



**WOLF WIND FARM NEAR
WOLWEFONTEIN, EASTERN CAPE
(DFFE Ref No.: 14/12/16/3/3/2/599/1)
ENVIRONMENTAL MANAGEMENT
PROGRAMME**

Wolf Wind Farm (RF) (Pty) Ltd

Submission date: [2022/06/10](#)

Document number: 1001792

Revision: [6](#)

Document control record

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Document Control						
Project name		WOLF WIND FARM NEAR WOLWEFONTEIN, EASTERN CAPE (DFFE Ref No.: 14/12/16/3/3/2/599/1): ENVIRONMENTAL MANAGEMENT PROGRAMME				
Document number		Project number		1001792		
Owner		Wolf Wind Farm (RF) (Pty) Ltd				
Owner contact		Magdalena Logan	Owner reference		m.logan@redrocket.energy	
Rev	Date	Revision details/status	Author	Reviewer	Verifier (if required)	Approver
1-3	June – December 2015	Original draft EMPr	Dirk Pretorius	Corlie Steyn	Patrick Killick	Andries van der Merwe
4	December 2021	Split draft EMPr into WEF and OHPL EMPS.	Genie de Waal	Patrick Killick		Patrick Killick
5	25 March 2022	Draft Final EMPr	Patrick Killick	Genie de Waal		Patrick Killick
6	10 June 2022	Final EMPr	Patrick Killick	Genie de Waal		Patrick Killick
Current revision		6				

NOTE: Text in red indicates where new information has been added to the EMPr in the current finalisation process and serves to identify the new information to the reader who reviewed the draft EMPr. Text in turquoise denotes changes since the Public Participation Process.

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Abbreviations

CLO	Community Liaison Officer
DFFE	Department of Forests, Fisheries and the Environmental
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EO	Environmental Officer
ESCO	Environmental Site Compliance Officer
NEMA	National Environmental Management Act (No. 107 of 1998)
OHSA	Occupational Health and Safety Act (No. 85 of 1998)
OEMPr	Operational phase Environmental Management Programme
SDEMA	Specification Data Environmental Management

1 Introduction to the micro-siting, layout and EMPR finalisation

This section provides the reader with the context and history of the project, including an overview of the various EA amendments and a description of the approach used in producing this final EMPr and meeting the conditions set out in the EA.

The Applicant, Wolf Wind Farm (RF) (Pty) Ltd, has been authorised to construct a ≤90MW Wind Energy Facility (WEF) and Overhead Powerline (OHPL) referred to as the Wolf Wind Farm on the border of the Sundays River Valley Local Municipality and Ikwezi Local Municipality, situated approximately 5km north of Wolwefontein, 35km north-west of Kirkwood and 36km south-east of Jansenville, atop the Klein Winterhoek Mountain range in the Eastern Cape. A scoping and Environmental Impact Assessment process (S&EIA) was undertaken in accordance with the National Environmental Management Act (Act 107 of 1998) (NEMA) and the 2010 EIA Regulations. The project was authorised on 14 September 2015 and has undergone several amendments. The original EA and all subsequent amendments are appended here in Annexure D.

Following the original Environmental Authorisation (EA), the wind energy market continued evolving, with larger and more efficient wind turbine models becoming available in the marketplace. To remain competitive with the Department of Energy's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), the project undertook several EA Amendments, mostly to increase turbine size and efficiencies. With the larger turbines, the project was also able to reduce the number of turbines but generate the approved 90MW. The last EA (AM6) amendment process was undertaken to separate the Wind Farm and OHPL into separate EAs, so that the OHPL section may be ceded to Eskom following construction, whereafter it would form part of the National Grid. This EMPr therefore only deals with the Wind Farm. Figure 1-1 to follow provides the pre-walkthrough project layout.

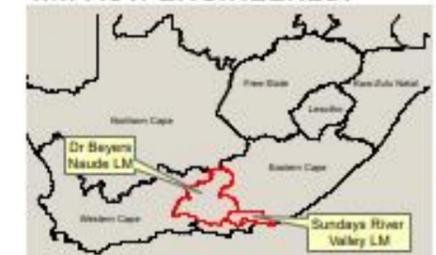
On the 28th of October 2021 the Minister of Mineral Resources and Energy, Mr Gwede Mantashe announced 25 Preferred Bidders selected under the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) Bid Window 5, of which the Wolf project was one. Refer also to the Department of Mineral Resources and Energy (DMRE) letter Annexure I.3 confirming the project's status as a Strategic Integrated Project (SIP). The Applicant is now required to fulfil various requirements to reach financial close and allow them, to enter into negotiations around a power purchase agreement and the construction of the project.

The draft Environmental Management Programme (EMPr) submitted together with the final application for authorisation was not approved in the EA of June 2015. Condition 15 of the 2015 EA states that a final EMPr must be submitted to the DFFE for approval before construction. The following additional requirements are linked with this and have been completed as part of the current process:

1. **Undertake a walkthrough and micro-siting of the project layout** – A bat specialist, bird specialist Freshwater specialist and Botanical and Fauna specialist (Terrestrial Ecologist) must be commissioned to undertake a walkthrough and ground truth the pre-walkthrough turbine project layout and make micro-siting recommendations for the Applicant's consideration in the final Layout. The reports detailing their investigations and recommendations are found in Annexure F.
2. **Develop the final layout plan** - following the walkthrough the Applicant revised the project layout with inputs from both technical and environmental teams. The final layout shows all relevant project components, and the final positions must be determined in consultation with the above specialists. On completion of the final layout, these specialists were asked to review and approve the final layout and provide any additional mitigation measures that may be necessary. Their approvals can be found in statements presented in Annexure G. The final layout is presented in Figure 3-1 to Figure 3-4 starting on pg. 22.
3. **A sensitivity map** - all the relevant sensitivities areas and features identified by specialists in the original EIA and updated during the subsequent EA amendment process and also during the walkthrough and

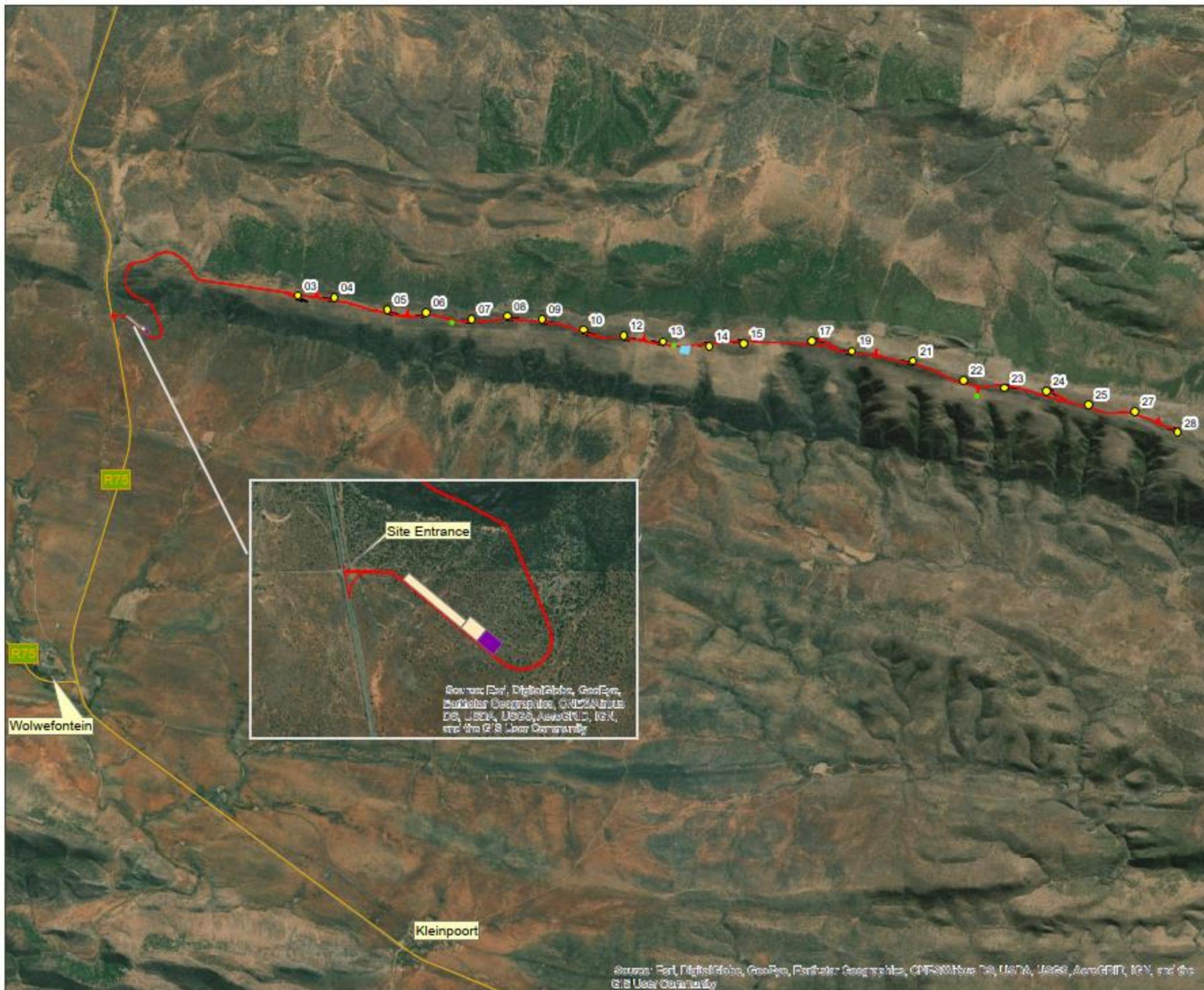
micrositing exercise are presented in Figure 3-5 and Figure 3-6, starting pg. 26. The final turbine layouts must be shown on the map.

4. **Management and monitoring plans** – The following specialist management and monitoring plans are to be developed and included with the final WEF EMPr:
 - a. Open Space Management Plan (See Annexure H.2)
 - b. Plant rescue and protection plan (See Annexure H.3)
 - c. Re-vegetation and habitat rehabilitation Plan (See Annexure H.4)
 - d. Alien invasive management plan (See Annexure H.5)
 - e. Stormwater, erosion, and pollution control management plan (See Annexure H.6)
 - f. Transportation management plan (See Annexure H.7)
 - g. Traffic management plan (See Annexure H.7)
5. **Updated EMPr** – The draft EMPr was updated to reflect all changes arising from the above requirements. For ease of reference, text in red (as used here) indicates where new information, additions or changes had been made to the draft EMPr, for ease of reference. Similarly, turquoise text (as used here) indicates updates since the completion of the public comment period to (a) respond to issues raised in the comment period or (b) changes to convert the documents to final status for submission.
6. **Public participation** – The 'draft' final EMPr and layout were available for all registered I&APs for review and comment and a comments and responses report (Annexure E.5) will be submitted with the final EMPr and layout to DFFE. A Public Participation Plan has been submitted and approved by the DFFE and can be found in Annexure E.1. Please refer to Section 1.2 for an overview of the Public Participation Process.
7. Condition 44 of the 2020 EA requires that Applicant obtain a written permit or approval from the South African Civil Authority (SACAA) confirming that the wind facility will not interfere with the performance of aerodrome radio communications, Navigation and Surveillance (CNS) equipment especially the radar before the commencement of the activity. The approval/Permit must be submitted to the DFFE: Director: Integrated Environmental Authorisations. This process is currently underway, see Annexure I.2 for correspondence between the Applicant and SACAA in this regard.



Legend

- Turbines
- Substation
- Roads
- Hardstands
- Temporary Laydown Area and Site Office
- Batching Plant
- Met Masts

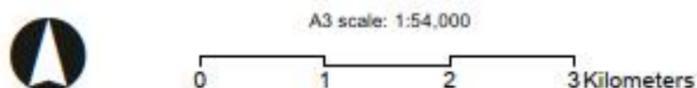


Notes:
 Aerial Imagery: ESRI

Wind Farm Substation less Eskom's switching station.

Prevailing wind direction: SE

Date: 2021/11/17 Version: 0



Job No: A89570 Map by: WL
 Projection: WGS_1984_UTM_Zone_35S

**Wolf Wind Farm
 Layout Plan**

Figure 1-1 | pre-walkthrough project layout

1.1 Summary of the project walkthrough and micrositing

In accordance with the conditions of the EA the following specialists were commissioned to undertake and walkthrough, of the site project layout, ground-truthing the layout and making recommendations regarding the final placement of the various components:

Table 1-1 | Walkthrough and micrositing specialist

Aspect	Specialist	Reference
Bats	Werner Marias (Animalia)	See Annexure F.1
Birds	Jon Smallie (Wildskies)	See Annexure G.1
Botanical and Fauna (Terrestrial ecology)	Dr Dave McDonald (Berg Wind Botanical Tours)	See Annexure G.2
Freshwater	R. Mathakutha (FEN Consulting (Pty) Ltd)	See Annexure G.3

These specialists provided recommendations for the Applicant to take under consideration while developing the final layout. The final layout aims to meet the environmental recommendations while remaining technically achievable and buildable. Table 1-2 to follow provides an overview of the layout changes considered in the final layout (See Figure 3-1). Note that where turbine positions change, the orientation of turbine hardstands and service roads must also be updated to allow for interconnectivity and a workable layout.

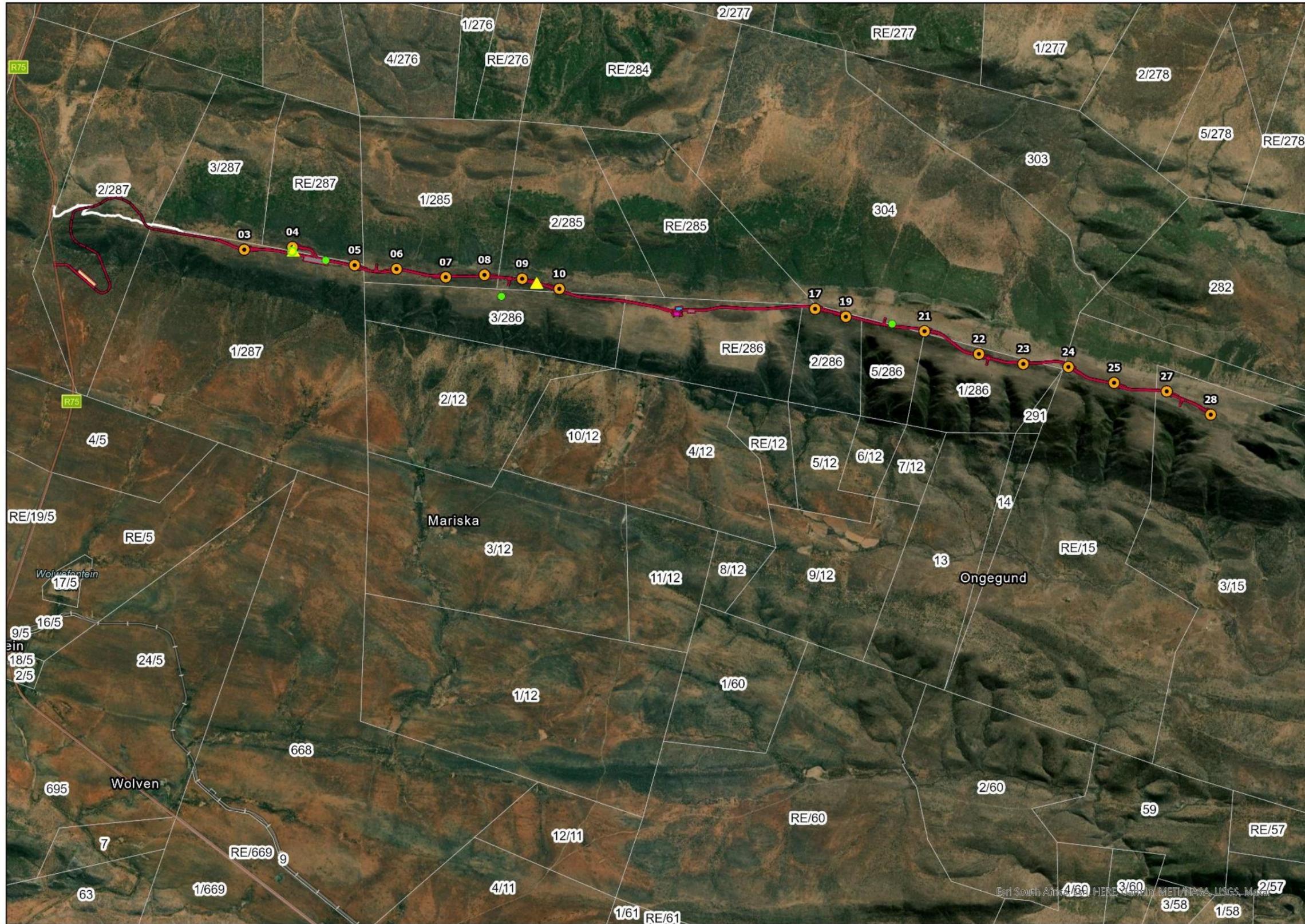
Table 1-2 | Summary of layout changes

Turbine	Change / reason
▶ Turbine 3 –	Moved West-Southwest of the former position to ensure the swept path of turbine and its hardstands do not encroach on the property to the North where there is no lease agreement. The revised site is also sufficiently set back from the proposed Eskom 765kV (which previously resulted in the loss of turbine positions 1 and 2).
▶ Turbine 4 -	The turbine was moved Northwest to provide sufficient space for an existing Neotel Tower and Trig Beacon (Zoupansnek). This moves the turbine further away from bat and bird sensitivity areas. Please refer to Annexure I.1 for a letter of no objection from Liquid Telecoms (previously Neotel).
▶ Turbine 5 ▶ Turbine 6 ▶ Turbine 7 ▶ Turbine 8 ▶ Turbine 9	No changes recommended
▶ Turbine 10 –	Moves west-north-west of the current position to provide an additional buffer from the 1.5km buffer areas around the new central Verreaux’s Eagle Nest and to avoid intersection with property boundaries by turbine hardstands
▶ Turbine 12 – ▶ Turbine 13 – ▶ Turbine 14 – ▶ Turbine 15 –	Two new Verreaux’s Eagle Nest sites were discovered on site. Buffer areas around the nests have been discussed with the BirdlifeSA (1.5km buffer for the central nest and 1km for the eastern nest) with the result that Turbines 12, 13, 14, and 15 cannot be developed and have been removed from the final layout. Thus, the project reduces from a 21 turbine to a 17 turbine layout.
▶ Turbine 17 –	Moves South of the previous position to ensure the hardstand does not straddle the property boundary to the North.
▶ Turbine 19 –	Moves West Northwest of the previous position to avoid Trig beacon (Midwater) with the turbine laydown areas and hardstand. The relocation also moves the turbine further away from bat sensitivity areas. The Trig Beacon cannot be moved.
▶ Turbine 21 –	Moves north of the previous position to ensure turbine hardstand does not straddle property boundary to the South. This move is also away from the bat and bird sensitive areas to the south

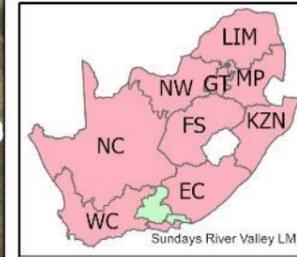
Turbine	Change / reason
▶ Turbine 22 –	No change.
▶ Turbine 23 –	Moves South of the previous position to ensure turbine laydown and hardstand does not intersect the property boundary to the North.
▶ Turbine 24 –	No change
▶ Turbine 25 –	
▶ Turbine 27 –	Moves east and away from bat and bird sensitivities and to accommodate an improved road layout
▶ Turbine 28 –	Moves northeast and away from bat sensitivities to accommodate an improved road layout

The final layouts are largely similar to that assessed in the original assessment and subsequent EA amendments. While the discovery of new nesting sites may influence an impact significance this has been countered with the forfeiture of an additional 4 turbine positions within an identified buffer area, this, together with the shut-down-on-demand mechanism on all turbines and the painting of one blade per turbine to further mitigate the bird collision impact are such that the impact significance is not any worse than that originally assessed and approved.

The final WEF layout was sent to the relevant specialists for review and approval. They have provided a statement indicating their satisfaction with the final layout which can be found as follows, bat specialist statement can be found in Annexure F.1, birds in Annexure G.1, terrestrial ecology in Annexure G.2 and freshwater in Annexure G.3. The relevant specialists and EAP are thus in support of the final layout as presented in this final EMP.



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LEGEND

Project Layout

Existing Structures

- Herotel Tower (Telecommunications)
- Viljoenskop (Trig Beacon)
- Zoutpansnek (Trig Beacon)
- Meteorological Masts

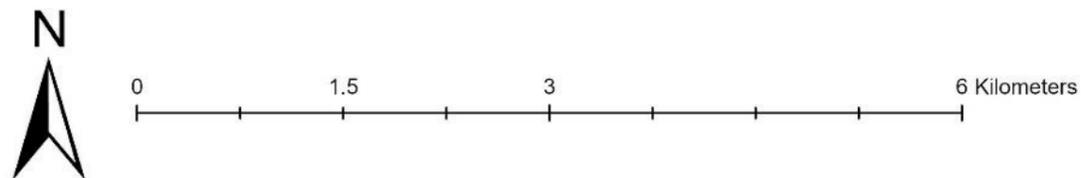
Proposed

- Turbines (17)
- Substation
- Laydown Area
- O&M Building
- Road Sidings
- Proposed Roads
- Existing Roads
- Property Boundaries

Notes:

Aerial Imagery: ESRI

Date: 10 March 2022



Jon No: 1001792 Map by: MR
Projection: GCS_WGS_1984

**WOLF WIND ENERGY FACILITY
LOCALITY MAP**

Figure 1-2 | Final Layout

1.2 Summary of the Public Participation Process

In the pre-application meeting, a public participation Plan was presented and subsequently approved for this EMPr and layout finalisation process. The Public Participation Plan can be found in Annexure E.1. It was agreed that an integrated public participation process could be undertaken, meaning that the public engagement requirements for the (a) Wolf Wind Energy Facility final EMPr (Including the IPP portion for the substation) and layout and (b) the Wolf Overhead Powerline (OHPL), was undertaken as a single combined public participation process. This was done as historically these projects were a single project and the registered I&APs were accustomed to commenting on these projects as one, thus a consolidated PPP served to avoid confusion, but also unnecessary duplication due to the interrelated nature of the project.

In accordance with the approved PP Plan, the process and opportunity to participate were advertised publicly and site notices were erected at key locations of the site to allow any new Interested and affected parties to register and participate in the process. The I&AP register was also updated to ensure, to the extent possible, that contact information with the key stakeholders was current. The I&AP register is included here in Annexure E.2. The 'draft' final EMPr and layout were available for public review between 25 March and 26 April 2022. The various proofs of PPP have been provided in Annexure E.3 including the dispatch of I&AP notifications via email and post, newspaper advertisements, site notices, uploads to SAHRIS, proof of hardcopy reports delivered to the Kirkwood and Jansenville libraries, and softcopy reports available on Dropbox and Google Drive.

Comments received for I&APs and Authorities can be found in Annexure E.4. and are repeated in the Comment and Responses Report in Annexure E.5, which also provides responses from the EIA team and Applicant to comments. Detailed comments were received from the following parties:

1. Patrick Grewar
2. BirdlifeSA
3. DFFE: IEM comment on the Wolf OHPL and switching station EMPr and layout
4. DFFE: IEM comment on the Wolf WEF and IPP portion of the shared substation EMPr and layout
5. SANParks.
6. DFFE: Biodiversity and Conservation

For ease of the reference, all changes to the EMPr and layout made since the version released for review including those made in response to the comment received are denoted by the turquoise font colour (as used here).

The final EMPr and layout (these documents), including responses to comments, are submitted to the DFFE: IEM for decision making. All registered I&APs will be notified of the Decision and the opportunity to appeal and the process to follow.

2 Overview

This chapter aims to provide an overview of the Environmental Management Programme (EMPr) for the proposed Wolf Wind Farm

2.1 Purpose of the EMPr

The EMPr is appended to the Environmental Impact Report and provides a link between the impacts identified in the EIA Process, the recommended mitigation measures, and the actual environmental management of said impacts on the ground during project implementation and operation of the project. The purpose of this document is to provide for environmental management throughout the project life cycle. The following main lifecycle stages are identified:

- ▶ Planning and design,
- ▶ Pre-construction and construction,
- ▶ Operation, and
- ▶ Decommissioning.

The EMPr is a working document that the applicant and any of their consultants and contractors may refer to during the implementation phases of the project and against which their environmental performance may be appraised. An EMPr must not be seen as a static document and must remain flexible to changes in project planning. The DFFE must however be notified of significant changes or deviations, and such notification must be submitted with a motivation for such deviation and the DFFE allowed to comment and review conditions of Authorisation. Significant deviations may necessitate an amendment of the Environmental Authorisation which is subject to a predefined set of procedures and involves a public participation process. **All changes to the draft EMPr arising from the current EMPr finalisation process have been marked in red text or blue for changes made after public participation for ease of reference.**

2.2 Legal requirements of Environmental Management Programmes

In terms of the EIA Regulations (Regulation 543 of 18 June 2010) enacted in terms of the National Environmental Management Act (no. 107 of 1998) (NEMA), the proposed project triggers Activity 10, 11 (iv, x and xi), 15 and 18 of Regulation R544 (18 June 2010), Activity 1 of Regulation R545 (18 June 2010) as well as Activity 14 of Regulation R546 (18 June 2010). As the proposed project triggers listed activities in terms of Regulation R544, R545 and R546 it is necessary to submit an EIA for Environmental Authorisation (Environmental Authorisation) to the Department of Environmental Affairs (DFFE). Section 22 (l) of the EIA Regulations requires that a draft EMPr is submitted as part of the Environmental Impact Report.

The contents of the EMPr must meet the requirements outlined in Section 24N (2) and (3) of NEMA and Section 33 of the EIA Regulations. The EMPr must address the potential environmental impacts of the proposed activity on the environment throughout the project life cycle including an assessment of the effectiveness of monitoring and management arrangements after implementation. The Department requires that the EMPr be submitted together with the Environmental Impact Report so that it can be considered simultaneously.

Section 33 of the EIA Regulations R543 stipulates the requirements of an EMPr.

33. *A draft environmental management programme must comply with section 24N of the Act and include –*
- (a) *details of –*
 - (i) *the person who prepared the environmental management programme; and*
 - (ii) *the expertise of that person to prepare an environmental management programme.*
 - (b) *information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplated by these Regulations, including environmental impacts or objectives in respect of—*

- (i) *planning and design.*
- (ii) *pre-construction and construction activities.*
- (iii) *operation or undertaking of the activity.*
- (iv) *rehabilitation of the environment; and*
- (v) *closure, where relevant.*
- (c) *a detailed description of the aspects of the activity that are covered by the draft environmental management programme.*
- (d) *an identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b).*
- (e) *proposed mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon.*
- (f) *as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development, including, where appropriate, concurrent, or progressive rehabilitation measures.*
- (g) *a description of the way it intends to—*
 - (i) *modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation.*
 - (ii) *remedy the cause of pollution or degradation and migration of pollutants.*
 - (iii) *comply with any prescribed environmental management standards or practices.*
 - (iv) *comply with any applicable provisions of the Act regarding closure, where applicable.*
 - (v) *comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable.*
- (h) *time periods within which the measures contemplated in the environmental management programme must be implemented.*
- (i) *the process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation because of undertaking a listed activity.*
- (j) *an environmental awareness plan describing the way—*
 - (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 to avoid pollution or the degradation of the environment.*
- (k) *where appropriate, closure plans, including closure objectives.*

The legislation hereby aims to ensure that effective environmental management is implemented throughout the life cycle of the project via the translation of EIA management actions into the EMPr. The Department of Environmental Affairs & Development Planning (DEA&DP)'s¹ *Guideline for Environmental Management Programmes* (2005) aims to inform and guide the preparation and implementation of EMPs. The guideline defines EMPs as:

“An environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the project are enhanced”.

Section 24N (2) and (3) of the NEMA provide a list of the requirements for an EMPr, as follows:

¹ Please note that DEA&DP's guideline is used even though the proposed project is based in the Western Cape, as DEA has not compiled a guideline on EMPs.

- 24N. (2)** *the environmental management programme must contain-*
- (a) *information on any proposed management, mitigation, protection, or remedial measures that will be undertaken to address the environmental impacts that have been identified in a report contemplated in subsection 24(1A), including environmental impacts or objectives in respect of –*
 - (i) *planning and design.*
 - (ii) *pre-construction and construction activities.*
 - (iii) *the operation or undertaking of the activity in question.*
 - (vi) *the rehabilitation of the environment; and*
 - (vii) *closure, where relevant.*
 - (b) *details of –*
 - (i) *the person who prepared the environmental management programme; and*
 - (ii) *the expertise of that person to prepare an environmental management programme*
 - (c) *a detailed description of the aspects of the activity that are covered by the draft environmental management plan.*
 - (d) *information identifying the persons who will be responsible for the implementation of the measures contemplated in paragraph (a).*
 - (e) *information in respect of the mechanisms proposed for monitoring compliance with the environmental management programme and for reporting on the compliance.*
 - (f) *as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to land use which conforms to the generally accepted principle of sustainable development; and*
 - (g) *a description of the way it intends to-*
 - (i) *modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation.*
 - (ii) *remedy the cause of pollution or degradation and mitigation of pollutants; and*
 - (iii) *comply with any prescribed environmental management standards or practices.*
 - (3)** *the environmental management programme must, where appropriate-*
 - (a) *set out time periods within which the measures contemplated in the environmental management programme must be implemented.*
 - (b) *contain measures regulating responsibilities for any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation because of prospecting or mining operations or related mining activities which may occur inside and outside the boundaries of the prospecting area or mining area in question; and*
 - (c) *develop 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 to avoid pollution or the degradation of the environment.*
- ~ Additional requirements

The EMPr aims to meet the requirements as legislated by the NEMA Regulations and complies with the guideline document for an Environmental Management Programme². This document must thus be seen in an iterative context allowing for amendments throughout the life cycle of the project, allowing for adjustments as new information is made available or situations on the ground change.

² Lochner, P. 2005. *Guideline for Environmental Management Plans*. CSIR Report No ENV-S-C 2005-053 H. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

2.3 International Regulatory Framework

The objectives and applicability of the eight International Finance Corporation (IFC) Performance Standards (PS) are detailed in **Table 2-1**.

Table 2-1 | Objectives and Applicability of the IFC PSs to Wolf Wind Farm

REF	REQUIREMENTS	PROJECT-SPECIFIC APPLICABILITY
Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts		
<p>Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of a project. An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by management and involves engagement between the client, its workers, and local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders.</p> <p>Objectives:</p> <ul style="list-style-type: none"> — To identify and evaluate environmental and social risks and impacts of the project. — To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks, and impacts to workers, Affected Communities, and the environment. — To promote improved environmental and social performance of clients through the effective use of management systems. — To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately. — To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated. 		
1.1	Policy	A formal ESMS will be compiled for the project before commencement covering these items
1.2	Identification of Risks and Impacts	
1.3	Management Programmes	
1.4	Organisational Capacity and Competency	
1.5	Emergency Preparedness and Response	
1.6	Monitoring and Review	
1.7	Stakeholder Engagement	
1.8	External Communication and Grievance Mechanism	
1.9	Ongoing Reporting to Affected Communities	
Performance Standard 2: Labour and Working Conditions;		
<p>Performance Standard 2 recognises that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers</p> <p>Objectives:</p> <ul style="list-style-type: none"> — To promote fair treatment, non-discrimination, and equal opportunity of workers. — To establish, maintain, and improve the worker-management relationship. — To promote compliance with national employment and labour laws. — To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain. — To promote safe and healthy working conditions and the health of workers. — To avoid the use of forced labour. 		
2.1	<ul style="list-style-type: none"> — Working Conditions and Management of Worker Relationship — Human Resources Policy and Management — Working Conditions and terms of Engagement — Worker's organisation — Non- Discrimination and Equal Opportunity — Retrenchment 	A formal ESMS will be compiled for the project before its commencement. Human resource and labour policies will be included in the ESMS.

REF	REQUIREMENTS	PROJECT-SPECIFIC APPLICABILITY
	— Grievance Mechanism	
2.2	— Protecting the Workforce — Child Labour — Forced Labour	
2.3	Occupational Health and Safety	
2.4	Workers Engaged by Third Parties	
2.5	Supply Chain	
Performance Standard 3: Resource Efficiency and Pollution Prevention		
<p>Performance Standard 3 recognises that increased economic activity and urbanisation often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. There is also a growing global consensus that the current and projected atmospheric concentration of greenhouse gases (GHG) threatens the public health and welfare of current and future generations. At the same time, more efficient and effective resource use, pollution prevention and GHG emission avoidance and mitigation technologies and practices have become more accessible and achievable in virtually all parts of the world.</p> <p>Objectives:</p> <ul style="list-style-type: none"> — To avoid or minimise adverse impacts on human health and the environment by avoiding or minimising pollution from project activities. — To promote more sustainable use of resources, including energy and water. — To reduce project-related GHG emissions. 		
3.1	— Resource Efficiency — Greenhouse Gases — Water Consumption	<ul style="list-style-type: none"> — The only applicable and material resource efficiency issue is water consumption due to the arid nature of the region and the general propensity for drought conditions in the country.
3.2	— Pollution Prevention — Air Emissions — Stormwater — Waste Management — Hazardous Materials Management — Pesticide use and Management	<ul style="list-style-type: none"> — The project is not greenhouse gas (GHG) emissions-intensive and a detailed assessment and reporting of emissions is not required. This project, however, seeks to facilitate resource efficiency and pollution prevention by contributing to the South African green economy. — Dust air pollution in the construction phase has been adequately addressed in the EMPr. — The project will not result in the release of industrial effluents. Potential pollution associated with sanitary wastewater is low and mitigation measures have been included in the EMPr. — Land contamination of the site from historical land use is not considered to be a cause for concern. — The waste generation profile of the project is not complex. Waste mitigation and management measures have been included in EMPr. — Hazardous materials are not a key issue; small quantities of construction materials (oil, grease, diesel fuel, cement etc.) and stored sanitary sewage in the operational phase are the only wastes expected to be associated with the project. The EMPr and emergency preparedness and response plan identifies these anticipated hazardous materials and recommends relevant mitigation and management measures.
Performance Standard 4: Community Health, Safety, and Security		
<p>Performance Standard 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts.</p> <p>Objectives:</p> <ul style="list-style-type: none"> — To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances. — To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities 		

REF	REQUIREMENTS	PROJECT-SPECIFIC APPLICABILITY
4.1	<ul style="list-style-type: none"> — Community Health and Safety — Infrastructure and Equipment Design and Safety — Hazardous Materials Management and Safety — Ecosystem Services — Community Exposure to Disease — Emergency Preparedness and Response 	<p>The requirements included in PS 4 have been addressed in the EI&R process and the development of the EMP. The following plans have been included in the EMP:</p> <ul style="list-style-type: none"> — Emergency Response Plan (Section 5.4.5). — A Community health Safety and Security Plan must be drafted for the project and adhered to and implemented by the Holder of the EA as well as any principal Contractors and sub-contractors
4.2	Security Personnel	<ul style="list-style-type: none"> — Traffic and Transport Management Plan (Annexure H.7) — Security and Access Control (Section 5.4.4.21).
Performance Standard 5: Land Acquisition and Involuntary Resettlement		
<p>Performance Standard 5 recognises that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use.</p>		
<p>Objectives:</p>		
<ul style="list-style-type: none"> — To avoid, and when avoidance is not possible, minimise displacement by exploring alternative project designs. — To avoid forced eviction. — To anticipate and avoid, or where avoidance is not possible, minimise adverse social and economic impacts from the land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. — To improve, or restore, the livelihoods and standards of living of displaced persons. — To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites. 		
5.1	<ul style="list-style-type: none"> — Displacement — Physical Displacement — Economic Displacement — Private Sector Responsibilities under Government Managed Resettlement 	<p>There is no involuntary physical or economic displacement or resettlement involved with this project, and PS5 is therefore not applicable.</p>
Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources		
<p>Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development.</p>		
<p>Objectives:</p>		
<ul style="list-style-type: none"> — To protect and conserve biodiversity. — To maintain the benefits from ecosystem services. — To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities. 		
6.1	Protection and Conservation of Biodiversity	<p>Critical Habitat and ecosystem services, in terms of PS6, are not impacted.</p> <p>However, all aspects of biodiversity will be managed through the recommendations outlined by the specialists and the EMP.</p>
Performance Standard 7: Indigenous People		
<p>Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded.</p>		
<p>Objectives:</p>		
<ul style="list-style-type: none"> — To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples. 		

REF	REQUIREMENTS	PROJECT-SPECIFIC APPLICABILITY
	<ul style="list-style-type: none"> — To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts. — To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner. — To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life cycle. — To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present. — To respect and preserve the culture, knowledge, and practices of Indigenous Peoples. 	
7.1	General <ul style="list-style-type: none"> — Avoidance of Adverse Impacts — Participation and Consent 	There are no identified indigenous people in South Africa. PS 7 is therefore not applicable.
7.2	Circumstances Requiring Free, Prior, and Informed Consent <ul style="list-style-type: none"> — Impacts on Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use — Critical Cultural Heritage — Relocation of Indigenous Peoples from Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use 	
7.3	Mitigation and Development Benefits	
7.4	Private Sector Responsibilities Where Government is Responsible for Managing Indigenous Peoples' Issues	
Performance Standard 8: Cultural Heritage		
Performance Standard 8 recognizes the importance of cultural heritage for current and future generations		
Objectives:		
<ul style="list-style-type: none"> — To protect cultural heritage from the adverse impacts of project activities and support its preservation. — To promote the equitable sharing of benefits from the use of cultural heritage. 		
8.1	Protection of Cultural Heritage in Project Design and Execution	<ul style="list-style-type: none"> — A cultural heritage study was performed as part of the S&EIR process. The impact of the proposed development on the cultural heritage resources of the area after the implementation of mitigation measures was assessed to be very low overall, except for the visual impact on the cultural landscape which was identified to be very high. — A Chance Find Procedure shall be included in the project's ESMS. — The office of the regional land claims commissioner confirmed the absence of land claims against the properties in terms of the Restitution of Land Rights Act (1994) during 2022

2.4 Wolf Environmental and Social Management System

An ESMS shall be implemented by the project. The system is founded on the requirements of the Equator Principles, IFC Performance Standards, IFC EHS Guidelines, IFC Sector Guidelines and Good International Industry Practices which are applicable to the Project, as well as ensuring compliance with:

- The social safeguards of the European Investment Bank covering population movement, including involuntary resettlement.

- The International Labour Organization's Core Labour Standards and Basic Terms and Conditions of Work.
- The International Bill of Human Rights in line with the United Nations' Guiding Principles on Business and Human Rights safeguards.

Project policies include the following, but are not limited to these, in terms of environmental and social management:

- Environmental, Health, Safety and Social Policy
- Labour Policy
- Drug and Alcohol Policy
- Smoking Policy
- Code of Conduct

An environmental, health, safety, security, and social specification outlines the expectations applicable to contractors, to ensure IFC PS benchmarks are met.

A project-specific stakeholder engagement plan shall be developed in terms of IFC PS 1. Internal and external grievance mechanisms shall be implemented, as per the project ESMS, throughout the lifecycle of the project.

The Community Health, Safety and Security Plan shall be implemented as a component of the ESMS, as per IFC PS 1 and IFC PS 4, and shall prescribe mitigation measures for potential community impacts that may be associated with project activities. These mitigation measures would include measures identified by certain parties that have previously raised concerns in terms of security issues during construction and further into operation.

Independent monitoring of the effective implementation of the ESMS shall be undertaken in terms of an independent monitoring schedule as per the requirements of the projects' s ESMS. Both internal and external audits on the ESMS will be undertaken during the lifecycle of the project and as prescribed by the projects ESMS.

All the ESMS documents with the EA, EMPr and any other legislated permits will become the management system/tool for the project.

2.5 Structure of the EMPr

The EMPr aims to address environmental management throughout the project life cycle, from planning and design, through construction, to operation and potential decommissioning. The EMPr has been structured to include the following sections:

- ▶ Chapter 1: EMPr finalisation background and context
- ▶ Chapter 2: Overview
- ▶ Chapter 3: Description and background of project.
- ▶ Chapter 4: Discussion summarising environmental management influencing the planning and design of the proposed project.
- ▶ Chapter 5: Construction EMPr based on identified impacts and mitigation measures from the Environmental Impact Report.
- ▶ Chapter 6: Operational Framework based on identified impacts and mitigation measures from the Environmental Impact Report.
- ▶ Chapter 7: Monitoring programme.
- ▶ Chapter 8: Erosion management plan.
- ▶ Chapter 9: General lights at night mitigations
- ▶ Chapter 10: Decommissioning Framework providing guidance on key considerations to be considered during decommissioning/closure.
- ▶ Chapter 11: Conclusion.

2.6 Expertise of Environmental Assessment Practitioners

Section 33 of EIA Regulations and Section 24N (2) and (3) of the NEMA requires that an EMPr must include the details of the person(s) who prepared the EMPr, and the expertise of that person to prepare an EMPr. In this regard, the *Curriculum Vitae* of the Environmental Assessment Practitioners who compiled the EMPr are included in **Annexure A**.

3 Background information

This Chapter provides a description of the proposed activity and outlines how environmental considerations have informed and been incorporated into the planning and design phases of the proposed wind energy facility. The planning and design phases discussed are limited to those associated with the pre-authorisation phases. Mitigation measures have been recommended for the detailed design phase.

3.1 Project Description

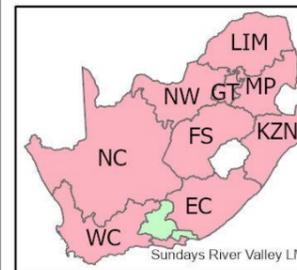
The proposed Wolf Wind Farm will consist of up to 17 turbines located on farms listed in Table 3-1. The project site is situated approximately 5km north of Wolwefontein, 35km northwest of Kirkwood and 36km south-east of Jansenville on the Klein Winterhoek Mountain range in the Eastern Cape. The site can be reached via the R75 and an existing gravel road leading east, up the mountain ridge towards the proposed site. The site includes several farms which amount to approximately 6,902ha in extent. The following project description taken from the last EA Amendment has been updated here to match the final layout, as follows.

- ▶ The development of a 90MW Wolf Wind Energy Facility, associated facilities and substation near Wolwefontein, within the Dr Beyers Naude and Sundays River Valley Local Municipalities, Easter Cape with centre coordinates 33 15'21.60'S by 24 55'10.03'E and will include the following
 - 17 Wind Turbine Generators (WTGs) (135m hub height with a 186m long rotor blade) generating up to 90MW
 - IPP portion of the new shared substation (132kV)
 - Underground cabling between turbines and on-site substation.
 - Hard stands.
 - Site access road.
 - New and upgraded site service roads.
 - Stormwater controls measures associated with all roads.
 - Laydown areas.
 - Security fencing and access gate.
 - The physical project footprint (or area to be disturbed) for the WEF and associated infrastructure which included the IPP portion of the substation is approximately 53.65ha.

Table 3-1 | List of farms included in the proposed Wolf Wind Farm

SG21 digit code	Farm / Org Name
C03500000000028600000	Paardeberg South
C03500000000028600005	Paardeberg South
C03500000000028500000	Paardeberg North
C03500000000030400000	Paardeberg North
C03500000000029100001	Dassiekloof Annex
C03500000000028500001	Paardeberg North
C03500000000028700000	Salt pan's neck
C03500000000028500002	Paardeberg North (Jackals Vlei)
C07600000000028700002	Salt pan's neck
C07600000000028700001	Mon Desir (Salt pan's neck)
C03500000000028600001	Paardeberg South
C03500000000028600002	Paardeberg South
C03500000000028600003	Paardeberg South
C07600000000001500000	Hartebeestefontein
C07600000000001500002	Hartebeestefontein

The project description above describes the final layout which is presented in Figure 3-1 to Figure 3-4 to follow. This layout shows the 17-turbine layout and key associated infrastructure making up the final layout for which approval is now being sought before construction. Figure 3-5 and Figure 3-6 provide the layout overlain on the key biodiversity information and all relevant site sensitivities identified by specialists in the original EIA and subsequent EA Amendments and the latest final walkthrough and ground-truthing exercise.



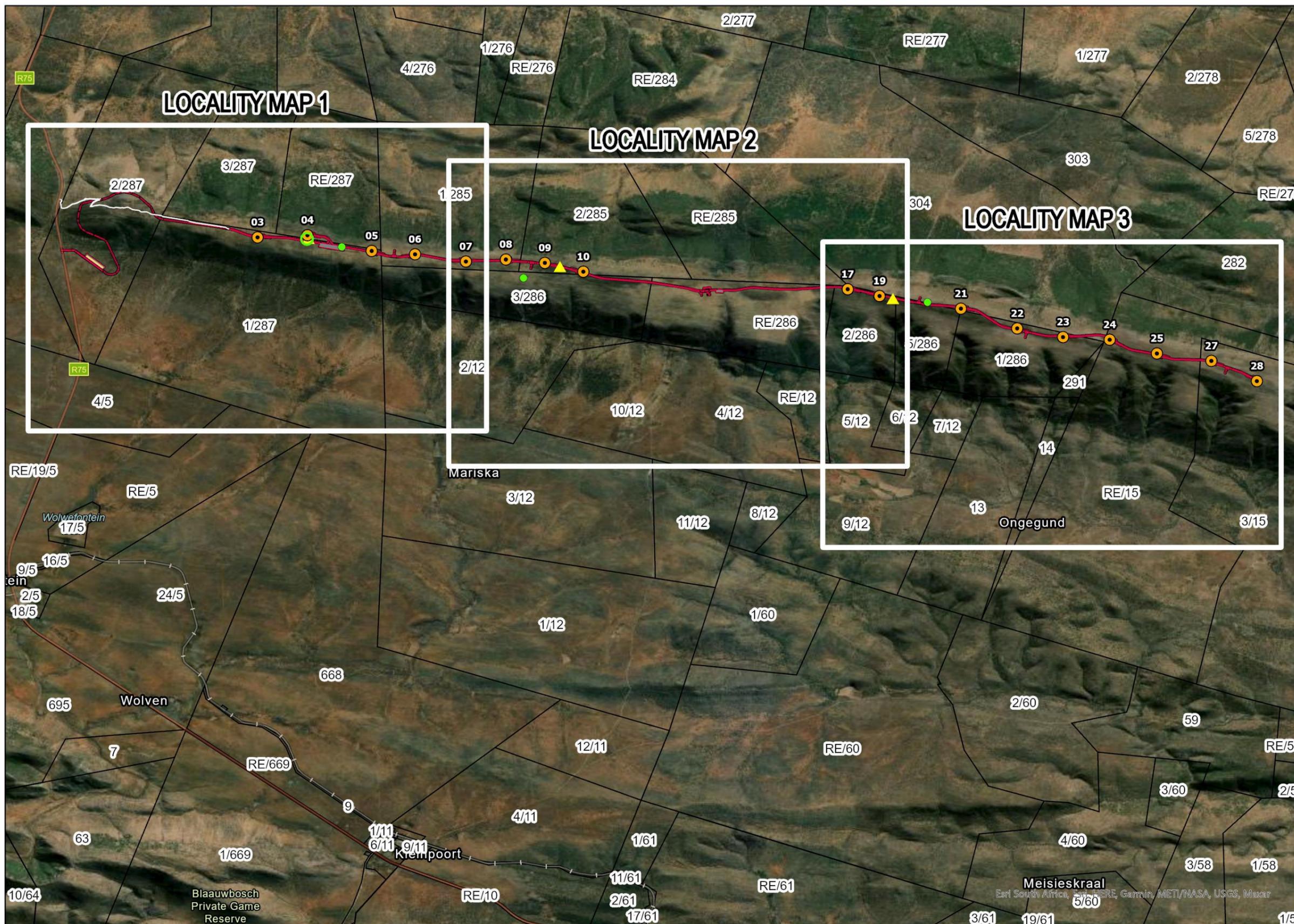
LEGEND

- Temporary Access Road
- Liquid_Telecoms_Tower
- Turbines (17)
- Trig Beacons
- Access Road
- Meteorological Masts
- Laydown Area
- Road Sidings
- Proposed Roads
- Property Boundaries

Notes:

Aerial Imagery: ESRI

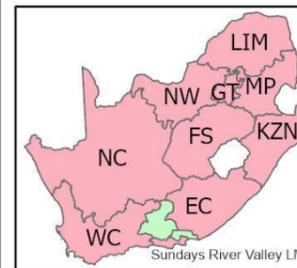
Date: 1 June 2022



Job No: 1001792 Map by: MR
Projection: GCS_WGS_1984

WOLF WIND ENERGY FACILITY
LOCALITY - KEY MAP

Figure 3-1 |The Wolf Wind Farm final layout – Overview map



LEGEND

- Temporary Access Road
- Liquid_Telecoms_Tower
- Turbines (17)
- Trig Beacons
- Access Road
- Meteorological Masts
- Laydown Area
- Road Sidings
- Proposed Roads
- Property Boundaries

Notes:

Aerial Imagery: ESRI

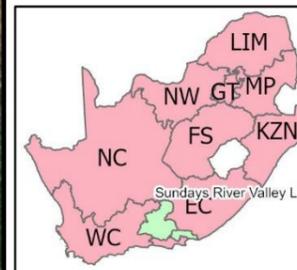
Date: 1 June 2022



Job No: 1001792 Map by: MR
Projection: GCS_WGS_1984

WOLF WIND ENERGY FACILITY
LOCALITY MAP
MAP 1 OF 3

Figure 3-2 | Final layout - Map 1 of 3



Legend:

- PROJECT LAYOUT
- TURBINES (17)
 - METEOROLOGICAL MASTS
 - PROPERTY BOUNDARIES
 - INTERNAL ROAD
 - HARDSTANDS
 - ROAD SIDINGS
 - LAYDOWN AREA
 - SUBSTATION
 - O&M BUILDING

Notes:

Aerial Imagery: ESRI

Date: 10 March 2022



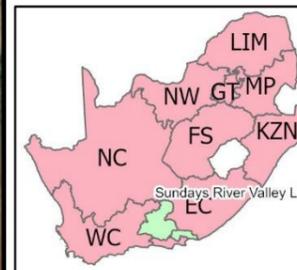
Jon No: 1001792 Map by: MR
Projection: GCS_WGS_1984

WOLF WIND ENERGY FACILITY

LOCALITY MAP

MAP 2 OF 3

Figure 3-3 | Final layout - Map 2 of 3



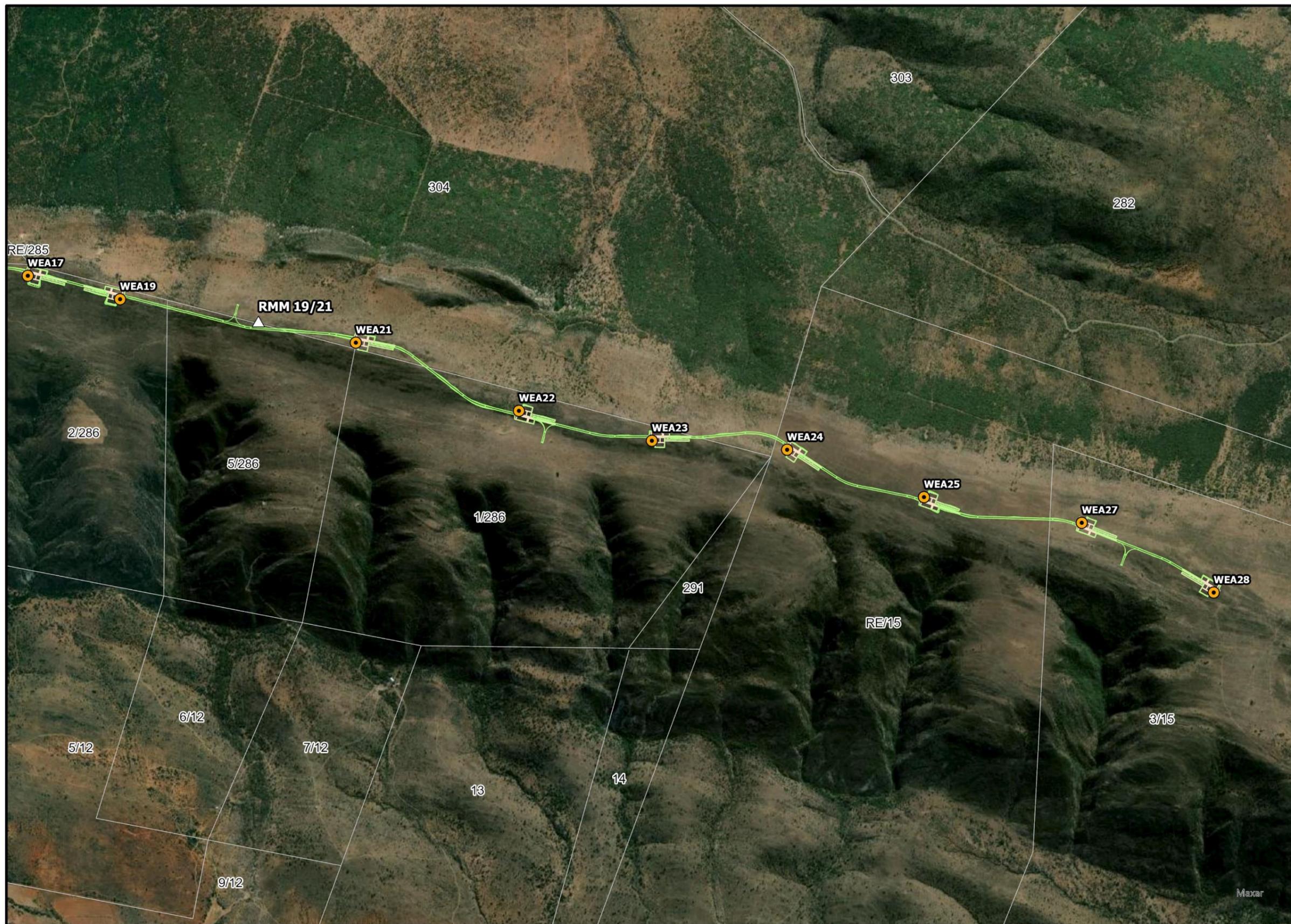
Legend:

- PROJECT LAYOUT
- TURBINES (17)
 - METEOROLOGICAL MASTS
 - INTERNAL ROAD
 - PROPERTY BOUNDARIES
 - HARDSTANDS

Notes:

Aerial Imagery: ESRI

Date: 10 March 2022



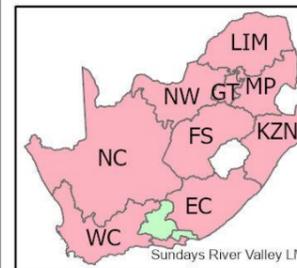
Jon No: 1001792 Map by: MR
Projection: GCS_WGS_1984

WOLF WIND ENERGY FACILITY

LOCALITY MAP

MAP 3 OF 3

Figure 3-4 | Final layout - Map 3 of 3



LEGEND

- Liquid Telecoms Tower
- ▲ Trig Beacons
- Substation
- Laydown Area
- O&M Building
- Road Sidings
- Turbines (17)
- Meteorological Masts
- Proposed Road
- Temporary Access Road
- NPAES
- ▲ Noise Sensitive Developments
- Drainage Lines

Eskom

- Eskom 765kV (Proposed)

Freshwater

- Artificial
- Natural
- Kriega River System
- Sundays River System
- Wolwefonteinspoortspruit River System
- Freshwater_InvestigationArea
- 100m Zone of Regulation (GN509)
- 32m Zone of Regulation (NEMA)

Avifauna

- Verreaux Eagle Nests
- No-Go 1.5km Buffer
- Southern Ridge Edge Buffer 250m

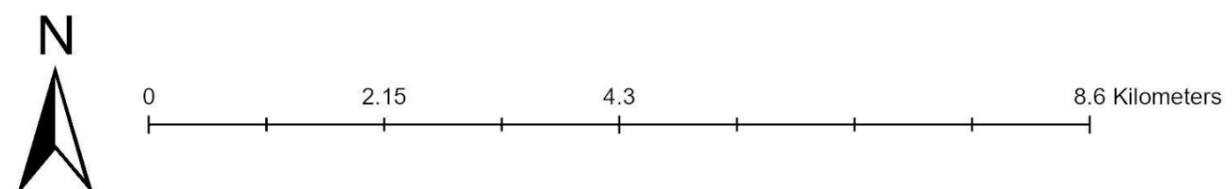
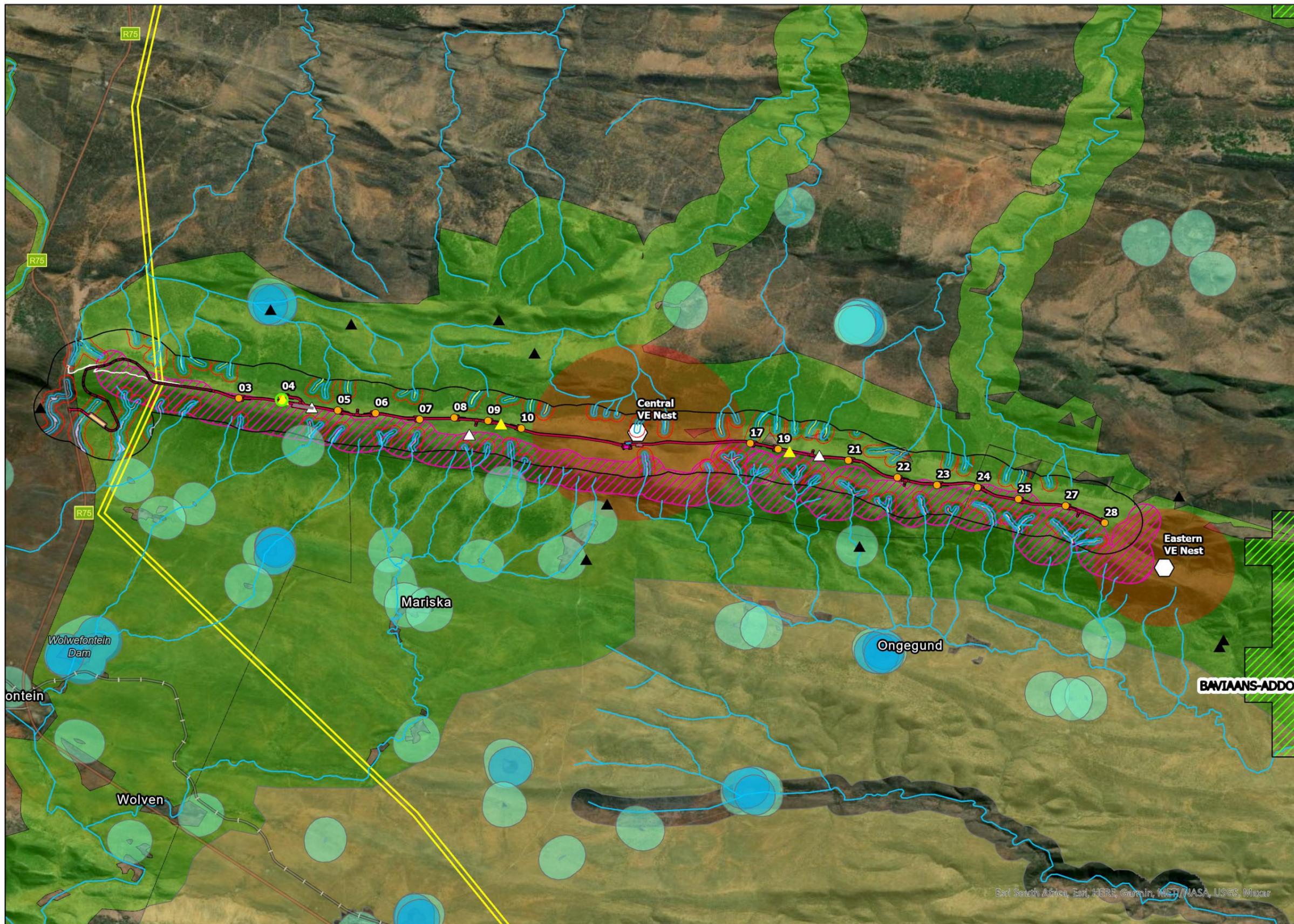
CBA & ESA

- Critical Biodiversity Area
- Ecological Support Area

Notes:

Aerial Imagery: ESRI

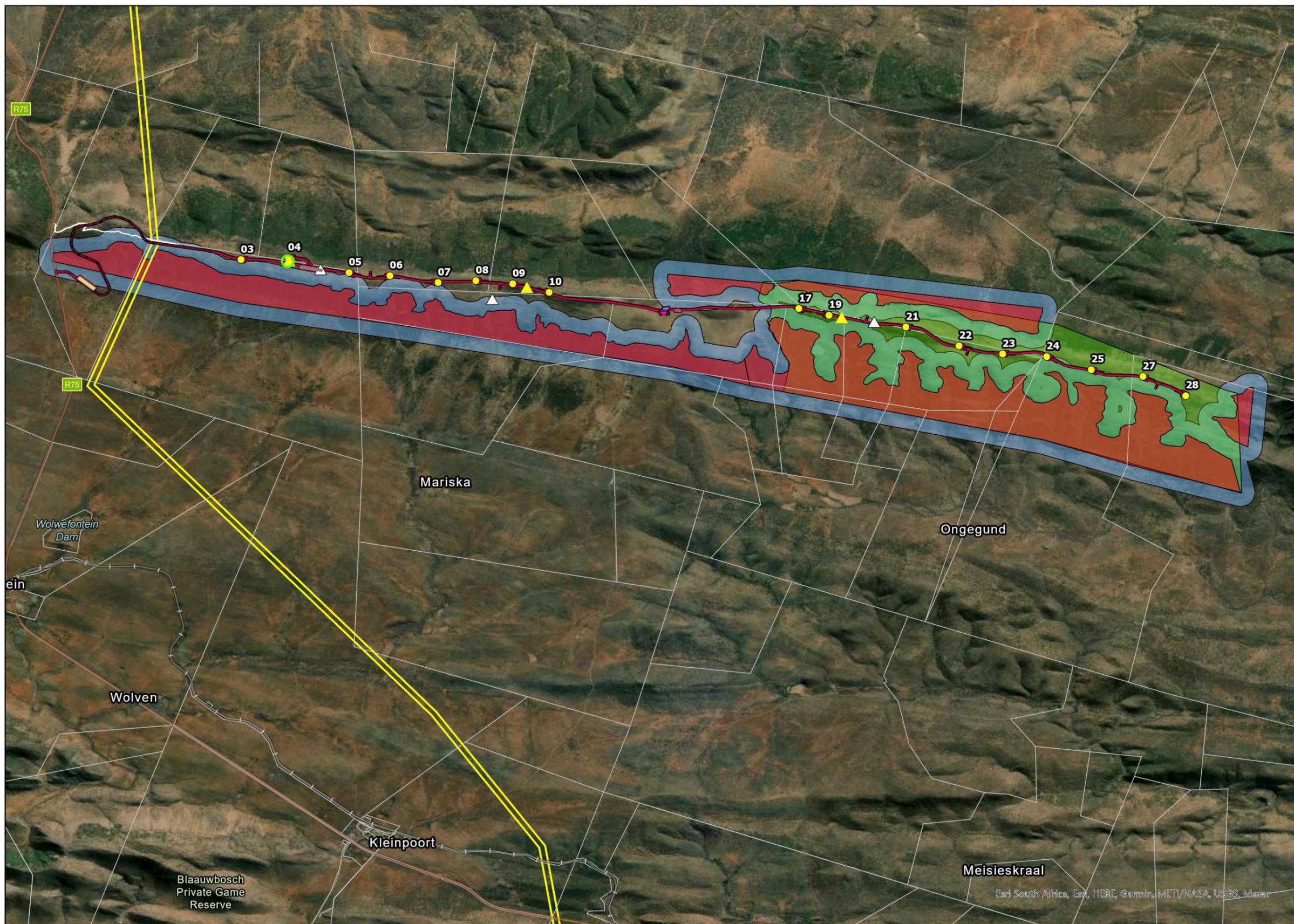
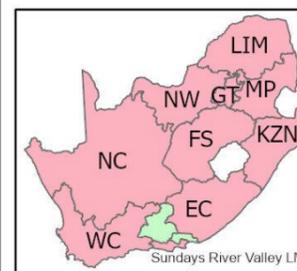
Date: 1 June 2022



Job No: 1001792 Map by: MR
Projection: GCS_WGS_1984

WOLF WIND ENERGY FACILITY
SENSITIVITY MAP 1

Figure 3-5 | The Wolf Wind Farm final layout overlain onto identified sensitivities – Map 1 or 2



LEGEND

- Liquid Telecoms Tower
- Trig Beacons
- Substation
- Laydown Area
- O&M Building
- Road Sidings
- Turbines (17)
- Meteorological Masts
- Proposed Road
- Temporary Access Road
- Property Boundaries

Eskom

- Eskom 765kV (Proposed)

Bats

- No-Go - Very High Sensitivity
- High Sensitivity Buffer 200m
- Medium Sensitivity

Notes:

Aerial Imagery: ESRI

Date: 1 June 2022



Job No: 1001792 Map by: MR
Projection: GCS_WGS_1984

WOLF WIND ENERGY FACILITY
SENSITIVITY MAP 2

Figure 3-6 | The Wolf Wind Farm final layout overlain onto identified sensitivities – Map 2 of 2

4 Planning and design Phase

During the planning phase, various plans, programmes, and permits are needed to meet the requirements of the EMP. **Table 4-1** below provides a quick reference list of these requirements³. Note that these requirements were identified during the EIA Phase and may require amendments as the projects proceed.

Table 4-1 | Plans, programmes, and permits required for the planning and design phase

Aspect	Plans, programmes, and permits required	Notes
Botanical and Fauna	Alien invasive management plan	See Annexure H.5
	Plant rescue and protection plan	See Annexure H.3
	Open space management plan	See Annexure H.2
	Re-vegetation and rehabilitation plan	See Annexure H.4
	Removal and transportation permit ⁴	None required
Avifauna	Bird monitoring programme	See Annexure G.1
	BAT monitoring programme	See Annexure H.1
Socio-Economic	Local employment policy and training programme	To be developed and implemented during construction and operational phases.
Surface water	Stormwater management plan	See Annexure H.6
	Pollution control	See Annexure H.6
	Erosion management plan	See Annexure H.6
Roads and traffic	Traffic management plan	See Annexure H.7
	Transport management plan	
SACAA approval	SACAA for approval of the final project layout.	See Annexure I.2 for the approval from the SACAA.

4.1 Design of the Project

The following table provides the specific mitigations measures originating from the specialist reports, EIAs and specialist micro-siting reports as well as the EA (14/12116t3/312/599/1 of 2/2/2020). The specific mitigations from the EA are denoted with the abbreviate EA followed by the EA condition number (i.e. EA16)

4.1.1 General

- ▶ EA41: The applicant must ensure all the no go areas are demarcated using fencing and appropriate signage before construction commences. Not however that no no-go areas have been identified for this site.
- ▶ EA43: A health and safety plan programme must be developed to protect both workers and the general public during the construction, operation and decommissioning of the wind energy facility. The programme must establish a safety zone for wind turbines from residences and occupied buildings, roads, right of way and other public access areas that is sufficient to prevent accidents resulting from the operation of the wind turbines.
- ▶ EA44: The Applicant obtain a written permit or approval from the South African Civil Authority (SACAA) confirming that the wind facility will not interfere with the performance of aerodrome radio communications, Navigation and Surveillance (CNS) equipment especially the radar prior to commencement of the activity. The approval/permit must be submitted to the DFFE: Director: Integrated Environmental Authorisations.
- ▶ EA47: Underground cables and internal access roads must be aligned as much as possible along existing Infrastructure to limit damage to vegetation and watercourses.

³ Department: Environmental Affairs, Requirements of EMP, Letter dated 16/10/2013

⁴ Removal and transportation of Threatened and Protected Species (TOPS) permits will be required from the provincial authority in terms of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) or cutting clearing or pruning of protected trees or forests under the National Forests Act (Act 84 of 1998).

- ▶ EA49: An integrated waste management approach must be implemented that is based on waste minimisation and must incorporate reduction, recycling, reuse and disposal.
- ▶ EA50: Any solid waste must be disposed of at a landfill licensed in terms of the National Environment Management Waste Act, 2008 (Act 59 of 2000).
- ▶ EA51: Liaison with landowner/farm managers must be done before construction to provide sufficient time for them to plan their activities.
- ▶ The layout to be submitted to the Department as per Condition 12 of the EA issued on 14 September 2015 must comply with the latest requirements for work in or near Eskom servitudes and Eskom Guidelines for renewable energy Generation Plant Set Backs to Eskom Infrastructure.

4.1.2 Noise (added 2020)

In the unlikely event that a wind turbine model with a sound power emission level higher than 110dBA is selected, then a noise specialist must be commissioned to revise the noise model and advise on turbine micro-siting or other mitigations to ensure that noise at the nearby sensitive receptors is kept within specified limits.

- ▶ EA42: The applicant must ensure that the National Noise Control Regulations and SANS10103:2008 are adhered to and that reasonable measures to limit noise from the work site are implemented.
- ▶ EA52: as above, should the applicant opt for a turbine model with a sound power level exceeding 110dBA, the applicant must appoint a qualified noise specialist to revise the facilities noise model, advise on turbine micro-siting, and propose additional mitigation measures for inclusion in the EMP if any.

4.1.3 Flora

The site forms part of a Critical Biodiversity Area (CBA2) and should continue to function as such after the construction of the Wind Farms. A rehabilitation specialist was commissioned to develop a detailed rehabilitation plan and programme before the commencement of construction. This plan makes recommendations regarding the protection of vegetation, stripping and stockpiling of topsoil and vegetative materials, collection, storage and treatment of seed, land re-profiling and replacement of topsoil and soil amelioration (including the treatment of foreign material and excavated cuttings, seeding, reseeding, mulching and erosion protection, stabilisation, and post-planting maintenance.

- ▶ Each wind turbine site was 'micro-sited' before construction to determine the most suitable position for the turbine and associated lay-down areas. **This requirement is now fulfilled, refer to Annexure F.3 for details;**
- ▶ Any sensitive plant species or habitat, and protected species such as *Encephalartos longifolius*, must be avoided;
- ▶ A botanical rescue and protection plan shall be compiled (**See Annexure H.3**) and implemented with the aid of a suitably qualified rehabilitation specialist; and
- ▶ An open space management plan has been compiled (**See Annexure H.2**) and will be implemented during the construction and operational phase.
- ▶ **Alien invasive management has been produced and included here as Annexure H.5.**
- ▶ **A Re-vegetation and rehabilitation plan has been produced and included here as Annexure H.4. Annexure H.5**

4.1.4 Birds

- ▶ **Verreux's eagles - 1km radius circular No-Go buffer for turbines around the Eastern nest, a 1.5km buffer around the central nest. Substation, OHPL connection & roads can remain in their current positions.**
- ▶ **Survey breeding status at two nests in each breeding season pre-construction.**
- ▶ **All collector power lines linking the turbines and linking turbine strings to the on-site substation must be placed underground. Underground cabling must follow roads as far as possible.**
- ▶ **The bird monitoring programme outlined by this report must be implemented by a suitably qualified and accredited avifaunal specialist. This monitoring must include the grid connection power line.**

- ▶ The findings of post-construction monitoring must be used to measure the effects of this facility on birds. If significant impacts are identified the wind farm operator will have to identify and implement suitable additional mitigation measures.
- ▶ A turbine shutdown on demand programme must be implemented from commissioning on all turbines within 3.7km of active nests. This will likely be technology led & will include use of audible & visual deterrence methods, with shutdown occurring where deterrence fails. Note that the Project has fully investigated this technically & financially & confirmed it will be viable based on shutdown frequency estimated from baseline flight activity data
- ▶ Blade painting to be implemented from commissioning on all turbines. One blade to be painted with a red stripe. Again, developer has confirmed this is technically & financially feasible
- ▶ A bird fatality threshold & adaptive management policy must be developed by commissioning & adhered to (all species)
- ▶ All collector powerlines linking the turbines to the on-site substation must be placed underground. Underground cabling must follow roads as far as possible.
- ▶ To reduce the disturbance of eagle breeding and the destruction of eagle habitat, the project must
 - establish a 1km radius circular No-Go buffer for turbines around the Eastern nest, & 1.5km buffer around the central nest. Substation, OHPL connection & roads can remain in current positions.
 - Survey breeding status at two nests in each breeding season pre-construction
- ▶ To reduce the destruction of eagle habitat the project must ensure that habitat closest to the nests is protected by maintaining a 1km radius circular No-Go buffer for turbines around the Eastern nest, & 1.5km buffer around the central nest. Substation, OHPL connection & roads need to remain in current positions and minimising the vegetation loss in these areas.
- ▶ To reduce Eagle collisions with turbines,
 - establish a 1km radius circular No-Go buffer for turbines around the Eastern nest, & 1.5km buffer around the central nest.
 - Owner to implement visual (blade painting) and technological shutdown on Demand fitted to all turbines within 3.7km of all active Verreaux's eagle nests and used where audio-visual deterrents fail. Conduct additional baseline monitoring to estimate 'eagle flight activity and spatial distribution monitoring', estimate productivity loss from shutdown
- ▶ It will be necessary to monitor the breeding status and productivity of the nesting Verreaux's Eagles during all breeding seasons (May to October) during construction. This can be done with a minimum of 3 specialist visits to the nest sites per breeding season, to observe the birds without disturbing them. Detailed requirements as follows:
 - Independent avifaunal specialist to make a minimum of 3 visits to nest site in each breeding season (May to October) during construction.
 - The breeding status & productivity of the eagles is to be determined and recorded.
 - Any observable response by eagles to construction disturbance to be documented.

4.1.5 Bats

- ▶ Adhere to the sensitivity map during turbine placement. Blasting must be minimised and used only where absolutely necessary.
- ▶ Consciously switch off all lights at a construction area when not required anymore, do not let it burn throughout the night. If suitable for the purpose utilize lighting temperatures (colours/wavelengths) that attract less insects.
- ▶ Adhere to the sensitivity map. Keep to designated areas when storing building materials, resources, turbine components and/or construction vehicles and keep to designated roads with all construction vehicles. Damaged areas not required after construction must be rehabilitated by an experienced vegetation succession specialist.

4.1.6 Visual

- ▶ Due to CAA regulations wind turbines have to be painted in bright white colours to increase its visibility to aircraft. For the same reason red warning lights have to indicate their presence during night time. See also the Section 6.5 for additional mitigation recommendations pertaining to lighting of the facility.
- ▶ The turbines will be equipped with pilot activated obstacle warning/navigation lights, thus the lights will not be on all night, but only when an aircraft is flying in the vicinity.

4.1.7 Socio-economic

- ▶ A Community Liaison Officer (CLO) shall be appointed before the construction period starts;
- ▶ A local employment policy shall be developed together with a training programme;
- ▶ Recruitment shall be based on sound labour practices and with gender equality and “locals first” policy as a key consideration;
- ▶ The developer must encourage the contractor to increase the local procurement practices and employment of people from local communities as far as feasible to maximise the benefits to the local economies; and
- ▶ The developer must engage with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods, and products from local suppliers, where feasible.

4.1.8 Surface Water

- ▶ The major storm occurrence i.e. 1:25 year, 1:50 and 1:100 year return must be used to calculate culverts in defined drainage lines and to determine flood levels where necessary. Intensities for each occurrence are as follows; 1:25 year – 46 mm/hour, 1:50 year – 50 mm/hour and 1:100 year – 60 mm/hour.
- ▶ Extreme care must be taken in the development of the stormwater system associated with the ascending main access road as this has the potential for stormwater accumulation, velocities and therefore significant erosion if not adequately designed and implemented.
- ▶ A stormwater, erosion and pollution management plan have been produced and appended here as Annexure H.6.
- ▶ EA45: Areas around fuel tanks must be bunded or contained in an appropriate manner as per the requirements of SABS 089:1999 Part 1.
- ▶ EA46: Leakage of fuel must be avoided at all times and if spillage occurs, it must be remedied immediately.

4.1.9 Roads (internal and external)

- ▶ A traffic and transport management plan shall be compiled and implemented during the construction and operational phase. This requirement has been fulfilled and the traffic management plan is appended as Annexure H.7;
- ▶ A transportation plan shall be compiled and implemented for the transport of wind turbine components. This requirement has been fulfilled and the traffic management plan is appended as Annexure H.7 ;
- ▶ Engage with the roads authorities prior to construction to ensure the necessary road upgrades, permits, traffic escorts, etc. are scheduled;
- ▶ Ensure that road junctions have good sightlines and reflectors;
- ▶ Internal roads shall be designed during the planning phase to have minimal impact on the environment; and
- ▶ Where internal roads need to be realigned, these must avoid drainage lines and steep slopes (where possible).
- ▶ . Permits will need to be obtained from the relevant road authorities for all abnormal loads and the specific route will be specified based on the characteristics of each load type.

- ▶ The Traffic Management Plan must be updated before the commencement of the construction phase when more detailed information regarding the delivery of components, traffic data and construction activities are available.
- ▶ Abnormal permits are required for vehicles exceeding the following permissible maximum dimensions on road freight transport in terms of the Road Traffic Act (Act No. 93 of 1996), refer to the traffic and transport plan for detail

5 Construction Phase

The Construction EMP aims to address mitigation measures pertaining to the construction phase as identified during the EIA. This section includes both General Environmental Specifications as well as Draft Environmental Specification Data, addressing general construction issues as well as project-specific issues that are not addressed by the General Environmental Specifications. It should be noted that the Draft Specification Data must be revised and updated as required post-authorisation.

5.1 General Environmental Specifications

The following specifications apply to all project components except the shared substation, which is covered by the DFFE's generic EMP for substations. A revised generic EMP for the shared substation is included here in Appendix D. The complete General Environmental Specifications have been included in **Annexure B** and include the following sections:

- ▶ Scope
- ▶ Definitions
- ▶ Normative References
 - Supporting Specifications
 - Management and administration
- ▶ Contractor Mobilisation and general provisions
 - Baseline photography
 - Method statements
 - Environmental awareness
 - Surveying and setting out
 - Environmental requirements
 - ~ Protection of natural features
 - ~ Protection of fauna and flora
 - ~ Protection of archaeological and paleontological remains
 - ~ Noise control
 - ~ Lighting
 - ~ Fuel (petrol and diesel)
 - ~ Contaminated water
 - ~ Stormwater and drainage
 - ~ Solid waste management
 - ~ Workshop, equipment maintenance and storage
 - ~ Materials handling, use and storage
 - ~ Dust
 - ~ Aesthetics
 - ~ Disruption to existing and neighbouring land use activities
 - ~ Temporary site closure
 - ~ Public roads
 - ~ Security and access control
 - ~ Access routes / haul roads
 - ~ Housekeeping
 - ~ Ablution facilities
 - ~ Recess areas and canteens
 - ~ Site clinic or first aid
 - Fire
 - Accidental leaks and spillages
- ▶ Community relations
- ▶ Construction methods and procedures
 - Site clearance
 - Demolition
 - Cement and concrete batching
 - Earthworks
 - Dewatering
 - Bitumen
 - Erosion and sedimentation control
 - Crane operations
 - Trenching
 - Drilling and jackhammering
 - Stockpiling
 - Site closure and rehabilitation
 - Temporary revegetation of the areas disturbed by construction
- ▶ Compliance with requirements and penalties
 - Compliance
 - Penalties
 - Removal from site and suspension of Works
- ▶ Measurement and payment
 - Basic principles
 - ~ General
 - ~ All requirements of the environmental management specification
 - ~ Work "required by the Construction Manager"
 - Billed items
 - ~ Method Statements: Additional work
 - ~ All requirements of the environmental management specification
- ▶ Emergency procedures

5.2 Plans, policies, programmes and permits required for the construction phase

During the construction phase-specific plans, policies, programmes, and permits are needed to be compiled and obtained to be included in the EMPr. Table 5-1 below provides a quick reference list of these requirements.

Table 5-1 | Plans required for the construction phase

Aspect	Plans, policies, programmes and permits required	Status
Flora	An alien invasive management plan	Complete - See Annexure H.5
Flora	The Re-vegetation and habitat rehabilitation plan	Complete - See Annexure H.4
Flora	An open space management plan	Complete - See Annexure H.2
Flora	The Plant rescue and protection plan	Complete - See Annexure H.3
Avifauna	The Bird monitoring programme	Complete - See Annexure G.1
	The Bird monitoring programme	Complete - See Annexure H.1
Freshwater	The Stormwater Management Plan	Complete – See Annexure H.6
	The Erosion management plan	
	The Pollution control plan	
Traffic	The Transport management plan	Complete – See Annexure H.7
	The Traffic management plan	
SACAA approval	An approval from the SACAA on the “as-built drawings” must be submitted to the DFFE - Director: Integrated Environmental Authorisations.	See Annexure I.2 for the approval of the final layout. This must be updated on the submission of as-builts to the SACAA and the resulting approval must be forwarded to the DFFE: IEM before construction starts.

5.3 Introduction to the Project Environmental Specifications

The following section provides the project-specific environmental specifications which, along with the General Environmental Specifications (Annexure B), must be included in all contract documentation associated with the proposed project and must be binding on the Contractor. The Contractor must be provided with the opportunity to cost for implementation of the EMPr in their tender submission. The Developer shall ensure that items pertaining to the environmental protection measures must be reflected in the Bill of Quantities and are adequately priced. Where provisions for the implementation of environmental specifications are deemed inadequate, the Contractor shall be instructed to amend this or face tender disqualification.

The project specifications must be read in conjunction with the General Environmental Specifications contained in Annexure B. The project specifications relate to project-specific requirements, as determined through the EIA process, and serve to augment the General Specification. Where the Project specifications conflict with the General Environmental Specifications, the project specifications or relevant specialists’ management plans shall take precedence.

Scope: The general principles contained within this Project specification shall apply to all construction-related activities. All construction activities shall observe any relevant environmental legislation and in so doing shall be undertaken in such a manner as to minimise impacts on the natural and social environment.

Interpretations: This Specification contains clauses specifically applicable and related to the environmental requirements for the proposed Wind Energy Facility, near Wolwefontein, Western Cape.

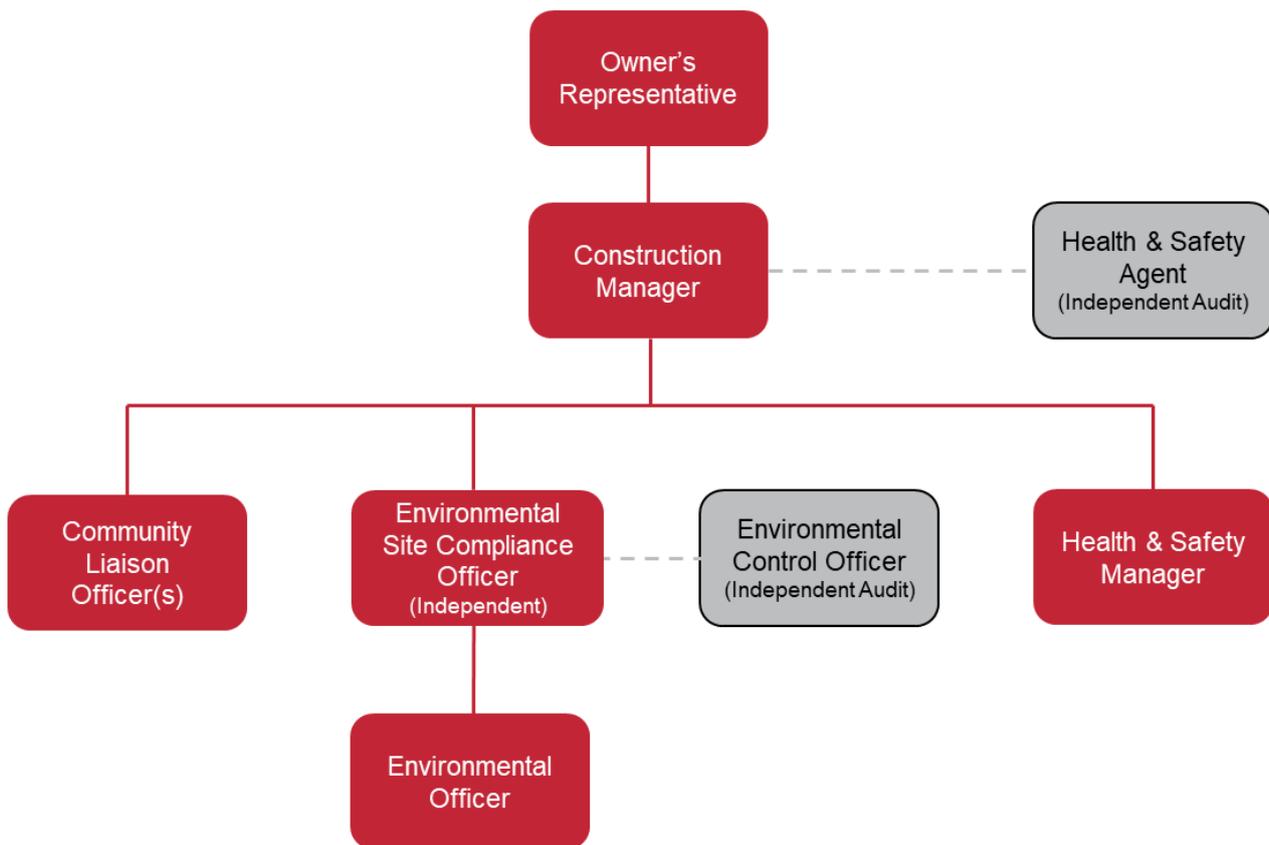
Definitions:

For this Specification the following definitions shall be added:

Developer/Owner: The developer refers to the holder of the Environmental Authorisation who will be responsible for the following tasks, but not limited to:

- ▶ Ensure that the requirements as set out in this EMPr are adhered to and implemented;
- ▶ Allocate the responsibilities assigned to the ECO to an independent suitably qualified individual before the start of construction activities on-site; and
- ▶ Provide all principal contractors working on the project with a copy of this EMPr as part of tender contract documentation to allow the contractors to cost for its requirements within their respective construction contracts.

It is important to note that the Developer, as the holder of the Environmental Authorisation, remains responsible for all aspects relating to environmental management, regardless of whether such functions and responsibilities are delegated or deferred to other parties. **The Owner's compliance management structure will be set up as follows and the Owner will have oversight of all activities to ensure compliance with the EMPr and responsible environmental practice.**



Principle Contractors shall each appoint their own compliance management structure, including Environmental Officers, Health and Safety Management, and Community Liaison Officers, who shall report to the Project Permit Holder, who in turn provides compliance oversight and assurance.

Figure 5-1 | Owner's compliance management structure

Environmental Control Officer (ECO): The Developer shall appoint a suitably qualified independent ECO to monitor the compliance of all parties in terms of this EMPr and the conditions contained in the Environmental Authorisation, as well as address environmental site issues. The ECO shall work with the Owners teams and Contractor's appointed EO. The designation is reserved for a suitably qualified (National Diploma / Degree in Natural Science or equivalent qualification), independent, environmental manager, with adequate environmental knowledge to understand and **verify the implementation of** the EMPr. The duties of the ECO during the construction phase will include but are not limited to:

- i) Liaison with the Owner, Project Manager, **ESCO** or Construction Manager and DFFE.
- ii) Monitoring of all the Contractor's activities for compliance with the various environmental requirements contained in the construction Specification.
- iii) Monitoring of compliance with the Environmental Authorisation related to the construction phase as issued by DFFE as well as other relevant environmental legislation.
- iv) Reviewing of the Contractor's environmental Method Statements for compliance with the EMPr and environmental best practices.
- v) Monitor and report on requisite remedial action taken in the event of non-compliance.
- vi) Monitor and report on the proactive and effective implementation and management of environmental protection measures.
- vii) Monitor and report on the register of public complaints, confirming that it is maintained by the Contractor and that all public comments or issues are appropriately reported and addressed.
- viii) Routine recording and reporting of environmental activities and general progress monthly.
- ix) Recording and reporting of environmental incidents and remediation; and
- x) Monitor compliance with and implementation of the construction phase EMPr, Operational Phase EMPr and Rehabilitation Plan, including compliance with the relevant conditions contained in the Environmental Authorisation.

Environmental Site Compliance Officer (ESCO): The Developer shall appoint a suitably qualified independent ESCO to oversee on-site compliance management and EMPr implementation on a day-to-day basis.

Environmental Auditor (EA): An independent Environmental Auditor must be appointed by the Owner to undertake an Environmental Audit every five years to verify compliance with the Conditions of EA and the EMPr and submit the results to the DFFE Director: Compliance Monitoring. Audit reports must comply with Appendix 7 of the NEMA. In addition to the five-yearly audits, the Owner must ensure an Audit is completed and submitted to the DFFE within 30 days of the completion of the construction phase (Refer to condition 31 of the EA).

Contractor's EO: The Contractor must ensure that all its sub-contractors, employees, etc., are made fully aware of the environmental issues detailed in this EMPr. The Contractor shall liaise closely with the Construction Manager / Construction Manager, **Environmental Site Compliance Officer (ESCO)** and the ECO and must ensure that all activities on site are conducted in an environmentally responsible manner and compliance with the requirements of the EMPr and conditions of EA. The Contractor shall appoint a suitably senior member or staff or qualified professional to the position of EO. The EO's duties will include the following:

- ▶ Liaise with all parties on matters relating to the environment;
- ▶ Assist with the compilation of environmental components of method statements;
- ▶ Undertake daily site compliance inspections of the various works areas;
- ▶ Compile a weekly report detailing the key findings and environmental matters observed and dealt with during the week and submit this to the ECO, **ESCO** and Construction Manager;
- ▶ Ensure Contractor is implementing the EMPr and conditions of Authorisation;
- ▶ Ensure that any environmental monitoring requirements are being fulfilled and include results in the weekly submissions;
- ▶ Report environmental accidents and incidents and oversee all remediated works;
- ▶ Make recommendations for disciplinary actions where and if required; and
- ▶ Undertake environmental awareness training and routine toolbox talks with contractor staff on matters relating to environmental management.

Responsible persons: Effective environmental management during the construction phase will be dependent on several project personnel. The purpose of this section is to define roles for personnel and to detail their respective responsibilities in the execution of the EMPr.

Construction Manager / Construction manager: The Construction Manager / Construction Manager is responsible for ensuring that the contract is carried out to completion on time, within budget and that each Contractor fulfils his obligations in terms of conditions contained in the Environmental Authorisation.

Working area: The land and any other place on, under, over, in or through which the Works are to be executed or carried out, and any other land or place made available by the developer in connection with the Works. The Working Area shall include the site office, construction camp, stockpiles, batching areas, the construction area, all access routes, and any additional areas to which the Construction Manager permits access. The construction footprint must be kept to a minimum.

5.4 Project Environmental Specifications

5.4.1 Baseline photography (Subclause 2.1)

Following the official handover of the site to the Contractor and before the commencement of mobilisation activities, the Contractor shall take photographs of all areas that will be impacted by construction activity and their immediate surroundings. Photographs shall include, inter alia, all works areas, site establishment and laydown areas, access roads, gates, no go and natural areas, debris, boundary fences, existing structures and infrastructure on the site and any defects or issues to any of the foregoing. These photographs shall be provided to the **ESCO and** Construction Manager for reference purposes.

5.4.2 Method statement (Subclause 2.2)

Method statements shall be produced and submitted for approval by the **ESCO and** Construction Manager at least five working days before the commencement of the activities. The Contractor shall not commence the activity until the Method Statement has been approved. Approval of method statements shall not unreasonably be withheld. The **ESCO and** Construction Manager may approve, reject, or approve with conditions of any method statement. Refer to the detailed list under Subclause 2.2.1-2.2.3 with specific reference to environmental awareness training, toolbox talks and construction information posters.

5.4.3 Surveying and setting out (Subclause 2.3)

5.4.3.1 Site establishment (Subclause 2.3.1)

The **ESCO and** Construction Manager shall be advised of the area that the Contractor intends to use for site establishment by way of the Mobilisation plan discussed under item 1) of Clause 2.2. The Contractor's camp shall occupy as small an area as possible, and no site establishment shall be allowed within 50 m of any watercourse unless otherwise approved by the **ESCO and** Construction Manager.

The Contractor shall inform the **ESCO and** Construction Manager of the intended actions and programme for site establishment. The site layout shall be planned to facilitate ready access for deliveries, facilitate future works and curtail any disturbance or security implications for neighbours.

5.4.3.2 Site fencing and demarcations (Subclause 2.3.2)

As may be required, the Contractor shall erect and maintain permanent and/or temporary fences of the type and in the locations directed by the **ESCO and** Construction Manager. Such fences shall, if so specified, be erected before undertaking designated activities. The Contractor shall not damage or remove any boundary fences without the agreement of the affected landowners. Where property fences are replaced, these shall, at the minimum, meet the specification of the fencing it replaces, in terms of top height, sturdiness and rigidity

(pole foundations and supports and strength and wire gauge), security (barbed or razor wire) and size of the largest openings (i.e., distances between horizontal wires or mesh dimensions).

5.4.3.3 **No Go Areas (Subclause 2.3.3)**

If required, certain areas shall be considered "no go" areas and these may be detailed in the Environmental Management Plan or as conditions attached to an Environmental Authorisation or specified by the ECO. The Contractor shall ensure that, insofar as he has the authority, no unauthorised entry, stockpiling, dumping or storage of equipment or materials shall be allowed within the demarcated "no go" areas. "No go" area demarcation fencing shall be established before the commencement of construction in the vicinity.

"No-go" areas shall be demarcated with fencing consisting of wooden or metal posts at 3 m centres with 1 plain wire strand tensioned horizontally at 900 mm from ground level. Commercially available danger tape shall be wrapped around the wire strand. The Contractor shall maintain the fence for the duration of construction and ensure that the danger tape does not become dislodged.

5.4.4 **Overarching environmental requirements (Subclause 2.4)**

5.4.4.1 **Protection of natural features (Subclause 2.4.1)**

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

The Contractor shall ensure that plant, equipment, materials, and staff are not permitted to enter any designated "no go" area.

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

5.4.4.2 **Protection of fauna and flora (Subclause 2.4.2)**

It is important that the ecological functioning of the site must not be negatively impacted e.g., by excluding fire. The fire-management programme must be adhered to.

- ▶ Any sensitive plant species or habitat, and protected species such as *Encephalartos longifolius*, must be avoided.
- ▶ Except to the extent necessary for the carrying out of the Works (as per an approved method statement), flora shall not be removed, damaged or disturbed. Firewood may not be collected from the site.
- ▶ Trapping, poisoning and/ or shooting of animals is strictly forbidden. No domestic pets or livestock belonging to the project staff are permitted on site.
- ▶ The use of biocides is subject to the approval of the **ESCO and** Construction Manager unless provided for in the project specification. Where the use of biocides and other poisonous substances has been specified, they shall be stored, handled and applied with due regard to their potentially harmful effects. Persons using any biocide or poisonous substances shall have received training in the appropriate handling, use and storage of such materials. Care will be taken to ensure no movement or drift occurs into non-target areas. Dyes shall be mixed into sprayed biocide so that the treatment areas may be inspected and the risk of over spray / re-spraying is avoided.
- ▶ Before vegetation clearance commences areas must be walked and slow-moving animals removed out of the impact area; and
- ▶ Any snakes found on site shall be removed from the site and released into an area away from the site, without harm.
- ▶ **To reduce the disturbance of eagle breeding and the destruction of eagle habitat, the project must establish a 1km radius circular No-Go buffer for turbines around the Eastern nest, and a 1.5km buffer around the central nest and Survey breeding status at two nests in each breeding season during the construction phase to compare this with breeding productivity compared pre, and during and post-construction**

- ▶ To reduce the destruction of eagle habitat the project must ensure that no new attractive habitat is created on-site, for example through the attraction of eagle prey species to road verges once civil works complete – and an audit by bird specialist to sign off on adequate compaction of verges & removal of waste rock/plant material must be undertaken.
- ▶ To reduce Eagle collisions with turbines,
 - establish a 1km radius circular No-Go buffer for turbines around the Eastern nest and a 1.5km buffer around the central nest.
 - Owner to implement visual (blade painting) and technological shutdown on Demand (with an option for audio deterrent) fitted to all turbines.
 - Conduct eagle flight activity and spatial distribution monitoring' to determine whether camera positions are adequate.

5.4.4.3 Protection of archaeological and palaeontological remains (Subclause 2.4.3)

During the construction phase, all substantial bedrock excavations must be monitored for fossil remains by the responsible Environmental Control Officer (ECO) and ESCO. In particular, the ECO must be alerted to the (slight) possibility that fossil-rich lenses or horizons of dark, organic-rich lagoonal mudrocks may be exposed during excavations into the Witpoort Formation along the Klein-Winterhoek ridge. Other possibilities include dark grey phosphatic carbonate nodules containing fossil plants and/or fish in the Waaipoort Formation as well as well-preserved fish and reptile remains within the Whitehill Formation.

Should substantial fossils (such as vertebrate bones and teeth, plant-rich fossil lenses or dense fossil burrow assemblages) be exposed during construction, the Environmental Officer must safeguard these, preferably *in situ*, and alert ECPHRA (*i.e.*, The Eastern Cape Provincial Heritage Resources Authority. Contact details: Mr Sello Mokhanya, 74 Alexander Road, King Williams Town 5600; smokhanya@ecphra.org.za) as soon as possible so that appropriate action can be taken by a professional palaeontologist, the cost of which is at the developer's expense. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (*e.g.*, stratigraphy, sedimentology, taphonomy). This is repeated in EA37 which states: *Should any historical, cultural, paleontological resources and graves be found during the construction of the project, all construction activities must be suspended and Eastern Cape Provincial Heritage Resources Authority together with the heritage specialists who surveyed and compiled HIA reports must be alerted so that the find can be investigated, and mitigation measures proposed.*

The palaeontologist concerned with mitigation work will need a valid fossil collection permit from ECPHRA and any material collected would have to be curated in an approved depository (*e.g.*, museum or university collection). All palaeontological specialist work would have to conform to international best practices for palaeontological fieldwork and the study (*e.g.*, data recording fossil collection and curation, final report) must adhere as far as possible to the minimum standards for Phase 2 palaeontological studies recently developed by SAHRA (2013).

The Contractor shall take reasonable precautions to prevent any person from removing or damaging any fossils, coins, articles of value or antiquity and structures and other remains of archaeological interest discovered on the Site, immediately upon discovery thereof and before removal. The Contractor shall inform the ESCO and Construction Manager immediately of such a discovery and carry out the ESCO and Construction Managers' instructions for dealing therewith. All construction within the vicinity of the discovery shall cease and the area shall be cordoned off until the Construction Manager authorises the resumption of construction in writing.

5.4.4.4 Noise control (Subclause 2.4.4)

The applicable regulations framed under the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), and the provisions of SANS 1200 A Subclause 4.1 regarding "built-up areas" shall apply to all areas within audible distance of residents whether in urban, peri-urban, or rural areas.

Appropriate directional and intensity settings are to be maintained on all hooters and sirens, and the Contractor shall provide and use suitable and effective silencing devices for pneumatic tools and other equipment such that the noise level in inhabited areas and dwellings adjacent to the work areas will not increase by more than

7 dB(A)Leq 60 above residual background sound levels. Similarly in habituated areas adjacent to access roads maximum noise levels shall not exceed 60 dB(A)Leq 60 and maximum sound pressure level of 70 dB(A).

Where excess noise generation is unavoidable, the Contractor shall use barriers, and isolate the source of any such noise to comply with the said regulations. The Contractor shall restrict any of his operations that may result in excessive noise disturbance to those communities and dwellings abutting the Site to the hours of 08:00 to 22:00 on weekdays and Saturdays. No work will be permitted on Sundays unless otherwise agreed to with the **ESCO and** Construction Manager.

Where loud construction operations or equipment are required, that cannot be practically barricaded (i.e., Pile driving, hydraulic breakers, or rock crushing), nearby residents that may be disturbed by the operation will be notified and provided with a program for the works before commencement. The Contractor shall be reasonable in accommodating the needs of neighbours and take reasonable measures to minimise the impact of noise on neighbouring communities.

Apart from warning and emergency sirens and public address systems used during an emergency, no sound is to be broadcast across the site without approval from the **ESCO and** Construction Manager.

5.4.4.5 **Lighting (Subclause 2.4.5)**

The Contractor shall ensure that any lighting installed on the site for his activities does not interfere with road traffic or cause a reasonably avoidable disturbance to the surrounding community or other users of the area. Subject to meeting the minimum requirements of the OHSA and general security, lighting shall be kept to the minimum. Care will be taken to ensure lighting is task-specific and does not spill into the surrounding environment through appropriate placement and shielding. Floodlighting of expansive work areas or up- or down lighting of vertical structures or natural features shall only be permitted if approved by **ESCO and** Construction Manager.

5.4.4.6 **Fuel (petrol and diesel) and oil (Subclause 2.4.6)**

Unless otherwise specified, fuel may be stored on-site in an area approved by the **ESCO and** Construction Manager. The Contractor shall ensure that all liquid fuels (petrol and diesel) are stored in tanks with lids, which are kept firmly shut or in bowsers. The tanks/bowsers shall be situated on a smooth impermeable surface (concrete or 250 µm plastic) with an earth bund (plastic must have a 5 cm layer of sand on top to prevent damage and perishing). The impermeable lining shall extend to the crest of the bund and the volume inside the bund shall be 130% of the total capacity of all the storage tanks/ bowsers. The bunded area shall be covered to protect it from rain. Provision shall be made for refuelling at the fuel storage area, by protecting the soil with 250 µm plastic covered with a minimum of a 5 cm layer of sand.

If fuel is dispensed from 200-litre drums, only empty externally clean drums may be stored on the bare ground. All empty externally dirty drums shall be stored in an area where the ground has been protected. The proper dispensing equipment shall be used, and the drum shall not be tipped to dispense fuel. The dispensing mechanism of the fuel storage drum shall be stored in a waterproof container when not in use.

The Contractor shall prevent unauthorised access into the fuel storage area. No smoking shall be allowed within the vicinity of the fuel storage area. The Contractor shall ensure that there is adequate fire-fighting equipment at the fuel stores.

Where reasonably practical, equipment shall be refuelled at the fuel storage area or the workshop as applicable. If it is not reasonably practical, then the surface under the refuelling area shall be protected against pollution to the reasonable satisfaction of the **ESCO and** Construction Manager before any refuelling activities. The Contractor shall employ the use of appropriate non-spill dispensing equipment and drip trays to prevent spills during refuelling. The Contractor shall ensure that there is always a supply of absorbent material readily available to absorb/ breakdown and where possible be designed to encapsulate minor hydrocarbon spillage. The number of such materials shall be able to handle a minimum of 200-litre of hydrocarbon liquid spill. The Contractor shall ensure that staff responsible for refuelling equipment is trained to clean up any fuel or oil spills as they occur. The Contractor shall obtain the **ESCO's and** Construction Manager's prior approval for any refuelling or maintenance activities. The fuel bowsers and stores must be inspected daily by the Contractor

and any contaminated soil shall be collected and disposed of via the hazardous waste system. Care will be taken to ensure that oil-contaminated soil, rags or other materials are not disposed of as part of the domestic waste system due to the fire risk.

5.4.4.7 Contaminated water (Subclause 2.4.7)

Contaminated runoff from the various construction and decommissioning activities on the site must be prevented from directly entering the streams and drainage channels. Construction as well as the decommissioning activities in work areas prone to stormwater disturbances/damages, i.e., the ascending portion of the main access road and any channel crossings, should preferably be scheduled and undertaken in the low rainfall months when storm water runoff can be contained and prevented from draining into the freshwater features.

The Contractor shall take reasonable measures to prevent the contamination of water and where this is not possible will set up a contaminated water management system, which shall include collection facilities to be used to prevent pollution, as well as suitable methods of disposal of contaminated water. The Contractor shall prevent the discharge of water contaminated with any pollutants, such as soaps, detergents, cement, concrete, lime, chemicals, glues, solvents, paints, and fuels, into the environment.

The Contractor shall notify the **ESCO and** Construction Manager immediately of any pollution incidents on Site. The **ESCO's and** Construction Manager's approval is required before the discharge of contaminated water to the Municipal sewer system.

5.4.4.8 Stormwater and drainage (Subclause 2.4.8)

Any increase in storm water runoff from the site into the drainage channels be prevented as far as possible by re-vegetating the surfaces and shaping the surface to capture runoff from hardened surfaces. No rubble associated with development activities should be placed with the drainage lines.

Should the development activities require any structure to be constructed within the drainage channels; these structures must not impede the flows in the channels after installation.

The Contractor shall ensure that storm water is managed in such a way that prevents erosion. The Contractor shall install temporary stormwater control measures which may include cut off drains, berms, side drains, retention ponds or similar needed to divert stormwater away from earthworks areas, or as directed by the **ESCO and** Construction Manager.

Apart from identified road crossings, all delineated river systems are to be regarded as no-go areas. According to the Stormwater management plan (Annexure H.6), the following mitigations must be adhered to:

- **Avoid any construction activities within the 1:100-year flood line or 100 meters from the edge of any watercourse, except for linear infrastructures such as transmission lines and flood-compatible infrastructure such as electricity pylons.**
- **Clearing of vegetation and associated excavation areas must be kept to a minimum.**
- **Construction of new access roads must be kept to what is necessary. Stick to existing roads as far as possible.**
- **Vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive stormwater and wind are anticipated to be low.**
- **No vegetation clearance must be undertaken before periods of inactivity.**
- **A berm/channel combination must be constructed around each of the construction sites using the excavated soil material.**
- **Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast. Thus, a water tanker must be available.**

- Soil/topsoil must be placed onto the concrete slab once it has dried up and the turbine fixed, with natural vegetation re-established to mimic the previous undisturbed environment as far as practically possible.
- All excavation/construction vehicles must be in good condition and inspected regularly to ensure there are no chemical spills (diesel/oil) which will negatively impact the receiving environment.
- Excavated soils must be stockpiled and separated into separate material types.
- The disconnection flow paths must be located on gradual slopes ($\leq 5\%$) to maintain sheet flow.
- The construction of the proposed roads will create large areas prone to erosion due to soils being exposed as well as sloping terrain. Roads must therefore be constructed in a manner to rapidly stabilise soils, while roadside drainage must be included where necessary. Additional information in this regard can be obtained in the SANRAL (2013) 6th Edition Drainage Manual.
- All disturbed areas must be rehabilitated (as soon as possible) to represent the previous undisturbed environment (soil, land use, slope) as closely as possible to limit the impact on receiving water resources through improved infiltration and limited soil erosion.
- A water tanker must be available to be used for dust suppression should the need arise
- Regular inspection of the berms/channels and sediment control areas must be undertaken to assess erosion which may result from a loss in vegetation or cavitation from soil slumping; and
- A practical erosion control handbook must be developed, based on the principles developed in this report and given to the construction contractors to ensure the impact on receiving water resources is limited.
- EA44: The stormwater, erosion and pollution management plans indicated that the stormwater management designs presented in this document are conceptual. Therefore, refinements in the detailed design phase must take place during the detailed design of the development. Kindly ensure that the detailed final designs are submitted with the final EMPr.

5.4.4.9 Solid waste management (Subclause 2.4.9)

The Contractor shall provide sufficient bins with lids on Site to store the produced daily. Solid, non-hazardous waste shall be disposed of in the bins provided and no on-site burying, dumping, or burning of any waste materials, vegetation, litter, or refuse shall occur. Bins shall not be allowed to become overfull and shall be emptied a minimum of once daily. The waste may be temporarily stored on the Site in a central waste area that is weatherproof and scavenger-proof, and which the ESCO and Construction Manager has approved.

All solid waste shall be disposed of offsite at an approved landfill site. The Contractor shall supply the ESCO and Construction Manager with a certificate of disposal.

5.4.4.10 Shutter oil and curing compound (Subclause 2.4.9.1)

Shutter oil and curing compounds pose a risk of causing water and soil contamination and accordingly are regarded as potentially hazardous substances. The Contractor shall ensure that shutter oil and curing compound containers in use are stored within the fuel bund. The remaining containers shall be inspected regularly to ensure that no leakage occurs. When shutter oil or curing compound is dispensed, the proper dispensing equipment shall be used, and the storage container shall not be tipped to dispense the oil/compound. The dispensing mechanism of the shutter oil/curing compound storage container shall be stored in a waterproof container when not in use.

Shutter oil and curing shall be used in moderation and shall be applied under controlled conditions using appropriate equipment. The Contractor shall take all reasonable precautions to prevent accidental and incidental spillage during the application of these compounds.

In the event of a shutter oil or curing compound spill, the source of the spillage shall be isolated, and the spillage contained. The Contractor shall clean up the spill, either by removing the contaminated soil or by the application of absorbent material in the event of a larger spill. Treatment and remediation of the spill area shall be undertaken to the reasonable satisfaction of the ESCO and Construction Manager.

5.4.4.11 **Shutter oil and curing compound (Subclause 2.4.9.1)**

Shutter oil and curing compounds pose a risk of causing water and soil contamination and accordingly are regarded as potentially hazardous substances. The Contractor shall ensure that shutter oil and curing compound containers in use are stored within the fuel bund. The remaining containers shall be inspected regularly to ensure that no leakage occurs. When shutter oil or curing compound is dispensed, the proper dispensing equipment shall be used, and the storage container shall not be tipped to dispense the oil/compound. The dispensing mechanism of the shutter oil/curing compound storage container shall be stored in a waterproof container when not in use.

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In the event of a shutter oil or curing compound spill, the source of the spillage shall be isolated, and the spillage contained. The Contractor shall clean up the spill, either by removing the contaminated soil or by the application of absorbent material in the event of a larger spill. Treatment and remediation of the spill area shall be undertaken to the reasonable satisfaction of the **ESCO and** Construction Manager.

5.4.4.12 **Bitumen (Subclause 2.4.9.2)**

The **ESCO and** Construction Manager shall be advised of the area that the Contractor intends to use for the storage of bitumen drums/ products. The storage area shall have a smooth impermeable (concrete or 250 µm plastic covered in sand) floor. The floor shall be bunded and sloped towards a sump to contain any spillages of substances. The bund shall be inspected and emptied daily and serviced when necessary. The bund shall be closely monitored during rain events to ensure that it does not overflow.

5.4.4.13 **Hazardous substances (Subclause 2.4.9.3)**

Procedures detailed in the Material Safety Data Sheets (MSDSs) shall be followed in the event of an emergency.

Petroleum, chemicals, and harmful and hazardous waste shall be stored in an enclosed and bunded area. This area shall be subject to the approval of the **ESCO and** Construction Manager. The waste shall be disposed of at a hazardous waste disposal site as approved by the **ESCO and** Construction Manager.

5.4.4.14 **Workshop, equipment maintenance and storage (Subclause 2.4.9.10)**

The Contractor shall ensure that all items of plant and equipment are inspected daily by the operators before commencement. Any maintenance requirements shall be seen before start-up, which includes fuel and oil leaks. Inspection checklists shall be retained and submitted to the Construction Manager upon request.

Leaking equipment shall be repaired immediately or removed from the Site. Where practical, all maintenance of equipment and vehicles on Site shall be performed off-Site or in the workshop. If it is necessary to do field maintenance, the Contractor shall ensure that measures are implemented to prevent the accidental spillage of oil and fuel into the environment and that the area is effectively cleaned after such maintenance. The Contractor shall ensure that in his workshop and other plant maintenance facilities, including those areas where, after obtaining the **ESCO and** Construction Manager's approval, the Contractor carries out emergency plant maintenance, there is no contamination of the soil or vegetation. The workshop shall have a smooth impermeable (concrete or 250 µm plastic covered with sand) floor. The floor shall be bunded and sloped towards an oil trap or sump to contain any spillages of substances (e.g., oil).

When servicing equipment on-site, drip trays shall be used to collect the waste oil and other lubricants. Drip trays shall also be provided in construction areas for stationary plants (such as generators, pumps, and compressors) and Transport and Earthmoving Equipment (such as scrapers, diggers, loaders, trucks, cranes, etc.). Drip trays shall be inspected and emptied daily. Drip trays shall be closely monitored during rain events to ensure that they do not overflow. Where practical, the Contractor shall ensure that equipment is covered so that rainwater is excluded from the drip trays.

The washing of equipment shall be restricted to urgent or preventative maintenance requirements only. All washing shall be undertaken off-Site or in the workshop with adequate facilities for dealing with wastewater, including an oil separator. The use of detergents for washing equipment on site is prohibited

5.4.4.15 **Materials handling, use and storage (Subclause 2.4.9.11)**

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

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

5.4.4.16 **Dust (Subclause 2.4.9.12)**

The Contractor shall take reasonable measures to minimise the generation of dust because of construction activities to the satisfaction of the **ESCO and** Construction Manager. The Contractor's dust management planning shall, as a minimum, take cognisance of the following:

- ▶ Schedule of spraying water on unpaved roads paying due attention to the control of runoff.
- ▶ Speed limits for vehicles on unpaved roads and minimisation of haul distances.
- ▶ Measures to ensure that material loads are properly covered during transportation.
- ▶ Schedule for wheel cleaning and measures to clean up public roads that may be soiled by construction vehicles.
- ▶ Minimisation of the areas disturbed at any one time and protection of exposed soil against wind erosion, e.g. by dampening with water or covering with straw
- ▶ Location and treatment of material stockpiles taking into consideration prevailing wind directions and location of sensitive receptors.
- ▶ Controlled blasting techniques to minimise dust and fly rock during blasting.
- ▶ Adherence to the dust loads and protective gear stipulated in the Occupational Health and Safety Act.
- ▶ Reporting mechanism and action plan in case of excessive wind and dust conditions.

During dry and, or windy periods, a water tanker shall be available for the control of dust, and the Contractor shall ensure that the sprays do not generate excess runoff.

During high wind conditions, the Contractor shall comply with the **ESCO and** Construction Manager's instructions regarding dust-dampening measures. The Construction Manager may request the temporary cessation of all construction activities where wind speeds are high and excessive dust is produced, and until dust levels return to acceptable levels.

As required by the National Dust Control Regulations, promulgated in terms of section 53(o) of the National Environmental Air Quality Act (Act 39 of 2004) the Contractor shall establish a network of dust monitoring points using method ASTM D1739: 1970 (or equivalent), sufficient in number to establish the contribution of the project to dust fall in the vicinity of the premises, to monitor identified or likely sensitive receptor locations, and to establish the baseline dust fall for the district. The following standards will apply:

- ▶ For residential areas, the dust fallout may not exceed 600mg/m²/day (on a 30-day average) more than two times a year and not on sequential months.
- ▶ For non-residential areas, the dust fallout may not exceed 1200mg/m²/day (on a 30-day average) more than two times a year and not on sequential months.

All items of plant capable of generating significant volumes of dust (i.e., crusher plants, concrete batching plants) shall be equipped with the necessary equipment (Bag filters in cement silos, sprayers and conveyor transfer and fall points and hoppers) to ensure that fugitive dust is minimised.

5.4.4.17 Aesthetics (Subclause 2.4.9.13)

According to CAA regulations, wind turbines must be painted in bright colours to increase their visibility to aircraft. For the same reason, red warning lights must indicate their presence during nighttime. **Note, due to the proximity of the Verreaux's Eagle Nest, all turbines will have a single blade painted with a double red (aviation) stripe to increase visibility for the birds.**

All site establishment components (as well as equipment) shall be positioned to limit visual intrusion on neighbours and the size of the area disturbed. The type and colour of roofing and cladding materials to the Contractor's temporary structures shall be selected to reduce reflection.

The Contractor shall take reasonable measures to ensure that construction activities do not have an unreasonable impact on the aesthetics of the area. Measures will be taken to obscure construction yards and associated plant and equipment from onlookers as far as is reasonable. Refer also to 2.4.5 regarding requirements for lighting.

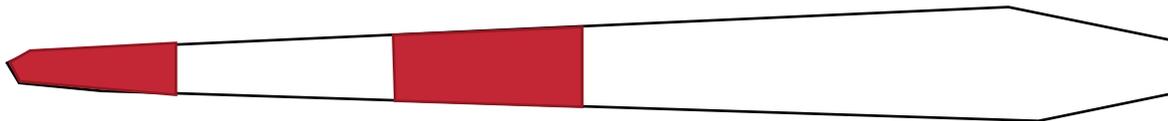


Figure 10: Turbine blade with 2 aviation red contrast stripes

5.4.4.18 Disruption to existing and neighbouring land use activities (Subclause 2.4.9.14)

The Contractor shall take measures to limit the disruption of any existing land use activities occurring on the site or neighbouring sites as far as reasonable. Where construction may impact on access routes, safe alternative access shall be provided to the satisfaction of the **ESCO and** Construction Manager. Where construction will result in disruptions to activities, the **Construction Manager** shall notify the affected landowner and inform him of the construction activity, the program and what mitigations measures will be implemented to minimise the disruptions. The Owner, Contractor and Construction Manager shall make compensations and or accommodate the landowner's requests and to maintain the status quo, as far as is reasonable.

5.4.4.19 Temporary site closure (Subclause 2.4.9.15)

If the site is closed for a period exceeding one week, the Contractor, in consultation with the Construction Manager shall carry out the following checklist procedure.

- ▶ Hazardous materials stores:
- ▶ Outlet secure / locked.
- ▶ Bund empty (where applicable).
- ▶ Fire extinguishers are serviced and accessible.
- ▶ Secure areas from accidental damage e.g. vehicle collision.
- ▶ Emergency and contact details are displayed.
- ▶ Adequate ventilation.

Safety:

- ▶ All trenches are secured or barricades in place.
- ▶ Fencing and barriers are in place as per the Occupational Health and Safety Act (No 85 of 1193).
- ▶ Emergency and management contact details for at least two standby staff are displayed.
- ▶ Pipe stockpile wedged/ secured.
- ▶ Emergency equipment, including firefighting and spill response materials and equipment, remain readily accessible to standby staff.
- ▶ Site security measures are in place.
- ▶ All plant and equipment have their keys removed or are disabled to prevent unauthorised start-up/theft.

Erosion:

- ▶ Wind and dust mitigation is in place.
- ▶ Slopes and stockpiles at a stable angle.
- ▶ Revegetated areas watering schedules and supply secured.

Water contamination and pollution:

- ▶ Cement and materials stores secured.
- ▶ Toilets are empty and secured.
- ▶ Refuse bins empty and secured.
- ▶ Drip trays empty and secure (where possible).
- ▶ Structures vulnerable to high winds are secure.
- ▶ All plant and equipment not in use are withdrawn from areas prone to flooding.

5.4.4.20 **Public roads (Subclause 2.4.9.16)**

The Contractor shall control the movement of all vehicles and plant including that of his suppliers so that they remain on designated routes, are distributed so as not to cause an undue concentration of traffic and that all relevant laws are complied with. In addition, such vehicles and plant shall be so routed and operated to minimise disruption to regular users of the routes not on the Site (Due to the site, this will be achieved more through the timing of deliveries, since the route options are limited). Where road safety may be impacted the Contractor shall notify the relevant roads authority and arrange for the necessary road warning signage and appoint trained points men to control traffic around any hazards. Any damage caused to the public road system because of construction or as a direct result of construction vehicles and equipment shall be repaired to the satisfaction of the Construction Manager.

On gravel or earth roads on Site and within 500 m of the Site, the vehicles of the Contractor and his suppliers shall not exceed a speed of 40 km/h. Mud and sand deposited onto public roads by construction activities shall be cleared daily or as required.

5.4.4.21 **Security and access control (Subclause 2.4.9.17)**

The Contractor shall ensure that access to the Site and associated infrastructure and equipment is always off-limits to the public during construction. If so required, as directed by the Construction Manager, the Contractor shall fence the site to ensure effective control of access to the site. This fence shall be a diamond mesh fence or similar with a minimum height of 1.8 m, and it shall be erected around the site and shall be maintained for the duration of construction.

All authorised personnel and visitors shall be issued with an identification card (or similar) to ensure that the security personnel may identify authorised persons.

The Project's overarching security objective is to protect the people and assets in a way that minimises conflict and respects the human rights of its diverse stakeholders, avoids creating or worsening conflict and addresses security threats in as peaceful a way as possible. The Project has adopted the IFC Performance Standards and supports World Bank Group Environmental, Health and Safety Guidelines as the overarching standards associated with human rights, labour force management, vulnerable groups, and stakeholder engagement to guide it towards the achievement of appropriately high levels of environmental and social performance throughout the Project's life cycle.

A security company must be appointed to guard the site and monitor access and must be registered with the Private Security Industry Regulatory Authority (PSIRA). The company must be utilised for the project life cycle, alternatively, different companies can be used for the construction, operations, and decommissioning phases. The choice is at the discretion of the Holder of the EA.

The following guiding principles have been developed for site security:

- All-access roads shall be gated to restrict access to the general public. Gates will be required to be kept locked when construction is occurring or when turbine maintenance is not occurring.
- The Contractor, before arriving on-site, will assess any risks posed by its security arrangements to people within and outside the Project site.

- No firearms are allowed on-site or in vehicles transporting staff to/from a site (unless used by security personnel).
- The Operations and Maintenance Building (“O&M building”) shall be locked at all times when Project personnel are not inside.
- The security arrangements must take into account the principles of proportionality and good international practice concerning hiring, rules of conduct, training, equipping, and monitoring of security.
- The contractor and Holder of the EA:
 - is required to make reasonable inquiries to ensure that those providing securities are not implicated in past abuses; and
 - Ensure that the security company is adequately trained in the use of force and appropriate conduct, and they act within the applicable law.
- A grievance mechanism for affected communities shall be provided to express any concerns about security arrangements.

The Project has adopted the United Nations Basic Principles on the Use of Force and Firearms and Voluntary Principles on Security and Human Rights.

5.4.4.22 Access routes/haul roads (Subclause 2.4.9.18)

Access to the Construction camp and working areas shall utilise existing roads or tracks as far as possible. Entry/exit points onto public roads shall take cognisance of traffic safety. Traffic safety measures shall include appropriate signage and signalmen where relevant.

Where temporary roads are required for construction the route, design and layout shall be subject to the approval of the **ESCO and** Construction Manager. Roads shall be routed to limit environmental impact by avoiding sensitive environmental features including rivers, wetlands, areas of botanical significance or any other areas as identified through environmental planning processes. Roads shall follow routes that minimise stormwater-related risks (i.e., steep gradients, cuts and fills, drainage lines, marshy areas). Where temporary roads cross drainage lines (which must be an approved, see Activity 18 of R 544 of NEMA) the reasonable provision shall be made to accommodate flooding without structural damages to the road crossing, approaches or the riverbanks, and the design of crossings shall be subject to approval by the **ESCO and** Construction Manager. Subject to the preceding requirements, roads shall be designed to have the least possible footprint needed to meet project objectives. All temporary roads shall undergo full rehabilitation at project completion and the expense of such shall be to the Contractor’s account. Unless inside the urban edge or part of an environmental authorisation in terms of NEMA R544 Activity No. 22. (II), no new construction road shall exceed 8m or, where such road already exists, be widened by more than 6m or lengthened by more than 1000m.

5.4.4.23 Housekeeping (Subclause 2.4.9.19)

The Contractor shall make available the time and resources need to undertake routine housekeeping of the works areas and site establishment areas at a minimum of a weekly interval. Housekeeping shall include maintenance of barriers, structures, signage, and material stockpiles to ensure that they are safe and aesthetically acceptable and to the satisfaction of the **ESCO and** Construction Manager. Construction materials shall be stacked in a safe, neat, and orderly fashion and shall comply with the requirements of the OHSA. Windblown litter, construction debris and spoil shall be collected and removed for disposal.

5.4.4.24 Ablution facilities (Subclause 2.4.9.20)

The Contractor shall deploy an adequate number (As per the requirements of the OHSA) of portable toilets at the various works areas and site establishment area, including provision for security and access control personnel. Toilets must not be located further than 100m from the place of work. Toilets must be placed in shaded areas wherever possible. The Contractor shall make provision to have the toilets cleaned and maintained hygienically and shall supply toilet paper. Toilets shall be secured to the ground to ensure they are not blown over during high winds or bumped over by some other means. The Contractor shall also make available a hand washing facility. Where portable toilets are located within view of the public or neighbouring residences or places of business, efforts must be taken to screen such facilities from view and provide privacy to users.

The Contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied and that the contents are properly stored and removed from the Site. Discharge of waste from toilets into the environment and burial of waste is strictly prohibited and must be treated at a registered wastewater treatment works. The Contractor shall keep a record, and provide such records upon request, of the location and volumes of waste disposed of. The use of pit latrines and soak-a-ways is prohibited unless approved by the **ESCO and Construction Manager**.

Washing, whether of the person or personal effects and acts of excretion and urination are strictly prohibited other than at the facilities provided. The Contractor shall take disciplinary action against any staff member found in contravention of this requirement.

5.4.4.25 Recess areas and canteens (Subclause 2.4.9.21)

The Contractor shall provide covered recess areas at the site establishment area and at various working areas, which are situated too far from the site establishment area to allow staff to return for recesses. The recessed area must provide shade but should not be located within 32m of drainage lines or wetland, in or adjacent to a “no go” area, in dense combustible vegetation or near any neighbour or activity to which they may cause a disturbance. The recess areas must also be located away from construction noise, dust, waste storage areas, hazardous materials stores, fuel storage and dispensing areas and any other activity that may contaminate food or impair comfort. The recess areas shall provide adequate seating to accommodate the staff stationed in that area of the works. Recess areas shall be located near, but not next to, ablution and hand washing facilities. Recess areas must also have an adequate supply of cool potable water, as determined by the number of staff working in that area. An adequate number of rubbish bins shall be provided to contain the waste generated by this facility in a day. The recess areas shall make provision for a smoking area, including seating and a fireproof sand-filled container for extinguishing cigarettes. Smoking shall otherwise be prohibited across the site and in the works areas. The recess areas shall be equipped with an appropriately sized fire extinguisher to deal with a fire at this location. Subject to implementation of reasonable fire protection measures and the presence of fire fighting equipment, the Contractor may establish a purpose-built warming or cooking fire in an area cleared of all combustible material near the recessed area. Staff shall not be permitted to eat or rest during recess times in any other areas other than the designated recess or canteen area.

5.4.4.26 Site clinic or first aid station (Subclause 2.4.9.22)

Should the scale of construction warrant the need for a first aid station (clinic, sick bay, medical bay) the following requirements shall apply. The design and maintenance of the first aid station shall be such that the hygienic safety of the patients can be assured. The first aid station shall be operated by a certified first aider or paramedic. All waste arising from the first aid station or site ambulance shall be treated as hazardous waste and shall not be disposed of via the domestic waste system. A safe potable water supply shall be provided. Effluents from washing shall be direct to a tank, collected and disposed of via the sewage disposal system.

5.4.5 Emergency procedures (Subclause 2.5)

In addition to the emergency procedures set out in the Contractor method statement titled Emergency preparedness and response plan the Contractor’s procedures for the following emergencies shall include:

5.4.5.1 Fire (Subclause 2.5.1)

Any wildfires that occur shall be reported to the **ESCO and Construction Manager** immediately. Smoking shall not be permitted in those areas where it is a fire hazard. Such areas shall include the workshop and fuel storage areas and any areas where the vegetation or other material is such as to make liable the rapid spread of an initial flame. In terms of the Atmospheric Pollution Prevention Act (No. 45 of 1965), burning is not permitted as a disposal method.

The Contractor shall ensure that there is basic but adequate fire-fighting equipment available on Site at all times. This shall include at least rubber beaters when working in urban open spaces and fynbos areas, and at least one fire extinguisher of the appropriate type when welding or other “hot” activities are undertaken.

The Contractor shall advise the relevant authority and Fire Protection Association (Emergency numbers must be prominently displayed at the site offices) of a fire as soon as one starts and shall not wait until he can no longer control it. The Contractor shall ensure that his employees are aware of the procedure to be followed in the event of a fire. The Contractor shall provide adequate fire protection measures at each work area and the site establishment area to deal with the type and nature of fire that may arise.

5.4.5.2 **Accidental leaks and spillages (Subclause 2.5.2)**

The Contractor shall ensure that his employees are aware of the emergency procedure(s) to be followed for dealing with spills and leaks, which shall include notifying the **ESCO and** Construction Manager and the relevant authorities. The Contractor shall ensure that the necessary materials and equipment for dealing with spills and leaks are available on Site at all times. Treatment and remediation of the spill areas shall be undertaken to the reasonable satisfaction of the **ESCO and** Construction Manager.

In the event of a hydrocarbon spill, the source of the spillage shall be isolated, and the spillage contained. The area shall be cordoned off and secured. The Contractor shall ensure that there is always a supply of absorbent material readily available to absorb/ breakdown and where possible be designed to encapsulate minor hydrocarbon spillage. The number of such materials shall be able to handle a minimum of 200 l of hydrocarbon liquid spill.

5.4.6 **Community relations (Subclause 2.6)**

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

The Contractor shall keep a "Complaints Register" on Site. The Register shall contain all contact details of the person who made the complaint and information regarding the complaint itself and any measures or agreements made in resolution to such complaint.

The Contractor shall develop an employment policy and shall disseminate this to interested communities, informing them of how many opportunities are available and the skills required for such opportunities. Depending on the scale of the project and the proximity and populace of nearby communities, the Contractor shall consider appointing a community liaison officer and an employment desk in the interested communities to manage the recruitment of staff. Local South Africans must be given priority in any employment opportunities and the Contractor's recruitment policy and nature and number of job opportunities must be communicated timeously and clearly to manage expectations and avoid conflict. This can be done by following the following mitigation measures:

- ▶ Organise local community meetings to advise the local labour on the project that is planned to be established and the jobs that can potentially be applied for.
- ▶ Set up a recruitment office in the nearby towns (i.e. Jansenville and Kirkwood) and adhere to strict labour recruitment practices that would reduce the desire of potential job seekers to loiter around the properties in the hope to find temporary employment.
- ▶ Establish a local skills desk (in Jansenville and Kirkwood) to determine the potential skills that could be sourced in the area.
- ▶ Recruit local labour as far as feasible.
- ▶ Control the movement of workers between the site and areas of residence to minimise loitering around the proposed facility by providing scheduled transportation services between the urban areas and the construction site.
- ▶ Engage communities concerning their possible involvement during construction in providing support services such as catering, temporary housing of workers, transportation, etc.
- ▶ Employ labour-intensive methods in construction where feasible.
- ▶ Formalise trading and service provision on the site, by providing a dedicated area for such services and signing contracts with service providers.

- ▶ Establish proper fencing around the property to reduce the desire of workers to trespass between the construction site and adjacent properties.
- ▶ Set up a gate and controlled access system to monitor the movement of people to and from the property, as well as to reduce the influx of job seekers to the site itself.
- ▶ Ensure that any damages or losses to the nearby farms that can be linked to the conduct of the construction workers are adequately reimbursed.
- ▶ Assign a person to deal with complaints and concerns of the affected parties
- ▶ Sub-contract to local construction companies where possible.
- ▶ Use local suppliers where feasible and arrange with the local Small and Medium Enterprises to provide transport, catering, and other services to the construction crew.
- ▶ Facilitate knowledge and skills transfer between foreign experts and South African professionals during the pre-establishment and construction phases.
- ▶ Set up apprenticeship programmes to build onto existing or develop new skills of construction workers, especially those coming from the local communities.

5.4.7 **Construction Methods and procedures (Subclause 2.7)**

5.4.7.1 **Site clearance (Subclause 2.7.1)**

The Contractor shall ensure that the clearance of vegetation is restricted to that required to facilitate the execution of the Works. Site clearance shall occur in a planned manner and cleared areas shall be stabilised as soon as possible. The detail of vegetation clearing shall be to the **ESCO and** Construction Manager's approval. All cleared vegetation shall either be mulched and mixed into the topsoil stockpiles or disposed of at an approved disposal site. The disposal of vegetation by burying or burning is prohibited without the requisite permit from the local authority.

The Contractor shall strip the topsoil and mulch layer within the working areas. The topsoil and mulch layer shall be stockpiled separately from the subsoil and used for subsequent rehabilitation and revegetation. topsoil and mulch layer stockpiles shall not be compacted.

Should fauna be encountered during site clearance, earthworks shall cease until fauna have been safely relocated from the affected area.

5.4.7.2 **Demolition (Subclause 2.7.2)**

Hazardous and non-hazardous materials shall be separated at the site and disposed of in a manner approved by the **ESCO and** Construction Manager.

All buildings older than 60 years require a permit from the South African Heritage Resources Agency in terms of the National Heritage Resources Act (no. 25 of 1999). A demolition permit is also required from the local authority in terms of the National Building Regulations.

5.4.7.3 **Cement and concrete batching (Subclause 2.7.3)**

Where applicable, the location of the batching plant (including the location of cement stores, sand, and aggregate stockpiles) shall be as approved by the **ESCO and** Construction Manager. The concrete/cement batching plant shall be kept neat and clean at all times.

No batching activities shall occur directly on the unprotected ground. The batching plant shall be located on a smooth impermeable surface (concrete or 250 µm plastic covered with 5 cm of sand). The area shall be bunded and sloped towards a sump to contain spillages of substances. All wastewater resulting from batching of concrete shall be disposed of via the contaminated water management system and shall not be discharged into the environment. Contaminated water storage areas shall not be allowed to overflow and appropriate protection from rain and flooding shall be implemented

Empty cement bags shall be stored in weatherproof containers to prevent windblown cement dust and water contamination. Empty cement bags shall be disposed of regularly via the solid waste management system

and shall not be used for any other purpose. Unused cement bags shall be stored so as not to be affected by rain or runoff events. In this regard, closed steel containers shall be used for the storage of cement powder and any additives. The Contractor shall ensure that sand, aggregate, cement, or additives used during the mixing process are contained and covered to prevent contamination of the surrounding environment.

The Contractor shall take all reasonable measures to prevent the spillage of cement/ concrete during batching and construction operations. During pouring, the soil surface shall be protected using plastic and all visible remains of concrete shall be physically removed on completion of the cement/ concrete pour and appropriately disposed of. All spoiled and excess aggregate/ cement/ concrete shall be removed and disposed of via the solid waste management system.

Where “ready-mix” concrete is used, the Contractor shall ensure that the delivery vehicles do not wash their chutes directly onto the ground. Any spillage resulting from the “ready-mix” delivery shall be immediately cleared and disposed of via the solid waste management system. Ready-mix trucks shall not be permitted to dump drum wash on-site unless into a contaminated water pond which must be fully rehabilitated at completion and the sediment collected for disposal.

5.4.7.4 Earthworks (Subclause 2.7.4)

All earthworks shall be undertaken in such a manner to minimise the extent of any impacts caused by such activities, particularly with regards to erosion and dust generation. No equipment associated with earthworks shall be allowed outside of the Site and defined access routes unless expressly permitted by the **ESCO and Construction Manager**.

5.4.7.5 Dewatering (Subclause 2.7.5)

Pumps shall be placed over a drip tray to contain fuel spills and leaks. Pumps shall be located sufficiently above the water line to ensure that it does not become inundated if pumping is discontinued. The Contractor shall take all reasonable precautions to prevent spillage during the refuelling of these pumps.

The Contractor shall ensure that, unless like the upstream water quality, none of the water pumped during any dewatering activities, including good points, is released into the environment without the **ESCO and Construction Manager's** approval. The **ESCO's and Construction Manager's** approval is required before the discharge of this water into the Municipal sewer system.

5.4.7.6 Bitumen (Subclause 2.7.6)

Overspray of bitumen products outside of the road surface and onto roadside vegetation or the surrounding environment shall be prevented using a method approved by the **ESCO and Construction Manager**.

When heating bitumen products, the Contractor shall take cognisance of appropriate fire risk controls. Heating of bitumen products shall only be undertaken using LPG or similar zero-emission fuels and appropriate firefighting equipment shall be readily available.

Stone chip/gravel excess shall not be left on-road/paved area verges. This shall be swept/raked into piles and removed to an area approved by the **ESCO and Construction Manager**.

Water quality from runoff from new/ fresh bitumen surfaces will be monitored visually by the **ESCO and Construction Manager** and remedial actions are taken where necessary by the Contractor.

5.4.7.7 Erosion and sedimentation control (Subclause 2.7.7)

The Contractor shall take all reasonable measures to minimise the footprint of disturbance and limit erosion and sedimentation due to the construction activities. Implement an effective system of run-off control, where it is required, that collects and disseminates run-off water from all hard surfaces and prevents potential downslope erosion. If an activity will mechanically disturb below the 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.

- ▶ Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them.
- ▶ Dispose of all subsurface spoils from excavations where they will not impact undisturbed land (for example on road surfaces or hard standing areas).
- ▶ During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.
- ▶ Erosion must be controlled where necessary on top soiled areas.

Where erosion and/or sedimentation, whether on or off the Site, occurs despite the Contractor complying with the foregoing, rectification shall be carried out in accordance with details specified by the **ESCO and Construction Manager**. Where erosion and/or sedimentation occur due to the fault of the Contractor, rectification shall be carried out to the reasonable requirements of the **ESCO and Construction Manager**.

Any runnels or erosion channels developed during construction or the defect's liability period shall be backfilled and compacted. Stabilisation of cleared areas to prevent and control erosion shall be actively managed. Consideration and provision shall be made for various methods, namely, brush cut packing, mulch or chip cover, straw stabilising (at a rate of one bale/ 20 m² and rotovated into the top 100 mm of the completed earthworks), watering, soil binders and anti-erosion compounds, mechanical cover or packing structures (e.g., Hessian cover).

Traffic and movement over stabilised areas shall be restricted and controlled, and damage to stabilised area shall be repaired and maintained to the satisfaction of the **ESCO and Construction Manager**.

5.4.7.8 **Crane operations (Subclause 2.7.8)**

Drive plants shall be well maintained, and drip trays shall be positioned at potential leak areas. Over-greasing of crane cables shall be avoided.

Movement and lifting of hazardous materials shall be undertaken such that they do not cause a pollution, spillage, or safety risk (were concrete buckets are in use).

5.4.7.9 **Trenching (Subclause 2.7.9)**

Trenching for services shall be undertaken in accordance with the engineering specifications with the following environmental amplifications, where applicable:

- ▶ Topsoil shall be removed and stockpiled separately from and not mixed with the subsoil. Preferably topsoil must be placed on the upslope side of the trench which subsoil is placed on the downslope side of the trench, levelled and used for construction access. The areas used for topsoil and subsoil stockpiling must not be cleared of shorter herbaceous vegetation and must not be grubbed. Only once the trench is backfilled and shaped will the topsoil be spread across the trench area,
- ▶ Soil shall be excavated and used for refilling trenches i.e. soil from the first trench shall be excavated and stockpiled, thereafter soil from the second excavated trench length shall be used to backfill the trench behind it once the services have been laid. The last trench shall be filled using the soil stockpiled from the first trench.
- ▶ Trench lengths shall be kept as short as practically possible before backfilling and compacting.
- ▶ Trenches shall be re-filled to the same level as (or slightly higher to allow for settlement) the surrounding land surface to minimise erosion.
- ▶ Stormwater control measures shall be used to reduce the ingress of stormwater into the trench. Where needed the Contractor shall provide temporary stormwater pipes to allow stormwater to cross the open trench.

5.4.7.10 **Drilling and jack hammering (Subclause 2.7.10)**

The Contractor shall take all reasonable measures to limit dust generation and noise because of drilling operations. The Contractor shall ensure that no pollution results from drilling operations, either because of oil and fuel drips, or from drilling fluid.

Any areas or structures damaged by the drilling and associated activities shall be rehabilitated by the Contractor to the satisfaction of the **ESCO and** Construction Manager.

5.4.7.11 **Stockpiling (Subclause 2.7.11)**

The **ESCO and** Construction Manager will identify suitable sites for stockpiling. Stockpiles shall be convex in shape and shall be limited in height so that it does not result in undue visual impacts or significant dust, as approved by the **ESCO and** Construction Manager. Stockpiles shall be so placed to occupy minimum width compatible with the natural angle of repose of material, and measures shall be taken to prevent the material from being spread over too wide a surface. Unless otherwise stipulated, areas for temporary stockpiling will not be cleared of shorter herbaceous vegetation as this compacted vegetation layer will serve protect the topsoil and serve as a marker during stockpile reclamation. Where required, appropriate precautions shall be taken to prevent the erosion and limit the compaction of the stockpiles. The Contractor shall ensure that all stockpiles do not result in the damming of water or run off or is itself washed away.

Top material stockpiles shall not be covered with any material (e.g., plastic) that may kill seeds or cause it to compost. If the stockpiles start to erode significantly or cause dust problems, they shall be covered with hessian or similar. Where practical, top material shall not be left for longer than six to eight months before being used for rehabilitation. If stored for longer than six months, the top material shall be analysed and ameliorated before use in rehabilitation works.

5.4.7.12 **Site closure and rehabilitation (Subclause 2.7.12)**

Any areas that the **ESCO or** Construction Manager believes may have been impacted upon or disturbed, shall be rehabilitated to the satisfaction of the Construction Manager, which includes all areas where top material has been stripped or compacted. Once construction is complete the Contractor shall clear all construction debris and materials from the Site not forming part of the Permanent Works. The area to be rehabilitated shall first be landscaped to match the topography of the surrounding area as it was prior to construction. The composition of vegetation to be used for any rehabilitation shall be specified.

The Contractor may not use herbicides, pesticides, fertilisers, or other poisonous substances for the rehabilitation process unless otherwise agreed with the **ESCO and** Construction Manager.

All rehabilitated areas shall be considered “no go” areas and the Contractor shall ensure that none of his staff or equipment enters these areas. The Contractor shall undertake irrigation of rehabilitated areas for a minimum period of six to eight weeks to encourage germination. They may elect to extend the irrigation programme, or the **ESCO and** Construction Manager may specify ongoing irrigation programme if required. However, any irrigation programme must taper off over a period of four to eight weeks before complete cessation as an abrupt cessation is likely to result in high seeding mortality rates (depending on local soil and climatological factors).

The Contractor shall undertake to remove all alien vegetation re-establishing on the area and shall implement the necessary temporary or permanent measures to combat soil erosion.

5.4.7.13 **Temporary revegetation of the areas disturbed by construction (Subclause 2.7.13)**

Where there is likely to be a delay of greater than two months in the landscaping and revegetation of a disturbed area or where that site is likely to be the subject of further construction activities at a later stage, the Contractor shall ensure that the area is temporarily revegetated to combat dust generation and prevent erosion. This revegetation shall occur incrementally immediately upon completion of the construction activities at the subject location.

Prior to revegetation, structures and material not forming part of the Permanent Works, including remnants of building materials, concrete foundations, timber, and foreign debris, shall be removed, and disposed of via the solid waste management system. The area shall be revegetated as follows:

- ▶ Compacted areas, such as roads, stockpile areas and construction platforms shall be ripped or scarified to depth of 300mm.

- ▶ The surface shall be shaped to conform to the adjacent landforms.
- ▶ Alien vegetation shall be cleared;
- ▶ For areas with a slope of greater than 1:3, straw shall be utilised as a binding material to stabilise the soil during revegetation and rehabilitation of the site. Straw shall consist of natural, dried fibres of hay or chaff of various lengths between 50mm and 400mm, delivered to Site in bales and shall be applied evenly by hand or machine at a rate of 1 bale per 20m² over the area to be revegetated. It shall then immediately be rotated into the upper 100 mm layer of soil.
- ▶ The prepared area shall be hydro- or hand-seeded at a rate of 40 kg/ha using a suitable indigenous grass species or Rye grass (*Lolium multiflorum*). In the event of hand-seeding, the seed mixture as specified shall be mixed with two parts per volume of clean dry plaster sand, then divided in half and applied evenly in two successive applications, one after the other, by means of an approved hand seeding machine (known colloquially as a “tefsaaier”). On completion of the seeding the surface shall be lightly raked to cover the seed with no more than 5 mm of soil.
- ▶ Water used for the irrigation of vegetated areas shall be free of pollutants that will have a detrimental effect on the plants. The vegetated area shall only be watered once, immediately following seeding. Watering must be carried out from a tanker, using a fine nozzle spray to avoid erosion and disturbance of the vegetation. Water for irrigation purposes may be from an approved source.

No construction equipment, vehicles or unauthorised personnel shall be allowed onto areas that have been vegetated. Only persons or equipment required for the preparation of areas, application of fertiliser and maintenance of revegetated area shall be allowed to operate on these areas.

5.4.8 Compliance (Subclause 3.1)

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

It is thus required that the Contractor shall comply with the environmental requirements on an ongoing basis and any failure on his part to do so will entitle the Construction Manager to certify the imposition of a penalty as detailed below.

5.4.8.1 Penalties (Subclause 3.2)

Penalties will be issued for certain transgressions. Penalties may be issued per incident at the discretion of the ESCO and Construction Manager. Such penalties will be issued in addition to any remedial costs incurred because of non-compliance with this Specification. The Construction Manager will inform the Contractor of the contravention and the amount of the penalty and shall be entitled to deduct the amount from monies due under the Contract.

5.4.8.2 Removal from site and suspension of Works (Subclause 3.3)

The Construction Manager may instruct the Contractor to remove from Site any person(s) who in their opinion is guilty of misconduct, or is incompetent, negligent or constitutes an undesirable presence on Site. Where the Construction Manager deems the Contractor to be in breach of any of the requirements of this Specification, he may order the Contractor to suspend the progress of the Works or any part thereof.

5.4.9 Measurement and payment: (Subclause 4)

5.4.9.1 General (Subclause 4.1.1)

Except as specified below, or in the Specification Data or as billed, no separate measurement and payment will be made to cover the costs of complying with the provisions of this Specification and such costs shall be deemed to be covered by the rates tendered for the items in the Bill of Quantities completed by the Contractor when submitting his tender.

5.4.9.2 All requirements of the environmental management specification (Subclause 4.1.2)

All work not measured elsewhere, associated with complying with any requirement of this Environmental Management specification will be measured and paid as a sum.

The tendered sum shall cover the cost of with complying with the environmental management specification and shall include for all materials, labour and plant required to execute and complete the Works as specified, described in the Bill of Quantities, or shown on the Drawing(s).

5.4.9.3 Work “required by the Construction Manager” (Subclause 4.1.3)

Where a clause in this Specification includes a requirement as "required by the Construction Manager", measurement and payment for compliance with that requirement shall be in accordance with the relevant measurement and payment clause of the Project Environmental Specifications.

5.4.10 Amendments to EMPr & Registers

Amendments to the EMPr must be submitted to and approved by the DFFE before the changes are commenced with.

Furthermore, copies of the attendance registers for all environmental awareness training, employee induction programme, complaints registers, penalty registers and method statements must be kept and made available to the DFFE on request.

6 Operations Phase

This section contains the framework Operational phase Environmental Management Programme (OEMPr) table which constitutes the Framework OEMPr. It is important to note that this Framework OEMPr has been compiled prior to authorisation of the proposed project and will be updated to include the conditions of the EA that will be issued by DFFE as part of the EA.

The information is summarised in tabular format according to the activity, aspect, impact, mitigation measure, performance indicators, resources, schedule, and verification. These criteria are listed and explained below:

The following components are identified / described:

- ▶ Activity: Component / activity of the project for which the impact has been identified.
- ▶ Aspect: The aspect of the above activity which will be impacted.
- ▶ Impact: The environmental impact identified and to be mitigated.
- ▶ Mitigation measure: Measures identified for implementation in terms of environmental management to reduce, rectify or contain the identified environmental impact – mitigation is divided into the following:
 - **Objective**: desired outcome of mitigation measure; and
 - **Mechanism**: method of achieving the objective.
- ▶ Performance indicators: Outcomes that will indicate achievement of objective/s.
- ▶ Responsibility: Party or parties identified for implementation of mitigation measure/s.
- ▶ Resources: Available resources to aid the implementation of mitigation.
- ▶ Schedule: Timeframe in which identified impact and mitigation measure is anticipated to occur.
- ▶ Verification: Party or parties identified as responsible for review and assessment of outcome.

6.1 Specification Data: Environmental Management (SDEMA)

Operational Framework Environmental Management Programme Table							
No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	RESPONSIBILITY	SCHEDULE	VERIFICATION
1.	Environmental management documentation and procedures	No framework within which to locate the management of the operational phase. No procedures against which to assess environmental performance during the operational phase and thus no measure of compliance.	Objective: To ensure that the operation of the wind energy facility does not result in avoidable impacts on the environment and that any impacts that do occur are anticipated and managed. Mechanism: 1) Appoint a suitably qualified person to monitor compliance (either independent or in-house). 2) Audit the compliance with the requirements of the environmental specification contained within the OEMPr. 3) Ensure an Audit is completed (in accordance with Appendix 7 of NEMA) and submitted to the DFFE within 30 days of the completion of the construction phase (Refer to condition 31 of the EA). 4) Undertake an Environmental Audit every five years and submit the result to DFFE	Environmental impacts are effectively monitored and managed during the operational phase. A comprehensive record of compliance and remedial actions is available to the Developer and authorities.	Developer	Twice in the 1 st three years and then once every five years.	Developer
2.	Environmental management of the operational phase	Positive impacts on the socio-economic environment during operation	Objective: To ensure that the operation of the wind energy facility maximises positive impacts on the socio-economic environment. Mechanism: 1) Train local people for operation and maintenance of facility (presumably only security personnel). 2) Employ local labour for the operational phase, where possible, and particularly for day-to-day operations and maintenance. 3) Adopt and audit (frequency to be determined by the policy) local employment policy with accompanying training programme.	Consult annual skills and training records, employment records and proof of staff residency in the area before employment.	Developer	During Operational Phase (full lifetime) when the need arises to employ people.	Developer
3.	Protection of fauna, flora avifauna and bats	During the construction phase impacts on vegetation would have been significant as the site would have been cleared of all vegetation.	Objective: To prevent unnecessary disturbance to natural vegetation, and minimise impacts to avifauna Mechanism: 1) The post-construction monitoring must be conducted for the lifespan of the facility, or as specified by the avifauna specialist and must include carcass searches and all the associated studies to measure the impact of the turbines through collision. 2) Strict monitoring for a possible invasion by alien plant species must be implemented and must remain in place for three years post-construction.	No animals are injured. No employees enter the no-go areas. No alien vegetation establishment. Invasive alien vegetation monitoring programme implemented.	Developer	As determined by relevant specialist	Environmental Auditor

Operational Framework Environmental Management Programme Table

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	RESPONSIBILITY	SCHEDULE	VERIFICATION
			<p>3) A basic "5 levels of mitigation" (by blade manipulation or curtailment), from light to aggressive mitigation is presented below:</p> <p>4) No curtailment (freewheeling is unhindered below manufacturer cut in speed so all momentum is retained, thus normal operation).</p> <p>5) 90 Degree feathering of blades below manufacturer cut-in speed, so it is exactly parallel to the wind direction to minimise free-wheeling blade rotation as much as possible without locking the blades.</p> <p>6) 90 Degree feathering of blades below manufacturer cut-in speed, with reduced power mode settings between manufacturer's cut-in speed and mitigation cut-in conditions.</p> <p>7) 90 Degree feathering of blades below mitigation cut in conditions.</p> <p>8) 90 Degree feathering throughout the entire night. If it is found during operation that mitigation is required, then depending on the severity of the impact and the level of confidence in operational mortality monitoring, a preliminary recommendation would be that curtailment mitigation initiates at Level 2-3 for the months, times and weather conditions determined from the data obtained to date to be the times most likely for increased bat activity.</p> <p>9) Stormwater run-off infrastructure must be maintained to mitigate both the flow and water quality impacts of any stormwater leaving the wind energy facilities site. Should any erosion features develop, they must be stabilised as soon as possible?</p> <p>10) The fire must not be excluded from the site (performs an important role in ecology), otherwise, vegetation may become senescent and its value as a CBA may be undermined. The Developer must liaise with the local conservation bodies, authorities, fire authorities (or FPA if in existence) and the farmers in the area and determine how and when the site should be allowed to burn, without jeopardising the infrastructure, i.e., setting deliberate back burns during natural fire events.</p> <p>11) EA38: A bird and bat monitoring programme must be implemented to determine the effect of the operation of the wind energy facility on avifauna and bats. This must commence before construction and continue during the operation of the wind energy facility.</p>				

Operational Framework Environmental Management Programme Table

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	RESPONSIBILITY	SCHEDULE	VERIFICATION
			<p>12) EA39: Reports regarding bird monitoring must be submitted to the relevant provincial environmental department, BirdlifeSA, the Endangered Wildlife Trust (EWT) and DFFE:IEM on a quarterly basis. The report will assist all stakeholders in identifying potential and additional mitigations measures and to establish protocols for bird monitoring programme for wind energy developments in the country.</p> <p>13) EA40: The baseline data collected and documented during the survey must be shared with the EWT and BirdlifeSA for a better understanding of the distribution or breeding behaviour of any of the priority species.</p> <p>14) EA48: The applicant must ensure that poaching, hunting, and killing of animals on site during construction phase of the project is strictly not allowed under any circumstance. In addition, firearms or any other hunting weapons must not be permitted on site.</p>				
4	Avifauna - Verreaux's Eagles	The combined impact on the Verreaux's Eagles present at the site	<p>Objective: Ensure wind farm has minimal effect on eagle breeding productivity. Ensure that the habitat closest to the nests is protected. Ensure that no new attractive habitat is created on-site, for example through the attraction of eagle prey species to road verges. Ensure zero eagle turbine collision fatalities once the wind farm operational</p> <p>Mechanism:</p> <ol style="list-style-type: none"> 1) 1km radius circular No-Go buffer for turbines around the Eastern nest, & 1.5km buffer around the central nest. Substation, OHPL connection & roads can remain in their current positions 2) Survey breeding status at two nests in each breeding season pre-construction 3) Owner to implement visual (blade painting) and with technological shutdown on Demand fitted to all turbines within 3.7km of all active Verreaux's eagle nests and used where audio-visual deterrents fail. Conduct additional baseline monitoring to estimate 'eagle flight activity and spatial distribution monitoring', estimate productivity loss from shutdown programme & optimise placement of camera equipment on site. 4) See Bird monitoring program (see 6.2.6). Ensure monitoring is implemented and carcass searches are undertaken and reported as scheduled. 5) Once civil works are complete an audit by a bird specialist to sign off on adequate compaction of verges & 	<p>Breeding productivity compared pre, during & post-construction</p> <p>Breeding productivity compared pre, during & post-construction</p> <p>The surface area of natural vegetation altered by construction can be measured and expressed as a proportion of eagle territory</p> <p>No increase in prey availability on site</p> <p>Bird fatality searches during the operational phase measure fatalities. If fatality thresholds are exceeded despite implemented mitigation, additional mitigation to</p>	Avifaunal specialist	As determined by relevant specialists and the monitoring programme. The avifaunal monitoring programme must continue for the life of the project.	Environmental Auditor

Operational Framework Environmental Management Programme Table

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	RESPONSIBILITY	SCHEDULE	VERIFICATION
			<p>removal of waste rock/plant material must be commissioned and any corrective measures identified by the audit must be implemented.</p> <p>6) Turbine shutdown on-demand programme to be implemented from COD on all turbines within 3.7km of active nests. Technology-led & will include the use of audible & visual deterrence methods, with shutdown occurring where deterrence fails⁵</p> <p>7) Blade painting to be implemented from COD on all turbines. One blade is to be painted with a red stripe</p> <p>8) Bird fatality threshold & adaptive management policy developed by COD & adhered to (all species)</p> <p>9) Conduct additional baseline monitoring to estimate eagle fatality rates, estimate productivity loss from shutdown programme & optimise placement of camera equipment on site</p>	<p>be applied or fatalities to be offset (likely through a power line mitigation programme)</p>			
5.	Stormwater runoff, erosion, and pollution of surface water and groundwater resources.	(iv) Stormwater runoff can impact the surface and groundwater resources. The mismanagement of stormwater can furthermore result in erosion.	<p>Objective: Prevent stormwater from eroding the land and becoming contaminated.</p> <p>Mechanism:</p> <p>1) Stormwater management for the site during the operational phase must be such that there are no direct discharges of storm water arising from constructed areas into any of the freshwater features.</p> <p>2) Stormwater management during the operation of the site must be such that there are no direct discharges of storm water arising from constructed areas into any freshwater feature.</p> <p>3) Implement erosion control measures must there be evidence of erosion'</p> <p>4) Early intervention strategies are pivotal in ensuring that the management plan is successful.</p> <p>5) Regular inspection of the WEF areas to assess erosion which may result from a loss in vegetation.</p> <p>6) The frequency of monitoring must be once in three months until such a time when vegetation has been fully established within the disturbed areas.</p> <p>7) Monitoring (quarterly) also be undertaken after every erosion rainfall event for a period of three years to ensure that the adjacent watercourses are not impacted, and the structural integrity of the WEF is maintained.</p>	<p>Stormwater control measures are effective at regulating runoff from the site and erosion channels do not develop.</p> <p>Freshwater ecosystems are not unduly disturbed by construction activities within the drainage channels.</p>	Contractor	After site clearing has taken place up to the end of the construction phase.	Developer

⁵ * Red Rocket has fully investigated this technically & financially & confirmed it will be viable based on shutdown frequency estimated from baseline (May & June 2021) flight activity data

Operational Framework Environmental Management Programme Table

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	RESPONSIBILITY	SCHEDULE	VERIFICATION
			8) Vegetated areas must not be subject to chemical fertilisation or herbicides or pesticides. 9) Continued watering to ensure wind erosion is limited at the construction sites until such time that the natural vegetation is effectively established; and 10) Maintain and clean all drainage structures along roads within the project area.				
5.	Visual impact	The proposed site is visible to the public and would have a negative visual impact on the sense of place if not maintained appropriately.	Objective: To protect the sense of place. Mechanism: 1) All lighting shall be kept to a minimum within the requirements of safety and efficiency. Refer to Section 8. 2) Where outdoor lighting of the facility is required (i.e., security and maintenance) this must take the form of motion-activated security lights so that they are off most of the time. 3) Navigation warning lights on turbines will be pilot-operated to reduce light pollution. This means the navigation warning lights will only be switched on when aircraft are flying in the area.	No complaints from the public.	Developer	Throughout the operational phase	(v) Developer
6.	Noise pollution	The activity might impact the noise levels of the area.	Objective: To reduce noise impacts. Mechanism: 1) Design and implement a noise monitoring programme. 2) Defining ambient sound levels employing the ETSU-R97 methodology before the development of the Wind Energy Facility at NSD01 and NSD03 3) Since wind energy facilities will only be in operation during periods that the wind is blowing it is critical that ambient sound level measurements reflect expected sound levels at various wind speeds. Because of the complexity of these measurements, the following methodology must be followed: 4) Compliance with the latest version of SANS 10103. 5) The measurement equipment made use of a windshield specifically designed for outdoor use. 6) The areas where measurements were recorded were selected to limit the risks of direct impacts by the wind on the microphone. 7) Measurements took place in 10-minute bins for at least one full night-time period; and 8) Noise data was synchronised with the wind data measured at a 10-meter height by the onsite meteorological mast. (vi)	Minimise noise pollution.	Contractor Acoustical Consultant	Before the operational phase commences	(vii) Developer; Environmental Auditor

Operational Framework Environmental Management Programme Table

No	ASPECT	IMPACT	MITIGATION MEASURE: (objective and mechanism)	PERFORMANCE INDICATOR	RESPONSIBILITY	SCHEDULE	VERIFICATION
7.	Impacts on the local economy (employment) and social conditions	The activity might impact the economy (local shops, restaurants, Guest Houses, etc.)	<p>Objective: To ensure the ongoing sustainability of the local tourism/hospitality industry.</p> <p>Mechanism:</p> <ol style="list-style-type: none"> 1) The operator of the proposed development must be encouraged to procure materials, goods and products required for the operation of the facility from local suppliers to increase the positive impact on the local economy as far as possible. 2) Give preference to local communities for employment opportunities. 3) Base recruitment on sound labour practices and with gender equality in mind. 4) Local Small and Medium Enterprises must be approached to investigate the opportunities for supplying inputs required for the maintenance and operation of the facility, as far as feasible. 5) The developer must consider establishing vocational training programmes for the local labour force to promote the development of skills required by the wind energy industry and thus provide the opportunities for these people to be employed in other similar facilities elsewhere around the study area or other parts of the country. 6) A three-year social development and economic development programme must be devised by the developer throughout the project's lifespan. 7) Engage with local authorities and inform them of the development as well as discuss with them their ability to meet the additional demands on social and basic services created by the in migration of workers. 8) Where feasible, assist the municipality in ensuring that the quality of the local social and economic infrastructure does not deteriorate using social responsibility allocations. 9) The plan must be reviewed on an annual basis and where necessary updated. 10) When devising enterprise development initiatives, the focus must be on creating sustainable and self-sufficient enterprises. 	Contribute to local community upliftment	Contractor	As required	Developer

6.2 Management and monitoring plans

The following management and monitoring plans were prescribed by the EA and have been taken copied here directly from the specialist management plans attached in Annexure H

6.2.1 Alien invasive management plan (Dr Dave McDonald – Bergwind)

In terms of environmental and agricultural legislation, declared weeds (can be indigenous) and alien invasive plant species, must be eradicated. Therefore, any project, such as the Wolf Wind Farm, near Wolwefontein in the Eastern Cape, must have a plan to systematically deal with the problem of invasive plant species. This is particularly important where there is disturbance due to the construction and operation of an industrial-type facility that is placed in an agricultural or otherwise minimally disturbed environment and provides invasive species with the opportunity to establish and spread.

The applicable legislation for dealing with invasive alien plant species is the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, the Environmental Impact Assessment Regulations, 2014 and the Conservation of Agricultural Resources Act, Act 43 of 1983.

The vegetation of the Wolf Wind Farm site has been described by the author (McDonald, 2013; 2021) and reference should be made to those reports. The major invasive identified on the site is *Opuntia ficus-indica* (prickly-pear cactus; the spiny form). In addition, the exotic *Solanum elaeagnifolium* (Poisonous Nightshade) was also found. Thus, the invasive alien programme is targeted principally at *O. ficus-indica* with control of other alien invasive species being of lesser importance.

The anticipated disturbance that could enhance the spread of alien invasive plant species is the clearing of existing natural vegetation for the footprints of the wind-turbine poles and on-site substation site, clearing of vegetation for the construction access roads and disturbance that would result from burying the cables from the turbines to the on-site substation. The management plan consists of three phases:

A) Initial control

The initial control would be the **eradication** of any alien invasive species within and close to the footprints of the wind turbines, substation, access roads and cable routes. This must take place before any construction at any given site where infrastructure would be placed. It is essential that the alien invasive species, if present, are specifically targeted. They must be removed before the clearing of other vegetation. Once removed they must be destroyed by being discarded in a recognized, licensed landfill. The contractor must not use the plant materials as mulch or compost or bury or dump it anywhere on site. Care must be taken to ensure all parts of the cleared plant are collected and removed from the site as these succulent plants can readily repropagate from small chunks into new plants.

B) Follow-up control

Follow up control must be carried out immediately after construction at any site. Once again, any alien invasive species that may have escaped being cleared initially, or that have become evident after the construction disturbance, must be removed and destroyed as above.

C) Maintenance

Maintenance and follow up are much the same. However, when the maintenance phase is reached, there must be very few, if any alien invasive plant species present. The maintenance phase for alien invasive plant species would be ongoing during the operational phase of the infrastructure. It would therefore require long-term monitoring to determine if invasive plant species have re-established and, if so, to take remedial action, as given above. This would be a long-term activity for the life of the wind farm.

D) Other requirements

- ▶ No topsoil, mulch or compost is to be brought onto the site without the prior permission of the ECO, who must first verify that such materials are likely to be free of alien invasive seed.
- ▶ Minimize the extent and duration of all exposed soils, clearing only, when necessary, only as much as necessary and rehabilitating disturbed areas as soon as possible.
- ▶ ECO must undertake routine inspection and identify any invasive species to be removed to the contractor for the duration of the construction phase. This duty shall pass to the operational team and become part of the routine maintenance and repair cycle.
- ▶ Food waste, especially those possible containing fruit or vegetable seed, must be collected in rubbish bins and removed from the site for disposal.

6.2.1.2 Alien plant species control methods

The methods given here pertain mainly to *Opuntia ficus-indica* (see cover photo) and less so to other plant species and are as follows:

- ▶ *Opuntia ficus-indica* has cladophylls, the broad green stems modified for photosynthesis (Figure 1). The cladophylls must be cut down and collected. They must then be removed to a landfill and destroyed by dousing with diesel and burnt. This is necessary because the cladophylls can sprout opportunistically and spread by vegetative growth. **All pieces** of any plants of *O. ficus-indica* that are cleared must be removed, otherwise, the smallest piece of a cut cladophyll can re-establish and grow again. The base of the cut plant must be poisoned with a suitable commercial herbicide.



Figure 1. The cladophylls (left) and flowers (right) of *Opuntia ficus-indica* prickly-pear cactus.

- ▶ Other invasive alien weeds such as *Solanum elaeagnifolium* (Figure 2) do not require special attention and must be cut and removed, ensuring that any fruits are also removed and disposed of in a licensed landfill.



Figure 2. Exotic weed *Solanum elaeagnifolium* (Poisonous nightshade).

- ▶ In addition to the above plant species, other invasive plant species, although not noted during the botanical survey, may become apparent. Examples are species such as the grasses *Pennisetum setaceum* (fountain grass) and *Nasella* spp. (Nasella tussock). These are undesirable since they are not only exotic but unpalatable to livestock. Such plants must either be treated with herbicide or removed. The latter method is often not successful due to the high seed load that these grasses place into the soil seed bank.
- ▶ If woody alien invasive species are found or become established during the construction and operational phases of the wind farm (more likely in the operational phase), these species must be controlled using appropriate methods for each species. Plant species such as *Acacia cyclops* that do not coppice can simply be cut, whereas *Acacia saligna* that coppices, must be cut and the stumps treated with the correct herbicide and coloured with dye to make sure that all cut stumps are treated.
- ▶ At present, this would not be necessary since no woody alien invasive plant species were found in the Wolf Wind Farm study area.

6.2.1.3 Conclusions

Alien invasive species are currently not a significant problem in the receiving environment of the Wolf Wind Farm. However, since the properties are actively farmed with livestock, any alien invasive eradication must be carried out in conjunction with the respective landowners and have their consent. Only in this way would an alien control programme be successful.

6.2.2 Plant rescue and protection plan (Dr Dave McDonald – Bergwind)

6.2.2.1 Introduction

The vegetation at the site of the Wolf Wind Farm is mainly Suurberg Quartzitic Fynbos. This vegetation is not threatened. No plant species of conservation concern (SCC) were found on the proposed turbine sites during the initial botanical survey of the wind farm site or the site walk down. The only exception is the occurrence of *Encephalartos longifolius* (Thunberg's Cycad). The latter species occurs on the steep south-facing slopes of the ridge, and it was strongly motivated in the botanical impact assessment (McDonald, 2013) that no turbines must be placed on the south spurs in close proximity to the cycads.

In general, the vegetation has also been impacted by grazing by both domestic livestock and wild antelope. As a result, many plants have been disturbed by trampling and overgrazing in places. The long (7-year) drought before the 2021-2022 summer rainy season has also had a significantly negative effect on the vegetation.

6.2.2.2 Objectives

The objective of a plant rescue and protection plan is to identify plant that would be vulnerable to disturbance by the construction of roads, turbines, and the on-site substation. The second objective

would be to ensure that any plants that require (i) protection are brought to the attention of construction crews and other personnel and, (ii) plants that can be rescued are located and moved in a 'search and rescue' operation to safe sites where they would not be disturbed by wind farm construction and operations activities.

6.2.2.3 Target Plant Species

As noted above, based on the data collected in the vegetation surveys, the Wolf Wind Farm area does not harbour plant species of conservation concern (SCCs) apart from the rare and protected cycad, *Encephalartos longifolius*. However, the precautionary principle must be observed, that SCCs may be found.

Not many geophytic species (bulbous plants) were found in the surveys of the site, however, there is no reason that geophytes must be lost if they can be successfully relocated.

One of the more obvious geophytes, although not rare or threatened, that must be rescued and translocated is *Boophone disticha* (gifbol) (Figure 1). This species is an important nectar-source for long-tongued flies and fills an important ecological niche. The bulbs also take a long time to reach maturity. It is the most obvious geophyte in the Wolf Wind Farm area and is numerous in the area planned for the on-site substation. All plants of this species that could be disturbed by construction activities must be relocated. Success of transplanting this species is anticipated to be high, whereas the likelihood of successful relocation of other geophytes is low, due to more demanding growing conditions.



Figure 1. *Boophone disticha* with large bulb half-exposed, with inflorescence just appearing (left) and with inflorescence fully developed (right).

A second group of plants that must be targeted is succulents; a group that includes principally the *Aizoaceae* and *Crassulaceae* in the Wolf Wind Farm area. The more robust species of succulents in the *Aizoaceae* such as *Machairophyllum cf. bijlilii* (Figure 2) are definite candidates for relocation. Similarly, plants in the family *Crassulaceae* such as species of *Cotyledon*, *Tylecodon* and *Crassula* are all good candidates for relocation.



Figure 2. *Machairophyllum cf. bijlilii*.

6.2.2.4 **Plant Rescue Plan**

The plant rescue plan must be implemented with the guidance of a landscape practitioner or botanist i.e., a person able to identify the species to be rescued. The following areas must be focused on for the 'search and rescue'.

A) **Roads**

Well-made roads would be necessary to enable transport of the turbine equipment onto the site. Currently, only farm tracks exist on the site. By virtue of this requirement, the roads will have to be formalised and made wider. This means that vegetation would be lost along the road routes.

B) **Turbine Sites**

Plant species that can be relocated (mainly succulents and geophytes) from turbine sites must be collected prior to clearing of other vegetation at these sites. If possible, the geophytes must be collected when they are dormant and the succulents when they are not in a growth phase. It is recognized, however, that this may not be possible, so collection of the plants at inappropriate times would nevertheless be better than no rescue at all.

6.2.2.5 **Methods**

The recommended method for rescue of the identified plants is as follows:

- ▶ All plants that can be rescued along the road routes and at the turbine sites, specifically geophytes and succulents, must be marked using stakes, once the road routes have been surveyed and the turbine sites demarcated. This must preferably take place in the growing season (but this may not be possible!).
- ▶ In the case of geophytes, the identified plants should be relocated by following up the marker stakes and then lifted when dormant (winter at the Wolf Wind Farm). They must then either be planted immediately at previously identified safe locations, or kept in a nursery for later transplantation.
- ▶ In the case of succulents, they must be collected in late summer and then kept in a holding nursery to ensure that they are healthy and in good condition for transplanting. The best time for transplanting would be in early summer so that the newly transplanted plants can benefit from summer rains.
- ▶ A strong recommendation is that the staff of the newly established Kwelerha Botanical Garden at Gqeberha should be approached to assist with the 'search and rescue' operation or at least act in an advisory capacity, and possibly take some plants into cultivation.

6.2.2.6 Plant Protection Plan

The only plant that needs protection in the Wolf Wind Farm area is *Encephalartos longifolius* (Thunberg's Cycad). Cycads are highly sought after and are poached for the illegal plant trade so stringent protection measures must be in place. The protection of these plants must form an integral part of the general security measures on the site; in other words, access to these plants must be restricted at all times.

With respect to the overhead grid connection power line, this must be aligned to AVOID disturbing any cycads. The lines may cross above the cycads, but they may not be disturbed by any construction or operational activities.

Although not threatened in any way, and not containing any Species of conservation concern (SCC), the woody thickets as a particular 'vegetation form' must be protected as far as possible. They could mainly be affected by the siting of the on-site substation and must be avoided.

6.2.2.7 Conclusions

The Plant Rescue and Protection Plan assumes that best practice will be applied in that the natural environment into which the wind turbines and formalised roads will be placed will be respected. However, that is not always the case and so stringent respect for the environment and particularly the vegetation must be enforced by the Environmental Control Officer. The overall aim must be to cause as little disturbance and harm to the environment as possible so that the ecosystem can function, with its special plant species, as if there was no wind energy infrastructure present.

6.2.3 Open space management plan (Dr Dave McDonald – Bergwind)

The Wolf Wind Farm is an industrial-scale installation that will be constructed on the Klein Winterhoek Mountain Range in the Eastern Cape Province. In keeping with best practice and by virtue of the wind farm being in the Greater Addo Park, it will be necessary to apply an open space management plan as the turbines and associated infrastructure only cover a small percentage of the site. Such a plan would have to tie in with the management plan applied by the landowners with respect to their livestock grazing.

The main aim of the Open Space Management Plan is to provide a framework for managing the Wolf Wind Farm site to ensure that the open space surrounding the fragmented footprint of the wind farm is kept in good condition. By that it would aim to maintain a biodiversity-compatible management regime to mitigate any negative factors that the wind farm would have on the environment in the long term. It is important to note that the site is currently grazed by livestock and wildlife and is expected to continue to service this function for the most part and according to the landowner's land management objectives.

The Wolf Wind Farm would comprise 17 wind turbines and associated infrastructure spread along the mountain ridge and an on-site substation located approximately half-way between the east and west limits of the wind farm. The turbines will be spaced so as to obtain optimal benefit for wind-power generation and therefore there will be relatively undisturbed natural habitat between the wind turbines. An Environmental Management Programme is an overarching plan that incorporates an Alien Invasive Management Plan, a Re-vegetation and Restoration Management Plan and a Plant Rescue and Protection Plan as well as an Open Space Management Plan. The latter plan aims to in some measure integrate the other plans to ensure that, where necessary, the mitigation measures to minimise negative impacts on the receiving environment are correctly and diligently applied.

6.2.3.1 Site Access Control and Protocols

- ▶ Access to the Wolf Wind Farm area must be strictly controlled during the construction and operational phases of the wind farm. Only authorized construction, operational and maintenance personnel must be allowed on the site, apart from authorized visitors. All personnel and visitors must sign in each time the site is entered.
- ▶ Appropriate signage must be in place that informs and reminds both staff and visitors about the about the sensitivity of the site in the non-construction areas.

- ▶ All non-construction area must be considered as 'No Go' areas.
- ▶ Vehicles must be restricted to approved access roads and construction footprints.
- ▶ No 'off-road' driving must be allowed.
- ▶ The speed limit for driving on the site must be set at 40 kmph.
- ▶ No fires on the site and no collection of firewood will be permitted.
- ▶ Collecting of plants, animals, reptiles or any archaeological artifacts must be forbidden except where necessary for safe operation of activities on the site. Permits for such activities from the relevant authorities and landowners must be in the possession of the Environmental Control Officer prior to any of the above activities taking place.
- ▶ Private livestock must be left strictly undisturbed.
- ▶ A system of fines must be in place for any person who contravenes the laid down protocols.
- ▶ An Environmental Control Officer, or designated person, must regularly audit the protocols to ensure adherence.

6.2.3.2 **Synchrony with other management plans**

- ▶ The Alien Invasive Management Plan will determine the methods for controlling weeds and alien invasive plant species.
- ▶ No non-locally-occurring plants, plant material or seed, mulch, compost or topsoil must be brought onto the site (unless by special approval of the ECO).
- ▶ Erosion control forms part of the Re-vegetation and Restoration Plan.
- ▶ Bird and mammal occurrence and monitoring will form part of faunal and avifaunal monitoring programmes as determined by specialists in those fields. Where necessary, however, they must dovetail with the Open Space Management Plan.

6.2.3.3 **Safety considerations with respect to wild animals and reptiles.**

Prior to the commencement of construction in any area, a walkthrough must be undertaken to check there are not mammals or reptiles in the areas that need relocation.

It may happen that personnel may encounter dangerous animals and / or reptiles on the site. This would apply particularly to dangerous snakes. Puff Adder, Berg Adder, Night Adder, Cape Cobra and Rinkhals are snake species that could pose a hazard to staff if encountered. Such snakes must be left alone or be removed by a suitably qualified person. No snakes may be harmed or killed.

Other reptiles such as tortoises, notably the Mountain Tortoise or Leopard Tortoise, that are known to occur on the site, must be moved out of harm's way and left strictly alone.

Trenches and other excavations must be routinely inspected for snakes and other animals who may have fallen in and need to be rescued.

6.2.3.4 **Security**

General security must be applied with discretion with respect to open space management. Security lighting at night must be kept to a minimum so as not to disturb nocturnal mammals and birds or create a visual disturbance.

6.2.3.5 **General**

- ▶ A concrete batching plant must be established, and care must be taken to ensure that the concrete and contaminated water is contained, treated within a designated area and disposed of responsibly offsite.
- ▶ Should spills of concrete occur, they must be immediately cleaned, and the site of the incident returned to the prior state.
- ▶ Fuel and oil must be stored in designated and approved containers that are bunded to prevent escape into the surrounding environment.
- ▶ General spillage of oil, diesel and other fuel must be cleaned, and the location of the spills returned to an acceptable state.

- ▶ Time must be put aside for daily housekeeping to ensure litter and debris are collected and disposed of in rubbish bins to avoid the spread of litter and waste by wind.

6.2.4 Re-vegetation and rehabilitation plan (Dr Dave McDonald – Bergwind)

As expected, when a large project such as a wind farm is constructed in a relatively undisturbed environment, it can result in a high negative impact on the receiving environment that has to be mitigated to minimise the negative effects. One of the mitigation means is to re-vegetate and rehabilitate areas disturbed during construction that would not be required during the operational phase. For this purpose, a plan is necessary to guide the restorative activities to achieve maximum remedial benefit to the receiving environment.

The vegetation of the Wolf Wind Farm site was described by the author (McDonald, 2013; 2021) and reference should be made to those reports. The site has been subject to grazing by cattle and sheep and prior to the onset of the summer rainy season in November 2021, the site had been in the grip of a severe drought. A combination of these factors means that the site is presently not in optimal condition with respect to vegetation and habitat.

The anticipated disturbance may lead to further degradation of the site is the clearing of existing the natural vegetation for the footprints of the wind-turbines and on-site substation, clearing of vegetation for the construction access and service roads and disturbance that would result from burying the cables from the turbines to the on-site substation and temporary laydown areas needed for the construction of the turbines. Some of these areas would be restorable and some would not, due to the need for some areas to remain unvegetated for operational purposes.

6.2.4.1 The Elements of the Re-vegetation and Rehabilitation Plan

The management plan consists of the following elements:

- A) **Identification of places needing active or passive re-vegetation.**
- B) **Identification of places needing active re-vegetation can be carried out concurrently with the construction phase. As sites have been cleared, construction has finished at the turbine sites and the sub-station site, the level of re-vegetation required can be determined and then either active re-vegetation can be implemented, or passive re-vegetation can be promoted. Implementation of active or passive re-vegetation.**

The approach that should be implemented depends on the extent of the disturbance, and what the substrate is. Areas that have bare soil, cleared of vegetation, are potentially areas that can be actively re-vegetated.

There is a strong tendency amongst practitioners to propose use of reseeded of bare areas using commercial seed mixtures. However, this inevitably introduces plants into an area that are not native to the site. An alternative method is proposed here.

For active re-vegetation, all vegetation that is cleared from a site must be kept (stockpiled) and then be chipped to form a mulch (NB. Excluding invasive species). The mulch must be kept. The area requiring re-vegetation must then be prepared by removing any foreign material (concrete, stone, metal etc.) and mechanically scarified. The chipped mulch must then be distributed over the area to be rehabilitated. This will re-introduce the seeds of the plants originally found on the site. The mulch would provide a 'growth medium' i.e., micro-habitat that would enhance germination of the seed. Since the vegetation is a form of fynbos (Suurberg Quartzitic Fynbos), it is also recommended that 'smoke water' (Brown, 1993) must be applied to the mulch on the site to stimulate germination of the fynbos seed. For successful restoration of the turbine sites, it would be necessary to fence each area around the turbines for a period of 3 years, where re-vegetation is intended. This would be necessary to keep livestock and the wild antelope from grazing and trampling the areas being rehabilitated. Once established the fences can be removed and the areas made available to livestock and game once more. Some turbine sites (probably the majority) are likely to have a large amount of rock spoil. The spoil rock stockpile must be kept on site for future erosion control purposes (see below).

In the case of the substation site, the soil is derived from shale (Suurberg Shale Fynbos). This accounts for the numerous non-fynbos shrubs and thicket found on the site. At this site, it is advisable to simply leave the site around the substation for the vegetation to regenerate passively. This would be enhanced by scarification of the soil surface, but the only other intervention must be to fence the area around the substation to keep grazing animals out.

c) Identification of eroded areas or potential erodible areas.

Different soils have different erosion susceptibilities. Sandstone-derived soils on the site are likely to be less erodible than shale-derived soils. However, erosion also largely depends on slope inclination and vegetation cover. It is anticipated that some of the turbine sites are likely to be more erodible than the majority, due to their location on steep slopes. Each construction site (turbine site and the substation site) would have to be regularly inspected, following rainfall events, and evaluated individually. The level of intervention to curb any erosion or potential erosion can then be determined.

Where necessary, rock spoil can be used to fill potential gullies and to slow the speed of water draining downslope. In some cases, gabion cages (rock-filled wire cages) may be necessary to keep the soil in place. Gabion cages are commercially available and on-site rock-spoil must be used as necessary to fill the cages as necessary. Other methods such as geotextile silt sausages can also be used where necessary.

The access roads on the site will not be tarred and so there is a high risk during the construction period as well as into the operational phase that the roads will be highly erodible surfaces. The terrain of the Wolf Wind Site is undulating and there will be numerous locations where access roads will be on steep slopes. To limit severe erosion, the roads **MUST BE** constructed with appropriate water bars and side drains to divert the runoff water from running directly downslope.

Definition: A water bar is a ridge (like a speed bump) that runs diagonally across the road, typically at a 30-degree angle. The ridge stops water from running down the road and diverts it to the side. Place water bars at frequent intervals to prevent significant water flow on the road.

The problem with roads is that they are in continuous use. It is thus imperative that the condition of the roads is constantly monitored during the construction phase (less so in the operational phase) to ensure that erosion is stopped early, before the problem becomes unmanageable.

The main objective of erosion control is to slow the speed of runoff, to allow silt to 'pool' and form a substrate for re-vegetation. So, re-vegetation is integral erosion control and methods can be adapted to meet the on-site requirements. The principles of runoff control are relatively simple and the methods to achieve successful erosion control will depend on innovative solutions adapted for the local conditions.

6.2.5 Traffic and Transport management plan (Pieter Arangie – ITS)

6.2.5.1 TRANSPORT MANAGEMENT PLAN

A) Abnormal Loads

A.1) Abnormal Load Considerations

Abnormal permits are required for vehicles exceeding the following permissible maximum dimensions on road freight transport in terms of the Road Traffic Act (Act No. 93 of 1996):

- ▶ Length: 22m for an interlink, 18.5m for truck and trailer and 13.5m for a single unit truck
- ▶ Width: 2.6m
- ▶ Height: 4.3m measured from the ground. Possible height of load – 2.7m.
- ▶ Weight: Gross vehicle mass of 56t resulting in a payload of approximately 30t
- ▶ Axle unit limitations: 18t for dual and 24t for triple-axle units
- ▶ Axle load limitation: 7.7t on front axle and 9t on single or rear axles

Any dimension / mass outside the above will be classified as an Abnormal Load and will require an application to the Department of Transport and Public Works for a permit that will give authorisation for the transportation of the abnormal load. A permit is required for each Province that the haulage route traverses.

A.2) **Guideline Documentation**

The Technical Recommendations for Highways (TRH 11): “Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads” outlines the rules and conditions that apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. The general conditions, limitations and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the Road Traffic Act and the relevant regulations.

A.3) **Permitting – General Rules**

The limits recommended in TRH 11 are intended to serve as a guide to the Permit Issuing Authorities. It must be noted that each Administration has the right to refuse a permit application or to modify the conditions under which a permit is granted. It is understood that:

- a) A permit is issued at the sole discretion of the Issuing Authority. The permit may be refused because of the condition of the road, the culverts and bridges, the nature of other traffic on the road, abnormally heavy traffic during certain periods or for any other reason.
- b) A permit can be withdrawn if the vehicle upon inspection is found in any way not fit to be operated.
- c) During certain periods, such as school holidays or long weekends an embargo may be placed on the issuing of permits. Embargo lists are compiled annually and are obtainable from the Issuing Authorities.

A.4) **Load Limitations**

The maximum load that a road vehicle or combination of vehicles will be allowed to carry legally under permit on a public road is limited by:

- ▶ the capacity of the vehicles as rated by the manufacturer
- ▶ the load which may be carried by the tyres
- ▶ the structural capacity on bridges and culverts
- ▶ the engine power of the prime mover(s)
- ▶ the load imposed by the driving axles and
- ▶ the load imposed by the steering axles

A.5) **Dimensional Limitations**

A load of abnormal dimensions may cause an obstruction and danger to other traffic. For this reason, all loads must, as far as possible, conform to the legal dimensions. Permits will only be considered for indivisible loads, i.e., loads that cannot, without disproportionate effort, expense, or risk of damage, be divided into two or more loads for the purpose of transport on public roads. For each of the characteristics below there is a legally permissible limit and what is allowed under permit

- ▶ Width
- ▶ Height
- ▶ Length
- ▶ Front Overhang
- ▶ Rear Overhang
- ▶ Front Load Projection
- ▶ Rear Load Projection
- ▶ Wheelbase
- ▶ Turning Radius
- ▶ Stability of Loaded Vehicles

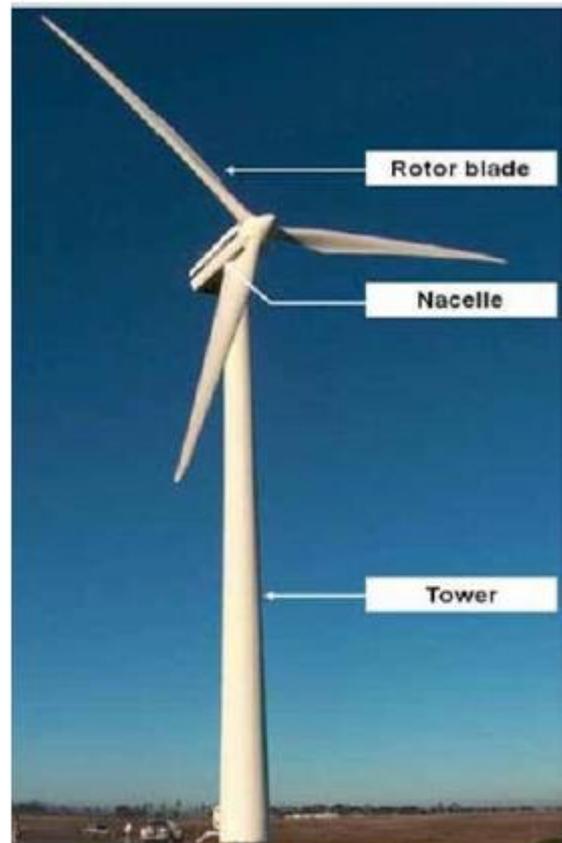


Figure 2: Typical Wind Turbine

A.6) Delivery of Heavy Equipment

The equipment that needs to be delivered to site are not only large but many of the parts are heavy. A typical tower, with rotor blades and Nacelle are shown in the following photograph.

The dimensions and weights of the various elements of the wind turbines are summarized in the following two tables. The most extreme dimensions are those of the rotor blades which could vary between 40 and 45 metres in length. The heaviest parts are the Nacelle which weighs more than 60 tons.

Table 2: Typical Dimensions and Weights of Components

Component		Weight (unit: ton)	Dimensions(unit: m) Length × width × height
Blade*	UP40.25	6.2	40.25 × 1.9 × 3.2
	UP37.5	6.0	37.5 × 1.9 × 3.2
Nacelle		61	10.2 × 3.8 × 3.8
Hub		15.1	3.75 × 3.75 × 3
Tower		Refer to Table 2 for details	

Table 3: Typical Dimensions and Weights of Tower Elements

Tower weight and dimension

Model	65mHH 2A+		65mHH 2A		80m 3A+		65mHH 3A	
Section	Weight (kg)	Dimension (unit:mm) Length ×bottom outer diameter	Weight (kg)	Dimension (unit:mm) Length ×bottom outer diameter	Weight (kg)	Dimension (unit:mm) Length ×bottom outer diameter	Weight (kg)	Dimension (unit:mm) Length ×bottom outer diameter
Upper	25500	23178×3210	34101	30247×3475	30580	28629×3282	28800	30300×3475
Middle	39891	21757×3654	39028	21486×4000	47161	26564×3787	32552	21453×4000
Bottom	49025	16938×4000	27742	10140×4000	58111	21680×4200	24939	10115×4000

Based on the above sizes and weights, the roadways to the site must have the following minimum requirements:

Width: Roads need to be at least 5,00 metres wide to accommodate the largest parts of 4.0 metres wide. The widest part that has to be transported is the nacelle.

Height: Vertical clearances need to be at least 4.65 metres to ensure no hindrances (e.g., overhead lines, telephone lines etc.).

Maximum Weight: The lower tower section and the Nacelle are of the heaviest parts that have to be transported. The final weights will have to be determined prior to determining the final loads and as part of the detail investigation.

Outer Curve Radius: The minimum outer and inner radii for the transport trucks must be at least between 25,0 metres and 28,0 metres. This will depend on the final lengths of the equipment to be transported and must be evaluated during the detail evaluation of the sites.

Maximum Slope: The maximum slope of asphalt roads must typically be lower than 10 percent and for gravel roads it must be lower than 7 percent. The type of loads and weights that will need to be transported together with the vehicles that will be used for the transport will determine the maximum gradients of the access roads. It will be necessary to evaluate these gradients during the detail evaluation phase.

Road Surfaces: Abnormal transport vehicles have low ground clearances, and it could be as low as 150 mm. The surfaces of all the tarred national and provincial roads must comply with this requirement. The gravel access roads must also comply with this requirement and will require careful construction control. Based on the abnormal load requirements the preliminary route as outlined in **Figure 3 (in this section)** is proposed for transporting the large equipment from the Coega harbour to the site. The power line equipment will be delivered by normal load heavy vehicles with possible stock piling of the equipment on the Wolf WEF site.

6.2.5.2 TRAFFIC MANAGEMENT PLAN

During the construction phase the increase in truck traffic along the roads in the site vicinity will be significant, compared to the current truck traffic along these roads. However, the expected total traffic volumes along these roads will still be well within the function of the roads and no operational or safety issues are expected. Due to the rural nature of the area around the development site the daily traffic distribution profile along the roads in the site vicinity is random with no specific peak during the day. The construction traffic will have an impact on road users and pedestrians along the surrounding road network, but with effective traffic management the impact can be minimised.

This Traffic Management Plan must be updated prior to the commencement of the construction phase, when more detailed information regarding the delivery of components, traffic data and construction activities are available. The Contractor must designate a person as the custodian of the plan and the custodian will ensure that all personnel and subcontractors are trained to ensure compliance. The requirements of the Traffic Management Plan shall apply to all personnel and subcontractors appointed to provide vehicles and machinery or drivers. The Plan needs to be reviewed after an incident and corrective measures must then be incorporated into the Plan.

The Traffic Management Plan must be updated once construction is completed to include the operational traffic requirements. A copy of the Traffic Management Plan must be kept on site the Plan must be available to all personnel. The Traffic Management Plan will be reviewed annually or after an incident, when corrective measures will be incorporated into the Plan.

A) Trip Generation

A.1) Construction Phase

A large amount of traffic will be generated during the construction phase. The following activities will probably occur during the construction phase:

- ▶ Construction of the internal access roads,
- ▶ Stripping and stockpiling of topsoil,
- ▶ Excavation and construction of the foundations for the wind turbines,
- ▶ Construction of the operations building,
- ▶ Erection/Assembly and disassembly of the cranes
- ▶ Assembly of the towers, nacelles and blades,
- ▶ Trenching for cabling and
- ▶ Reinstatement of the site.

The internal access roads will be constructed mainly of local materials sourced on site if the material is suitable, otherwise material will be imported from commercial sites. These roads will be retained and used for inspection and maintenance of the wind turbines.

The tower foundations are large reinforced concrete footings. It is assumed that the material removed during excavation will be utilised within the site to create hardstand areas for the cranes and in reinstating the site after construction. It is assumed that the concrete will be mixed on site and the raw materials will be transported to the site via the existing road network. It is assumed that up to 70 truckloads will be required for each foundation.

Approximately 20 heavy truck loads are required on site to assemble and disassemble the cranes. The components of the wind turbines will be transported to the site from Coega harbour and approximately 12 abnormal truck loads are required per wind turbine.

Estimates of the peak hour vehicle trips for new developments are typically based on empirical observations at similar land uses. The estimates summarised in **Table 3 above** are based on information sourced from other similar projects and it is also based on the assumption that the proposed maximum of 28 wind turbines will be constructed over the 12-month period.

Table 4: Expected Generated Truck Trips during the Construction Phase

Material	Approximate Number of Trucks loads required
Foundations	1 960
Construction Cranes	20
Tower Sections	112
Nacelles	28
Blades	84
Switch Cabinets	56
TOTAL	2 260

Although the construction period can be between 12 to 18 months, for the purposes of this study it is assumed that most the construction work can be completed within a 12-month period to represent a possible worst-case scenario. It is expected that approximately 2 260 trucks loads will be required during the 12-month construction period, working approximately 300 days during the construction period. This means that on average approximately 8 trucks will visit the site per day which equates to approximately 16 truck trips spread over an eight-hour day.

Based on information sourced from other similar projects it is assumed that approximately 200 construction workers could be employed during the peak construction period. It can be expected that the bulk of these workers will commute to/from the construction site via bus or minibus taxis. If 70 percent of the construction staff travels with minibus taxis with an average occupancy of 12

passengers per vehicle it equates to approximately 12 minibuses visiting the site in the morning and afternoon peak hours. If the remaining 30 percent travel with private vehicles, it equates to approximately 184 motor vehicle and truck trips during the average weekday with approximately 84 trips during the a.m. and p.m. peak hours when workers are dropped off or picked up.

It is expected that for the power line construction less than 100 trucks will be required delivering equipment and building material during the construction period, depending on the type and size of the power line poles/pylons. The construction period could probably vary between three to eight months. It is assumed that delivery of the equipment will occur within and spread over a six-month period. With a possible 150 working days in a six-month period, it means that on average less than 1 truck will visit a site per day which is insignificant.

Based on information sourced from other similar projects it is assumed that approximately 50 construction workers could be employed during the peak construction period for the power line. It can be expected that the bulk of these workers will commute to/from the construction site via bus or minibus taxis. If 70 percent of the construction staff travels with minibus taxis with an average occupancy of 10 passengers per vehicle it equates to approximately 4 taxis visiting the site in the morning and afternoon peak hours. If the remaining 30 percent travel with private

vehicles, it equates to approximately 40 motor vehicle and truck trips during the average weekday for the power line construction, which is insignificant.

A.2) **Trip Distribution and Assignment**

It is expected that most of the trips to/from the Wolf Wind Farm will travel via the R75 from direction Kirkwood and Uitenhage. The trucks delivering the components and equipment will come from the Coega/Gqeberha area via the R75.

A.3) **Operational Phase**

The number of permanent staff on site for the Wolf WEF is not expected to be more than 20 people and the day-to-day operation of the proposed Wind Farm will generate relatively low traffic volumes.

It is not expected that there will be permanent staff employed at the substations except for the periodic repairs and maintenance. The operational phase of this power line project is not expected to generate any traffic volumes during the typical weekday peak hours.

B) **Licensing**

All construction vehicles shall have the necessary licences, a valid roadworthy certificate and shall comply with the relevant traffic and transport licencing requirements. All drivers of vehicles shall have the required licences to operate the vehicle (or machinery) operated by them on site or on any public roads. A professional driving permit (PDP) is required if any of the following vehicles are operated:

- ▶ Goods vehicles, (more than 3 500 kg).
- ▶ Breakdown vehicles.
- ▶ Buses (any bus).
- ▶ Minibus taxis (more than 3 500 kg), transporting 12 or more people, including the driver.
- ▶ Goods vehicle carrying dangerous goods (more than 3 500 kg).
- ▶ Road tank vehicles for petroleum-based flammable liquids.
- ▶ Motor vehicles transporting 12 or more people, including the driver

c) Staff Transport

All staff shall be transported in appropriate vehicles and staff shall not be allowed to be transported on the back of open trucks. Passenger vehicles shall not exceed the carrying capacity of the vehicle.

Collections/Drop-off points for staff shall be located at a safe distance from construction activities. Designated pedestrian pathways shall be demarcated where appropriate. All staff shall receive the appropriate site safety induction training. Staff training shall include appropriate precautionary measures required to be undertaken to facilitate safe and efficient traffic management.

d) Road Maintenance

Based on the expected number of construction trips generated by the proposed development the existing road network has sufficient capacity to accommodate the additional trips from an operational perspective. During construction it is expected that road surfaces will require maintenance at regular intervals to prevent damage to the road structure. Once construction is completed the Provincial roads must be inspected and repaired where necessary.

e) Maintenance of Vehicles and Equipment

All vehicles and equipment shall be regularly maintained, repaired when necessary and inspected on a regular basis to ensure that the vehicles are in good working order. All freight and passenger vehicles shall be monitored to ensure that vehicles are not overloaded.

f) Signage

Signage, in accordance with the South African Road Traffic Signs Manual, will be required at appropriate locations along all access roads, the internal roads to the site and public roads used by construction vehicles (in consultation with the relevant traffic authorities) to indicate the following:

- ▶ all road and pedestrian hazards
- ▶ site access
- ▶ site offices
- ▶ wayfinding signs on internal roads e.g. parking, toilets, emergency assembly point
- ▶ crossing points
- ▶ speed limits
- ▶ turning traffic, heavy vehicles
- ▶ dedicated routes for construction vehicles and staff
- ▶ no-go areas
- ▶ any traffic control information relevant to the construction activity at the time

It is recommended that flagmen be implemented when high volumes of construction traffic are expected to help direct traffic to ensure safe movement of the vehicles and reducing the potential conflicts.

g) Speed limits

All drivers operating vehicles shall comply with the posted speed limits (or the maximum allowable speed as per the permit for abnormal load vehicles) on public roads as well as a proposed 30km/h speed limit within the construction site and access roads.

h) Stakeholder Engagement

Interested and affected parties must be informed of all transport activities taking place that may affect them or require approval e.g., local community, the local authorities e.g., law enforcement and affected landowners.

Stakeholder engagement must address and provide information to stakeholders regarding general construction activities, construction vehicles routes, projected timelines, procedures for complaints and emergency procedures.

I) Abnormal Loads

It is recommended that construction and abnormal load traffic must be limited to outside the typical traffic peaks in build-up areas and through towns. Provincial and Local traffic officials must assist abnormal load vehicles through the towns.

All deliveries with abnormal loads will operate under an approved transportation plan with the necessary traffic routes and traffic accommodation plans in place.

J) General Construction Traffic

Most of the equipment and construction material will be delivered to the site with heavy vehicles. The turbine components will be transported by abnormal load vehicles. It is expected that the delivery of the equipment will occur over a 12-month period and the impact of the delivery vehicles on the existing traffic along the road network in the site vicinity will be acceptable.

J.1) Mitigation Measures Include:

- ▶ The delivery of components and construction materials to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- ▶ using a mobile batch plant as well as temporary construction material stockpile yards near the proposed site.
- ▶ Transporting site personnel to and from the site by means of busses or minibus taxis. This will reduce the number of trips bound for the site

K) Power Line Road Crossings

There are three power line crossings over major roads, i.e., 1) The R335 near the Eskom Grassridge Substation, 2) the R75 near Kirkwood and 3) The R75 at Kleinpoort. There are existing power line crossings at these locations and the crossings are along straight sections of these roads. No sight distance issues are expected at these locations for construction activities.

The power line also crosses over minor roads and farm roads between the site and the Eskom Grassridge Substation. These are low volume roads, and no issues are expected during the construction period. Some minor disruptions are expected with short road closures during construction at the road crossings.

Specific traffic management plans must be confirmed with the road's authority prior to any construction activity at the locations where the powerlines cross any major public road.

6.2.6 Bird Monitoring Programme (Jon Smallie – Wildskies)

The work done to date on the proposed site has established a baseline understanding of the distribution, abundance, and movement of key bird species on and near the site. Once operational a similar data collection process will be required in order to allow a before- after comparison. The following programme has therefore been developed. It is recommended that this programme be implemented by the wind farm with the assistance of a suitably qualified avifaunal specialist. The findings from operational phase monitoring must inform an adaptive management programme to mitigate any impacts on avifauna to acceptable levels over the entire project lifecycle.

6.2.6.1 Construction phase monitoring

It will be necessary to monitor the breeding status and productivity of the nesting Verreaux's Eagles during all breeding seasons (May to October) during construction. This can be done with a minimum of 3 specialist visits to the nest sites per breeding season, to observe the birds without disturbing them. Detailed requirements as follows:

- ▶ Independent avifaunal specialist to make a minimum of 3 visits to nest site in each breeding season (May to October) during construction.
- ▶ The breeding status & productivity of the eagles is to be determined and recorded.
- ▶ Any observable response by eagles to construction disturbance to be documented.

There is no requirement for monitoring on the OHPL connection during construction phase.

6.2.6.2 Operational phase monitoring

The intention with operational phase bird monitoring is to repeat as closely as possible the methods and activities used to collect the pre-construction data or 'baseline' and allow for comparative analysis. This work will allow the chronological comparative assessment of the impacts of the proposed facility on avifauna and the possible ongoing development of active and passive mitigation measures that may be required in the future.

One very important additional component needs to be added to the monitoring requirements, namely mortality estimates through carcass searches under turbines. The following programme has therefore been developed to meet these needs, and must start as soon as possible after the commencement of operation of the first phase of turbines (not later than 3 months):

Note that this framework is an interim draft. The most up to date version of the best practice guidelines (Jenkins et al 2015, under revision 2022) must inform the programme design at the time to ensure the monitoring and adaptive management programme remains current with the best practice guidelines.

6.2.6.3 Live bird monitoring

This monitoring component must be conducted by a team of field ornithologists under the supervision of the avifaunal specialist. Note that due to the construction of the wind farm and particularly new roads, it may be necessary to update the location of the below monitoring activities from those used pre-construction phase monitoring.

- ▶ The walked transects of 1km each that have been done during pre-construction monitoring on the site must be continued.
- ▶ The vehicle based road count routes on the site must be continued, and conducted twice on each site visit.
- ▶ The focal sites on the site must be surveyed on each site visit. If any sensitive species are found breeding on site in future these nest sites must be defined as focal sites.
- ▶ All other incidental sightings of priority species (and particularly those suggestive of breeding or important feeding or roosting sites or flight paths) within the broader study area must be carefully plotted and documented.
- ▶ The Vantage Points already established on the overall site must be used to continue data collection post construction. The exact positioning of these may need to be refined based on the presence of new turbines and roads. It is recommended that the four vantage points used most recently by Arcus (2022) and provided here, must be used.

Vantage point (VP)	Coordinates
VP1	33°15'13.55"S by 24°53'27.18"E
VP2	33°15'19.43"S by 24°54'54.39"E
VP3	33°15'15.61"S by 24°56'26.55"E
VP4	33°15'44.00"S by 24°58'16.31"E

- ▶ The activities at the control site must be continued. i.e. two vantage points, 3 walked transects and one driven transect. The control site is located at 33° 17' 57.88"S by 25° 00' 13.84"E

6.2.6.4 Bird Fatality estimates

Bird fatality estimates are now an accepted component of post construction monitoring programs, and the latest guidelines must always be used to update the monitoring program. It is important that in addition to searching for carcasses under turbines, an estimate of the detection (the success rate that monitors achieve in finding carcasses) and scavenging rates (the rate at which carcasses are removed and hence not available for detection) is also obtained (Jenkins *et al*, 2015, under revision 2022). Both of these aspects can be measured using a sample of carcasses of birds placed out in the field randomly. The rate at which these carcasses are detected and the rate at which they decay or are removed by scavengers must also be measured.

Fatality searches must be conducted as follows:

- ▶ The area surrounding the base of turbines must be searched (up to a radius equal to 75% of the maximum height of turbine) for collision victims.
- ▶ All turbines on the wind farm must be searched at least once a week (Monday to Friday).
- ▶ Any suspected collision casualty must be comprehensively documented as follows (as per Jenkins *et al*, 2015):

RECORDING AND REPORTING MORTALITIES: All suspected collision incidents must be comprehensively documented, detailing the following recommended variables:

- Observer name
- Project name
- Date
- Time
- Species
- Age class (where possible)
- Sex (where possible)
- GPS location/s
- Condition of remains
- Nearest turbine number
- Distance to nearest turbine
- Compass bearing to nearest turbine
- Habitat type/mix of habitats
- Gradient of slope (flat, gentle, steep)
- Aspect of slope (none, north, north-east, east...)
- Plot on map
- Photograph the collision site as it was located

- ▶ A team of carcass searchers will need to be employed and trained and these carcass searchers will work on site every day searching the turbines for mortalities for at least the first two years of operations, longer if significant impacts are detected. The duration will be determined by the avifaunal specialist contracted for the first two years of operations.

The OHPL must be patrolled by vehicle at least quarterly to detect any bird fatalities and monitor the durability of line marking devices installed to mitigate bird collisions.

The most up to date version of the best practice guidelines (Jenkins *et al*, 2015, under revision 2022) must inform the programme design at the time.

The above programme must be reported on quarterly to the wind farm operator, who must submit these reports to the DFFE, BirdLife South Africa and SANParks. According to Jenkins *et al*, 2015, this reporting must include the following:

- As a minimum, the annual report should attempt to answer the questions listed below.*
- a) *Has the habitat available to birds in and around the WEF changed?*
 - b) *Has the abundance of birds and/or species composition changed?*
 - c) *Have the distributions and/or movements of priority species changed?*
 - d) *Is there evidence that the breeding success at focal nest sites may have changed?*

- e) Where the answer is yes to any of the above four questions, what is the nature of the observed changes? (Compare these changes before (during) and after construction).
- f) What is the nature, and likely drivers, of any changes observed?
- g) What is the likely demographic and ecological significance of any observed changes in bird populations at the site (including consideration of the magnitude and direction of change) at both the local and broader population scale?
- h) What are the collision rates and total number of bird fatalities at the WEF? (Collision rates must be reported per MW (nameplate capacity) and per turbine. Data must be reported in both raw and corrected forms).
- i) What is the species and, as far as possible, age and sex composition of fatalities?
- j) What proportion of fatalities is likely to be due to collisions with wind turbines?
- k) Are there any factors (e.g., site characteristics and proximity to wind turbines) that may contribute to these fatalities? l) Is additional monitoring and/or mitigation necessary and if so, what needs to be done?

6.2.7 Bat Monitoring Plan (Low De Vries – Volant Environmental)

Operational monitoring must be done during the first two years that the WEF facility is operational, and after that a survey must be done once every five years. Impacts must however be continuously monitored and assessed throughout the lifespan of the WEF in consultation with a bat specialist. As such, the specialist must have access to the WEF for the full duration of the monitoring program. To allow for comparison to other Operational Monitoring Programs the methods used must be standardised as far as possible.

6.2.7.1 Acoustic monitoring

Acoustic monitoring must be conducted as it was done during the Pre-construction survey if these still comply with the latest Pre-construction Guidelines (MacEwan *et al.* 2020b). This includes one bat detector microphone that must be mounted on the met mast in the rotor sweep zone. If the met mast is no longer available on the property, a microphone must be deployed from the nacelle of at least one turbine that is located close to the original geographical position of the met mast. In addition, a minimum of one microphone must be deployed at between 7 and 10 m above ground and for every 5 000 ha or per every habitat type present on the site. The data obtained from these bat detectors will allow for comparison between the original Pre-Construction Survey and the subsequent Operational Monitoring to assess if bat activity has changed. In addition, it will allow the specialist to assess if the WEF is impacting on the diversity and abundance of bats across a two-year period.

6.2.7.2 Carcass searching

Carcass searching is the predominant method that is used to assess fatalities at any WEF facility as this gives a real time estimate of the number of fatalities and the species impacted. Prior to the commencement of carcass searches, permission and permits must be obtained to collect and store carcasses and live bats from the relevant provincial authority. All staff involved with the collection of carcasses and live bats must be fully vaccinated against rabies. Although it is not a requirement, it is recommended that all collected carcasses be sent to a museum to be stored as voucher specimens. This will require additional permits, including export permits and a Section 20, which must be applied for before the start of monitoring.

A) Frequency of carcass searches

As stated above, monitoring must be done over a two-year period and every five years thereafter for the lifespan of the WEF. This two-year period is, however, dependent on the number of bat fatalities detected, and if this approaches or exceeds the threshold limits (MacEwan 2020a) then carcass search monitoring must be extended for at least another year.

Areas underneath all turbines present on the AOI must be searched, regardless of the number of turbines present. Each area must be searched at least twice a week, results will be dependent on

several factors, including carcass removal by scavengers (see section D)), the risk of fatalities per turbine, monthly bat activity and carcass decay rate per season. If it is found that carcasses are being removed at a rapid rate by scavengers, then the search interval must be decreased to match the removal rate by scavengers, as determined by the bat specialist. Carcass searches must be increase during times of peak bat activity as outlined in the Pre-Construction Report (Moir and Marais 2014), which states that activity is higher between late October and early December, mid-December and early January, mid-February to late March and mid-August to late September. However, times of peak activity must also be informed and changed based on acoustic monitoring that is being conducted during the Operational Phase Monitoring. Special attention must also be paid to turbines located in areas of higher risk, and the number of searches must be increased in these areas.

B) Carcass search plots

An area of half of the maximum height of the blade tip must be search around each turbine as it has been suggested that most bat carcasses are found within this area. Considering that the maximum height of each blade tip is at least 228 m above the ground it is recommend that a circular area with a diameter of 230m (115 m in all directions) be searched around each turbine. Within this plot, transects that are spaced 6 m apart must be walked and searches conducted within 3 m on either side of this transect. In areas with dense vegetation the space between transects must be decreased to ensure that the area is effectively searched.

Due to certain aspects, including dense vegetation and rocky areas, search plots cannot always extend to the required radius in all direction. As such, habitat mapping must be done on a seasonal basis to assess the changes in vegetation structure throughout the year. The following visibility classes are recommended by SABAA (Aronson *et al.* 2020):

Table 6-1 | Visibility classes for search plots

Visibility class	Percentage ground cover	Vegetation heigh
Class 1 – Easy	≥ 90 % bare ground	≤ 15 cm tall
Class 2 – Moderate	50 % bare ground	≥ 15cm tall
Class 3 – Difficult	Little or no bare ground	≥ 25 % ≥ 30cm tall

Turbines must be searched in a randomized order so that the data is not biased towards a specific time of day or turbine and all carcasses found within the search plot must be collected. During collection, nitrile gloves must be worn, and the carcasses placed in labelled Ziploc bags for storage. Carcasses can be used at a later stage during carcass removal trials (see section D)), and care must be taken that no human scent is passed on to the carcasses.

The data associated with each carcass must be appropriately logged, and these data includes, but is not limited to, turbine number, time of collection, distance to turbine and GPS locations. Examples of full data sheets are provided in Aronson *et al.* 2020, but these must be adjusted to suite the specific AOI and environmental conditions. If possible, the cause of death must be noted, but this is not a requirement based on the Guidelines.

C) Training of search teams

As it will not always be possible for the bat specialist to be on site conducting the carcass searches, the team responsible must be well trained to conduct the searches and be educated in the potential impacts of WEF, data collection and management, and the skills needed to collect the data, bat handling and bat ecology. The efficiency of all staff must be tested before the monitoring is started to test if training was indeed successful and whether the search team is competent enough to conduct the field work without the specialist being present. This will involve field trials where a known number of bat carcasses in various states of decomposition, or decoys when carcasses are not available, is placed randomly around turbines in all vegetation categories. This will allow the specialist to assess the efficiency of the

search team by comparing the number of carcasses/decoys found by the search team to the number that was placed. Everyone that forms part of the team must be assessed separately without prior knowledge. At least 10 carcasses/decoys must be used per visibility class and of different sizes.

D) Carcass removals

A trial must be conducted to determine the number of bat carcasses that are removed by scavengers in the area. This is done by placing a known number of bat carcasses in the area and revisiting these carcasses to determine how long it takes for scavengers to remove them. These trials must be done between turbine plots to avoid attracting scavengers to turbines and reduce trampling in turbine search plots. Gloves must be worn to avoid imparting human scent onto carcasses. A minimum of 10 carcasses must be used evenly spaced across visibility classes.

6.2.7.3 Fatality estimation

To standardize fatality estimation across WEFs, software GenEst must be used to estimate the number of bat deaths per turbine and across the area. It is assumed that the number of carcasses present at the onset of the survey is zero, even though this might not always be the case if the survey commences after the turbines are operational. As such, all carcasses must be removed prior to the start of the survey if it commences after the WEF is operational. Data must be presented as number of fatalities per MW per year (fatalities/MW/year), the number of fatalities per turbine (fatalities/turbine), and/or the number of fatalities per facility (fatalities/facility). Mitigation measures need to be employed if the number of fatalities exceeds the thresholds as stipulated in MacEwan *et al.* 2020a. All records must be kept in a central database that can be accessed by stakeholders.

6.2.7.4 Thresholds and mitigation

Based on Mitigation Guidelines for South Africa, bat fatalities at WEF in the Albany Thicket ecoregion may not exceed 0.44 bats per 10 ha per annum. Given the size of the current POAI that equates to 303,7 bat fatalities per annum, and if this number is exceeded immediate mitigation measures must be prescribed by the bat specialist and implemented. Given the relatively low bat activity across the POAI, and that activity was even lower in the rotor sweep zone, it is not expected that this number of bat fatalities will be reached. However, special attention must be paid to species listed in Table 3 of MacEwan (2020a) which list species where one fatality could trigger the need for immediate mitigation interventions. Based on the original EIA and records in the ACR (2020) it is however not expected that any of these species must be present on the PAOI. If it becomes necessary to additionally implement mitigation interventions, these must be weather and turbine specific and be implemented under the advisement of the bat specialist undertaking the Operational Monitoring.

6.3 Stormwater and erosion control management plan (B. Mzila of Zimpande Research Collaborative, part of SASEnvironmental)

The proposed development is likely to have some impact on the natural surface water flow regime of the proposed site, particularly during the construction phase, thus impacting on the generation of stormwater and the associated potential for erosion. It is therefore imperative to identify all possible impacts that the proposed WEF might have on stormwater generation and manage this water accordingly. Therefore, the purpose of this section is to produce a stormwater and erosion control management plan which will ensure that the clean and dirty water generating areas are firstly identified and then managed appropriately for both the construction and operation phases. The aim of this management plan is to consider best practices as presented in various guidelines in South Africa and beyond. These include:

- ▶ Government Notice 704 (Government Gazette 20119), which includes important guidelines by which clean and dirty water producing areas can be managed effectively. This guideline is specific to mining, but the principles are useful in managing runoff impacted by development.

- ▶ Department of Water and Sanitation (DWS) Best Practice Guideline G1 for Stormwater Management.
- ▶ The South African Roads Agency Limited (SANRAL) 6'th edition Drainage Manual (2013) provides some valuable insight specific to the construction and operation of various roads, a network of which will be developed as part of this proposed project; and
- ▶ Landcom Soils and Construction, Volume 1, 4th edition from 2004 has been used widely in the South African context in providing practical recommendations regarding the management of stormwater and associated erosion controls.

6.3.1 Identification of Sensitive areas

The footprint areas are considered suitable for WEF installations since the footprint areas within which the crane pads are to be located are relatively flat area with an average slope of 0.3 percent. The infrastructure is equally exposed to any potential runoff; however, no risks are foreseen for this area.

6.3.2 Stormwater Management Issues

The concrete crane pads are impervious, and they are generally installed in a manner that allows stormwater to fall directly to the ground. To encourage infiltration and discourage erosion, the site is graded to encourage sheet flow of runoff across the site, including areas under the panels. Figure 13 below depicts a typical illustration of a WEF development.



Figure 6-1 | Typical installation and foundation examples for the WEF including the crane pad

6.3.3 Clean and Dirty Water Areas

The GN 704 regulations were consulted during this study, as a minimum requirement stipulated under the regulation for any person in control of the mine to carry some of the activities listed in section 1.1 of

this document. It must be noted that, although GN 704 is applicable to mining scenarios, it was found to be useful in the development of a stormwater and erosion management plan for this study.

The following definitions are important to the development of a stormwater and erosion control management plan

Under the definitions section on Regulation GN 704:

"Clean water system", includes any dam, other form of impoundment, canal, works, pipeline and any other structure or facility constructed for the retention or conveyance of unpolluted water.

"Dirty water system", includes any dam, other form of impoundment, canal, works, pipeline, residue deposit and any other structure or facility constructed for the retention or conveyance of water containing waste. These areas are however anticipated to be associated with areas prone to erosion by rainfall due to the exposure of soil attributable to vegetation stripping. Without mitigation, disturbed areas will likely result in a higher proportion of Total Suspended Solids (TSS) compared to undisturbed areas. Sediment control is consequently necessary and is commonly achieved through the inclusion of stormwater settling facilities (also known as silt traps) or through silt fences.

Based on the above extract from Regulation GN 704, construction of the dirty water management and containment infrastructure is deemed necessary as a minimum requirement in terms of Regulation GN704. A system of clean water diversion trenches and berms must redirect the water around the WEF crane pads, and the water allowed to recharge the downgradient landscape after it has been released in a diffuse manner.

The extent of the impact of the proposed WEF development is anticipated to be limited to the project area during the construction phase. It is therefore the opinion of the specialist that the magnitude of the impact is anticipated to be low, as stormwater generating areas will only be limited to infrastructural areas.

6.3.4 Construction Phase Management Plan for Crane Pads & Turbines

For the purposes of this study, the WEF and associated infrastructure areas are considered 'dirty areas' since the infrastructure areas will likely generate sedimentation due to vegetation clearing as well as excavation which will subsequently impact on the adjacent watercourses. It is therefore imperative that the necessary mitigation measures are put in place to ensure that the impact on the receiving is reduced as far as practically possible.

Sediment control is often necessary where vegetation is stripped away, exposing areas susceptible to erosion during significant storm events. Control of sediment is generally achieved through the inclusion of stormwater settling facilities. Silt laden runoff (with a high TSS load) require a slowing down of the water for the suspended solids to settle. The following mitigation measures must be adhered to, as adopted from a combination of the various guidelines previously listed:

- ▶ Avoid any construction activities within the 1:100-year flood-line or 100 meters from the edge any watercourse, except for linear infrastructure such as transmission lines and other flood compatible infrastructure such as electrical pylons;
- ▶ Clearing of vegetation and associated excavation areas must be kept to a minimum;
- ▶ Vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive stormwater and wind are anticipated to be low;
- ▶ No vegetation clearance must be undertaken prior to periods of inactivity;
- ▶ Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast. Thus, a water tanker must be available onsite;

- ▶ Soil/topsoil must be placed onto the concrete slab once it has dried up and the turbine fixed, with natural vegetation re-established to mimic the previous undisturbed environment as far as practically possible.
- ▶ All excavation/construction vehicles must be in good condition and inspected regularly to ensure there are no chemical spills (diesel/oil) which will negatively impact the receiving environment;

6.3.5 Construction Phase Management Plan for Access Roads

Construction of access routes across or near watercourses may potentially impede the natural flow of water, particularly if access is required across running water. Thus, uncontrolled access of vehicles through watercourses must be avoided as this will likely alter the hydrology and soil structure of these areas. The duration of impact on the system must be minimised as far as possible by ensuring that the duration of time in which flow alteration and sedimentation will take place is minimised. The bullet points below summarise key mitigation measures that can be adopted to ensure that the impact on the watercourses is minimised as far as practically possible:

- ▶ Construction of new access roads must be kept to what is necessary. Stick to existing roads as far as possible;
- ▶ The construction of the proposed access roads will create large areas prone to erosion due to soils being exposed as well as sloping terrain. Roads must therefore be constructed in a manner to rapidly stabilise soils, while roadside drainage must be included where necessary. Additional information in this regard can be obtained on the SANRAL (2013) 6th Edition Drainage Manual;
- ▶ All disturbed areas must be rehabilitated (as soon as possible) to represent the previous undisturbed environment (soil, land use, slope) as closely as possible to limit the impact on receiving water resources through improve infiltration and limited soil erosion;
- ▶ A water tanker must be available to be used for dust suppression must the need arise; and
- ▶ A practical erosion control handbook must be developed, based on the principles developed in this report and given to the construction contractors to ensure the impact on receiving water resources is limited;
- ▶ No dumping of construction material must be allowed within a watercourses or associated buffer zones at any stage of the power line construction. No temporary storage of building material must be allowed within all wetland areas or the associated buffer zones;
- ▶ No servicing or refuelling of equipment or mixing of concrete must be allowed within any wetland area or associated buffer; and
- ▶ Ensure that no alteration of the watercourse bed material or riverbed profile takes place or that the longitudinal and cross sectional profile of the wetland occurs in order to prevent erosion, ponding and sedimentation.

6.3.5.1 Stormwater Management and Erosion Control for Crane Pads and Turbines

In terms of stormwater management and erosion control, four options have been considered for the site, namely:

1. A silt fence approach.
2. Light trenches/small berms routed to bioswales and well sized settling ponds.
3. Herringbone type drainage structures to reduce flows; or
4. A combination thereof.

Following the analysis of the terrain, vegetation, soil and the extent of the footprint area, a catchment reduction approach was adopted which aimed at reducing the velocity of runoff to reduce the erosive energy to ensure that soil erosion is limited during all phases of development.

This approach is aimed to achieve the following:

- ▶ Diverting upstream clean water which would otherwise flow into the dirty areas;

- ▶ Containing dirty water in the dirty areas and allow suspended sediment to settle out prior to release; and
- ▶ Providing added flood protection which mitigates residual flood risk.

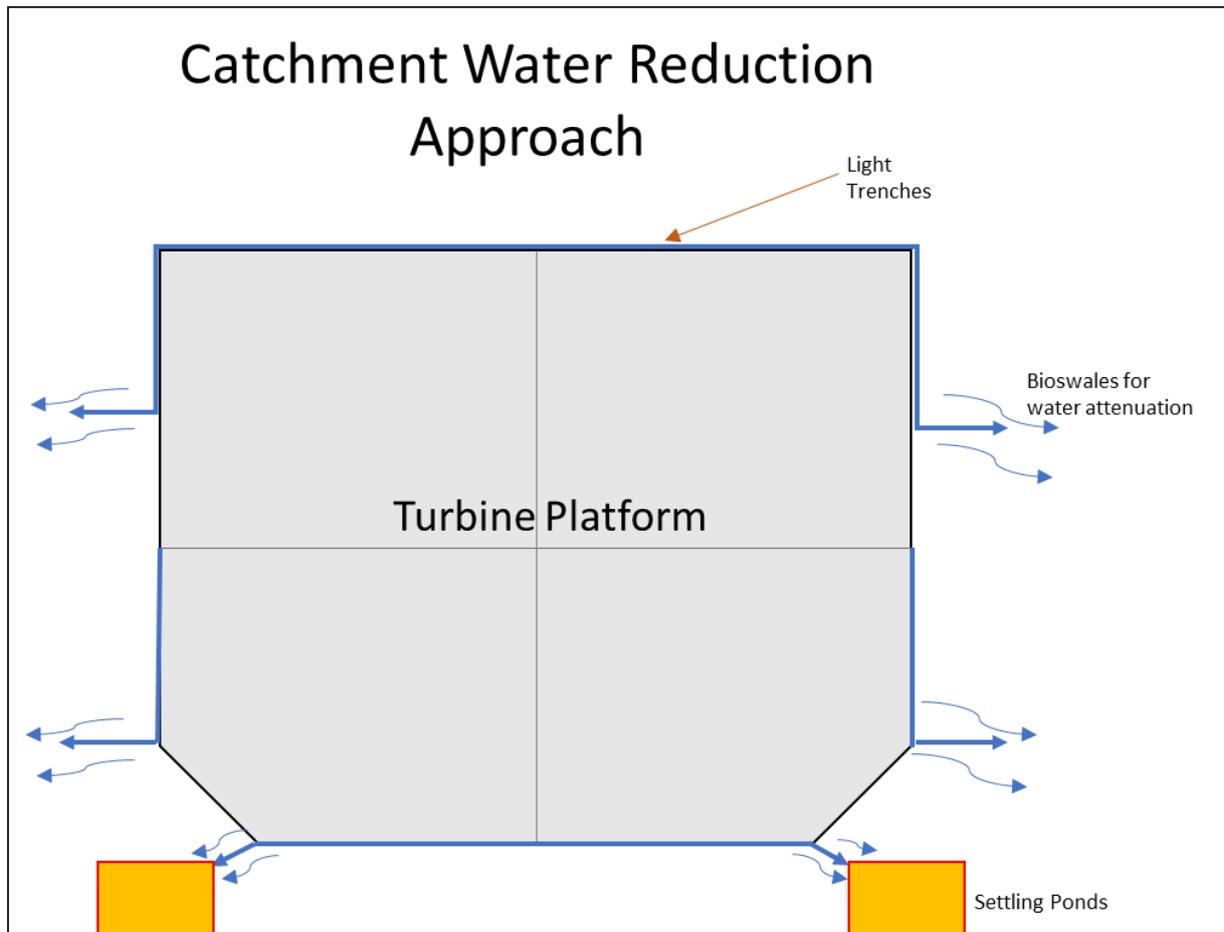


Figure 6-2 | Conceptual illustration of the catchment reduction approach associated with the crane pad

The volume of runoff calculated from the stormwater modelling programme for a 1:10 year rainfall with a design rainfall of 64.9mm for the catchment area (includes turbine platform and crane pad) depicted in Figure 14 is summarised below volumes indicated are for the entire flood event:

The catchment area for each crane pad and turbine area was calculated to have an approximate area of 0.25ha, and the total runoff was 5,783m³. The channel component to cater for the flood event using the standardised design parameters was more than sufficient, for the generic scenarios modelled. The catchment area channel had a peak flow of 1.06 m³/s. The results are summarised below.

Table 6-2 | Summary results of the stormwater from the PCSWMM Model

Total Precipitation (mm)	Total Evaporation (mm)	Total Infiltration (mm)	Total Runoff (mm)	Total Runoff (m3)	Peak Runoff (m3/s)
64.9	51.28	14.82	28,91	5783	1.06

The construction of the dirty water berm and channel can be achieved using a trench digger or scraper (for instance) which provides sufficient capacity to accommodate the peak flow.

The constructed berm and channel must route runoff to a sediment control area where sediment can settle, thereby minimising impact on the downstream receiving environment with water being released

after settling the solids. The sediment control area can be a silt trap or silt fence since runoff rates for this area are anticipated to be low. A silt fence is however recommended for this area due to the low peak flows and volumes expected. Regular inspection of the berms/channels and sediment control areas must be undertaken to assess erosion which may result from a loss in vegetation or cavitation from soil slumping. Figure 9 presents a conceptual stormwater/erosion management using a berm/channel and silt trap approach. It must be noted that clean water diversion was considered in this assessment to reduce the dirty water volume, however the volume of clean water could not be quantified due to unavailability of accurate contour data.

6.3.5.2 Stormwater Management and Erosion Control for Access Roads

During the construction and operational phases of the proposed power line route, erosion berms must be installed to prevent gully formation and siltation of the wetland resources. The following points must serve to guide the placement of erosion berms:

- ▶ Where the track has slope of less than 2%, berms every 50m must be installed.
- ▶ Where the track slopes between 2% and 10%, berms every 25m must be installed.
- ▶ Where the track slopes between 10%-15%, berms every 20m must be installed.
- ▶ Where the track has slope greater than 15%, berms every 10m must be installed

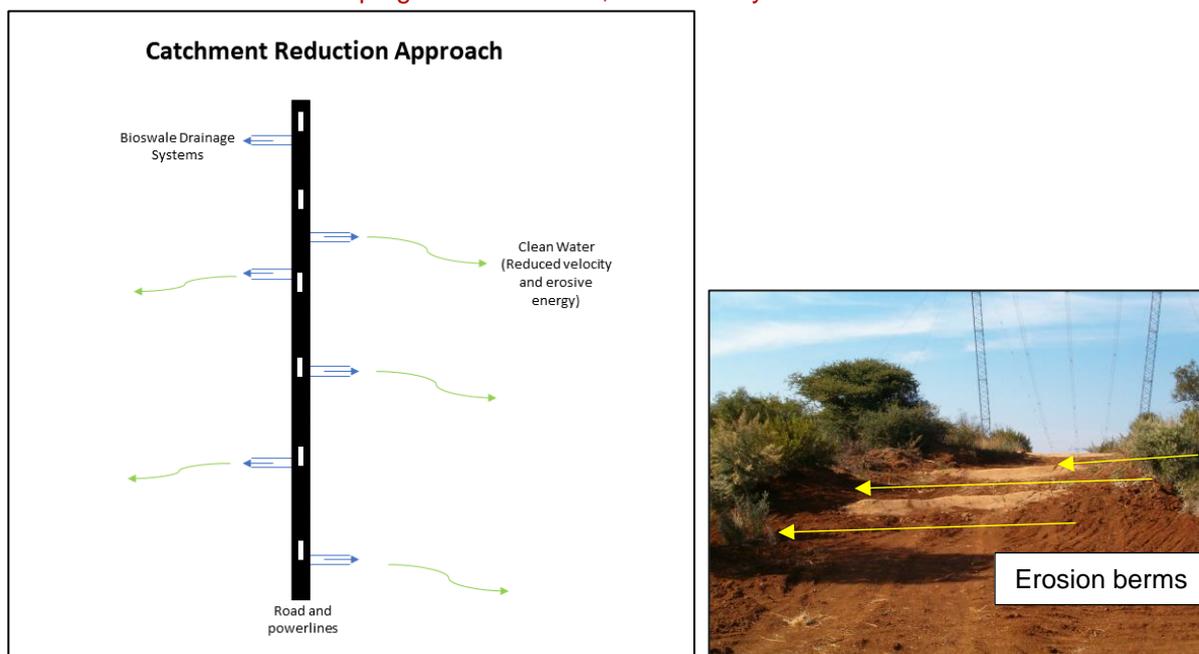


Figure 6-3 | Conceptual illustration of the catchment reduction approach associated with the access roads

The berm and channel approach were tested using PCSWMM stormwater modelling software as outlined in Appendix A. The 1:10 year recurrence interval event was selected as it represents a reasonable design event for sediment control, and the standardised diversion design was considered sufficient to accommodate runoff from the 1:10 year recurrence interval event.

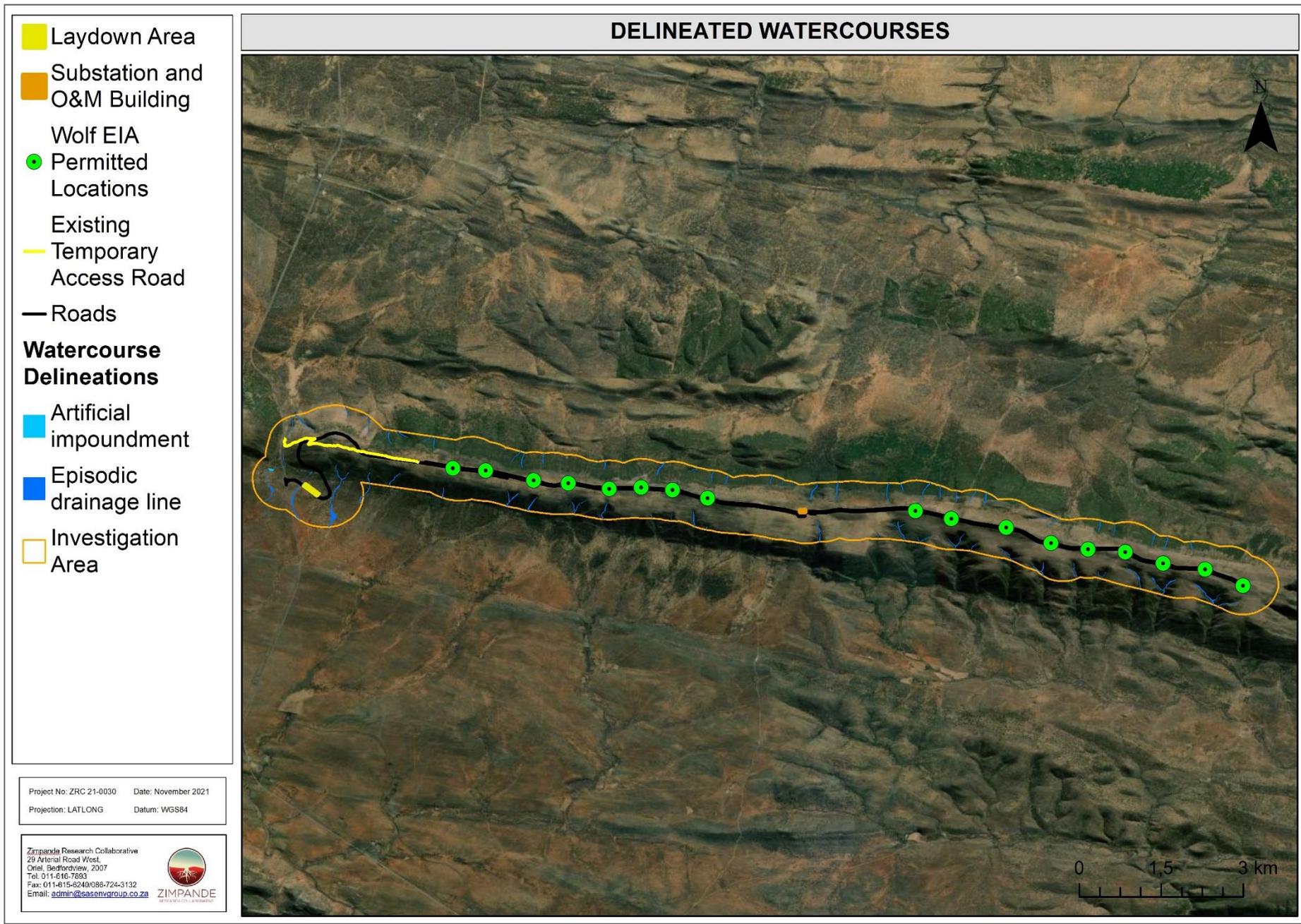


Figure 6-4 | Delineated watercourses associated with the proposed development.



6.3.5.3 Operational Phase - Management Plan

During the operational phase, it is anticipated that the impact on surface water resources will be limited, particularly if the principles presented in the construction phase (above) are adhered to. The following will, however, need to be considered:

- ▶ Early interventions strategies are pivotal in ensuring that the management plan is successful;
- ▶ Regular inspection of the WEF areas to assess erosion which may result from a loss in vegetation;
- ▶ Vegetated areas must not be subject to chemical fertilisation or herbicides or pesticides;
- ▶ Continued watering to ensure wind erosion is limited at the construction sites until such time that the natural vegetation is effectively established; and
- ▶ Maintain and clean all drainage structures along roads within the project area.

6.4 Pollution monitoring management plan

Contamination sources are mostly unpredictable and often occur as incidental spills, leaks, and sedimentation during both the construction and operational phase. The watercourses associated with the development are equally disposed to pollution, and the significance of contamination is moderately high for all identified watercourses without mitigation, largely depending on the nature, volume and/or concentration of the contaminant of concern as well as the rate at which contaminants are transported by water. Excavation of foundation of WEF support structures will likely result in loose sediments within the landscape, specifically if works are taken during a period of rainfall (if applicable) and this mostly likely affect the watercourses in terms of sedimentation and runoff volume delivered into the watercourses particularly during the construction phase. Whereas potential leakages of construction machinery may also impact the soil particles which may potentially be transport to the watercourses during erosive rainfall events. If the management protocols are not well managed this will more likely lead to potential reduction of water quality of the watercourses. Therefore, strict pollution management protocols and activity specific Environmental Management Programme (EMP) and monitoring guidelines must be adhered to during the construction and operational activities.

Key pollution management and monitoring include but not limited to:

- ▶ Sediment traps can be created by pegging an appropriate geotextile across the entire width of the work area at the specified support structure, held down by cobbles/boulders or by geotextile wrapped hay bales spanning the width of the work area and staked into position;
- ▶ Dust suppression measures must be implemented (such as spray watering on gravel access roads) throughout the proposed development activities to prevent excessive dust and suppress the potential for runoff of sediment which may impact the watercourses;
- ▶ The frequency of monitoring must be once in three months until such a time when vegetation has fully established within the disturbed areas;
- ▶ Monitoring must also be undertaken after every erosion rainfall event for a period of three years to ensure that the adjacent watercourses are not impacted, the structural integrity of the WEF is maintained;
- ▶ Withdraw equipment for maintenance if change in emission characteristics is noticeable;
- ▶ A spill prevention, emergency spill response plan, and fire prevention plans must be developed and be implemented;
- ▶ An emergency response contingency plan must be put in place to address clean-up measures must a spill and/or a leak occur, as well as preventative measures to prevent contamination;
- ▶ Burying of any waste including rubble, domestic waste, empty containers on the site must be strictly prohibited and all construction rubble waste must be removed to an approved disposal site; and
- ▶ Spill kits (such as spill-sorb or a similar type product) must be kept on site and used to clean up hydrocarbon spills in the event that they must occur.

6.5 General lights at night mitigations

Effective light management needs to be incorporated into the design of the lighting to ensure that the visual influence is limited without jeopardising operational safety and security.

Mitigation:

- ▶ Effective light management needs to be incorporated into the design of the lighting to ensure that the visual influence is limited without jeopardising operational safety and security (See lighting mitigations by The New England Light Pollution Advisory Group (NELPAG) and Sky Publishing Corp in 14.2);
- ▶ Utilisation of specific frequency LED lighting with a green hue on perimeter security fencing.
- ▶ Directional lighting on the more exposed areas of operation, where point light source is an issue;
- ▶ No use of overhead lighting and, if possible, locate the light source closer to the operation; and
- ▶ Near field or task lighting using LEDs is preferred over flood lighting.

Mesopic Lighting

Mesopic vision is a combination of photopic vision and scotopic vision in low, but not quite dark, lighting situations. The traditional method of measuring light assumes photopic vision and is often a poor predictor of how a person sees at night. The light spectrum optimized for mesopic vision contains a relatively high amount of bluish light and is therefore effective for peripheral visual tasks at mesopic light levels (CIE, 2012).

The Mesopic Street Lighting Demonstration and Evaluation Report by the Lighting Research Centre (LRC) in New York found that the 'replacement of white light sources (induction and ceramic metal halide) were tuned to optimize human vision under low light levels while remaining in the white light spectrum. Therefore, outdoor electric light sources that are tuned to how humans see under mesopic lighting conditions can be used to reduce the luminance of the road surface while providing the same, or better, visibility. Light sources with shorter wavelengths, which produce a "cooler" (bluer and greener) light, are needed to produce better mesopic vision. Based on this understanding, the LRC developed a means of predicting visual performance under low light conditions. This system is called the unified photometry system. Responses to surveys conducted on new installations revealed that area residents perceived higher levels of visibility, safety, security, brightness, and colour rendering with the new lighting systems than with the standard High-Purity Standards (HPS) systems. The new lighting systems used 30% to 50% less energy than the HPS systems. These positive results were achieved through tuning the light source to optimize mesopic vision. Using less wattage and photopic luminance also reduces the reflectance of the light off the road surface. Light reflectance is a major contributor to light pollution (sky glow).

'Good Neighbour – Outdoor Lighting'

Presented by the New England Light Pollution Advisory Group (NELPAG) (<http://cfa.harvard.edu/cfa/ps/nelpag.html>) and Sky & Telescope (<http://SkyandTelescope.com/>). NELPAG and Sky & Telescope support the International Dark-Sky Association (IDA) (<http://www.darksky.org/>).

What is good lighting? Good outdoor lights improve visibility, safety, and a sense of security, while minimising energy use, operating costs, and ugly, dazzling glare.

Why should we be concerned? Many outdoor lights are poorly designed or improperly aimed. Such lights are costly, wasteful, and distractingly glary. They harm the night-time environment and neighbours' property values. Light directed uselessly above the horizon creates murky skyglow — the "light pollution" that washes out our view of the stars.

Glare Here's the basic rule of thumb: If you can see the bright bulb from a distance, it's a bad light. With a good light, you see lit ground instead of the dazzling bulb. "Glare" is light that beams directly from a bulb into your eye. It hampers the vision of pedestrians, cyclists, and drivers.

Light Trespass Poor outdoor lighting shines onto neighbours' properties and into bedroom windows, reducing privacy, hindering sleep, and giving the area an unattractive, trashy look.

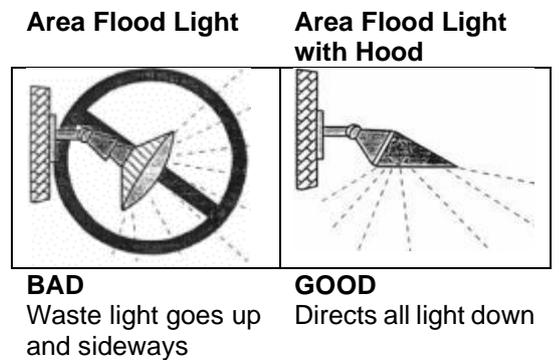
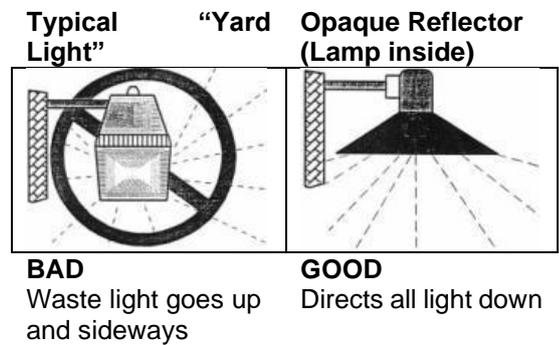
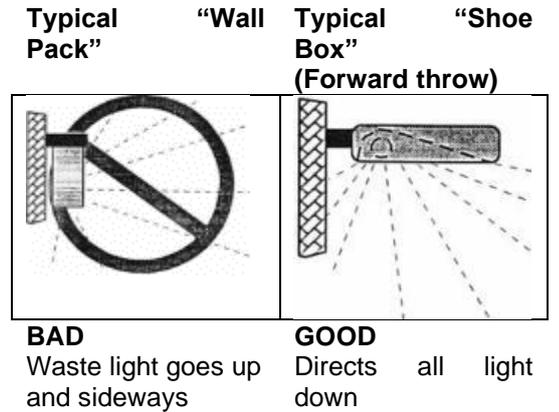
Energy Waste Many outdoor lights waste energy by spilling much of their light where it is not needed, such as up into the sky. This waste results in high operating costs. Each year we waste more than a billion dollars in the United States needlessly lighting the night sky.

Excess Lighting Some homes and businesses are flooded with much stronger light than is necessary for safety or security.

How do I switch to good lighting?

Provide only enough light for the task at hand; don't over-light, and don't spill light off your property. Specifying enough light for a job is sometimes hard to do on paper. Remember that a full Moon can make an area quite bright. Some lighting systems illuminate areas 100 times more brightly than the full Moon! More importantly, by choosing properly shielded lights, you can meet your needs without bothering neighbours or polluting the sky.

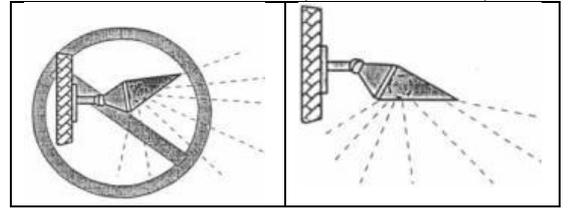
Good and Bad Light Fixtures



1. Aim lights down. Choose “full-cut-off shielded” fixtures that keep light from going uselessly up or sideways. Full-cut-off fixtures produce minimum glare. They create a pleasant-looking environment. They increase safety because you see illuminated people, cars, and terrain, not dazzling bulbs.
2. Install fixtures carefully to maximize their effectiveness on the targeted area and minimise their impact elsewhere. Proper aiming of fixtures is crucial. Most are aimed too high. Try to install them at night when you can see where all the rays go. Properly aimed and shielded lights may cost more initially, but they save you far more in the long run. They can illuminate your target with a low-wattage bulb just as well as a wasteful light does with a high-wattage bulb.
3. If colour discrimination is not important, choose energy-efficient fixtures utilising yellowish high-pressure sodium (HPS) bulbs. If “white” light is needed, fixtures using compact fluorescent or metal-halide (MH) bulbs are more energy-efficient than those using incandescent, halogen, or mercury-vapour bulbs.

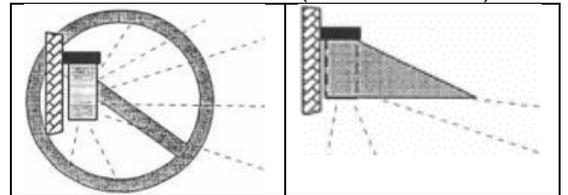
What You Can Do to Modify Existing Fixtures

Change this . . . to this (Aim downward)



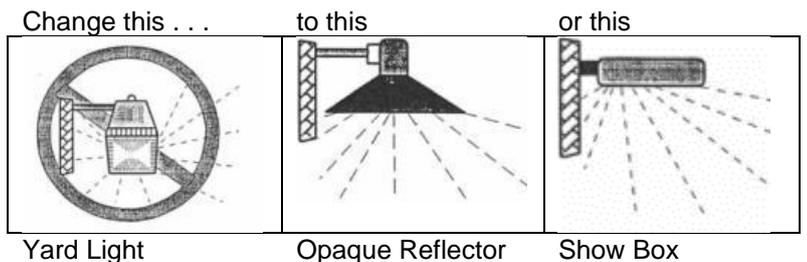
Floodlight:

Change this . . . to this (Aim downward)



Wall Pack

4. Where feasible, put lights on timers to turn them off each night after they are no longer needed. Put home security lights on a motion-detector switch, which turns them on only when someone enters the area; this provides a great deterrent effect!



Replace bad lights with good lights.

You'll save energy and money. You'll be a good neighbour. And you'll help preserve our view of the stars.

7 Decommissioning

The Power Purchase Agreement for the Wolf Wind Farm facility is only valid for a period of 20 years after which the facilities would be decommissioned and the site rehabilitated, or the Power Purchase Agreement extended, the turbines re-powered and the plant will continue to operate. Should the Wind Energy Facility be decommissioned, materials and infrastructure that could not be recycled would need to be disposed of at an approved landfill site. Infrastructure must be removed, and disturbed areas rehabilitated in accordance with the specifications of a suitably qualified rehabilitation specialist during decommissioning.

Since the proposed Wind Energy Facility is comprised of inert materials (mostly concrete), the residual risks associated with decommissioning would be negligible. Should the need arise to decommission the Wind Energy Facility a decision would need to be made as to whether the ancillary infrastructure would be removed or left *in situ*. Roads which are no longer required after decommissioning must be scarified and the areas rehabilitated with the assistance of a rehabilitation specialist.

Materials will be recycled where appropriate, and any hazardous substances shall be removed and disposed of in terms of the requirements of the relevant legislation (e.g., Hazardous Substances Act, No. 15 of 1973) and SANS specifications.

A detailed decommissioning plan must be developed before the closure of the Wind Energy Facility. The construction phase EMPr could be used as a guideline to facilitate the detailed decommission phase EMPr. The mitigation measures below are only provisional mitigation measures.

- ▶ All Wind Energy Facility structures, associated structures and fencing shall be removed and recycled.
- ▶ Unnecessary internal roads (as agreed upon by the landowner) shall be ripped and then rehabilitated. An agreement is to be reached with the landowners regarding roads and fencing.
- ▶ All impacted footprint areas shall be rehabilitated and restored to indigenous, endemic vegetation as per the construction phase rehabilitation plan.
- ▶ Noise and disturbance associated with decommissioning activities shall be kept to a minimum.
- ▶ Remove infrastructure not required for the post-decommissioning use of the site. This may include the turbines, ancillary buildings, masts etc.
- ▶ Rehabilitate access roads and servitudes not required for the post-decommissioning use of the site. If necessary, an ecologist must be consulted to give input into rehabilitation specifications.
- ▶ Monitor rehabilitated areas quarterly for at least a year following decommissioning, and implement remedial action as and when required.
- ▶ Contaminated runoff from the various decommissioning activities on the site must be prevented from directly entering the streams and drainage channels.
- ▶ All rubble associated with construction and decommission activities must be removed from the drainage lines after these phases are complete.
- ▶ All principles used in the construction phase EMPr and associated Environmental specifications will apply to decommissioning activities.

8 Conclusion

In conclusion, it should be noted that the EMPr must be regarded as a living document and changes should be made to the EMPr as required by project evolution, while retaining the underlying principles and objectives on which the document is based.

The EMPr has incorporated impacts and mitigation measures from the Environmental Impact Report, specialist reports **subsequent EA amendments and the micrositing and EMPr finalisation process** as well as incorporating principles of best practice in terms of environmental management. By identifying the potential impacts, mitigation measures, performance indicators, responsibilities, available resources, potential schedule, and verification responsibility, the EMPr has provided a platform on which both the construction phase and the operational phase EMPrs can be founded. The EMPr has ensured that the individual EMPrs will be able to incorporate mitigation measures based on the project in its entirety as opposed to phase-specific measures. The EMPr must be included in all tender documentation so that perspective services providers and contractors are made aware of and able to price for compliance with the EMPr.

This EMPr will be submitted to the DFFE following a 30day public comment period. All comments and responses are submitted to the DFFE for consideration in reaching a decision.

ANNEXURE A CURRICULUM VITAE OF ENVIRONMENTAL ASSESSMENT PRACTITIONERS

**ANNEXURE B CONSTRUCTION EMPR GENERAL
ENVIRONMENTAL SPECIFICATIONS
(COMPREHENSIVE)**

**ANNEXURE C GENERIC EMPR FOR THE
DEVELOPMENT AND EXPANSION OF SUBSTATION
INFRASTRUCTURE FOR THE TRANSMISSION AND
DISTRIBUTION OF ELECTRICITY (DEPARTMENT OF
ENVIRONMENTAL AFFAIRS)**

ANNEXURE D ENVIRONMENTAL AUTHORISATION AND AMENDMENT

**ANNEXURE D.1 Original EA (2015-09-14)
14/12/16/3/3/2/599**

ANNEXURE D.2 EA AM1 (2016-11-17)
14/12/16/3/3/2/599/AM1

ANNEXURE D.3 EA AM3 (2017-09-14)
14/12/16/3/3/2/599/AM3

ANNEXURE D.4 EA AM4 (2018-11-26)
14/12/16/3/3/2/599/AM4

**ANNEXURE D.5 EA AM5 (2020-09-22
14/12/16/3/3/2/599/AM5**

ANNEXURE D.6 EA (2022-02-02)
14/12/16/3/3/2/599/1

ANNEXURE D.7 EA AM1 (2022-05-25)
14/12/16/3/3/2/599/1/AM1

ANNEXURE E PUBLIC PARTICIPTATION

ANNEXURE E.1 **Approved Public Participation Plan**

ANNEXURE E.2 I&AP Register

ANNEXURE E.3 Proof of notifications

ANNEXURE E.4 Comments received

ANNEXURE E.5 Comments and responses Report

ANNEXURE F SPECIALIST REPORTS INFORMING FINAL LAYOUT

ANNEXURE F.1 Bat specialist statement regarding micrositing

ANNEXURE F.2 Avifauna Micrositing Report

ANNEXURE F.3 Terrestrial Ecology (Botanical and Fauna) Report

ANNEXURE F.4 Freshwater Report

ANNEXURE G SPECIALIST STATEMENT ON FINAL LAYOUT

ANNEXURE G.1 Avifauna statement regarding the final layout

ANNEXURE G.2 Terrestrial Ecology (Botanical and Fauna) statement regarding the final layout

ANNEXURE G.3 Freshwater statement regarding the final layout

ANNEXURE H SPECIALIST MANAGEMENT PLANS

ANNEXURE H.1 Bat monitoring plan

ANNEXURE H.2 Open Space Management Plan

ANNEXURE H.3 Plant rescue and protection plan

ANNEXURE H.4 Re-vegetation and habitat rehabilitation Plan

ANNEXURE H.5 Alien invasive management plan

ANNEXURE H.6 Stormwater, erosion, and pollution control management plan

ANNEXURE H.7 Transportation and Traffic management plan

ANNEXURE I MISCELLANEOUS

ANNEXURE I.1 Neotel acceptance letter

ANNEXURE I.2 SACAA Approval

ANNEXURE I.3 Confirmation of SIP status

In diversity there is beauty
and there is strength.

MAYA ANGELOU

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