

The following monitoring actions must 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

### 13.8 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 must be conducted regularly. Every 6 months for the first two years after construction and annually thereafter. All aliens identified must 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 must take place where the natural vegetation is slow to recover or where repeated invasion has taken place following disturbance.	Biannually, but revegetation must 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, must be controlled using methods that leave the soil protected, such as using a weed-eater to mow above the soil level.	When necessary
No alien species must be cultivated on-site. If vegetation is required for esthetic purposes, then non-invasive, water-wise locally-occurring species must be used.	When necessary

### 13.8.1 Monitoring Actions - Operational Phase

The following monitoring actions must be implemented during the operation 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

### 13.9 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

#### 13.9.1 Monitoring Actions - Decommissioning Phase

The following monitoring and evaluation actions must 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 for 3 years after decommissioning and rehabilitation	Alien plant surveys and distribution map	Biannually for 3 years
Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Annually for 3 years

## 14 PLANT RESCUE AND PROTECTION PLAN

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.

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.

#### **14.1 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.

#### **14.2 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.

#### **14.3 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 must commence during early spring after the first rains.

#### **14.4 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. Further details are listed in the Re-vegetation and Habitat rehabilitation Plan.

## 15 RE-VEGETATION AND HABITAT REHABILITATION 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, 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; and
- 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  
»Viable goals of desired outcomes

Prior to vegetation rehabilitation, all stakeholders involved must 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 IAPs 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 must 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.

### 15.1 Map and Create Management Areas

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

- Current land cover
- Roads and residential
- Areas with IAPs, subdivided further in sparse or dense infestations where applicable
- Transformed areas
- Untransformed indigenous vegetation

For every one of the management areas, the project proponent, in consultation with the land users, 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 / intervention be done (method statements) including schedule of work
- realistic and desirable end states including list of species that must 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.

### 15.2 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 must be possible and viable for at least the following:

- Stabilisation of soils
- Stabilisation of riparian areas
- Storm water reduction through management and wetland integrity
- Clearing of IAPs
  - The degree to which IAPs 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.

### 15.3 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.

### 15.4 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 must preferably be with a cover of vegetation. A dense initial grass or other perennial cover will be desirable. The appropriate seed mix must 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.

### 15.5 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 must be re-introduced, seed must 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 must 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 must 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); and

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

### 15.6 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 must 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 technique (Tongway and Hindley 2004), adapted to integrate both surface soil characteristics and the vegetation to be monitored
- Re-emergence of IAPs
  - 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.

### 15.7 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, particularly if planting of trees and shrubs occurs.
- The rehabilitation phase (including post seeding maintenance) must 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 must 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.

## 16 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 grid connections and substations the primary purpose of the open plan management plan is therefore 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.

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 must 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 must 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 must be strictly controlled;
- All visitors and contractors must be required to sign-in;
- Signage at the entrance must indicate that disturbance to fauna and flora is strictly prohibited.

The following activities must 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 road; and
- No interfering with livestock.

### 16.1 Grazing Management

The development of the wind energy facility will not prevent the site from being used for its current landuse. Parts of the farm are used for cultivation of planted pasture and small grain grazing – all used only for grazing. There is no small grain harvested on the farm. Grazing is compatible with biodiversity maintenance provided that it is implemented according to the basic principles of sustainable grazing management. While the majority of these are beyond the scope of the current plan, the following basic principles must be adhered to:

- A grazing management plan for the site must be developed in cooperation with Agricultural Extension services.

- The stocking rate applied must be within the recommended limits as identified by the Department of Agriculture.
- Livestock must be rotated through the different paddocks at the site in a manner which allows for the growth and recovery of the vegetation between grazing events.
- Precautions must be taken to ensure that the development of the site does not increase the risk of stock theft within the facility. These include access control as previously described, as well as security patrols.

## **17 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 development. Traffic volumes are most likely to increase during the construction phase. Operations, maintenance and decommissioning phase traffic is expected to be insignificant, except where a major WEF component (i.e. replace damaged turbine blade) could be required.

The development must be accessible to passenger cars, buses, trucks and abnormal multi-vehicle combinations which will be delivering WT components. Access to the site needs to be safe and practical to minimise the risk of pedestrian and vehicle accidents through:

- The provision of adequate traffic control; and
- Clear visibility by ensuring sufficient stopping sight distances and sufficient markings and warnings signs.

The traffic management plan to be implemented during construction and decommissioning should consist of the following recommended mitigation measures:

- The arrival and departure of construction vehicles should be staggered during off-peak periods to have a distributed effect over low volume traffic periods.
- All vehicles with abnormal loads should have exemption permits as required by the National Road Traffic Act 93 of 1996.
- The Contractor and Site Safety Officer / ESO, during construction and decommissioning should ensure correct signage and safety precautions are in place for vehicles and pedestrians on-site and at the site access. These may include warning signs, construction vehicle signage and flagmen.
- Unpaved roads must be watered to lessen dust generation and routine maintenance on road surface to maintain condition.
- Vehicles transporting materials that can be blown away and cause dust must be securely covered and adhere to speed limits.
- Community participation/stakeholder involvement at every stage of the project is recommended to allow the community to be informed before the start of site activities.
- A comprehensive assessment of the entire route is recommended on award of the project.
- Prohibit WEF equipment and materials transportation at night, during the school December holiday period, on public holidays, during festivals or other special events.

Actions to be implemented by the Contractor and the Developer:

- 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 / ESO:

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

## **18 TRANSPORTATION MANAGEMENT PLAN**

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

The following actions must 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;
- Any roads damaged during the transportation of components, or from other construction vehicles must be rehabilitated and returned to pre-construction conditions.

The following monitoring activities must be carried out by the ECO / ESO:

- Conduct site audits and report non-compliance with the above-mentioned conditions

## **19 WASTE MANAGEMENT PLAN**

A waste management plan (WMP) is important to ensure a safe and healthy environment and that sustainable waste management and procedures are followed throughout the lifecycle of the project. The DFFE promulgated the National Environmental Management: Waste Act 59 of 2008 (Waste Act) and in 2010 developed the National Waste Management Strategy (NWMS). The WMP provides recommended measures for the collection, temporary storage and safe disposal of the various waste streams associated with the project and includes recommendations for the recovery, re-use and recycling of waste. The purpose of this plan is therefore to ensure that effective procedures are implemented for the handling, storage, transportation and disposal of waste generated from the project activities on site.

The introduction of an internationally best known practise in waste management, the Waste hierarchy (Plate 21.1 below) is one of the best mechanisms that came into effect with the promulgation of the waste act. The waste act promotes the exercising of the duty of care and the implementation of the waste hierarchy while protecting the environment.



**Plate 19-1: Waste Hierarchy- National Waste Management Strategy 2010**  
(Source: <https://www.dffe.gov.za/projectsprogrammes/workingonwaste>)

### 19.1 Construction Phase Waste Management

A method statement to detail the specific (hazardous) waste management practices should be prepared by the Contractor prior to the commencement of activities.

#### *General Waste Management*

- Construction methods and materials should be carefully considered and implemented in view of waste reduction, re-use, and recycling opportunities.
- The ESO / ECO must conduct waste classification and rating in terms of SANS 10288 and Government Notice 634 published under the NEM: WA.
- The ESO / ECO must develop, implement and maintain a waste inventory reflecting all waste generated during construction for both general and hazardous waste.
- A dedicated waste area must be established on site for the storage of all waste streams before removal from site. The storage period must not trigger listed waste activities as per the NEMWA, GN 921 of November 2013.
- Waste collection bins and hazardous waste containers must be provided by the contractor and placed at strategic locations around the site for the storage of organic, recyclable and hazardous waste.
- Hazardous waste must be stored separate from other forms of waste to avoid contamination. The following items are hazardous: Batteries, Light bulbs (fluorescent, LED, Halide), Electronic waste, used oils, chemicals and chemical containers.
- The location of all temporary waste storage areas must aim to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control, while being reasonably placed in terms of centrality and accessibility on site. Where required, an additional temporary waste storage area may be designated, provided identical controls are exercised for these locations.
- Waste storage shall be in accordance with all Regulations and best-practice guidelines and under no circumstances may waste be burnt on site.
- All waste removed from site must be done by a registered / licensed subcontractor, who must supply information regarding how waste recycling / disposal will be achieved. The registered subcontractor must provide waste manifests for all removals at least once a month or for every disposal made, records of which must be kept on file at the site camp for the duration of the construction period.

- Waste must be stored in designated containers and not on the ground.
- Hazardous waste must be stored in a lockable container on an impermeable surface and bunded, should the need arise.
- Waste generated on site must be removed on a regular basis. This frequency may change during construction depending on waste volumes generated at different stages of the construction process, however removal must occur prior to the storage capacity being reached to avoid overflow of containers and poor waste storage.
- Waste should not be dumped, buried or burned on site.
- Reduce waste transportation and disposal costs by ensuring full loads of waste are transported instead of half loads.
- Setting up a reverse logistics system (products move from supplier to customer and vice-versa) would minimise waste and reduce disposal costs, i.e, suppliers deliver batteries and collect used batteries.

#### *Waste Management Practices*

- To achieve sustainable waste management, it is recommended a procurement policy be implemented that takes into account the waste that will be generated at the end of the construction phase. Sourcing local goods would reduce costs of transportation and carbon emissions. Purchasing and using environmentally safe cleaning and building materials as well as considering reusable/recyclable goods will help to achieve reduced waste.
- Once a waste inventory has been established, targets for the recovery of waste (minimisation, re-use, recycling) should be set.
- Recyclable materials must be identified as part of the site's waste management monitoring records.
- Waste manifests and waste acceptance approvals (i.e. receipts) from designated waste facilities must be kept on file at the site office, in order to record and prove continual compliance for future auditing.
- It is the responsibility of the ESO / ECO to ensure that each subcontractor implements their own waste recycling system, i.e. separate bins for food waste, plastics, paper, wood, glass cardboard, metals, etc. Such practises must be made contractually binding upon appointment of the subcontractors. Signage / colour coding must be used to differentiate disposal areas for the various waste streams (i.e. paper, cardboard, metals, food waste, glass etc.).
- Septic tanks and portable toilets must be maintained regularly and monitored by the ESO / ECO. Below ground storage of septic tanks must withstand the external forces of the surrounding environment. The area above the tank must be demarcated to prevent any vehicles or heavy machinery from moving around in the surrounding area.
- Hazardous waste must be stored within a bunded area constructed according to SABS requirements, and must ensure complete containment of the spilled material in the event of a breach. As such, appropriate bunding material, design, capacity and type must be utilised to ensure that no contamination of the surrounding environment will occur despite a containment breach. The net capacity of a bunded compound in a storage facility should be at least 120% of the net capacity of the largest tank and should also take into consideration the capacity displaced by other tanks within the same bunded area and any foundations.
- Interconnected tanks should be treated as a single tank of equivalent total volume for the purposes of the bund design criteria.
- Inspections and maintenance of bunds must be undertaken regularly. Bunds must be inspected for leaks or cracks in the foundation and walls. If any leaks occur in the bund, these must be removed immediately.

- The position of all waste storage areas must be located so as to ensure minimal degradation to the environment. The main waste storage area must have a suitable stormwater system separating clean and contaminated stormwater.
- Bund systems must be designed to avoid dewatering of contaminated water, but to rather separate oil and hydrocarbons from water prior to dewatering.
- It is assumed that any rainwater collected inside the bund is contaminated and must be treated by oil / water separation (or similar method) prior to dewatering, or removed and stored as hazardous waste, and not released into the environment.
- Following rainfall event bunds must always be dewatered in order to maintain a sufficient storage capacity in the event of a breach.
- No mixing of hazardous and general waste is allowed.

The success of the Waste Management Plan is determined by measuring criteria such as waste volumes, cost recovery from recycling and cost of disposal. Recorded data can indicate the effect of training and education, or the need for education. It will provide trends and benchmarks for setting goals and standards and provide clear evidence of the success or otherwise of the plan.

- Documentation (waste manifest, certificate of issue or safe disposal) must be kept detailing the quantity, nature, and fate of any regulated waste for audit purposes.
- Waste management must form part of the monthly reporting requirements in terms of volumes generated, types, storage and final disposal.
- Training and awareness regarding waste management shall be provided to all employees and contractors.

## 19.2 Operation Phase Waste Management

Operation phase activities will result in the production of limited amounts of general waste consisting mostly of cardboard, paper, plastic, tins, metals and a variety of synthetic compounds. Hazardous wastes (including grease, oils) will also be generated. All waste generated will be required to be temporarily stored at the facility in appropriate sealed containers prior to disposal at a permitted landfill site or other facilities.

### *Waste Management Practices*

- The Operational Manager must develop, implement and maintain a waste inventory reflecting all waste generated during operation for both general and hazardous waste streams.
- Adequate waste collection bins at site must be supplied. Separate bins should be provided for general and hazardous waste.
- Recyclable waste must be removed from the waste stream and stored separately.
- All waste must be stored in appropriate temporary storage containers (separated between different operation wastes, and contaminated or wet waste).
- Waste storage shall be in accordance with all best-practice guidelines and under no circumstances may waste be burnt on site.
- Waste generated on site must be removed on a regular basis throughout the operation phase.
- Waste must be removed by a suitably qualified contractor and disposed at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor and kept on site.

### *Waste Management Practices*

Records must be kept of the volumes / mass of the different waste streams that are collected from the site throughout the life of the project. The appointed waste contractor is to provide monthly reports to the operator containing the following information:

- Monthly volumes / mass of the different waste streams collected;
- Monthly volumes / mass of the waste that is disposed of at a landfill site;
- Monthly volumes / mass of the waste that is recycled;
- Data illustrating progress compared to previous months.

This report will aid in monitoring the progress and relevance of the waste management procedures that are in place. If it is found that the implemented procedures are not as effective as required, this WMP is to be reviewed and amended accordingly. This report must form part of the ESO's reports to the ECO on a monthly basis.

## **20 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 (see below) must therefore be seen in conjunction with the SWMP. Actions are listed that will ensure that storm water is channelled in a controlled manner from roads and substations 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;
- Any run-off from the BESS area must be controlled and managed before entering any stormwater channel; and
- Prevent surface run-off from areas of potential contamination.

## **21 EROSION MANAGEMENT PLAN**

### **21.1 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.

### **21.2 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.

## **21.3 Background**

### ***21.3.1 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.

### ***21.3.2 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.

## ***21.3.3 Erosion and Sediment Control Principles***

The goals of erosion and sediment control during and after construction at the site must 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.
- 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.

## ***21.3.4 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 must not operate independently, but must rather be seen as complementary activities within the broader environmental management of the site and must 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 must 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 must be minimized. Allied to this the fact that topsoil does not store well and must 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 must not be cleared at a time, especially in areas such as slopes where the risk of erosion is higher.

#### **21.4 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 must 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 must be provided such that downstream shrinkage of wetland width does not occur. Moreover, culverts must be aligned, as far impossible, with existing, natural channels.
- All crossings of drainage systems must ensure that both surface and shallow subsurface flows can be accommodated where appropriate and that unnatural channelisation does not occur downstream.

#### **21.5 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 must 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.

##### ***21.5.1 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 must apply.

- Adequate culverts must be provided along the length of all roads to prevent diversion of flow from natural drainage lines.

- Culverts must be carefully located, such that outlet areas do in fact align with drainage lines.
- The downstream velocity of runoff must be managed, such that it does not result in downstream erosion – on steep slopes, where roads have been constructed on cut areas, allowance must 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 must 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 must 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.

## 21.6 Monitoring Requirements

### 21.6.1 Construction Phase

The following monitoring actions must 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

### 21.6.2 Operational Phase

The following monitoring actions must 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

## 22 FUEL STORAGE MEASURES

### 22.1 Storage Tanks

The storage tanks will be within contained areas to prevent spills contaminating soil and water, and with a design to capture and contain a volume of spill of at least 110% of the volume of stored fuel. These containers can be built in concrete and painted with anti-corrosive paint. The floor of the container must be inclined to permit the collection of the spilled liquids.

The storage tanks must also have a cover protection on top, prepared for drainage and collection of runoff.

### 22.2 General Procedures

- Transport routes for the transport of fuel will be clearly indicated;
- Pollution control equipment (spill and leak cleaning kits) must be readily available;
- Ensure personnel training, including: measures to prevent fuel spills, to treat/clean fuel spills, how to react on spill of flammable liquids on clothing and in the inhalation of vapours, leaks simulations; fuel vapour recovery processes, etc. Keep records of all training;
- Maintain the premises and equipment in a clean and tidy state;
- Regularly clean outdoor areas with a broom;
- Wastewater from outside areas must be directed to the contaminated water drainage system, and not enter the storm water system;
- Used oils (waste oil) will be collected, re-used, stored and disposed of in line with disposal procedures for hazardous wastes;
- Ensure the proper management of other hazardous wastes (contaminated soils, used spilling kits, waste lube, etc.); and
- All hazardous waste should be collected by a licensed service provider and transported to a licensed disposal facility.

### FILLING OPERATIONS

- Isolate the area by cones and a rope;
- Prohibit refuelling operations during tank filling operations;
- Avoiding having people who are not involved in the operation within a 10 metre radius;
- Prohibit smoking and the use of mobile telephones or any other ignition sources during tank filling operations or vehicle refuelling, within a 3 metre radius;
- Use a tight-fill cap to completely seal off the connections between the tubing and the truck's and station's tanks;
- Engines must be turned off during refuelling;
- Prevent overflowing and spilling situations when the storage tanks are being filled (verify filling sensors and be aware of overflow alarms).

### Preventing Accidents with fuel mixtures

Establish a procedure to deal with the potential occurrence of these situations, such as:

- The chemicals and reaction mechanisms associated with the substances mixed or blended must be well understood and documented
- Chemical and process hazards must be understood and addressed and the facilities must ensure that process equipment, controls, and procedures are designed, installed and maintained to safely operate the process
- All employees must understand the chemical and process hazards
- Facilities must establish a system for Standard Operating Procedures and ensure that they are understood and followed

- Display clear and informative messages for users of the station, as to how to deal with this situation;
- Prepare a procedure to suitably dispose of wastes recovered from the batches of fuel mixture.

### Spill Kits

- Emergency spill kits of absorbent material (e.g. sand) must be provided and stored next to the higher risk sites, and must be easily-accessible, ideally outside, in order to allow an immediate response when a spill occurs. This will be clearly labelled and ready for use.
- Drums for the storage of contaminated material must be provided.
- An accurate drawing of the local drainage system shall be posted next to the spill kit.

### Closure Phase

- During the closure phase, there may be loss of product into the soil, as a result of a deliberate or accidental release during closure and removal of tanks and tubing. In addition, this risk may arise outside of the facility site, if the tanks and/or tubing are not properly disposed of.
- In the closure phase, it is important to remove all tanks and pipes. A risk may arise if the tanks are left on site with residual products. As the integrity of the equipment will no longer be ensured or monitored.
- During closure, it must be ensured that facilities do not present a risk to the environment, health or safety. Measures must be taken to ensure that the closure does not result in an unacceptable risk, including:
  - Any and all waste products will be removed from the tanks. Care will be taken to ensure that no product is lost into the soil. Tank closure must be carried out safely, with the removal of explosive vapours, for example by filling the tanks with water or inert gases. All tanks will be safe prior to their removal from the ground. Similar methods will be employed prior to the removal of the pipes.
  - Water used in this process will be contaminated with residual product, and thus a water contamination risk may arise if the contaminated water is not disposed of in a way which is appropriate for hydrocarbon contamination. This would normally imply the removal to a suitable waste handling facility.
  - According to best environmental practices, the tanks, tubing and distributors will be disposed of. However, if the tanks remain in situ, it will be ensured that the procedure is safe. After making the tanks inert and safe, they will be filled in with sand, concrete, inert mud or hydrophobic foam.
  - The tanks and associated tubing which are no longer considered appropriate or safe for fuel storage will not be used for storage of other hydrocarbons, without first ensuring their integrity.
  - The oil/water separators will be removed for disposal, off the facility site. Otherwise they will be filled in a similar way to the tanks. Regardless of the fate of the oil/water separator, all liquid and mud waste will be removed (off the facility site) and all the inlets and outlets will be sealed.
  - Whatever drainage system left behind will be modified to ensure that it does not serve as a path for pollutants to reach groundwater or other waters.
  - If the deactivation is temporary, product can be left in the tanks. In this case, all monitoring procedures will be carried out as if the facility were in operation. If for any reason the monitoring cannot carry on, the tanks will be emptied and made inert.
  - Personnel involved in the closure of a filling and fuel station will be aware and respect obligations with regards to waste disposal, in line with the best practices described above.

<b>Environmental Aspect</b>	<b>Action or Measure</b>
<b>Prevent accidental spills from entering the stormwater drainage system</b>	Provide cleaning equipment conceived specifically to deal with minor spills as may occur at the station. Place a clearly-identified spill kit in a visible location for each fuelling line.
	Develop a step-by-step guide to use of the spill kit.
	Develop an evacuation plan and/or response procedures for emergencies involving large fuel spills.
	Train the whole team in the emergency response procedures. Make sure that all staff knows where the emergency equipment is to be found and is acquainted with its maintenance.
	Label all of the stormwater drains on site in the proximity of the facilities as "Clean Water Only".
	Inspect the fuel distribution area in order to confirm that rainwater drained or emptied from the roof doesn't enter the areas marked out.
	Check whether the embankment around the fuel distribution area is in good condition and has the capacity to contain a fuel leak in the event of an emergency.
<b>Minimise the risks of environmental contamination and from issues of workers' health and safety</b>	Provide training to the staff regarding the disposal of material contaminated with fuel, such as absorbent material from the spill kit, soaked in fuel.
	Ensure that the product safety cards for all fuels and oils are up-to-date and accessible at all times.
	Should any contamination be found on-site during the decommissioning phase of the existing / proposed facility, the Western Cape Province Pollution and Chemicals Management Directorate must be informed of such contamination, as required in terms of Part 8 of the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008) ("NEM: WA").
	Should more than 100m <sup>3</sup> of general waste and/or or more than 80m <sup>3</sup> of hazardous waste be stored at the proposed WEF for a period exceeding 90 days, the applicant will need to register in terms of, and adhere to, the NEM: WA National Norms and Standards for the Storage of Waste promulgated in GN No. 926 of 29 November 2013.
<b>Minimise the risks of fuel leaks as may result in pollution of the sub-soil and groundwater</b>	Check if there is fuel, from a possible leak, in the spill containment sumps installed at the tank's discharge nozzle.
	Check if there is fuel, from a possible leak, in the all tanks containment sumps, installed on the manhole to the storage tanks. In the event of suspected leakage, report it immediately.
	Check if there is fuel or lube, from a possible leak in the containment sumps installed under the tanks.
<b>Minimise the risks of fuel leaks as this may result in pollution of the</b>	Check if there is fuel, from a possible leak, in the chambers of the containment sumps installed under the pumps

Environmental Aspect	Action or Measure
<b>sub-soil and groundwater</b>	
<b>Minimise the risks of harmful emissions to the atmosphere and the loss of fuel</b>	Check that lids, flanges and connections are closed.
	Confirm that the ventilation conduits are not blocked.
	Supervise the fuel deliveries.
<b>Minimise the risks of water pollution</b>	Carry out an Oil-Water Separator inspection to ensure effective treatment.
<b>Integrity control</b>	Adequate maintenance and calibration of the monitoring equipment

## 23 FIRE MANAGEMENT PLAN

The National Veld and Forest Fires Act (Act 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
- Infrastructure such as transmission lines

### 23.1.1 Fire Regimes on-site

Fynbos and Renosterveld are known to be dependent on particular fire regimes as important drivers of ecosystem dynamics in these vegetation types, with many species being reliant on fire for germination and recruitment of young plants. Fire also clears areas allowing for enough space and light for the flowering and reproduction of bulbs and annuals that are otherwise dormant. Should the interval between fires be too long, many individual plants may die without having reproduced, while fires that are too frequent will eliminate slower growing species. By counting branching events and terminal seed heads along a stem of the protea and *Leucospermum* species on site it seemed like parts of the site are overdue for a fire.

The operational phase can disrupt fire regimes, prolong the fragmentation natural habitat and ecological corridors and alter soil moisture content. Infrastructure to be developed within natural vegetation that requires frequent burning is not recommended as fires are generally not compatible with infrastructure as they pose a threat to operations and are therefore suppressed or prevented in these areas. Conversely, if operational phase activities result in fires that are too frequent, this would allow for the spread of alien vegetation.

### 23.1.2 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. Rather targeted risk management must 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 must be implemented.

## **24 AVIFAUNA MANAGEMENT AND MONITORING PLAN**

### **24.1 Construction Phase Bird Monitoring Programme**

Construction phase bird monitoring must be conducted in line with the current best practise guidelines and applicable species specific guidelines. Construction phase bird monitoring must be conducted throughout the entire construction phase of the WEF.

#### ***24.1.1 General Management Actions***

- A site specific EMPr must be implemented, which gives appropriate and detailed description of how construction activities must be conducted to reduce unnecessary destruction of habitat;
- Environmental Control Officers to oversee activities and ensure that the EMPr is implemented and enforced;
- High traffic areas and buildings such as offices, batching plants, storage areas etc. should where possible be situated in areas that are already disturbed;
- Temporary construction facilities and laydown areas should where possible be situated in areas that are already disturbed;
- Existing roads and farm tracks should be used where possible;
- The minimum footprint areas of infrastructure should be used wherever possible, including road widths and lengths;
- No WTGs should be constructed in no-go areas, while associated infrastructure should be avoided where possible in these areas;
- The construction Phase ECO, the onsite Environmental Manager, and the client's representative on site (e.g. the resident engineer) are to be trained to identify Red Data and priority bird species, as well as their nests. If any nests or breeding locations for these species are located, an avifaunal specialist is to be contacted for further instruction;
- Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken;
- The minimum number of WTGs should be constructed to achieve the required MW output. It is preferable to have smaller number of WTGs with larger rotor diameters, compared with more WTGs with smaller rotors (e.g. if the two proposed WTGs are constructed it would be preferable if all four of the existing operational WTGs were decommissioned if financially viable to meet generation targets);
- WTGs must not be constructed within any designated no-go areas;
- WTGs must be placed out of high sensitivity areas where possible; and
- Turbines placed in areas of high sensitivity areas must be fitted with Radar Assisted Shutdown on Demand (RASOD) or similar technology and a single blade must be painted (red or preferably black in accordance with latest research) pending approval from the South African Civil Aviation Authority (CAA).

### ***24.1.2 Reporting***

- An avifaunal specialist must confirm the reporting requirements, but these must be in line with guideline requirements and reports must be submitted to relevant stakeholders in line with applicable guidelines.

## **24.2 Operational Phase Bird Monitoring Plan**

### ***24.2.1 Introduction***

The aim of the operational phase monitoring will be to determine the actual impacts of the WEF on avifauna. These impacts can then be assessed against observed activity of birds on site during the same time (and associated environmental conditions) that the impacts were realised. Operational monitoring is therefore critical to:

- Determine the actual impacts of the WEF;
- Determine if additional mitigation is required (adaptive management); and
- Improve future assessments.

Operational phase (i.e. post-construction) bird monitoring at the Darling 1B WEF must commence once all turbines have been erected and the blades are turning. This may be during the commissioning phase, prior to the commercial operation date of the facility. An avifaunal specialist must be appointed to design the site specific monitoring methodology (e.g. exact survey locations, sampling frequencies and sampling times etc.) and to implement the monitoring plan.

Monitoring must be done in line with the latest best practise guidelines applicable at the time of monitoring commencing. Operational monitoring must have two components: Bird Activity Monitoring (BAM) and Carcass Searches (CS).

Reports must be generated as part of operational monitoring programme and must be submitted to Birdlife SA, Endangered Wildlife Trust (EWT), Department of Forestry, Fisheries and the Environment (DFFE) and the relevant provincial environmental department / authority.

### ***24.2.2 Bird Activity Monitoring***

- Bird Activity Monitoring (BAM) must mirror the pre-construction monitoring surveys conducted for the Darling 1B WEF and be in line with the applicable South African post-construction monitoring guidelines and be conducted for the first three years of operations. The need for further fatality monitoring should then be reviewed, but at a minimum it must happen in year 5, 10, 15, 20, 25 etc. (i.e. every 5 years), in line with the applicable South African monitoring guidelines.
- The BAM must include thorough and ongoing nest searches and nest monitoring. The results of this monitoring should advise the need for any additional ongoing activity monitoring.
- BAM must be conducted over at least 72 hours per vantage point per 12-month period.
- BAM must include Vantage Point (VP) Surveys, from the same VP locations used during pre-construction monitoring (where possible) and must also include transect (walked and driven) surveys, incidental observations, and surveys of relevant focal sites including nest sites.

### ***24.2.3 Carcass Searches***

- Carcass Searches (CS) must be done for the first three years of operations. The need for further fatality monitoring (i.e. carcass searching) should then be reviewed, but at a minimum it must happen in year 5, 10, 15, 20, 25 etc. (i.e. every 5 years), in line with the applicable South African monitoring guidelines.

- If one or more Great White Pelican or Black Harrier carcasses are located and determined likely to have resulted from WTG collisions in any sensitivity area over the lifespan of the facility then those WTGs likely to have been responsible must be fitted with appropriate mitigation measures (such as RASOD or suitable technology that may be available at the time and to be determined by an avifaunal specialist) to reduce the likelihood of more collisions occurring at that WTG.
- If one or more Great White Pelican or Black Harrier carcasses are located and determined likely to have resulted from WTG collisions after the implementation of shut-down-on-demand systems or similar technology then an appropriate curtailment strategy must be determined by an avifaunal specialist in consultation with relevant parties and implemented for those WTGs likely responsible for the mortalities.

#### **24.2.4 Programme Revision**

- Frequent and regular review of operational phase monitoring data (activity and carcass) and results by an avifaunal specialist must be conducted. This review should also establish the requirement for continued monitoring studies (activity and carcass) throughout the operational and decommissioning phases of the development.
- The reviews should also strive to identify sensitive locations at the development including WTGs and areas of increased collisions that may require additional mitigation.

## **25 BAT MANAGEMENT AND MONITORING PLAN**

### **25.1 Construction and Decommissioning Management Plan**

Roost disturbance and / or destruction as well as disturbance during the construction and decommissioning phase would only cause a minor and possibly negligible impact to bats given the small scale of the project and are not assessed further. To ensure this is the case, all buildings should be buffered by up to 200 m, in which no construction activities are allowed. Decommissioning activities should be restricted to daylight hours to have negligible impacts to bats.

### **25.2 Operational Management Plan**

- Use blade feathering up to the manufacturers cut-in speed to prevent blades from free-wheeling, from thirty minutes before sunset to thirty minutes after sunrise in all seasons except winter. Blade feathering must be used at all four D1 WEF turbines as soon as possible, and at the D1B WEF turbines once these are operational.
- As soon as the first turbine has been erected, acoustic monitoring at height and ground level must be undertaken.
- Operational acoustic monitoring and carcass searches (inclusive of scavenger removal and searcher efficiency bias trials) for bats must be performed, based on best practice available at the time (i.e. two years initially) to monitor bat mortality and bat activity. Thereafter, monitoring must take place in year 5, and every 5 years thereafter. Acoustic monitoring must include monitoring at height (i.e., such as on a turbine or met mast) and at ground level (on a met mast and/or short mast(s)). The number of sampling locations required must be determined by the size of the area and habitats available at the operational facility. This is to be determined by an appropriate bat specialist at the time of appointment for the operational monitoring campaign.
- Carcass searching must be undertaken daily in all seasons for the first two years as per current best practise. Beyond the initial two years, monitoring of impacts must then continue throughout the lifespan of the facility. The scope of this monitoring must be informed by the findings of the initial two years of operational monitoring. However, as a minimum, following the initial two-year period, monitoring of impacts (together with seasonal scavenger removal and bias trials) must be repeated again for an entire year

in year five, and again every five years thereafter. The search interval must be twice a week initially, to be updated using carcass removal rates by scavengers for the specific study area.

- Estimated bat fatality must be evaluated against best practise thresholds and more stringent curtailment (e.g., shutting down turbines during periods of high bat activity, associated with various seasonal and environmental parameters) and/or acoustic deterrents used if thresholds are exceeded. Note that the thresholds were not developed for small scale WEFs thus expert judgement by a bat specialist must be used to evaluate the thresholds to determine if they are logical. The carcass search data must be assessed seasonally to determine the observed and estimated fatality rate.
- Records of bat fatality and fatality estimates must be kept in a central database that can be accessed by various stakeholders to facilitate greater understanding of bat-wind energy impacts including cumulative impacts.

## 26 CONCLUSION

In terms of the National Environmental Management Act 107 of 1998, as amended, everyone is required to take reasonable measures to ensure that they do not pollute the environment. Reasonable measures include informing and educating employees about the environmental risks of their work and training them to operate in an environmentally acceptable manner.

Although all foreseeable actions and potential mitigation measures and management actions are contained in this document, the EMPr should be seen as a day-to-day management document. The EMPr thus sets out the environmental and social standards, which would be required to minimise the negative impacts and maximise the positive benefits of the Darling 1B WEF. The EMPr could thus change daily, and if managed correctly lead to successful construction and operational phases of the development.

Furthermore, in terms of the 'Act', the cost to repair any environmental damage shall be borne by the person responsible for the damage. It is therefore imperative that the management plan is successfully implemented, as a failure to comply could have legal implications. The environmental impacts on the site will not be significant if the construction management is well implemented, and a set of operational guidelines are developed by the long term site management body.