

ENVIRONMENTAL MANAGEMENT PROGRAMME FOR HOOGLAND 1 WIND FARM

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ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
BA	Basic Assessment
BE	Black Enterprise
BESS	Battery energy storage system
CBA	Critical Biodiversity Area
CLO	Community Liaison Officer
DEA&DP	Department of Environmental Affairs and Development Planning
DFFE	Department of Forestry, Fisheries and Environment (formerly Department of Environmental Affairs (DEA))
EA	Environmental Authorisation, i.t.o. NEMA
EAPASA	Environmental Assessment Practitioners Association of South Africa
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIRF	Environmental Incident Report File
EMPA	Environmental Management Planning and Approvals
EMPr	Environmental Management Programme
ESA	Ecological Support Areas
ESO	Environmental Site Officer
GHG	Greenhouse Gas
HSE	Health, Safety and Environment
HWC	Heritage Western Cape
KNP	Karoo National Park
MPRDA	Mineral and Petroleum Resources Development Act (No. 28 of 2002)
MSDS	Material Safety Data Sheet
NEMA	National Environmental Management Act, 1998 (No. 107 of 1998)
NEM:BA	National Environmental Management: Biodiversity Act, 2004 (No. 10 of 2004)
NHRA	National Heritage Resources Act, 1999 (No. 25 of 1999)
NWA	National Water Act, 1998 (No. 36 of 1989)
O&M	Operation and Maintenance
Red Cap	Red Cap Energy (Pty) Ltd
RMIPPPP	Risk Mitigation Independent Power Producer Procurement Programme
REIPPP	Renewable Energy Independent Power Producer Procurement Programme

Acronym / Abbreviation	Definition
SAHRA	South African Heritage Resources Agency
SCC	Species of Conservation Concern
SE	Site Engineer

1. INTRODUCTION

Red Cap Energy (Pty) Ltd ('Red Cap') is proposing to develop four wind farms and associated grid connections (together referred to as the Hoogland Project or project) in an area located between Loxton and Beaufort West in the Western Cape Province.

Hoogland 1 and 2 are located to the north closer to Loxton (see Figure 1-1) and form the Northern Cluster of wind farms that will share a grid connection named the Hoogland Northern grid connection. Hoogland 3 and 4 are located closer to Beaufort West and comprise the Southern Cluster which will similarly share a separate grid connection, named the Southern grid connection.

The two grid connections are each in the form of 132 kV overhead power lines and will connect the Hoogland wind farms to an approved Collector Substation on Red Cap's adjacent Nuweveld wind farms project (see Figure 1-1).

It is intended that these projects would be bid in a forthcoming round of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP).

Each of the aforementioned projects (i.e. the four wind farms and two grid connections) were the subject of an Environmental Impact Assessment (EIA) or Basic Assessment (BA) process that were undertaken in terms of the National Environmental Management Act (107 of 1998) (NEMA) EIA Regulations GN R982 of 2014 (as amended) and submitted to the Department of Forestry, Fisheries and the Environment (DFFE) as part of the application process for Environmental Authorisation (EA) for each facility¹.

Each project would therefore have its own EA and have specific conditions that would need to be complied with. DFFE issued the following reference number for the Hoogland 1 Wind Farm: 14/12/16/3/3/2/2147.

Specialist studies were commissioned to verify the sensitivity and assess the impacts of the wind farms under the Gazetted specialist protocols (GN R 320 and GN R 1150 of 2020).

This Environmental Management Programme (EMPr) has been prepared specifically for the Hoogland 1 Wind Farm (hereafter "Hoogland 1" or "the project") and associated infrastructure. Separate EMPrs have been developed for the Hoogland 2, Hoogland 3 and Hoogland 4 wind farms as well as for the two grid connections.

Construction management of substation and overhead powerline infrastructure with a capacity greater than 33 kV must be undertaken in accordance with generic EMPrs for this infrastructure² (see Appendix F to the Final EIA Report for the generic substation and overhead powerline infrastructure EMPrs). The scope of this EMPr therefore relates to all other components of the project (see Section 1.2.2) and excludes the construction of substation and overhead powerline infrastructure with a capacity of more than 33 kV.

¹ The Department of Forestry, Fisheries and the Environment (DFFE) granted Red Cap permission to combine the two Northern Cluster Wind Farms (Hoogland 1 and Hoogland 2) into one application for Environmental Authorisation; and similarly to combine the two Southern Wind Farms (Hoogland 3 and Hoogland 4) into one process under Regulation 11 (1) of GN R. 982; however, it is anticipated that separate EAs will be issued for the four projects, and as such separate EMPrs are being prepared for each. The two grid connections were dealt with as stand-alone / separate application processes.

² Government Notice 435 of 2019

1.1 PURPOSE OF THE EMPr

The purpose of this document is to provide environmental management practices and recommendations to ensure that the known and possible unknown impacts associated with the project are avoided, and where they cannot be avoided, are managed, mitigated and/or kept to acceptable levels. This EMPr is thus intended for use by all role players and must form part of the contract documentation for all contracts pertaining to the construction and operation of the project and will thus form a binding agreement between the Contractor and the Applicant (see Section 2).

The recommendations included herein are applicable to the following phases of the proposed development:

- Planning and design;
- Pre-construction and construction;
- Operation; and
- Closure and decommissioning.

Decommissioning mitigatory measures that have been identified through the EIA process are included in this EMPr; however, decommissioning is not dealt with in detail as the action of 'decommissioning' itself would have to comply with the prevailing legislation at that time (including environmental).

This EMPr aims for alignment and optimisation of environmental management processes with conditions of authorisation that may arise. Any conditions of authorisation contained in the EA that contradict the recommendations made in this EMPr, supersedes the recommendations of this document. Prior to the commencement of construction of the project the EMPr must be updated to incorporate all conditions of authorisation contained in the EA, any relevant conditions of other environmental and/or land use permits.

The intention is also that the document is not static, and that improvements can be made as the project progresses and the need arises. Furthermore, the EMPr must be updated where the findings of the environmental audit reports indicate insufficient mitigation of environmental impacts associated with the proposed project, or insufficient levels of compliance with the EMPr

Any significant revisions to the EMPr document must be approved by DFFE before the EMPr is revised. The Environmental Control Officer (ECO) shall be responsible for the implementation and distribution of any "approved" revisions to the EMPr.

1.2 PROJECT BACKGROUND

1.2.1 Site Location and Description

The site has an area of 16 772 ha and is located in the Nuweveld hinterland within the Central Karoo District Municipality and Beaufort West Local Municipality (see Figure 1-1). The site is located ~75km north of Beaufort West and spans the R381, it is centred on the following coordinates: 31°38'18.90"S, 22°18'0.44"E (see Figure 1-2).

The site and surrounding area are rural, characterised by extensive small stock agriculture – mostly sheep and game. As such farms are large to maintain economic viability, and homesteads are few and far between. Small communities who work as farm labourers or in the tourism industry are housed on farms in the area. The Karoo

National Park (KNP), the primary tourist destination in the region, is located to the south of the site approximately 15 km away (see Figure 1-1).

1.2.2 Project Components

The wind farm requires several key components to facilitate the generation of electricity at a large scale. These include:

- A maximum of 60 wind turbines and associated crane pads;
- Two onsite substations³ (including an operations and maintenance area with offices, stores, workshops and laydown area);
- Two battery energy storage systems (BESS) in the vicinity of each substation;
- Underground cables and overhead high voltage power lines³ (to get over steep slopes/ drainage lines etc – up to 66 kV) linking the turbines to each other and to the substations;
- Roads;
- N1 Bypass; and
- Upgrades to watercourse crossing on public roads on and off the site (see Figure 1-4).

Table 1-1 below represents these various wind farm components and their specifications, as well as a detailed breakdown of their impact footprints or sizes. Temporary areas necessary for construction are also included. The location of these components in relation to the wind farm site is shown on Figure 1-2.

Designated construction areas will include temporary site camp/s and general laydown areas and associated maintenance and storage buildings/areas along with guard cabins, as well as a bunded fuel & lubricants storage facility and a concrete batching plant. Individual turbine temporary laydown areas including crane boom laydown areas, blade laydown areas and other potential temporary areas will be established at each turbine.

The construction period for the facility is estimated to be between 18 – 24 months.

The operational life of a wind energy facility is typically 20-25 years where after it could be refurbished / upgraded, or decommissioned depending on the situation at the time, subject to the relevant environmental processes and authorisations.

The targeted nameplate generation capacity for the wind farm is up to a maximum of 420 MW.

Table 1-1: Details of the project

Project Component	Description	Hoogland 1
Location	Central coordinates:	31°38'18.90"S, 22°18'0.44"E
Access	For commuter traffic and some small loads, access from the south would be via Beaufort West via the N1 and R381 travelling between	Through Loxton, south along the R381 towards HL01 and HL02

³ Construction management of substation and overhead powerline infrastructure with a capacity greater than 33 kV must be undertaken in accordance with generic EMPs for this infrastructure according to Government Notice 435 of 2019. The scope of this EMP therefore excludes this infrastructure.

Project Component	Description	Hoogland 1
	Beaufort West and Loxton. For abnormal loads the main access routes for each wind farm are as follows:	
Extent	The total area of the site being considered for developing the wind farm (including shared infrastructure sections where relevant):	16,772 ha
Number of wind turbines and generation capacity	Up to a maximum of 60 wind turbines per wind farm will be developed. The targeted nameplate generation capacity for the wind farm is up to a maximum of 420 MW.	60
	However, the number of turbines included in the layout for approval for the wind farm is as follows:	87
Wind turbine specifications	Rotor diameter:	100 m to 195 m (50 m to 97.5 m blade / radius)
	Hub height:	80 m to 150 m
	Rotor top tip height:	130 m to 247.5 m (maximum based on 150 m hub + 97.5 m blade = 247.5 m)
	Rotor bottom tip height:	Minimum of 20 m (and not lower)
Turbine Foundations	Each turbine will have a circular foundation with a diameter of up to 35 m, alongside the 40 m hardstand (1 400 m ²). The permanent total footprint is as follows:	8.4 ha (permanent)
Turbine Hardstands and Laydown Areas	Each turbine will have a permanent crane pad of 80 m x 40 m placed adjacent to each turbine foundation. The total permanent footprints are as follows:	19.2 ha (permanent)
	An additional 20 m x 40 m of temporary hardstand area will also be required near each of the crane pads. Further, a blade laydown area of 104 m x 20 m and an additional embankment area (where necessary due to slopes) of approximately 104 m x 5 m will be required. A temporary crane boom assembly area of 120 x 15 m will also be accommodated. Temporary areas are up to a maximum of a maximum of 5 200 m ² per turbine.	31.2 ha (temporary)

Project Component	Description	Hoogland 1
	The total temporary footprint of Hoogland 1 is as follows:	
Cabling	Turbines to be connected to on-site substation via up to 66 kV cables. Cables to be laid underground in trenches mainly adjacent to proposed wind farm roads (as part of the temporary impact of 'Site roads' below) but in some instances the cables will deviate from the road. Such sections of off-road cables amount to the following length and footprint:	10.7 km 6.4 ha (temporary)
	Where it has been possible, cables have been routed along existing local roads. Note that cables running next to public roads will not be able to run within the road reserve, but as close as possible to the road reserve in the adjacent private owned land. These have the following length and footprint:	0.5 km 0.3 ha (temporary)
Internal wind farm overhead power lines	In limited instances, overhead lines will be used where burying is not possible due to technical, geological, environmental or topographical constraints. The potential locations of these are depicted in the layout and they will be subject to walkdowns by the relevant specialists and micro-siting. Up to 66 kV overhead power lines supported by structures of up to approximately 22 m in height are proposed, as well as tracks for access to the pylons. The total length of the indicative overhead lines and the footprint of the pylons and tracks are as follows:	0.2 km 0.1 ha (permanent)
	Where possible, to reduce areas of new impact, sections of overhead line have been routed next to proposed Eskom overhead lines. Such sections of overhead lines have the following additional length and footprint:	3.2 km 1.9 ha (permanent)

Project Component	Description	Hoogland 1
Site Roads	The total road network length is as follows:	122.2 km ⁴
	Permanent roads will be 6 m wide and over above this may require side drains on one or both sides depending on the topography. Many roads will have underground cables running next to them. The permanent footprint of the road network is as follows:	97.7 ha ⁴ (permanent)
	An up to 15 m wide road corridor may be temporarily impacted during construction and rehabilitated to allow for a 6 m road surface after construction. The temporary footprint of the road network is as follows:	110 ha ⁴ (temporary)
	This total road network also includes upgrades to sections of public roads, to the following extent:	4.7 km (permanent)
	This total road network also includes shared road infrastructure with the other wind farm in the respective cluster:	16.9 km (permanent)
Wind farm Substations	Two 150 m x 75 m substation yards that will include an Operation and Maintenance (O&M) building, Substation building and a High Voltage Gantry. The area for the two substation yards is as follows:	2.3 ha (permanent)
Battery energy storage system (BESS)	Two ±3.5 ha areas for a BESS which may be adjacent or slightly removed from each of the two substations depending on the local constraints. Each BESS may either be connected to the wind farm substation by an underground or	7 ha (permanent)

⁴ Note these areas represent more than will be impacted given the road values are based on all the turbines shown in the layout for each individual wind farm being constructed wherein reality only 60 of these turbines will be developed.

Project Component	Description	Hoogland 1
	overhead cable or may require its own substation which would be located within the BESS footprint and would be connected directly to the Eskom switching station via a short 132 kV overhead line.	
O&M area	The O&M area will include all offices, stores, workshops and laydown area. The substation building will be housed in the substation yard.	Forms part of substation yard
Security	<p>Security gate and hut to be installed at most entrances to each wind farm site (estimated as 4 entrances each at 20 m²).</p> <p>No fencing around individual turbines, existing fencing shall remain around perimeter of properties.</p> <p>Temporary and permanent yard areas to be enclosed (with access control) with an up to 2.4 m high fence.</p>	80 m ²
Temporary areas required for the construction / decommissioning phase	<p>Temporary construction areas:</p> <ul style="list-style-type: none"> • Temporary site camp/s areas of ±20 000 m² • Batching plant area of ± 2 000 m² • General laydown area of ± 36 000 m² • Each wind farm will have a bunded fuel & lubricants storage facility at the site camp. <p>Individual turbine temporary laydown areas including crane boom laydown areas, blade laydown areas and other potential temporary areas are detailed above under “turbine hardstands”.</p>	6 ha (temporary)
Shared offsite infrastructure: N1 Bypass Road	As part of the Nuweveld wind farms, a temporary bypass road is required on the N1 to avoid the town of Beaufort West with the major wind farm components. The road surface will be up to 6 m wide, with side drains,	6.8 ha (shared, temporary)

Project Component	Description	Hoogland 1
	<p>but a 12 m wide road corridor may be temporarily impacted during construction and rehabilitated once construction is complete.</p> <p>The length of the temporary road will be about 5.6 km of which about 2.5 km is along an existing track. It is planned that this road will also be used by the Hoogland wind farms and this is why it is shared infrastructure between the Nuweveld projects and these projects.</p>	
Other offsite shared infrastructure	Stream crossings upgrades along the R381 to the north of the project area and along the DR02314 to the north-west of the project area are required.	<p>4.4 ha (shared, permanent)</p> <p>5 ha (shared, temporary)</p>
Total disturbance footprint:		166 ha (temporary) and 141 ha (permanent)
<p>*Note these areas represent more than will be impacted given the road values are based on all the turbines shown in the layout for each individual wind farm being constructed wherein reality only 60 of these turbines will be developed per wind farm.</p>		

1.2.3 Project Phasing

Pre-Construction Phase

The pre-construction phase includes activities such as:

- Pre-Construction monitoring;
- Specialist micro-siting;
- Appointment of the contractor/consultants;
- Contractor develop code of conduct for employees;
- Appointment of an ECO and their relevant contractors and consultants;
- Pre-construction environmental workshop/induction training of all employees;
- Site demarcation;
- Establishment of a site camp;
- Demarcation of areas such as fuel areas and plant rescue (when applicable);
- Processes to obtain permits for e.g. permits required to remove any protected tree or plant species;
- Finalising of design; and
- Finalisation of any additional management and monitoring plans.

Construction Phase

The construction phase commences with earthworks and thereafter includes all activities relating to the physical construction of the proposed development, such as the installation of services, construction of foundations, erecting wind turbines and construction of buildings.

Operational Phase

The operational phase commences when the proposed development is being used for its intended purposes i.e. providing power into the national grid. This phase will include ongoing operation and maintenance of the wind farm, as well as ongoing environmental management and monitoring requirements (e.g. removal of alien vegetation and undertaking of the faunal monitoring programme).

Decommissioning Phase

The decommissioning phase refers to the discontinuation of the wind farm should the option to upgrade the facility not be favourable at the end of its life cycle (20 - 25 years). This would entail disconnecting the facility from the national grid, removing any components to be recycled / resold as far as possible and dismantling of the facility with all its associated structures and infrastructure. Final rehabilitation of the site would also form part of the decommissioning phase.

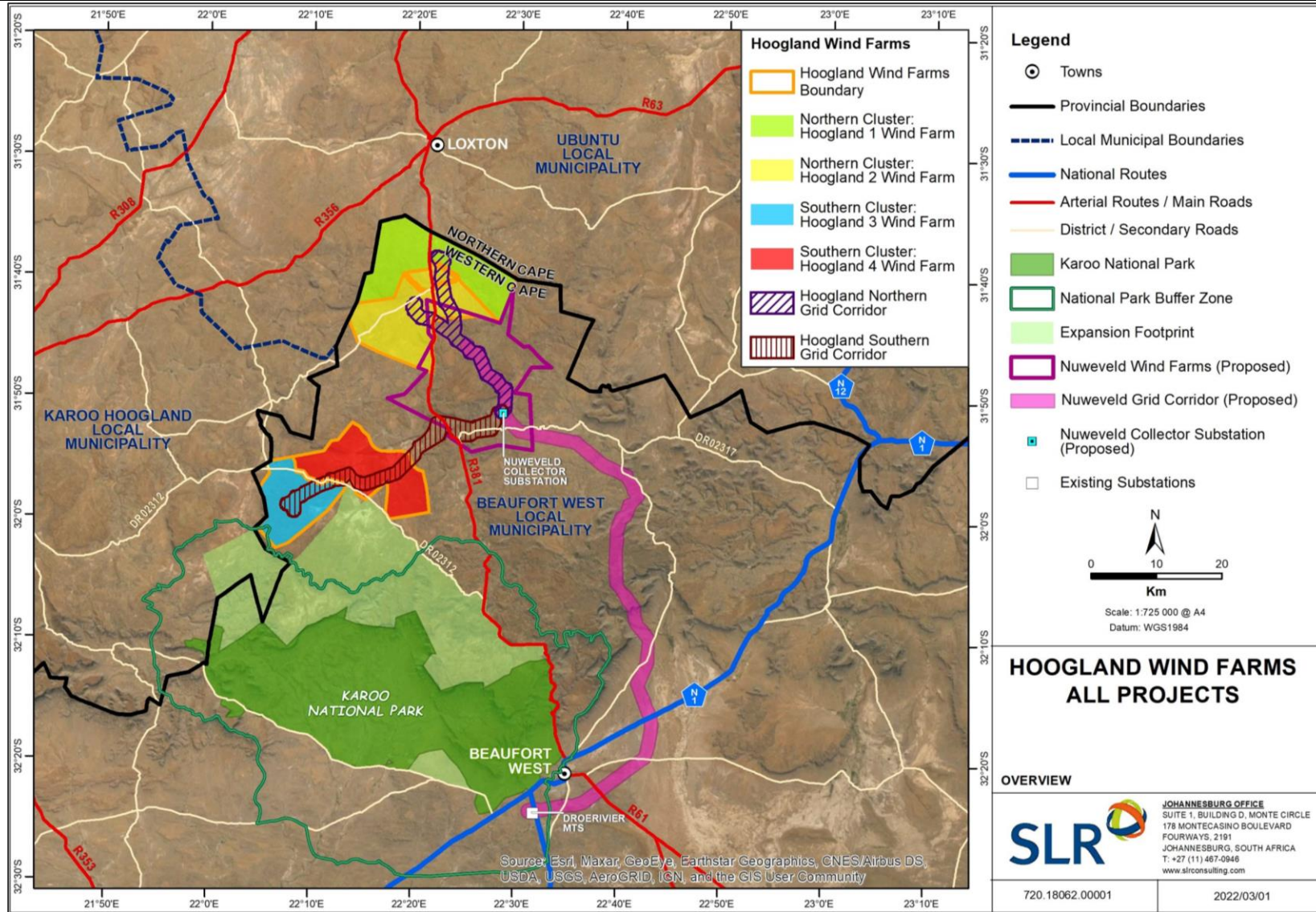


Figure 1-1: Locality map of the project

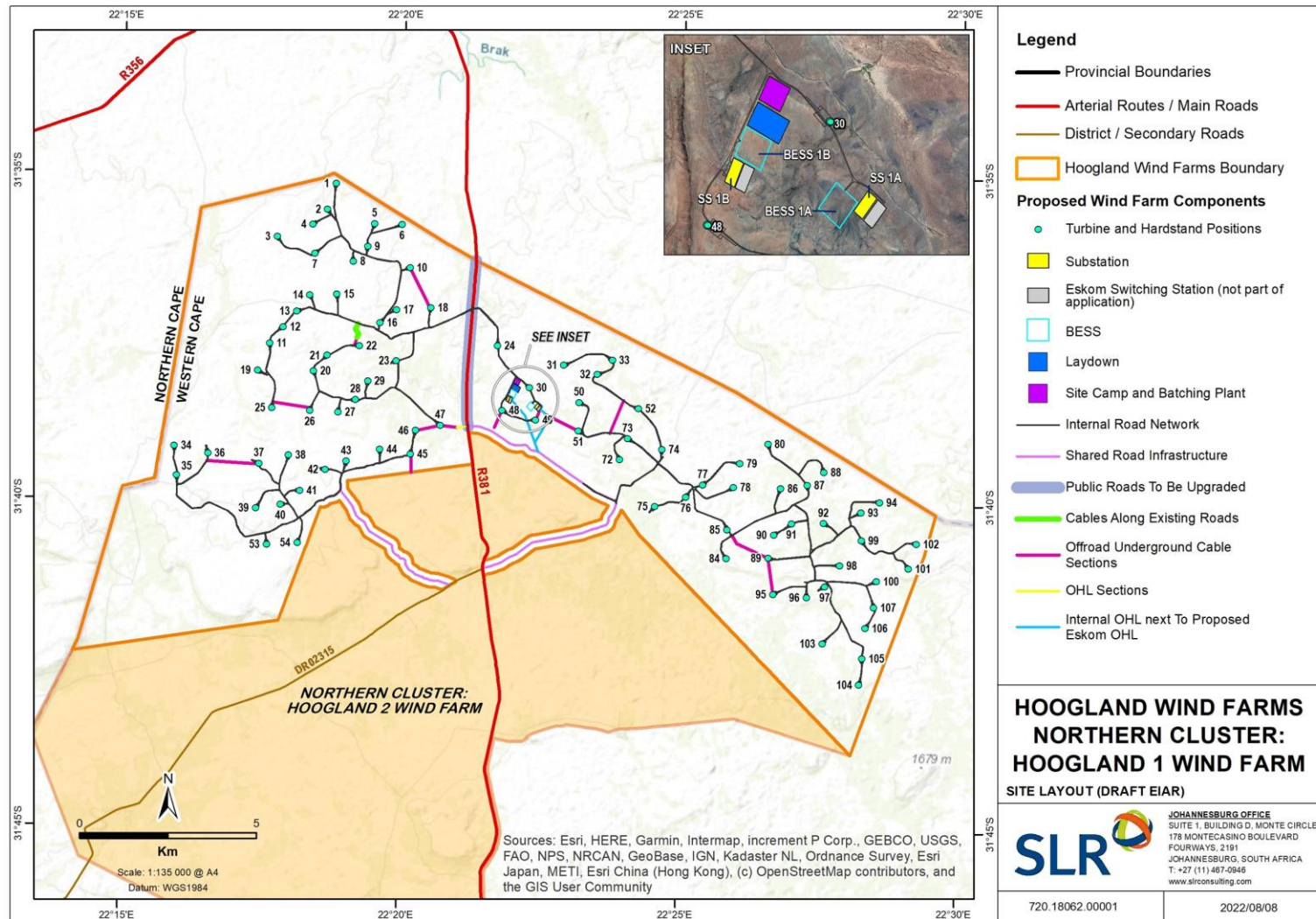


Figure 1-2: Proposed layout for the Hoogland 1 Wind Farm

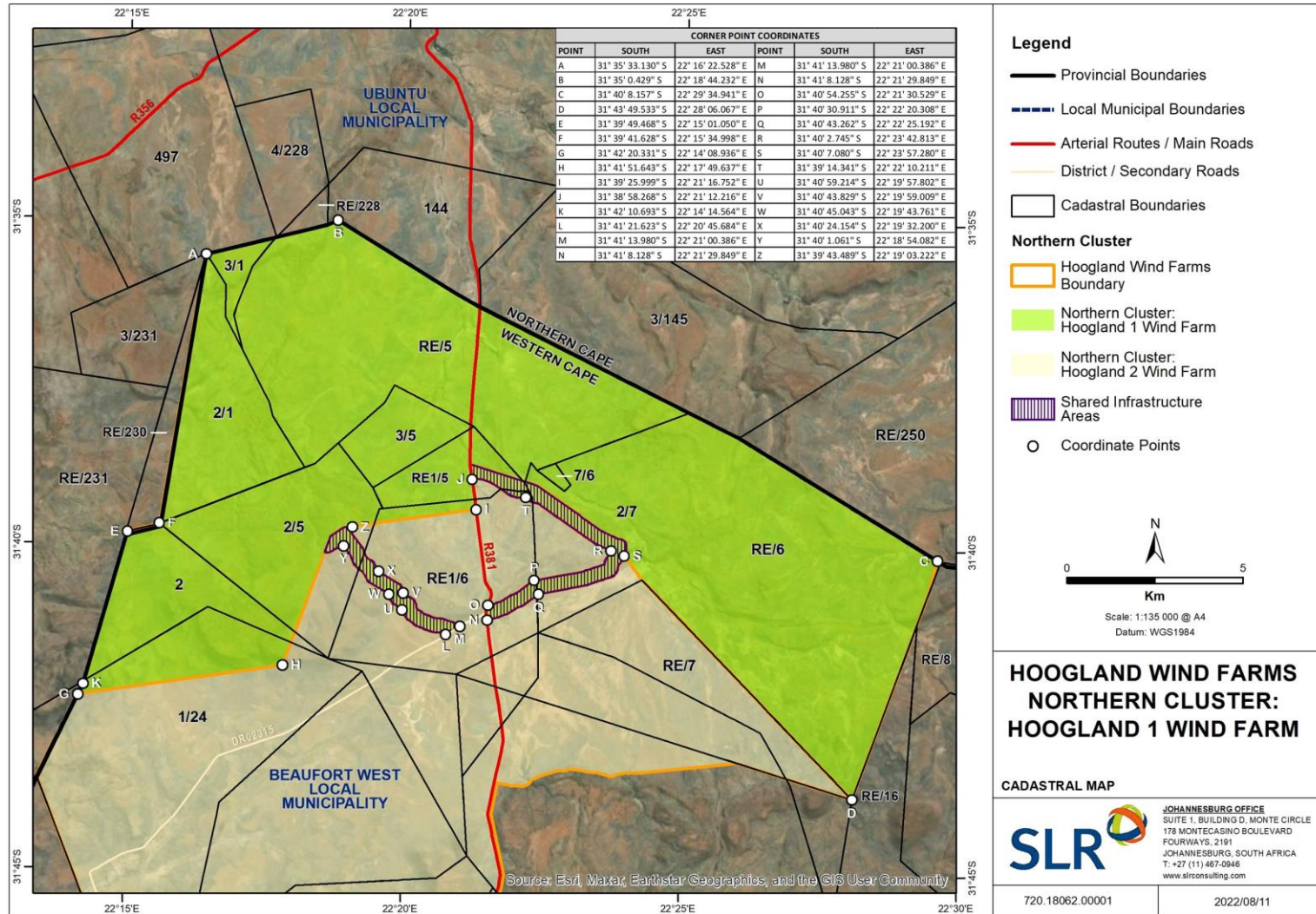


Figure 1-3: Cadastral Map for the Hoogland 1 Wind Farm

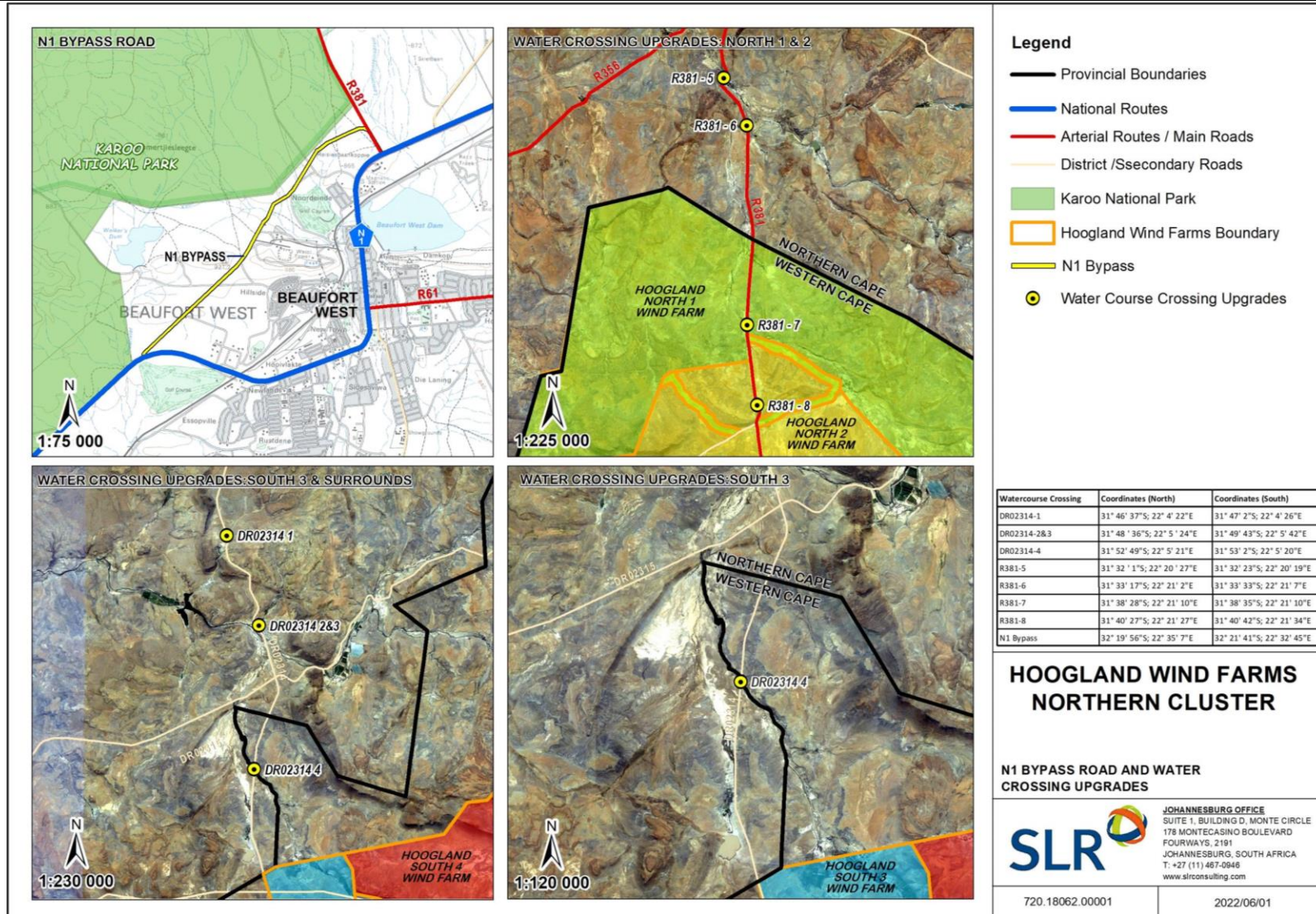


Figure 1-4: The proposed N1 Bypass and offsite watercourse crossings upgrades

1.3 ENVIRONMENTAL ASPECTS

1.3.1 Impacts and Management Outcomes

During the environmental assessment process, the various specialists identified and assessed impacts, and proposed mitigatory measures to manage the various potential impacts (see Sections 3.2.1, 4.1, 5 and 6). The intent of these and other “standard” mitigation measures presented in this document (see Sections 4.2 to 4.21), is to achieve the stated impact management outcomes and reduce the level of an impact on the environment as far as possible.

The various identified impacts that were assessed as part of the environmental process, the impact management outcomes and post- mitigation significance ratings are summarised in Table 1-2 below.

Table 1-2: Post-mitigation impact significance and impact management objectives

FIELD	PHASE	POTENTIAL IMPACT	IMPACT MANAGEMENT OUTCOME	POST- MITIGATION SIGNIFICANCE
Climate Change	All Phases	Climate change impacts (GHG emissions)	N/A	Very High +
Geotechnical	Construction	Ground disturbance during construction	Rehabilitate disturbed areas	Medium -
	Construction	Soil erosion during construction	Avoid erosion and rehabilitate disturbed areas	Low -
	Operational	Soil erosion during operational phase	Avoid erosion and rehabilitate disturbed areas	Low -
	Decommissioning	Ground disturbance during decommissioning	Rehabilitate disturbed areas	Medium -
	Decommissioning	Soil erosion during decommissioning stage	Avoid erosion and restore natural topography	Low -
Agriculture	Construction	Loss of agricultural potential	Avoid erosion and rehabilitate disturbed areas	Very Low -
	Operational	Increased financial security for farming operations	N/A	Very Low +
	Decommissioning	Loss of agricultural potential	Avoid erosion and rehabilitate disturbed areas	Very Low -
Terrestrial Ecology	Construction	Impacts on Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs) and general ecological processes within the site	Restrict loss of sensitive habitat	Low -
	Construction	Impact on the Riverine Rabbit	Restrict loss of sensitive rabbit habitat and prevent disturbance to, and mortalities of rabbit	Low -
	Construction	Habitat loss and degradation impact on the Karoo Dwarf Tortoise	Restrict loss of sensitive faunal habitat	Low -
	Construction	Karoo Dwarf Tortoise mortalities due to earthworks and roadkill	Avoid disturbance to, and mortalities of faunal species	Low -
	Operational	Impacts on Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs) and general ecological processes within the site	Avoid disturbance to, and mortalities of faunal species	Low -
	Operational	Impact on the Riverine Rabbit	Avoid and monitor faunal species mortalities	Low -
	Operational	Karoo Dwarf Tortoise mortalities due to roadkill	Avoid and monitor faunal species mortalities	Low -
	Operational	Karoo Dwarf Tortoise mortalities due to predation by corvids	Avoid and monitor faunal species mortalities	Low -
	Decommissioning	Impact on the Riverine Rabbit	Restrict loss of sensitive rabbit habitat and prevent disturbance to, and mortalities of rabbit	Low -
Bats	Construction	Loss of foraging habitat by clearing of vegetation	Avoid loss of sensitive bat habitat and rehabilitate disturbed areas	Very Low -
	Construction	Roost destruction during earthworks	Avoid loss of sensitive bat habitat	Insignificant

FIELD	PHASE	POTENTIAL IMPACT	IMPACT MANAGEMENT OUTCOME	POST- MITIGATION SIGNIFICANCE
	Operation	Bat mortalities during foraging	Avoid and monitor bat mortalities	Low -
	Operation	Bat mortalities during migration	Avoid and monitor bat mortalities	Low -
	Operation	Increased bat mortalities due to light attraction and habitat creation	Limit light sources and prevent artificial habitat creation	Low -
Avifauna	Construction	Habitat destruction	Avoid loss of sensitive avifaunal habitat	Medium -
	Construction	Disturbance of birds	Avoid disturbance to avifaunal species	Low -
	Operational	Disturbance of birds	N/A	Low -
	Operational	Displacement of birds	Monitor avifaunal behaviour	Low -
	Operational	Collision of birds with turbines	Avoid collisions with turbines through design mitigation	Medium -
	Operation	Collision & electrocution of birds on overhead power lines	Avoid collisions and electrocutions on overhead powerlines through design mitigation	Low -
	Decommissioning	Disturbance of birds	Prevent disturbance to avifaunal species	Low -
Aquatic	Construction	Damage or loss of riparian systems and disturbance of waterbodies	Avoid erosion and sedimentation of watercourses	Very Low -
	Construction	Impact on riparian and wetland systems through the possible increase in surface water runoff on form and function	Manage the increase of surface water flows	Very Low -
	Construction	Changes to hydrological regimes that could also lead to sedimentation and erosion	Manage the increase of surface water flows	Very Low -
	Construction	Potential impacts on localised surface water quality	Avoid contamination of watercourses	Very Low -
	Construction	Groundwater abstraction	Ensure sustainable groundwater abstraction	Very Low -
	Operational	Impact on riparian and wetland systems through the possible increase in surface water runoff on form and function	Manage the increase of surface water flows	Very Low -
	Operational	Changes to hydrological regimes that could also lead to sedimentation and erosion	Manage the increase of surface water flows	Very Low -
	Operational	Groundwater abstraction	Ensure sustainable groundwater abstraction	Very Low -
	Decommissioning	Damage or loss of riparian systems and disturbance of waterbodies	Avoid erosion and sedimentation of watercourses	Very Low -
	Decommissioning	Impact on riparian and wetland systems through the possible increase in surface water runoff on form and function	Manage the increase of surface water flows	Very Low -
	Decommissioning	Potential impacts on localised surface water quality	Prevent contamination of watercourses	Very Low -

FIELD	PHASE	POTENTIAL IMPACT	IMPACT MANAGEMENT OUTCOME	POST- MITIGATION SIGNIFICANCE
Visual	Construction	Visual intrusion of construction activities on the Karoo landscape.	Avoid the placement of infrastructure in visually sensitive areas Prevent visual clutter	Medium -
	Operational	Visual intrusion of wind turbines on the Karoo landscape.	N/A	High -
	Operational	Visual intrusion of infrastructure on the Karoo landscape.	Screen infrastructure from receptor views	Medium -
	Operational	Visual intrusion of lighting at night.	Prevent light pollution	Medium -
	Operational	Visual impact of the N1 Bypass road on the Karoo National Park, Beaufort West town and the gold course	Screen infrastructure from receptor views and prevent light pollution	Medium -
	Decommissioning	Visual intrusion of activities to remove infrastructure.	Rehabilitate disturbed areas	Medium -
Heritage	Construction	Impacts to archaeological resources	Identify and record heritage artefacts	Very Low -
	Construction	Damage to or destruction of built heritage resources	N/A	Insignificant
	Construction	Impacts to the cultural landscape	Reduce and limit disturbances to receptors	Medium -
	Operation	Impacts to the cultural landscape	Reduce and limit disturbances to receptors	Medium -
	Decommissioning	Impacts to the cultural landscape	Reduce and limit disturbances to receptors	Medium -
Palaeontology	Construction	Loss or degradation of local palaeontological heritage resources of scientific and/or conservation value within the Hoogland Wind farm sites in the Western Cape	Identify and preserve palaeontological resources	Very Low -
	Construction	Loss or degradation of local palaeontological heritage resources of scientific and/or conservation value of the Northern Cape watercourse crossing road upgrades	Identify and preserve palaeontological resources	Medium -
Noise	Construction	Daytime Wind Turbine construction activities	N/A	Insignificant
	Construction	Night-time Wind Turbine construction activities (NSR 18, 19 and 23)	Minimise the night-time noise-generating activities	Very Low -
	Construction	Daytime road construction activities	N/A	Insignificant
	Construction	Daytime road traffic from construction vehicles	N/A	Insignificant
	Operation	Daytime Wind Turbine operation raising ambient sound levels	Minimise wind-turbine noise	Very Low -
	Operation	Night time Wind Turbine operation raising ambient sound levels	Minimise wind-turbine noise	Low -
Shadow flicker	Operation	Shadow Flicker effects on identified receptors	Screen shadow flicker at sensitive receptors	Insignificant
Traffic	Construction	Increased Road Incidents	Avoid road traffic incidents	Low -

FIELD	PHASE	POTENTIAL IMPACT	IMPACT MANAGEMENT OUTCOME	POST- MITIGATION SIGNIFICANCE
	Construction	Road Degradation	Maintain road condition	Low -
	Construction	Dust	Reduce dust generation	Low -
	Construction	Intersection Safety	Avoid road traffic incidents at intersections	Medium -
	Operation	Intersection Safety	Avoid road traffic incidents at intersections	Medium -
Socio-economic	Construction	Impacts from expenditure on the construction of the project	Maximise procurement and employment in local communities	Medium +
	Construction	Impacts on tourism	N/A	Low -
	Construction	Impacts associated primarily with the influx of people	Maximise employment in local communities Avoid anti-social behaviour Promote worker health and safety	Low -
	Construction	Impacts on surrounding landowners and communities	Avoid and respond to anti-social behaviour	Low -
	Construction	Impacts on property value	N/A	Low -
	Operation	Impacts from expenditure on the operation of the project	Maximise procurement and employment in local communities	High +
	Operation	Impacts associated with the funding of socio-economic development, enterprise development and shareholding	Maximise funding of socio-economic development, enterprise development and shareholding	High +
	Operation	Impacts associated primarily with the influx of people	Maximise employment in local communities Avoid anti-social behaviour Promote worker health and safety	Low -
	Operation	Impacts on tourism	N/A	Medium -
	Operation	Impacts on surrounding landowners and communities	Avoid and respond to anti-social behaviour	Low -
	Operation	Impacts on property value	N/A	Low -
	Decommissioning	Impacts from expenditure on decommissioning of the project	Maximise procurement and employment in local communities	Medium +
	Decommissioning	Impacts associated primarily with the influx of people	Maximise employment in local communities Avoid anti-social behaviour Promote worker health and safety	Low -
	Decommissioning	Impacts on tourism	N/A	Low -
	Decommissioning	Impacts on surrounding landowners and communities	Avoid and respond to anti-social behaviour	Low -
Decommissioning	Impacts on property value	N/A	Low -	

1.3.2 Environmental Sensitivity Mapping

The specialists identified key features/areas on site pertaining to their respective field of study and developed sensitivity criteria for each of the following infrastructure types (see Table 9-1 in the final assessment report):

- Turbines;
- Internal overhead power lines;
- Roads and underground cables; and
- Buildings.

These outputs were provided spatially and were compiled into the consolidated No-Go maps (which combines the No-Go sensitivities of all specialist fields into one map). The No-Go maps for each infrastructure type, with relevant project components superimposed, are shown in Figure 1-5 - Figure 1-8.

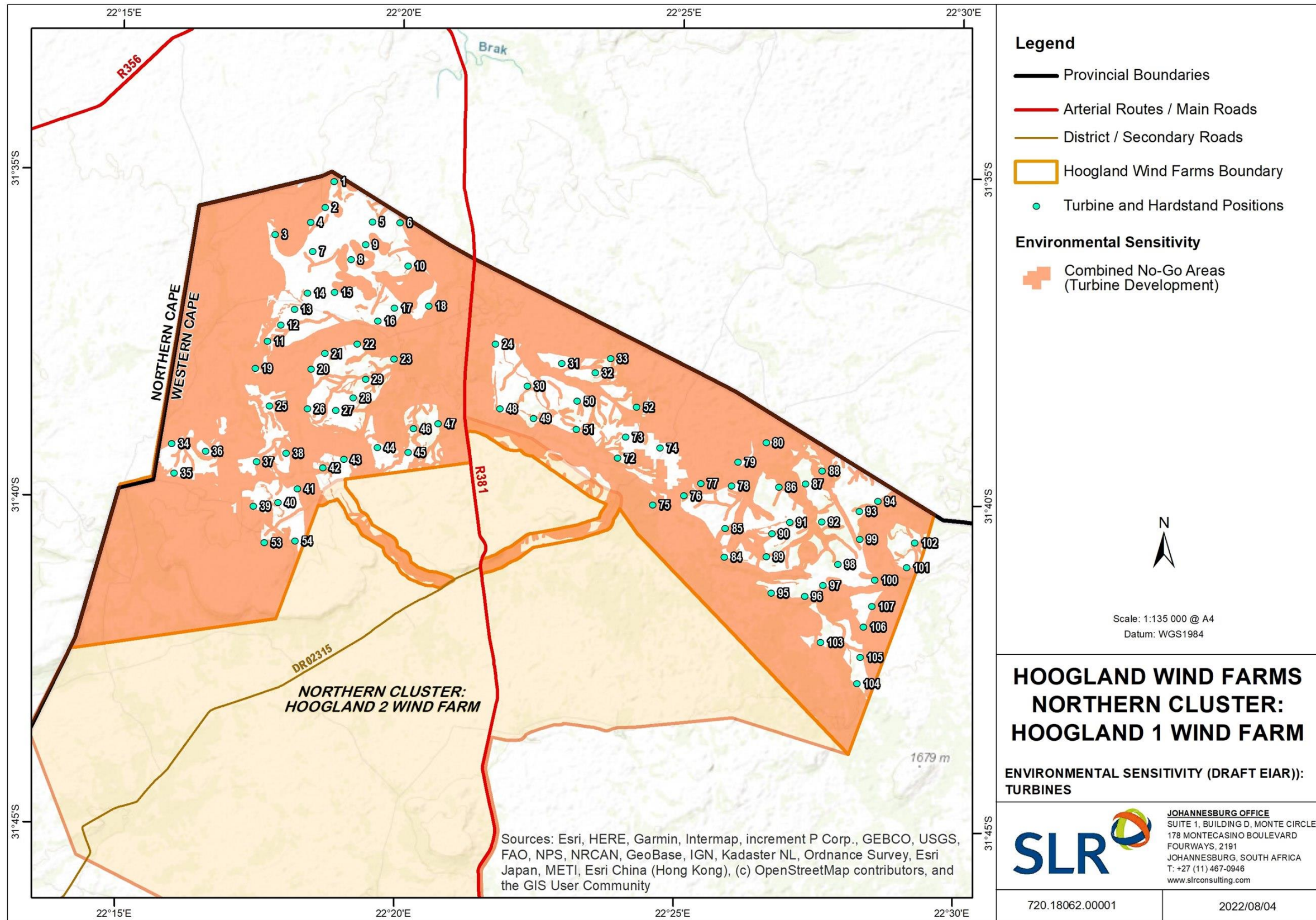


Figure 1-5: Consolidated No-Go maps for turbines

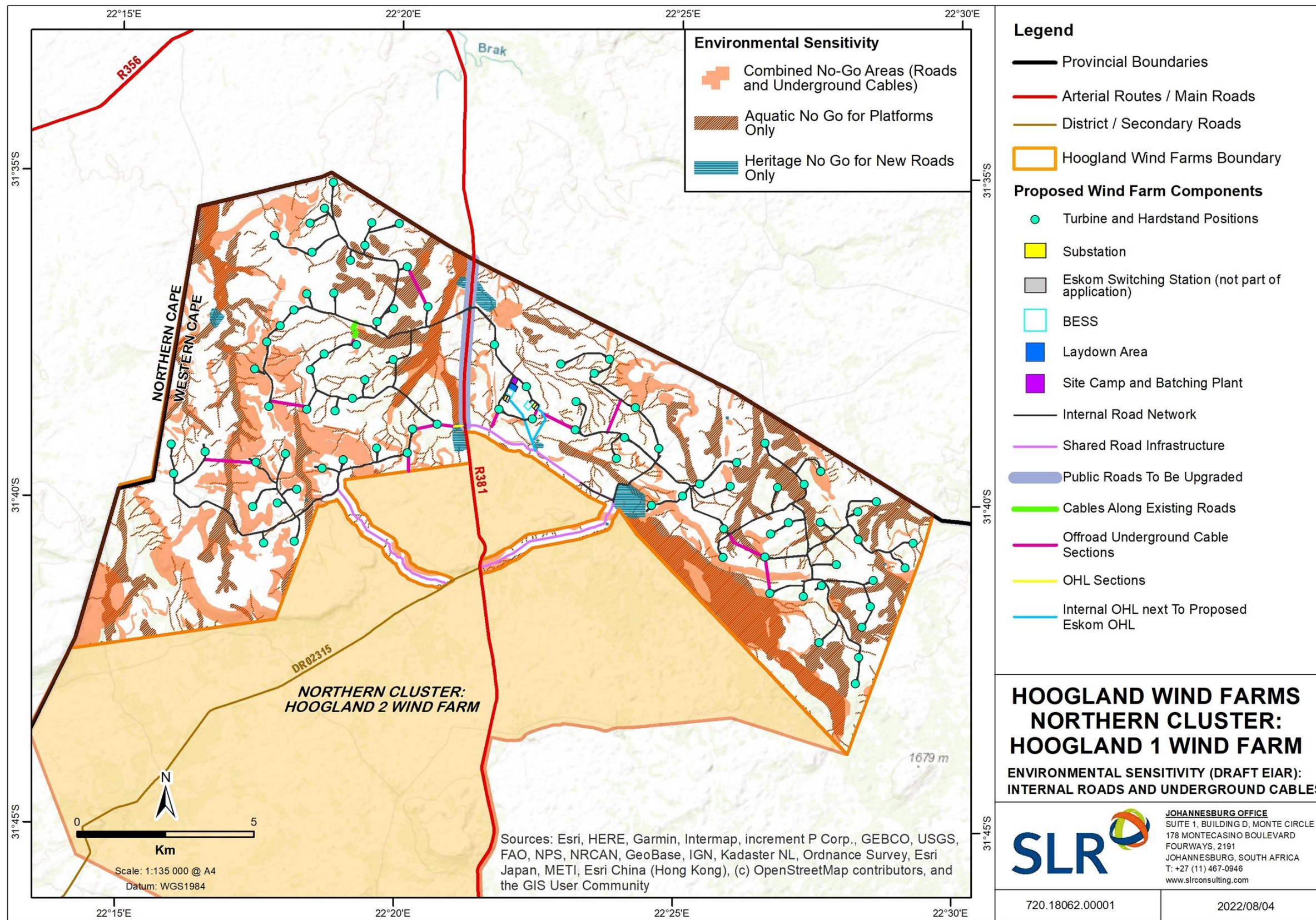


Figure 1-6: Consolidated No-Go maps for roads and underground cables

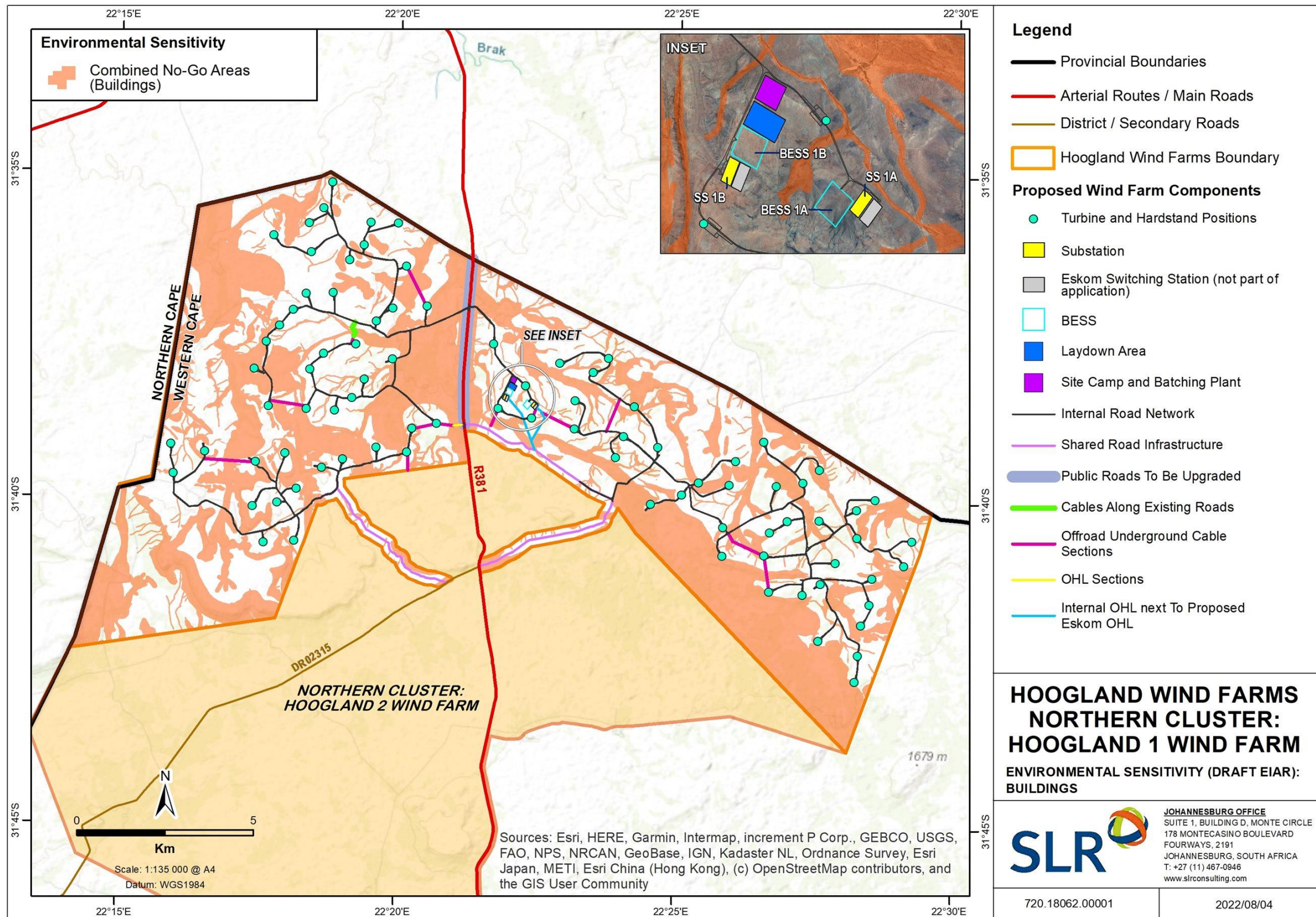


Figure 1-7: Consolidated No-Go maps for buildings

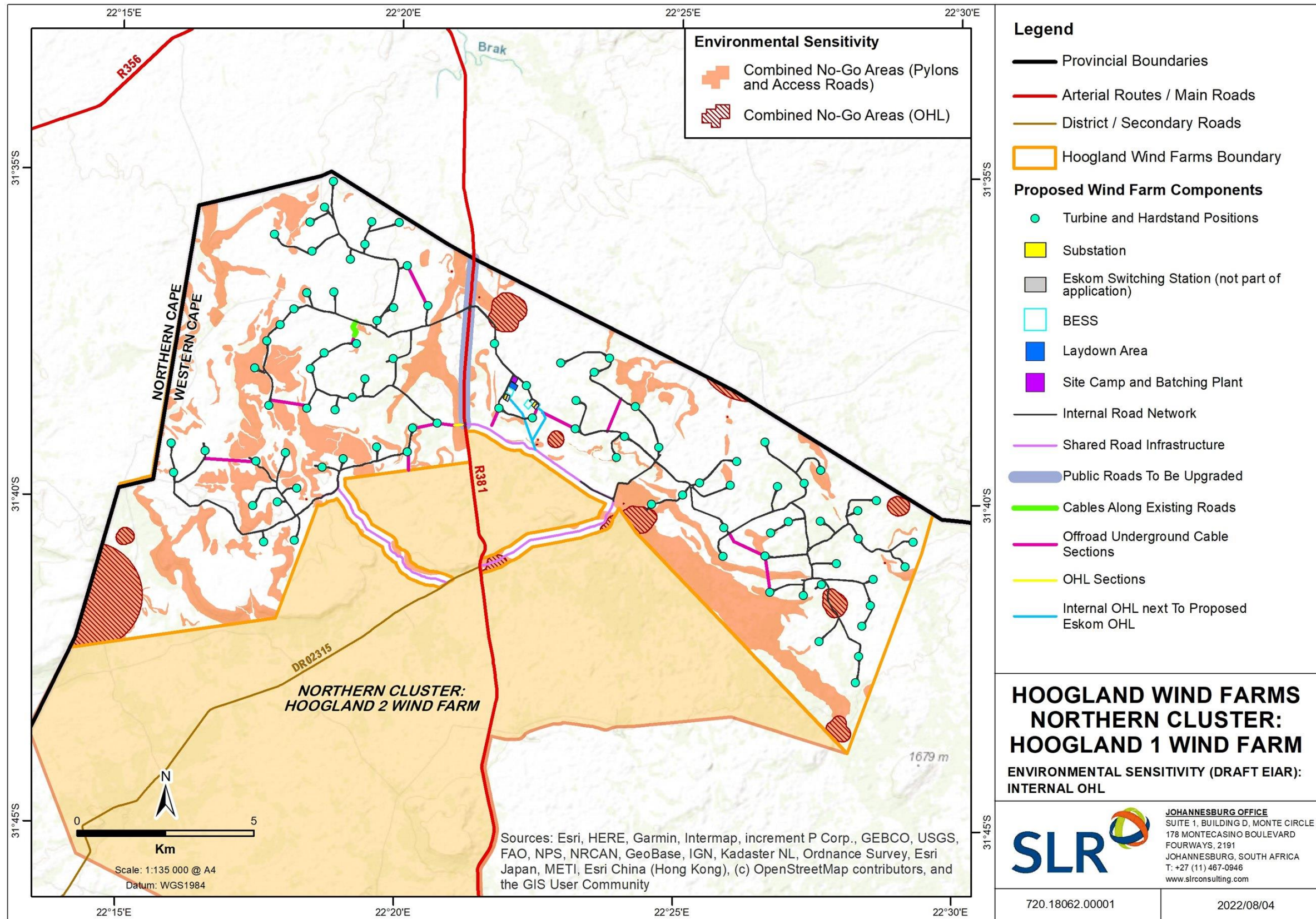


Figure 1-8: Consolidated No-Go maps for internal overhead powerlines

1.4 PROJECT TEAM

The details of the independent EAP Project Team that were involved in the preparation of this report are provided in Table 1-3. SLR has no vested interest in the proposed project other than fair payment for consulting services rendered as part of the EIA process and has declared its independence as required by the EIA Regulations 2014, as amended. The project team's curricula vitae (include proof of registrations and membership) are attached as Appendix A.

1.4.1 Details of the EAP

Table 1-3: Details of the EAP project team

General				
Organisation	SLR Consulting (South Africa) (Pty) Ltd			
Postal address	PO Box 798 RONDEBOSCH 7701			
Tel No.	+27 (0)21 461 1118 / 9			
Fax No.	+27 (0)21 461 1120			
Name	Qualifications	Professional registrations /memberships	Experience (Years)	Tasks and roles
Stuart-Heather Clark	B.Sc. (Hons) Civil Engineering M.Sc. Environmental Management	IAIA EAPASA	24	Report and process review
Liandra Scott-Shaw	B.Sc. (Hons) Ecological Science B.Sc. Biological Science	SACANASP (Pri.Sci. Nat) SAWEA	7	Management of the EIA process, including process review, specialist study review, management of the public participation process and report compilation
Stephan Jacobs	B.Sc. (Hons) Geology B.Sc. Environmental Management & Geology	IAIA	6	Project administration, undertaking of public participation process activities and report compilation

1.4.2 Qualifications and Experience of the EAP Project Team

- Stuart Heather-Clark** is a Technical Director in SLR's Environmental Management Planning and Approvals (EMPA) team in Africa and EAP for the Hoogland wind farms and grid connection projects. He holds a B.Sc. (Honours) in Civil Engineering and a Master's degree in Environmental Science and has 24 years of relevant experience. He has expertise in a wide range of environmental disciplines, including EIAs, EMPs,

environmental planning and review and public consultation and is a registered EAP with the Environmental Assessment Practitioners Association of South Africa (EAPASA).

- **Liandra Scott-Shaw** is the Project Manager for the Hoogland wind farms and grid connection projects. She has a B.Sc. and B.Sc. (Honours) in Ecological Science from the University of KwaZulu-Natal and has worked as an EAP since 2013. She has been involved in a number of projects covering a range of environmental disciplines, including Basic Assessments, Environmental Impact Assessments and Environmental Management Programmes. She has gained experience in a wide range of projects relating to renewable energy.
- **Stephan Jacobs** is the Project Assistant for the Hoogland wind farms and grid connection project and holds a B.Sc. undergraduate degree in Environmental Sciences as well as a B.Sc. Honours degree in Environmental Management & Analysis from the University of Pretoria. He has worked as an Environmental Consultant / EAP since 2015. His key focus is undertaking and managing Basic Assessment (BA) and Environmental Impact Assessment (EIA) processes for various types of projects, especially for renewable energy projects which form part of South Africa’s REIPPPP as well as the 2020 Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP). He also has experience in compiling EMPRs and undertaking and facilitating Public Participation and stakeholder engagement processes, especially for renewable energy projects. He has gained e experience in a wide range of projects relating to infrastructure development and renewable energy.

1.4.3 Details of Independent Specialists

Table 1-4 lists the specialist studies undertaken for the assessment process.

Table 1-4: Details of the specialist team

Discipline	Company	Specialist
Climate Change	Promethium Carbon	Robbie Louw
Geotechnical	R.A. Bradshaw & Associates cc	Richard Bradshaw
Agriculture	Johann Lanz Consulting	Johann Lanz
Terrestrial Ecology (including Riverine Rabbits)	3Foxes Biodiversity Solutions	Simon Todd
Herpetology (Karoo Dwarf Tortoise)	Sungazer Faunal Surveys	Marius Burger
Bats	Animalia Consultants	Werner Marais
Avifauna	Wildskies	Jon Smallie
Aquatic Ecology	EnviroSci (Pty) Ltd	Dr Brian Colloty
Geohydrology	GEOSS	Shane Teek, Dale Barrow and Julian Conrad
Visual	Bernard Oberholzer Landscape Architects (BOLA) and qARC	Bernard Oberholzer, Quinton Lawson

Discipline	Company	Specialist
Archaeology	ASHA Consulting	Dr Jayson Orton
Palaeontology (Western Cape)	Natura Viva	Dr John Almond
Palaeontology (Northern Cape)	Banzai Environmental	Elize Butler
Noise	Enviro-Acoustic Research	Morné de Jager
Shadow Flicker	Arcus	Emma Lewis; Martin Stevenson
Traffic	Athol Schwarz	Athol Schwarz
Socio-economic / tourism	Independent Economic Researchers	Dr Hugo van Zyl; James Kinghorn

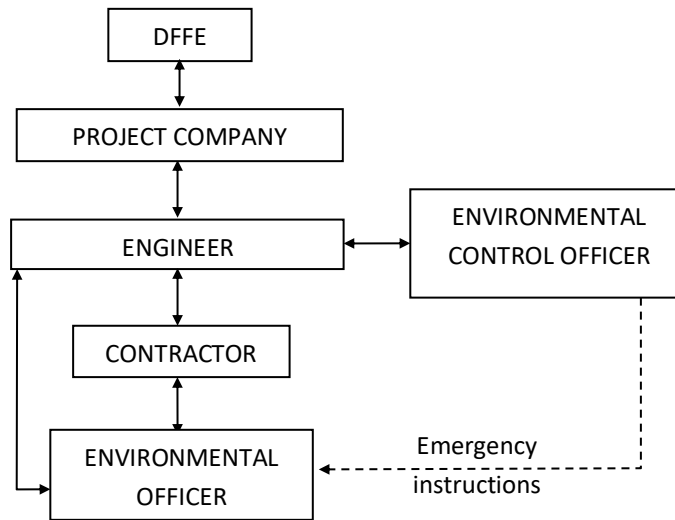
1.5 APPLICANT DETAILS

Component	Description
Company Name	Red Cap Hoogland 1 (Pty) Ltd
Address:	Unit 2B, Mainstream Centre, Main Road Hout Bay, Cape Town, 7806
Responsible person:	Lance Blaine / Gerald Ehlers / Kirsten Jones
Tel:	021 790 1392
E-mail:	lance@red-cap.co.za

2. IMPLEMENTATION OF EMPr

2.1 ROLES AND RESPONSIBILITIES DURING CONSTRUCTION PHASE

Details of the management structure during construction for this EMPr is presented below. All official communication and reporting lines including instructions, directives and information shall be channelled according to the management structure.



2.1.1 Department of Forestry, Fisheries, and the Environment

DFFE is the designated authority responsible for authorising this EMPr and has overall responsibility for ensuring that the Project Developer complies with this EMPr, and any conditions listed in the Environmental Authorisation. DFFE shall also be responsible for approving any significant amendments that may be required to the EMPr. DFFE may further perform random site inspections to check compliance with the EMPr.

2.1.2 Project Company

The Project Company refers to the holder of the EA who will assume overall responsibility for the administration and implementation of the EA and EMPr. The Project Company will be responsible for the following tasks amongst others:

- Ensure that all conditions of approval as contained in the EA are adhered to;
- Ensure that the requirements as set out in this EMPr are adhered to and implemented;
- Ensure all authorisations, permits, consents are in place and any other legal requirements are settled before any action is undertaken that requires these to be in place;
- Provide resources and appoint external contractors as required for the implementation of this EMPr;
- Review, update and amend the EMPr to include relevant conditions of approval contained in the EA and other approvals (if applicable) or when site specific circumstances necessitate a change in an approach to site management;

- 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; and
- Ensure close liaison with local municipal managers, local councillors and other stakeholders involved in socio-economic development to ensure that the project is integrated into wider socioeconomic development strategies and plans for the area.

2.1.3 Site Engineer or Contract Manager

The term “Site Engineer” (SE) in the context of this EMPr refers to the company or companies so named in the Contract Data, whose function it is to administer the Contract as an agent to the Project Company. The term “Engineer” may also refer to “Employer’s Agent” or “Project Manager” depending on the construction contract.

The natural person nominated by the Engineer, who shall observe the execution of the Works, examine and test materials and workmanship, and deliver and receive communications to/from the Contractor is the Contract Manager.

The term “Contract Manager” may also refer to “Employer’s Agent Representative” or “Supervisor” depending on the construction contract.

The role of the Site Engineer and/or Contract Manager, pertaining to environmental matters, may include:

- Act as an agent to the Project Company on matters relating to the environment, and compliance with the EMPr;
- Ensure compliance and monitoring of all Health, Safety and Environmental aspects as it relates to the project and in accordance with the relevant legislation;
- Receive and review ECO reports, ensure that any issues contained therein are addressed and report to the Project Company as required;
- Approve, in consultation with the ECO, the Contractor’s Method Statements required in terms of the EMPr;
- Ensure that the Contractor is well-versed in the contents of the EMPr and that their conduct is proactive and effective in terms of environmental management and protection measures;
- Ensure the Contractor is aware of its responsibilities in terms of the EMPr, including (but not limited to):
 - Appointing an environmental officer/s to assist with the EMPr implementation;
 - Maintaining a register of public complaints and a record of how these are responded to and the timeframe provided for this;
 - Supporting the ECO in their roles and responsibilities; and
 - Issue instruction to cease work where such an instruction is warranted and issuing of any relevant fines or disciplinary action that may be applicable.

2.1.4 Contractor

The Contractor must:

- Ensure that all of its sub-contractors, employees, etc., are fully aware of the environmental issues detailed in this EMPr.
- Liaise closely with the SE/Contract Manager and the ECO;

- Ensure that the works on site are conducted in an environmentally sensitive and safe manner and in accordance with the requirements of the EMPr;
- Prevent actions that may cause environmental harm; and
- Ensure compliance of all site personnel/visitors with the EMPr and other conditions of approval where relevant.

2.1.5 Environmental Control Officer

The Project Company shall appoint a suitably qualified independent ECO⁵ to monitor the Contractors' compliance in terms of this EMPr and the conditions contained in the EA, as well as address environmental site issues. The ECO shall work closely with the Contractor's appointed Environmental Site Officer (ESO).

The duties of the ECO include but are not limited to:

- Liaise with the Project Company, Site Engineer and/or Contract Manager and DFFE;
- Conduct environmental induction training with the contractor prior to commencement of work (see Section 2.7);
- Ensure the proactive and effective implementation and management of environmental protection measures;
- Monitor the Contractors' activities for compliance with the various environmental requirements contained in the EMPr and any specific conditions of authorisation contained in the EA regularly (refer to Section 2.3 for Compliance Monitoring), including:
 - Undertaking compliance inspections and audits at defined intervals as per the ECO Schedule in Section 2.3 and the requirements of the conditions of the EA;
 - Compiling ECO Reports on the findings of the inspections and audits, as well as on any emergency or unforeseen situations and incidents in which the expertise of the ECO has been consulted;
- Submit ECO Reports to the project team, DFFE, Project Company and Eskom (or any other authority/body deemed necessary by the project team);
- Monitor the implementation of requisite remedial action in the event of non-compliance and record proof of such in the subsequent ECO Report;
- Consult with the SE/Contract Manager and Contractor should any non-compliances merit a potential 'stop-work' instruction;
- Attend relevant site meetings with the engineer, contractor and other relevant project team members at least once a month or as may be required depending on circumstances or any issues that need to be discussed;
- Review the Contractor's Method Statements (from an environmental perspective) required in terms of this EMPr, prior to the proposed activities taking place;
- Ensure that a register of public complaints is maintained by the Contractor and that any and all public comments or issues are appropriately and timeously reported and addressed; and

⁵ The designation is reserved for a suitably qualified (National Diploma / Degree in Natural Science or an equivalent qualification), independent, environmental manager, with adequate environmental knowledge to understand and monitor the implementation of the EMPr.

- Provide ad-hoc environmental advice, including opinion on environmental legal requirements, to the Project Company and the Contractor regarding issues that may arise during the Contract.

2.1.6 Environmental Site Officer

The ESO refers to the nominated staff member of the Contractor who will fulfil the role of the Contractor's environmental representative to monitor, review and verify compliance with the EMPr. An ESO must be appointed by the Contractor for the duration of the contract.

The ESO shall liaise closely with the SE/Contract Manager and the ECO and shall ensure that the works on site are conducted in an environmentally responsible manner and in compliance with the requirements of the EMPr.

The role of the ESO will include, but are not limited to:

- Liaise between the Contractor and ECO on matters relating to the environmental considerations on site;
- Assist with the compilation of environmental components of Method Statements on behalf of the Contractor;
- Undertake daily inspections of the various work areas to ensure all activities are being undertaken in accordance with the EMPr;
- Maintain all site documentation and records pertaining to the EMPr and environmental matters and approvals;
- Provide a regular and routine account on environmental matters to the ECO, including any environmental incidents, events or accidents;
- Report environmental incidents (Section 2.4) and maintain the Complaints Register (Section 2.5);
- Maintain a photographic record of the construction activities;
- Oversee that corrective action is implemented within the stipulated timeframes where non-compliances are registered; and
- Respond to and report on environmental accidents, incidents and events immediately, and ensure that all works requiring remediation are undertaken in accordance with the ECO or SE/Contract Manager's instructions.

2.1.7 Community Liaison Officer

The Community Liaison Officer (CLO) refers to an independent person who ideally is a member of one of the local communities in the vicinity of the wind farm.

The role of the CLO will be to:

- Facilitate community relations for the duration of the construction phase;
- Provide recommendations for, and facilitate notification or information dissemination methods for issues such as any planned service disruptions or nuisance disturbances; and
- Liaise with the complainants to address any issues.

2.1.8 Competent Authority – National Department of Forestry, Fisheries, and the Environment

The DFFE is the competent authority responsible for issuing the EA and enforcing compliance with the conditions of authorisation contained in the EA and relevant environmental legislation.

The DFFE's responsibilities include, amongst others:

- Enforce the EA and its conditions;
- Review the EMPr and any required updates or revisions;
- Undertake compliance inspection site visits, if required;
- Review ECO and audit reports;
- Review incident reports; and
- Enforce the applicable legal mechanisms should any contraventions of the EMPr or EA occur.

2.2 ROLES AND RESPONSIBILITIES DURING OPERATIONS PHASE

2.2.1 Department of Forestry, Fisheries, and the Environment

DFFE is the designated authority responsible for authorising this EMPr and has overall responsibility for ensuring that the Project Developer complies with this EMPr, and any conditions listed in the Environmental Authorisation. DFFE shall also be responsible for approving any significant amendments that may be required to the EMPr. DFFE may further perform random site inspections to check compliance with the EMPr.

2.2.2 Project Company

The Project Company refers to the holder of the EA who will assume overall responsibility for the administration and implementation of the EA and EMPr throughout operations.

The Project Company will appoint a Health, Safety and Environment (HSE) team to develop and implement HSE Management Plans and Systems for the operational phase.

2.2.3 HSE Team

The HSE Team's responsibilities will include, amongst others:

- Draft detailed HSE (or equivalent) documents which will include all of the operational aspects of the EMPr;
- Implement and enforce actions required by the detailed management plans (e.g. emergency response plans and safety plans), including monitoring and reporting;
- Train workers on how to perform tasks required by the detailed management plans;
- Provide the required items including safety equipment and emergency response equipment required by the management plans;
- Manage waste contractors and other external contractors and consultants used in the operational phase of the project; and
- Update the management plans with any required changes as the project progresses.

2.3 COMPLIANCE MONITORING

2.3.1 ECO Schedule

Routine Compliance Inspections and Reports

The Contractor shall allow the ECO (and any officials from DFFE, should the need arise) access to the site for the purposes of compliance monitoring. The ECO shall undertake routine monitoring of the Contractor's activities for compliance with the various environmental requirements contained in the EMPr, including but not limited to:

- Undertaking routine compliance inspections on a weekly basis or at the defined intervals as provided in the conditions of the EA;
- Documenting the findings of each of the inspections in the form of diary entries, a checklist, a report or similar, including dated photographic evidence of any identified issues (where possible);
- Communicate findings and non-compliances to the Contractor, together with timeframes for the implementation of remedial action and close out;
- Preparing monthly reports (see below) and providing these to the Contract Manager and the Contractor, and to DFFE on request; and
- Attending a minimum of one monthly progress meeting with the project team (i.e. Contract Manager, the Contractor and the ESO, or nominated representatives).

The monthly report should summarise the findings of the routine compliance inspections undertaken as well as progress on any remedial action that was required during the month in question. In the event of non-compliance, the report might include:

- Relevant/supporting documentation or evidence of the non-compliance (e.g. minutes of any meetings held to discuss the non-compliance, email/written correspondence on the matter, dated photographic evidence);
- Remedial action required to remedy non-compliance or prevent repeat occurrences, including responsible persons and deadlines for such action; and
- Dates of eventual compliance or close-out by the Contractor on previous non-compliance findings.

The day-to-day monitoring and verification that the EMPr is being adhered to shall be undertaken by the SE / Contract Manager and the ESO.

Environmental Emergencies, Incidents or Events

Should there be any environmental emergencies or incidents, the ECO may elect to inspect the site. The ECO shall ensure that any entries in the Environmental Incident Report File and Complaints Register are tabled at the monthly progress meeting and appropriately addressed.

2.3.2 Disciplinary Action, Penalties and Fines

Where a transgression occurs due to negligence, or due to disregard for the requirements of the EMPr, or due to ignoring remedial instruction from the ECO, SE/Contract Manager or relevant Authority, then this is unacceptable, and could result in a disciplinary action (e.g. a time penalty or a monetary fine, withholding payment certificates if in accordance with the terms of Contract, or even legal action). The terms of Contract shall include mechanisms for disciplinary action (such as the issuing penalties and fines), and the recovery of any monies due (including for any remedial costs where these were born by a third party).

The level of non-compliance is ultimately to the discretion of the SE/Contract Manager, ECO and the Authorities, but a guide to determining this level in the event of negligence or disregard, and the associated minimum monetary fine for consideration is provided in Table 2-1 below (the table does not include for penalties or other

mechanisms of disciplinary action, which could be implemented in addition to the monetary fine). A record shall be kept of any penalties or monetary fines issued for environmental transgressions.

Activities that are directly endangering the environment or are resulting in a significant and detrimental breach of the EA or EMPr may be stopped by the SE/Contract Manager in consultation with the ECO until such breach is rectified. Regulatory authorities such as the DFFE and Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) also have the right to stop activities in consultation with the SE/Contract Manager and ECO.

In all instances where costs are incurred in rectifying a breach of the EMPr, enforcing the provisions of the EMPr, or in taking remedial or preventative action to safeguard the environmental integrity, the costs will be recovered jointly or severally from the Project Company and/or the Contractor. Note must be taken in this respect of Section 28 of NEMA which places a duty of care for environmental protection on “every person who causes, has caused or may cause significant pollution or degradation of the environment”.

Table 2-1: Guide to fine determination

Level of Non-Compliance	Description	Minimum Fine
Minor non-compliance (>3 repeated offences)	A non-conformance with the EMPr that has the potential to result in minor environmental or social consequence	R2 000.00
Moderate non-compliance (>2 repeated offences)	A non-conformance with the EMPr that results in minor environmental or social consequence, or has the potential to result in major environmental or social consequence	R5 000.00
Major non-compliance (1 st offence)	A non-conformance with the EMPr that results in major environmental or social consequence	R10 000.00

2.4 ENVIRONMENTAL INCIDENT REPORT FILE

The Contractor shall keep an Environmental Incident Report File (EIRF) on site to document any environmental incidents, emergencies or accidents occurring because of construction activities, and any resulting action taken to remedy the harm, and/or prevent repeat occurrences.

In the event of an environmental incident., the Contractor must:

- Bring the incident to the attention of the ECO as soon as practically possible; and
- Ensure that the environmental incidents and resulting action are recorded in the EIRF.

The EIRF must:

- Have numbered pages – any missing pages must be accounted for by the Contractor;
- Be tabled during monthly site meetings;
- Be made available to the SE/Contract Manager, the ECO, the Project Company, and/or any authority at any time if requested; and
- Make provision for the documentation of the:
 - Nature of the environmental incident;
 - Management team or contractor responsible for the incident;

- Timing and duration of the incident; and
- Response action applied, including a list of those notified of the incident.

2.5 COMPLAINTS REGISTER

The Contractor shall keep a Complaints Register on site to allow the general public to document any comments on or complaints regarding the activities of the site.

The Complaints Register must:

- Have numbered pages – any missing pages must be accounted for by the Contractor;
- Be tabled during monthly site meetings;
- Be made available to the SE/Contract Manager, the ECO, the Project Company, and/or any authority at any time if requested; and
- Include a section for the documentation of the action taken to address the complaint.

The procedure for dealing with public complaints shall include:

All complaints must be investigated, responded to, and recorded in the Complaints Register within 28 calendar days.

2.6 METHOD STATEMENTS

An environmental Method Statement is a written submission by the Contractor to the SE/Contract Manager, to the satisfaction of the ECO, in response to a condition of approval and/or a requirement of the EMPr, or a request by the ECO or SE/Contract Manager. The Method Statement describes the plant, materials, labour and method that the Contractor proposes to use to carry out an activity, in such detail that the SE/Contract Manager and ECO are able to assess whether the Contractor's proposal is in accordance with the Scope of Work and/or will produce results in accordance with the EMPr.

Method Statements are required in terms of this EMPr (either specified below, or for any activities that are proposed as variations to the standard construction practices detailed or referred to in the Contract Documents, or for any activities requiring special attention as specified in this EMPr and/or requested by the ECO or SE/Contract Manager as well as any requirements of permits or licenses).

The Contractor shall not commence any activity until the Method Statement in respect thereof has been approved and shall, except in the case of emergency activities, allow a period of one week for consideration of the Method Statement by the SE/Contract Manager and ECO. Changes may be requested if the proposal does not comply with the specification or, in the reasonable opinion of the SE/Contract Manager and/or ECO, the proposal may result in, or carries unreasonable risk of damage to the environment in excess of that permitted by the EMPr.

The Contractor shall carry out the works in accordance with the approved Method Statement. Approval of the Method Statement shall not absolve the Contractor from any of his obligations or responsibilities in terms of the Contract.

Method Statements must be readily available on the site and shall be communicated to all relevant personnel.

Any proposed changes to the original approved environmental Method Statements require the submission of amended Method Statements for approval, and these amendments require the signatures of the Contractor, the ECO and the SE/Contract Manager.

2.6.1 Required Method Statements

The following Method Statements are to be provided by the Contractor within 14 calendar days of commencement of Contract, and prior to the commencement of relevant construction activities:

- **Emergency preparedness** – procedures and equipment for medical emergencies, runaway fires, environmental incidents, site evacuation and staff assembly.
- **Placement of boreholes** – placement of the borehole, laydown areas or storage areas, method of drilling, chemicals to be used, bunding, water management and any specific measures identified by the specialist.
- **Vegetation clearing** – including methods and areas for clearing and felling.
- **Site establishment** – camp/s, lay-down or storage areas, site access and required infrastructure.
- **Workshop and plant servicing.**
- **Ablution facilities** – washing facilities (including methods for managing grey water) and toilets (including the number of, location and method of securing portable/chemical toilets, the proposed service providers to remove and dispose of resultant waste and their service schedule).
- **No-Go areas** – location, demarcation, and access control.
- **Hazardous chemical substances** (as defined in the Regulations for Hazardous Chemical Substances in GN 179 [25 August 1995]), hydrocarbon substances (which includes all fuels and oils) or dangerous goods to be used – storage, handling, and disposal procedures of the materials.
- **Hydrocarbon spills** – procedures, reporting and training required to address accidental spills.
- **Concrete mixing and batching** – locations, bunding, and cement-laden water management.
- **Waste Management** – the type of waste anticipated; the storage, handling, reuse, recycling and/or disposal procedures proposed for each waste, together with the facilities proposed to receive such waste.
- **Stockpile management** – including proposed locations and erosion management.
- **Access management** – including proposed engagement with affected landowner/s, proposed routes, gates, and fencing, crossings, access control, existing services management.
- **Working in watercourses or wetlands** - access, crossings, and dewatering activities (if any).
- **Heritage Resource protection.**
- **Traffic and Detour Management** – lane closures, signalman, alternative routes, etc.

Method statements may also be requested by the ECO or SE/Contract Manager as the need arises. The Contractor shall submit any additional Method Statements that arise within such reasonable time as the ECO or SE/Contract Manager shall specify.

2.6.2 Content of a Method Statement

Method statements must, as a minimum, indicate the following:

What: A brief description of the activity to be undertaken (and in relevant instances, the proposed variation from or deviation to the Contract Documentation, or this EMPPr).

- Where:** A description/sketch map of the locality of work or layout proposed.
- How:** A detailed description of the work, methods, materials, or process proposed (and in relevant instances, reinstatement/rehabilitation requirements).
- When:** The sequencing of actions with commencement and completion date estimates.
- Who:** Nominated responsible representatives and their assigned responsibilities.

The Contractor (and, where relevant, any sub-contractors) must sign the Method Statement, thereby indicating that the work will be carried out according to the methodology recorded in the approved Method Statement. An example of a Method Statement is attached as Appendix B.

2.7 ENVIRONMENTAL AWARENESS TRAINING AND STAFF INDUCTION

The Contractor shall ensure that all staff receive site environmental awareness and staff induction training in appropriate languages, as well as any refresher courses, pertaining to their role on the project.

Awareness training should be provided in the following instances:

- Prior to staff members commencing with any site activities; and
- In the event of an environmental incident or emergency (e.g. staff assembly and site evacuation, medical emergencies, the locations and basic use of fire extinguishers, first aid kits and spills kits, and the use of safety equipment).

Environmental awareness training must cover the following topics, where relevant:

- Explanation of the environmental process that preceded the EA and why it was important to conduct the environmental process;
- Conditions of authorisation contained in the EA;
- Staff Code of Conduct;
- Sensitive environmental features located within and around the site and No-Go areas;
- The reasons why mitigation measures are required and the benefits of implementing these measures;
- The EMP and its contents (e.g. animals, littering etc.);
- The role of the ECO;
- Responses to environmental incidents;
- Emergency procedures;
- Landowner considerations, including access and transport routes on each property, gate management, communication expectations, etc.; and
- Types of heritage resources that may be exposed during construction and the necessary steps to follow in the event that archaeological resources are unearthed – refer to the respective procedures in Section 4.1.

In addition to environmental awareness training, all personnel (including sub-contractors) shall receive regular toolbox talks and refresher courses on the induction material, for the duration of the contract, including “lessons learnt” to prevent recurring issues.

An example of an Environmental Awareness and Induction Training Course is included in Appendix C.

2.8 TEMPORARY SITE CLOSURE

If the site is closed for a period exceeding one week during the construction or decommissioning phase, the Contractor shall ensure that (to be verified by the ECO):

- Hazardous materials stores are secured and locked, with adequate ventilation;
- Bund(s) are emptied (where applicable);
- Fire extinguishers are serviced and accessible;
- Emergency and responsible personnel contact details are displayed;
- All trenches and manholes secured and closed;
- Fencing and barriers are in place;
- Material stockpiles are secured;
- Access gates are locked and secured;
- Dust mitigation is in place, and slopes and open-soil stabilised;
- Toilets emptied and secured;
- Refuse bins emptied and secured; and
- Drip trays emptied and secured (where possible).

2.9 RECORD KEEPING

All records and documents relating to the implementation of this EMPr shall be retained, easily retrievable for the duration of the Contract, and filed by the Contractor for a minimum of 12 months after cessation of activities.

These records and documents must be made available to the SE/Contract Manager, ECO and/or relevant authority upon request.

These records and documents shall include (but shall not be limited to) the most recent versions of:

- The EA;
- Other permits, licenses and registrations;
- The EMPr and any associated management plans;
- EIRF and Complaints Register;
- Approved Method Statements;
- Staff induction and environmental training material and attendance registers;
- Checklists for temporary site closure;
- Monthly compliance reports prepared by the ECO;
- Certificates of waste disposal;
- Disciplinary action (including time penalties or monetary fines) for environmental transgressions; and
- Independent Environmental Audits.

2.10 INTERNAL REVIEW AND AUDITING

The Contractor and ESO shall establish an internal review procedure to monitor the progress and implementation of the EMPr.

Internal audits must, as a minimum, be undertaken within six months of the commencement of construction and annually thereafter for the duration of construction.

At the conclusion of construction (including rehabilitation) phase, an environmental audit report shall be compiled and submitted to DFFE. This report shall be compiled by the ECO, in collaboration with the RE, EO and the Contractor. It shall, as a minimum, outline the implementation of the EMPr, and highlight any problems and issues that arose during the construction period to report, on a formal basis, the lessons learned from this project.

Internal audit reports must indicate compliance status with the conditions of the EA, the WUL and the EMPr and make recommendations for improved environmental management.

2.11 EXTERNAL AUDITS

Independent audits of compliance with the EA and EMPr must be undertaken at a frequency specified by the DFFE in the EA for the project as per Regulation 26(e) of the EIA Regulations, 2014⁶, and must comply with the procedural other requirements of independent audits as outlined in Regulation 34 of the EIA regulations, 2014. Furthermore, external audit reports must include, as a minimum the information requirements of independent audit reports as stipulated in Appendix 7 of the EIA Regulations, 2014.

⁶ GNR 982 of 2014, as amended.

3. PRE-CONSTRUCTION PHASE REQUIREMENTS

3.1 LEGAL COMPLIANCE

3.1.1 EMPr

The EMPr must form part of contract documents, and its requirements must guide the design phase. Table 3-1 indicates how the EMPr should guide activities in this phase.

Table 3-1: EMPr requirements during detailed design

Item	Requirement	Responsibility	Monitoring
1.	This EMPr is an extension of the conditions of the Environmental Authorisation and is binding on all parties involved in this project.	Project Company	DFFE
2.	This EMPr is to form part of the contract documentation for tender such that the Contractor/s is/are aware of its conditions and associated pricing implications.	Engineer / Contract Manager	Project Company
3.	This EMPr will advise the design phase of the project in terms of providing the environmental requirements with regards to pylon locations, routing options, access choices and mitigation / management options.	Engineer / Contract Manager	EAP
4.	The appointments associated with the project team required to implement this EMPr shall be made prior to any activities (that may require their attention) being undertaken.	Project Company	DFFE

3.1.2 Permits, Licences and Registration

Activities must be executed in accordance with the law and requirements of the relevant authorities. Table 3-2 indicates certain licences, permits and registrations that may be required for the project – note that this list should not be considered to be comprehensive, and it is the responsibility of the Project Company to ensure that all permits, licences and registrations are in place prior to project commencement.

Table 3-2: Licences and permits

Item	Requirement	Responsibility	Monitoring
General:			
1.	Should any permits, licenses or registrations be required then the Project Company shall ensure that these are applied for by a relevant specialist/professional, and that these are obtained prior to such activities commencing.	Project Company to engage with relevant specialist	Relevant Competent Authority
NEM:BA:			
2.	Protected plant species may require a permit to be issued by CapeNature (Western Cape) or NCDENC (Northern Cape) in terms of the National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA) or in terms of the Western Cape Nature Conservation Laws Amendment Act, 2000 (Act No. 3 of 2000) before they may be disturbed, rescued, transported, translocated or destroyed.	Project Company to engage with relevant specialist	CapeNature
3.	Where protected trees species cannot be avoided or where clearance of forest is required, then the relevant permits shall be obtained from the DFFE.	Project Company to engage with relevant specialist	DFFE
NHRA:			
4.	If it is not possible to avoid archaeological or palaeontological sites (either previously identified or newly discovered during micro-siting), or mitigation is found to be more feasible than in-situ conservation, a permit in terms of Section 35 of the National Heritage Resources Act (No 25 of 1999) (NHRA) and Chapter IV of the NHRA Regulations must be applied for by a professional archaeologist or palaeontologist prior to construction.	Project Company to engage with Archaeologist	SAHRA or HWC

Item	Requirement	Responsibility	Monitoring
	Mitigation of the archaeological or paleontological sites may only occur if permitted by the South African Heritage Resources Agency (SAHRA) or the Heritage Western Cape (HWC).		
NWA:			
5.	Section 21 of the National Water Act (No. 36 of 1998) (NWA) recognises water uses that are to be licensed (unless these are existing lawful uses, permissible in terms of Schedule 1, or permissible in terms of a General Authorisation) before they may commence. An integrated Water Use License Application will be required.	Project Company to engage with Aquatic Specialist	DWS
MPRDA:			
6.	Mining activities such as sand mining, borrow pits and quarries may require permits or licenses from the Department of Mineral Resources in terms of the Mineral and Petroleum Resources Development Act (No. 28 of 2002) before they may commence.	Project Company to engage with Environmental Consultant	DMRE

3.2 DETAILED DESIGN

3.2.1 General and Specialist Specific Pre-Construction Mitigation Measures and/or Activities

The measures listed in Table 3-3 have been stipulated to ensure that general and specific requirements of the specialists pertaining to environmental sensitivities are integrated into the design. Recommendations from commenting authorities have also been included where relevant.

Table 3-3: Pre-construction mitigation measures and/or activities

Item	Requirement	Responsibility	Monitoring
General:			
1.	Compile outstanding management plans listed in Table 3-5	Project Company	DFFE

Item	Requirement	Responsibility	Monitoring
2.	Implement and comply with management plans that relate to the pre-construction phase (see Section 0)	Project Company	DFFE
3.	The expertise of a Terrestrial Ecologist, an Aquatic Ecologist, an Archaeologist, a Palaeontologist and an Avifaunal Specialist are to be enlisted to conduct post-authorisation micro-siting with the design engineers to reduce potential impacts relating to these specialist fields.	Project Company to engage with relevant specialists	DFFE
4.	Final adjustments to the layout shall be made once the specialist micro-siting recommendations from the walkthrough process have been provided. Any No-Go Areas (areas that shall be excluded from any construction activity or general access by the construction team) within the development sites or servitudes shall be clearly indicated on maps and included with the micro-siting reports or attached to the EMPr.	Project Company	DFFE
5.	Due to the medium risk to the SKA and based on a request from SRAO, a detailed EMC Control Plan must be developed by the renewable energy facility developer should an EA be granted, and development must not commence prior to complying with the AGA Act	Project Company	DFFE
6.	Refer to the design mitigation in the Battery Energy Storage System Risk Assessment (Appendix P).	Project Company	DFFE
7.	Where possible, plan for construction during the drier periods of the year as the area is prone to flooding.	Project Company	DFFE
Climate change:			
8.	Project owners engage with the turbine manufacturers to ensure the operability of the turbines in extremely hot weather	Project Company	DFFE
Terrestrial Ecology:			
9.	Undertake a pre-construction walk through of the development footprint to refine the layout through micrositing of turbines, buildings, substation (and associated battery facility), access roads and internal roads where it impacts on SCC	Project Company	DFFE

Item	Requirement	Responsibility	Monitoring
10.	<p>A Riverine Rabbit Monitoring Programme should be implemented at the site to evaluate the post-construction impact of the development on the Riverine Rabbit as well as other key fauna at the site. As there is some potential for noise and disturbance-related impacts on Riverine Rabbits, the development presents a clear opportunity to evaluate the degree to which Wind Farms are compatible with the maintenance and conservation of Riverine Rabbit populations within their boundaries. The monitoring programme should be conducted with input from EWT and should include pre-construction monitoring to establish a reliable baseline of Riverine Rabbit abundance and distribution at the site. This should be followed by matched post-construction monitoring to evaluate the potential negative impacts on the Riverine Rabbit population.</p> <p>It is estimated that each phase of the above monitoring would need to last approximately 1 year (not necessarily continuously, but in order to capture different seasons and different associated activity levels). The monitoring must be conducted in a manner which allows for reliable effect sizes and statistically-backed inferences to be made.</p>	Project Company	DFFE
11.	<p>Funding to conduct the above monitoring and a feedback mechanism to improve future wind energy development in areas with Riverine Rabbits (i.e., input on guidelines for wind energy development in Riverine Rabbit areas). The running cost of such monitoring is estimated at approximately R200 000 per year. This excludes the initial outlay for any cameras and associated equipment. Assuming that 30 cameras are deemed sufficient, then this would amount to approximately R100 000 at current camera trap prices for a typical camera trap suitable for this application. In addition, this excludes any advanced statistical analyses required.</p>	Project Company	DFFE
12.	<p>A Fauna Monitoring Programme as detailed for Riverine Rabbit Species (above) should be implemented at the site before and after construction so as to monitor the impact of the development on faunal presence within the facility.</p>	Project Company	DFFE

Item	Requirement	Responsibility	Monitoring
13.	The Applicant should, develop and fund a conservation initiative for the life of the wind farm in partnership with EWT or a similar qualified NGO with experience of Riverine Rabbit Conservation in the area. This initiative should focus on enhancing management of the most suitable Riverine Rabbit Riparian habitat in the broader Karoo with the aim of halting the current trend of degradation and the associated decline in the Riverine Rabbit population. The Applicant should make provision for R250,000 per annum towards this fund during the construction and operational phases of the wind farm commencing at the start of construction. The annual amount of R250,000 is applicable to the year 2022 and should be escalated in accordance with CPI each year after that.	Project Company	DFFE
14.	Adhere to the sensitivity maps and no-go areas provided by the specialist when determining the final layout of the Wind Farm and associated infrastructure.	Project Company	DFFE
15.	Develop an alien vegetation management plan, soil erosion management plan, revegetation and rehabilitation plan based on the site attributes and environmental constraints. Note generic plans have been drafted and included as Appendix F, L and I and must be updated to include any additional detail required.	Project Company	DFFE
16.	Ensure that all vegetation-related preconstruction permits, surveys and walk-throughs have been conducted prior to the commencement of construction activity.	Project Company	DFFE
17.	Develop an open space management plan as part of the project EMPr. Note generic plans have been drafted and included as Appendix J and must be updated to include any additional detail required.	Project Company	DFFE
18.	The design should ensure that there is no electrical fencing around substations (and associated battery facilities) or other features within 30cm of the ground as tortoises become stuck against such fences and are electrocuted to death. Alternatively, a guard wire set at 20cm can be used to keep larger tortoises away from the fence.	Project Company	DFFE

Item	Requirement	Responsibility	Monitoring
19.	Ensure that all fauna-related preconstruction permits, surveys and walk-throughs have been conducted prior to the commencement of construction activity.	Project Company	DFFE
20.	Should access roads, internal cables and overhead lines traverse drainage lines and riparian areas mapped as CBAs these should be microsited by a suitably qualified ecological and aquatic specialist before construction in that area starts to ensure any potential impacts are minimised	Project Company	DFFE
21.	Where any new roads, cabling and/or overhead lines traverse areas mapped as High Riverine Rabbit habitat sensitivity, the route should be microsited by a suitably qualified ecological specialist before construction commences to ensure any potential impacts are minimised. Existing tracks through these areas should be used where present.	Project Company	DFFE
22.	<p>A Karoo dwarf tortoise Monitoring Plan must be compiled for the construction and operational phases prior to construction. Monitoring of the following components should be included:</p> <ul style="list-style-type: none"> • Monitor construction activities aimed at reducing impacts on the Karoo Dwarf Tortoise, i.e., an ECO must oversee the implementation of mitigating measures. • Monitor (keep log of) tortoise killed by earthworks and traffic. <p>Operational monitoring to include annual inspections along powerlines to monitor corvid numbers, the extent of corvids nesting on these structures, and to check for tortoise carcasses below these nesting sites.</p>	Project Company	DFFE
23.	Avoid areas identified as prime Karoo Dwarf Tortoise habitat, as per the layouts produced during the EIA phase. This has been implemented via the sensitivity mapping.	Project Company	DFFE
24.	CBAs should be avoided for roads as far as possible. The use of existing roads through these areas is considered acceptable. Therefore, the current layout is suitable in this regard.	Project Company	DFFE

Item	Requirement	Responsibility	Monitoring
25.	Avoid impact to restricted and specialised habitats such as pans, wetlands and rock pavements. The final development footprint to be authorised should be checked for such sensitive features in the field, such that there is a high degree of confidence that the final layout avoids such features so that significant changes to turbines or roads are not required at the preconstruction phase.	Project Company	DFFE
26.	Minimise the development footprint near watercourses and other ecologically significant features.	Project Company	DFFE
27.	Incorporate special design features to roads and other infrastructure to provide safer options for tortoises to minimise the potential of roadkill mortalities – i.e. allow fauna to pass over, through or underneath these features as appropriate.	Project Company	DFFE
Aquatic Ecology:			
28.	A pre-construction walkthrough with an aquatic specialist is recommended and they can assist with the development of the Stormwater Management Plan and Aquatic Rehabilitation and Monitoring Plan, coupled to micro-siting of the final layout. Note generic plans have been drafted and included as Appendix I and K and must be updated to include any additional detail required.	Project Company	DFFE
29.	A detailed stormwater management plan as per item above must be developed in the pre-construction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil.	Project Company	DFFE
30.	Suitable stormwater management systems must be installed along roads and other areas.	Project Company	DFFE
31.	The following applies to watercourse crossing upgrades: <ul style="list-style-type: none"> All pipe culverts must be removed and replaced with suitable sized box culverts, where road levels are raised. 	Project Company	DFFE

Item	Requirement	Responsibility	Monitoring
	<ul style="list-style-type: none"> • River levels, regardless of the current state of the river / water course will be reinstated thus preventing any impoundments from being formed. The related designs must be assessed by an aquatic specialist during a pre-construction walkdown. • Suitable stormwater management systems must be installed along roads and other areas and monitored during the first few months of use. • Any erosion / sedimentation must be resolved through whatever additional interventions maybe necessary (i.e., extension, energy dissipaters, spreaders, etc).. • A detailed monitoring plan must be developed in the pre-construction phase by an aquatic specialist, where any delineated wetlands occur within 50 m of existing crossings. 		
Geohydrology:			
32.	In an effort to limit the groundwater abstraction volumes, consideration should be given to the application of a stabilization compound to the <i>in-situ</i> materials used for road construction.	Project Company	DFFE
33.	The legal status of groundwater use at each property should be confirmed. This will inform the need for future water use authorisations.	Project Company	DFFE
34.	Where necessary, water use authorisations must be obtained for groundwater abstraction from new or existing boreholes. Quarterly groundwater monitoring (abstraction volumes, quality and water levels) should be provided for.	Project Company	DFFE
35.	Every effort should be made to visit all boreholes and undertake yield and quality tests at boreholes that could be considered for future supply (based on their relative proximity to Wind Farm infrastructure). The information obtained from the NGA database would be a useful starting point in determining which of the boreholes should be tested for their yields. Further, the relative sizes,	Project Company	DFFE

Item	Requirement	Responsibility	Monitoring
	GA volumes (and cap volumes) of the respective farm portions should also be considered when planning scientific yield testing.		
36.	No boreholes to be drilled in river channels / lines or wetlands.	Project Company	DFFE
37.	Groundwater exploration via geological and geophysical methods is recommended for Wind Farms, should existing boreholes not be sufficient.	Project Company	DFFE
38.	All boreholes planned for use will require scientific yield and quality testing and analysis. During yield testing, erosion should be monitored and addressed as necessary.	Project Company	DFFE
Bats:			
39.	Avoid No-go areas by adhering to the sensitivity map (this has been applied in the current layout to date).	Project Company	DFFE
40.	If wind farm is found to be in a migration path, apply appropriate mitigation measures to ensure that the facility's bat mortalities are below a sustainable threshold.	Project Company	DFFE
41.	Artificial lighting to be kept to a minimum on the infrastructure (O&M buildings and on wind turbines), while still adhering to safety and security requirements. For example, this can be achieved by having floodlights down-hooded, installing passive motion sensors onto lights around buildings and possibly utilising lights with lighting colours (also referred to as lighting temperatures) that attract fewer insects.	Project Company	DFFE
42.	For buildings, ensure the design does not allow for any entrance holes into the roof cavity.	Project Company	DFFE
Avifauna:			
43.	The No-Go areas identified by the specialist and the High sensitivity areas (with associated conditions) should be adhered to.	Project Company	DFFE
44.	Blade painting and/or shutdown on demand (either observer or technology led) implemented to mitigate bird-	Project Company	DFFE

Item	Requirement	Responsibility	Monitoring
	turbine collision risk ⁷ ; alternatives approved by the bird specialist and which the specialist believes would achieve similar results to these other two options may also be considered. A decision on which of these is applied should be taken within 6 months of the project achieving preferred bidder status. In the meantime all necessary financial and technical provisions must be made by the developer.		
45.	A pre-construction avifaunal walk down should be conducted to confirm final layout and identify any sensitivities that may arise between the conclusion of the Environmental Authorisation process and the construction phase.	Project Company	DFFE
46.	The facility must be monitored once operational in accordance with the most recent version of the best practice guidelines available at the time (Jenkins et al., 2015, 2022 in prep). These guidelines currently state that a minimum of two years of monitoring must be completed, although if significant impacts are detected this will need to be extended. The results of this monitoring should feed into an Adaptive Management Plan for the facility, refer to Appendix H.	Project Company	DFFE
47.	Monitoring of breeding status of Martial and Verreaux's Eagles should be conducted in all breeding seasons post acceptance of the project as preferred bidder prior to and during construction (to establish a baseline).	Project Company	DFFE
48.	The bird-turbine collision risk must be through the implementation of effective mitigation measures from commercial operation date (COD) onwards. Two potential options exist to our knowledge: blade painting; and shutdown on demand (either observer or technology led). Since it will be several years before the proposed Wind	Project Company	DFFE

⁷ Since it will be several years before the proposed wind farm is constructed, there is an opportunity to learn more about these two measures in the interim and make a decision on which option is implemented at that time. Several operational wind farms have just begun observer led shutdown on demand programmes in SA, and two wind farms are about to trial blade painting. There is therefore a high likelihood of having more experience on the effectiveness of such measures a year or two from now.

Item	Requirement	Responsibility	Monitoring
	Farm is constructed a decision on which be taken within 6 months of the project achieving preferred bidder status. Any alternative that is identified in the interim that is approved by the bird specialist and which the specialist believes would achieve similar results to these other two options may also be considered. Financial provision must be made for this mitigation.		
49.	Where relevant, overhead conductors or earth wires should be fitted with an Eskom approved anti bird collision line marking device to make cables more visible to birds in flight and reduce the likelihood of collisions. The location of these will be determined through the final walkthrough. Should new more effective bird flight diverters (BFDS) come available the developer needs to be ready to procure and fit these.	Project Company	DFFE
50.	The safety of the pole design currently proposed, should be improved by using a bird perch at the very top of the pole.	Project Company	DFFE
51.	Any change in pylon design should be agreed by the avifauna specialist.	Project Company	DFFE
Socio-economic:			
52.	Establish a Monitoring Programme in collaboration with affected landowners that is specifically designed to provide clarity on impacts and risks. Aspects or risks that should be monitored need to be agreed on with affected landowners. The Contractor/ Project Owner should formally commit to mitigation and potential compensation actions that may arise from REIPPPP monitoring requirements.	Project Company	DFFE
53.	Setting up a skills and services database in partnership with the local municipality and civil society for the local area before any hiring or contracting decisions are made. This can help to ensure fairness and limit potential interference in hiring processes.	Project Company	DFFE
54.	Set targets for use of local labour, based on REIPPPP thresholds and targets outlined in DMRE, 2021 (e.g., RSA-based employees who are citizens and from local	Project Company	DFFE

Item	Requirement	Responsibility	Monitoring
	communities should make up at least 20% of the workforce).		
55.	A fire management plan should be drawn up prior to construction in agreement with affected landowners. The Contractor/ Project Owner should also ensure that they join the local fire protection agency.	Project Company	DFFE
56.	If the local fire protection agency deems it necessary, then fire breaks around the site should be constructed as a first order of business before any other construction works begin.	Project Company	DFFE
Heritage:			
57.	Pre-construction survey of the layout followed by micrositing or mitigation as appropriate or possible.	Project Company Archaeologist	DFFE
58.	The archaeological site at waypoint 1703 that will be crossed by a proposed wind farm road must be excavated prior to construction. Excavation should at least cover the area to be disturbed.	Project Company	DFFE
59.	The archaeological site at waypoints 1978 and 1979 that will be overlapped by a turbine footing must be excavated prior to construction. Excavation must target the densest part(s) of the scatter within or close to the impact zone.	Project Company	DFFE
60.	The two graves at waypoint 1696 must be fenced with a regular farm-style fence with a pedestrian entrance gate so as to ensure that they are easily identifiable on site. The fence must be placed at least 5 m from the graves and the electrical cable must be placed a minimum of 5 m away from the fence, but preferably further if possible.	Project Company	DFFE
61.	In the Northern Cape, a permit application to NBKB will need to be made on SAHRIS for alteration or demolition of the R381 bridge which is older than 60 years.	Project Company	DFFE
62.	Replacement structures for the existing bridges on the local access roads must be designed to have a similar appearance to the current structures.	Project Company	DFFE

Item	Requirement	Responsibility	Monitoring
63.	Where road surfacing is required use low contrast materials where possible.	Project Company	DFFE
Palaeontology:			
64.	The final layout must be evaluated by a palaeontologist to determine which areas, if any, need a pre-construction survey. An approved Work Plan from Heritage Western Cape or a Permit from SAHRA will be required by the specialist palaeontologist responsible for mitigation work.	Project Company	DFFE
65.	Standard paleontological mitigation (recording and collection) of the well-preserved tetrapod skull and skeleton near crossing DR02314-2&3 (31°49'9.97"S, 22°5'21.48"E in the Northern Cape) should be implemented prior to construction. A permit in terms of section 35 of the NHRA and Chapter II and Chapter IV of the June 2000 Regulations must be applied for from SAHRA in order to mitigate the tetrapod fossil.	Project Company	DFFE
Visual:			
66.	Visually sensitive skylines, such as dolerite ridges, koppies, and rock outcrops avoided in the layout design.	Project Company	DFFE
67.	Where a choice exists between turbines to be dropped (when the final 60 turbine positions, or less, are selected), and all other factors are equal, priority should be given to dropping outlier turbines or those in the 'high' visual sensitivity areas including those within 1 km of the R381, and consideration given to removing turbines where widening of gaps improve the clustering effect.	Project Company	DFFE
68.	Substations and O&M Buildings to be located in unobtrusive low-lying areas away from provincial and district roads where possible. The current location meets these requirements.	Project Company	DFFE
69.	On-site signage to be discrete, and billboards prohibited. Signage to be fixed as low as possible, preferably against a backdrop to avoid intrusion on the skyline.	Project Company	DFFE
70.	Security and other outdoor lighting to be fitted with reflectors to conceal the light source.	Project Company	DFFE

Item	Requirement	Responsibility	Monitoring
71.	A CAA-approved warning system which only requires the red lights to come on when an aircraft is in the vicinity (on demand warning lights) must be used to reduce the night-time impacts to the sense of place.	Project Company	DFFE
72.	Use of reflectors on area and security lighting to conceal light sources.	Project Company	DFFE
73.	Where a choice exists between turbines to be dropped (when the final turbine positions selected), and all other factors are equal, priority should be given to dropping outlier turbines or those in the 'high' visual sensitivity areas, and consideration given to removing turbines where widening of gaps improve the clustering effect.	Project Company	DFFE
Noise:			
74.	The potential noise impact must be evaluated again should the layout be revised where any wind turbines are located closer than 1,000 m from a confirmed NSR	Project Company	DFFE
75.	The potential noise impact must be evaluated again should the applicant make use of a wind turbine with a maximum sound power emission level exceeding 108.5 dBA re 1 pW	Project Company	DFFE
76.	Once-off noise measurements are recommended at the location of NSRs 18 and 19 before the construction phase starts, to establish the existing ambient sound levels. Once the Wind Farms are operational, noise measurements should be repeated to assess the noise levels at these receptors. Refer to the Noise Management Plan as Appendix M.	Project Company	DFFE
Traffic:			
77.	Traffic Management Plan (TMP) is to be compiled once the contractor has been appointed and all the relevant details of the construction process are known. The TMP needs to address, <i>inter alia</i> : - clearly defined route/s to the site for specific vehicles needed to transport equipment and materials - scheduled deliveries to avoid local congestion. A draft Traffic Management Plan has been compiled as a guide from which a detailed TMP can be compiled, and is	Project Company	DFFE

Item	Requirement	Responsibility	Monitoring
	attached as Appendix N. The TMP is a living document to be continually reviewed and updated.		
78.	The developer shall contribute to the maintenance of all roads affected by the development, during the construction and operational phases of the development. Provision should be made for this.	Project Company	DFFE
79.	All remedial work or modifications to any of the public roads shall be done in consultation with and have the approval of the local road's authority (as is standard practice through the municipal planning approval process).	Project Company	DFFE
80.	The treacherous section of the gravel road, through the Molteno Pass on the TR05801, is to be upgraded by the developer to improve the safety of the road for all road users, including the personnel commuting to and from the site on a daily basis. This upgrade would need to be implemented prior to or during site establishment but before major earthworks commence on the development.	Project Company	DFFE
81.	The access into Loxton from the TR016 (R63) is to be upgraded by the developer to accommodate the expected transportation requirements. This upgrade would need to be implemented to facilitate the delivery of abnormal loads to the proposed development. This is only applicable if this has not already been undertaken as part of the Nuweveld Wind Farm Project.	Project Company	DFFE
82.	The route for construction vehicles from the TR016 (R63) to the TR05801 should not unduly impact the local community of Loxton and should avoid the commercial centre of Loxton. In this regard, unless a technical issue is identified once the final turbine and abnormal trucks specifications are known, the route from R63 is via Auret Street, onto Fraserburg Street, onto the TR05801.	SE/Contract Manager	ECO
83.	The interaction of concrete delivery trucks on the public road network is a serious concern that needs to be mitigated prior to the approval of the proposed development.	Project Company	DFFE

Item	Requirement	Responsibility	Monitoring
Agriculture:			
84.	Design an effective system of stormwater run-off control, where it is required - that is at any points where run-off water might accumulate. The system must effectively collect and safely disseminate any run-off water from all accumulation points and it must prevent any potential down slope erosion. This is to be included in the detailed stormwater management plan.	Contractor	ECO

3.3 MANAGEMENT PLANS

The management plans listed in Table 3-4 are appended to the EMPr.

Table 3-4: Management plans appended to the EMPr

Management Plan	Reference
Fossil Chance Find Protocol	Appendix D
Plant Rescue and Protection Plan	Appendix E
Invasive Alien Plant Management Plan	Appendix F
Bat Mitigation Action Plan	Appendix G
Avifauna Monitoring Plan and Adaptive Management Plan	Appendix H
Rehabilitation Management Plan	Appendix I
Open Space Management Plan	Appendix J
Stormwater Management Plan	Appendix K
Erosion Management Plan	Appendix L
Noise Management Plan	Appendix M
Traffic Management Plan	Appendix N
Fire Management Plan	Appendix O
BESS Design Mitigation	Appendix P

The management plans listed in Table 3-5 are to be compiled following project approval and before construction commences.

Table 3-5: Management plans to be compiled following project approval

Management Plan
Aquatic Rehabilitation and Monitoring Plan
Riverine Rabbit (and Faunal) Monitoring Programme
Emergency Response Plan
Karoo Dwarf Tortoise Monitoring Plan
EMC Control Plan

3.4 NOTIFICATION OF COMMENCEMENT OF CONSTRUCTION

The ECO shall give DFFE at least two week's (or as specified in the Environmental Authorisation) written notice to the DFFE prior to the commencement of construction. A general notification letter shall also be sent to neighbouring residents and other relevant stakeholders listed on the project database.

4. CONSTRUCTION PHASE EMPR

4.1 SPECIALIST SPECIFIC MITIGATION MEASURES

Table 4-1 contains specific mitigatory measures recommended by specialists as they pertain to the construction phase. Recommendations from commenting authorities have also been included where relevant.

Table 4-1: Pre-construction mitigation measures and/or activities

Item	Requirement	Responsibility	Monitoring
Terrestrial Ecology:			
1.	Search and rescue for reptiles, including the Karoo dwarf tortoise and other vulnerable species during construction, before areas of intact vegetation are cleared. Such search and rescue should be conducted by relevant experts with experience in search and rescue of the faunal groups concerned.	Project Company	DFFE
2.	Monitoring of vegetation clearing during construction by the ECO to ensure that any plant SCC within the development footprint area are translocated to safety where necessary.	SE/Contract Manager	ECO
3.	All vehicles should adhere to a low-speed limit on site. Heavy vehicles should be restricted to 30km/h and light vehicles to 40km/h.	Contractor	ECO
4.	All laydown areas, construction sites etc. with waste disposal bins, should be provided with lockable bins that are tamper proof by baboons, monkeys and other fauna.	Contractor	ECO
5.	Limiting access to the site and ensuring that construction staff and machinery remain within the demarcated construction areas during the construction phase. Environmental induction for all staff and contractors on-site.	Contractor	ECO
6.	No excavated holes or trenches should be left open for extended periods as fauna may fall in become trapped.	Contractor	ECO
7.	Holes and trenches that are open should be checked on a regular basis (preferably daily) to ensure that any fauna that have fallen in and become trapped can be rescued to safety.	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
8.	A log should be kept detailing all fauna-related incidences or mortalities that occur on site, including roadkill, electrocutions etc. during construction and operation. These should be reviewed annually and used to inform operational management and mitigation measures.	Contractor	ECO
9.	Monitoring of site clearing during construction by the ECO to ensure that any fauna remaining within the development footprint area are translocated to safety where necessary.	SE/Contract Manager	ECO
10.	Demarcate sensitive habitats such as riparian areas as no-go areas during construction with construction tape or similar markers and signage. Monitoring of construction activities to ensure that the development remains within the demarcated development footprint.	SE/Contract Manager	ECO
11.	During construction, driving between sunset and sunrise should be reduced as far possible as this is when Riverine Rabbits are most active, and the risk of collisions is highest.	Contractor	ECO
12.	No dogs should be allowed on site and precautions to ensure that there is poaching or other direct faunal disturbance on site should be implemented.	Contractor	ECO
13.	There should be a monitoring programme for Riverine Rabbit roadkill during construction that should be used to inform any additional mitigation and avoidance that should be implemented. Should rabbits be killed by traffic, then the traffic management to and from the site should be reviewed in collaboration with the EWT Drylands Programme, to identify additional mitigation and avoidance that should be implemented to further reduce roadkill.	SE/Contract Manager	ECO
14.	Ensure that riparian areas near to the development footprint are clearly demarcated as no-go areas with appropriate signage and barriers.	SE/Contract Manager	ECO
15.	Monitor (keep log of) tortoise killed by earthworks and traffic.	SE/Contract Manager	ECO

Item	Requirement	Responsibility	Monitoring
16.	Conduct annual surveys along the powerlines to 1) census crow numbers, 2) log crow nesting sites, and 3) log tortoise carcasses observed along the powerlines.	SE/Contract Manager	ECO
17.	Construction activities must be monitored by ECO with the aim to guard against potential impacts on Karoo Dwarf Tortoises where feasible.	SE/Contract Manager	ECO
18.	Minimise the development footprint as far as possible, which includes locating temporary-use areas such as construction camps and lay-down areas in low sensitivity or previously disturbed areas.	SE/Contract Manager	ECO
19.	Monitoring of construction activities to ensure that the development footprint within CBAs is restricted to the authorised development footprint.	SE/Contract Manager	ECO
Aquatic Ecology:			
20.	Where large cut and fill areas are required these must be stabilised and rehabilitated during the construction process, to minimise erosion and sedimentation	Contractor	ECO
21.	All liquid chemicals including fuels and oil, including for the BESS, must be stored in with secondary containment (bunds or containers or berms) that can contain a leak or spill. Such facilities must be inspected routinely and must have the suitable PPE and spill kits needed to contain likely worst-case scenario leak or spill in that facility, safely.	Contractor	ECO
22.	Washing and cleaning of equipment must be done in designated wash bays, where rinse water is contained in evaporation/sedimentation ponds (to capture oils, grease cement and sediment).	Contractor	ECO
23.	Mechanical plant and bowsers must not be refuelled or serviced within 100m of a river channel.	Contractor	ECO
24.	All construction camps, lay down areas, wash bays, batching plants or areas and any stores should be more than 50 m from any demarcated water courses.	Contractor	ECO
25.	Littering and contamination associated with construction activity must be avoided through effective construction camp management.	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
26.	No stockpiling should take place within or near a water course.	Contractor	ECO
27.	All stockpiles must be protected and located in flat areas where run-off will be minimised and sediment recoverable.	Contractor	ECO
28.	ESO to monitor the site on a daily basis to ensure plant is in working order (minimise leaks), spills are prevented and if they do occur, are quickly rectified.	Contractor	ESO
29.	All alien plant re-growth, which is currently low within the greater region must be monitored and should it occur, these plants must be eradicated within the project footprints and especially in areas near the proposed crossings.	Contractor	ECO
Geohydrology:			
30.	Quarterly groundwater monitoring (abstraction volumes, quality and water levels) should be implemented to ensure sustainable use that is within the authorised volumes; as well as for contamination. Mitigation should be applied as necessary to ensure no long term impacts are incurred. Also see Section 4.21 with regards to boreholes.	Contractor	ECO
Bats:			
31.	Rehabilitate cleared vegetation where possible at areas such as laydown yards.	Contractor	ECO
Avifauna:			
32.	All construction activities should be strictly managed according to generally accepted environmental best practice standards, so as to avoid any unnecessary impact on the receiving environment.	Contractor	ECO
33.	Monitoring of breeding status of Martial and Verreaux's Eagles should be conducted in all breeding seasons post acceptance of the project as preferred bidder prior to and during construction (to establish a baseline).	Project Company	ECO
34.	During construction, all road and hard stand verges and other disturbed areas must be fully compacted to as hard as they were prior to construction, to ensure that these	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
	areas do not attract ground burrowing mammals in artificially high abundance and closer to turbines. Piles of spoil material close to turbines should be avoided as far as possible as these also attract prey species. It is essential that the new wind farm does not create favourable conditions for such mammals in high risk areas.		
Agriculture:			
35.	Implement an effective system of stormwater run-off control, where it is required - that is at any points where run-off water might accumulate. The system must effectively collect and safely disseminate any run-off water from all accumulation points and it must prevent any potential down slope erosion. This should be included in the stormwater management plan.	Contractor	ECO
36.	Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas to stabilise disturbed soil against erosion.	Contractor	ECO
37.	If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.	Contractor	ECO
Socio-economic:			
38.	<p>A Code of Conduct should be established for the project, in addition:</p> <ul style="list-style-type: none"> • The Code of Conduct should identify what types of behaviour and activities by workers are not permitted taking account of the needs of surrounding landowners and communities residing in affected areas. • All staff, contractors and members of the workforce must be made aware of the Code of Conduct during the recruitment process. • Awareness training must be provided during their induction onsite and prior to commencement of work duties on site. 	SE/Contract Manager Project Company	ECO

Item	Requirement	Responsibility	Monitoring
	<ul style="list-style-type: none"> Display the Code of Conduct in the operation and maintenance buildings and construction areas. 		
39.	Set targets for how much local labour should be used based on the project needs and the availability of existing skills and people that are willing to undergo training.	SE/Contract Manager	ECO
40.	Opportunities for the training of unskilled and skilled workers from local communities should be maximized.	SE/Contract Manager	ECO
41.	Maximise the use of local sub-contractors where possible through tendering and procurement and ensure meeting the REIPPPP local content requirements.	SE/Contract Manager	ECO
42.	Exploring ways to enhance local community benefits with a focus on broad-based BEE and preferential procurement.	SE/Contract Manager	ECO
43.	<p>Ensure that employees are adequately prepared to cope with the challenges that come with being employed through the establishment of an employee induction programme.</p> <p>An effective employee induction programme is essential to ensuring that new employees, some of whom will be unfamiliar with the responsibilities of maintaining employment, are adequately prepared and motivated to adjust to the lifestyle required of them. This programme should incorporate life skills training as well as basic financial literacy training.</p>	Contractor	ECO
44.	Counselling services should be made available to employees to ensure that they have adequate guidance.	Contractor	ECO
45.	Assisting smaller enterprises where possible in tendering for contracts and in accessing finance which are common constraints to their participation in projects.	SE/Contract Manager	ECO
46.	Avoiding potential service provider decisions that may lead to abuse or local dissatisfaction. For example, only appointing one accommodating rental agent or one catering supplier may lead to local dissatisfaction regarding the spreading of project benefits.	SE/Contract Manager	ECO
47.	As far as possible, avoid significant variation in salaries between various contractors for the same types of jobs.	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
	When variations are too high, the likelihood of dissatisfaction increases.		
48.	A 'locals first' policy with regard to construction labour needs.	SE / Contract Manager / Contractor	ECO
49.	The community should be able to contact the site manager or his/her representative to report any issues which they may have. The site manager and his/her representative should be stationed within the area and should therefore be available on hand to deal with and address any concerns which may be raised.	SE/Contract Manager	ECO
50.	A complaints register should be available on site to any individual who may have a particular complaint with regards to the construction process.	SE/Contract Manager	ECO
51.	The Project Owner and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase	SE / Contract Manager / Contractor	ECO
52.	Arrangements must be made to enable workers from outside the area to return home at reasonably regular intervals. This would reduce the risk posed by non-local construction workers to local family structures and social networks.	SE / Contract Manager / Contractor	ECO
53.	Condoms should be freely available to employees and all contractor workers.	Contractor	ECO
54.	The applicant should honour their commitment to spend R100 000 per year during construction to contribute to security initiatives in the affected areas.	Project Company	ECO
55.	The contractor should make the necessary arrangements for ensuring that all non-local construction workers are transported back to their place of residence once the construction phase is completed.	Contractor	ECO
56.	Close coordination with the municipality is required, including regular meetings.	SE/Contract Manager	ECO
57.	No construction workers, with the exception of security personnel, should be allowed to stay on the site overnight.	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
58.	The movement of workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis.	Contractor	ECO
59.	The Contractor/ Project Owner should implement measures to assist and, if needed, fairly compensate potentially affected landowners whereby damages to farm property, stock theft or significant disruptions to farming activities can be minimized or reduced. Measures should be agreed on before construction commences.	Project Company	ECO
60.	Implement the fire management plan and ensure correct personnel appointed and trained.	SE/Contract Manager	ECO
61.	The temporary bypass must be gated to prevent use by the public.	SE/Contract Manager	ECO
62.	The applicant should consult community representatives, including relevant people within the local municipality as well as ward councilors, regarding planning for the use of the N1 temporary bypass to ensure that all stakeholders are kept informed as to the timing of project-traffic and potential ways of ensuring the safety of community members in the area.	Project Company	ECO
Heritage:			
63.	Keep construction duration as short as possible.	SE/Contract Manager	ECO
64.	Minimise landscape scarring.	Contractor	ECO
65.	Rehabilitate any areas not required during operation.	Contractor	ECO
66.	Trenching within 30 m of waypoint 1696 must be monitored by relevant project staff and/or the ECO.	SE/Contract Manager	ECO
67.	Road construction work around the Slangfontein farm werf must be monitored by relevant project staff and/or the ECO to ensure that the walls remain unharmed.	SE/Contract Manager	ECO
68.	If any archaeological material or human burials are uncovered during the course of development, then work in the immediate area should be halted. The find would	SE/Contract Manager	ECO

Item	Requirement	Responsibility	Monitoring
	need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.		
69.	Northern Cape watercourse crossing upgrades: If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/ Ngqalabutho Madida 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA.	SE/Contract Manager	ECO
Palaeontology:			
70.	The Environmental Control Officer (ECO) / Environmental Site Officer (ESO) responsible for the development must be informed that sediments of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup) have a Very High Palaeontological Sensitivity and should be made aware of the possibility of important fossil remains (vertebrate bones, teeth, burrows, petrified wood, plant-rich horizons etc., such as those illustrated in this report) being found or unearthed during the construction phase of the development.	SE/Contract Manager	ECO
71.	Monitoring for fossil material of all major surface clearance and deeper (>1m) excavations by the ECO/ESO on an on-going basis during the construction phase.	SE/Contract Manager	ECO
72.	Significant fossil finds should be safeguarded and reported at the earliest opportunity to Heritage Western Cape for recording and sampling by a professional palaeontologist (Contact details: Heritage Western Cape. 3rd Floor Protea Assurance Building, 142 Longmarket Street, Green Market Square, Cape Town 8000. Private Bag X9067, Cape Town 8001. Tel: 021 483 5959 Email: Ceoheritage@westerncape.gov.za	SE/Contract Manager	ECO
73.	An approved Work Plan from Heritage Western Cape will be required by the specialist palaeontologist responsible for mitigation work. Minimum Standards for palaeontological heritage reports and fieldwork have been specified by Heritage Western Cape (2021).	SE/Contract Manager	ECO

Item	Requirement	Responsibility	Monitoring
74.	Northern Cape watercourse crossing upgrades: The Environmental Control Officer (ECO) for this project must be informed that sediments of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup) have a Very High Palaeontological Sensitivity.	SE/Contract Manager	ECO
75.	Northern Cape watercourse crossing upgrades: Training of accountable supervisory personnel by a qualified palaeontologist in the recognition of fossil heritage is very important and necessary.	SE/Contract Manager	ECO
76.	Northern Cape watercourse crossing upgrades: If Palaeontological Heritage is uncovered during surface clearing and excavations the Chance find Protocol attached should be implemented immediately. Fossil discoveries ought to be protected and the ECO/site manager must report to South African Heritage Resources Agency (SAHRA) as per section 35 (3) of the schedule (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation (recording and collection) can be carried out	SE/Contract Manager	ECO
77.	Northern Cape watercourse crossing upgrades: Before any fossil material can be collected from the development site the specialist involved would need to apply for a collection permit from SAHRA. Fossil material must be housed in an official collection (museum or university), while all reports and fieldwork should meet the minimum standards for palaeontological impact studies proposed by SAHRA (2012).	SE/Contract Manager	ECO
78.	Northern Cape watercourse crossing upgrades: Standard paleontological mitigation (recording and collection) of the well-preserved tetrapod skull and skeleton near crossing DR02314-2&3 (31°49'9.97"S, 22°5'21.48"E) should be implemented prior to construction. A permit in terms of section 35 of the NHRA and Chapter II and Chapter IV of the June 2000 Regulations must be	Project Company	ECO

Item	Requirement	Responsibility	Monitoring
	applied for from SAHRA in order to mitigate the tetrapod fossil.		
79.	Adherence with the Fossil Chance Finds Protocol as Appendix in Appendix D	SE/Contract Manager	ECO
Noise:			
80.	<p>Minimising the risk of annoyance developing with the project, specifically with regards to Noise Sensitive Receptors (NSRs) 18, 19 and 23. This could include:</p> <ul style="list-style-type: none"> • minimise simultaneous night-time construction activities closer than 1,000 m from any NSR • with regard to unavoidable road construction activities in the vicinity of NSRs (closer than 1000 m), the Contractor and ECO must liaise with the potential NSRs that may be affected, keeping them informed of the nature and duration of intended activities. • minimise construction activities (that generate significant impulsive noises) within 2 000 m from NSRs at night, planning the completion of these noisiest activities (such as pile driving, rock breaking and excavation) only during the daytime period. 	Contractor	ECO
81.	<p>With regards to equipment and plant:</p> <ul style="list-style-type: none"> • Where practicable, mobile equipment should be fitted with broadband (white-noise generators/alarms), rather than tonal reverse alarms; • The use of vehicle horns should be minimized where possible; and • Ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures. Engine bay covers over heavy equipment could be pre-fitted with sound absorbing material. Heavy equipment that fully encloses the engine bay should be considered, ensuring that the seam gap between the hood and vehicle body is minimised. 	SE/Contract Manager	ECO
82.	The Health and Safety Induction should include a component on environmental noise to sensitize all	SE/Contract Manager	ECO

Item	Requirement	Responsibility	Monitoring
	employees and contractors about the potential impact from noise, especially those employees and contractors that have to travel past receptors at night, or might be required to do work close (within 1,000m) to NSRs at night		
83.	A complaints register must be kept on site. Should there be a noise complaint, once-off noise measurements must be conducted at the location of the person that registered a valid and reasonable noise complaint (NSR staying within 2 000 m from location of construction activities). Refer to the Noise Management Plan (Appendix M).	SE/Contract Manager	ECO
Visual:			
84.	Disturbed areas rehabilitated / revegetated as soon as possible during the construction phase.	SE/Contract Manager	ECO
85.	Temporary laydown and areas and batching plants to be located away from arterial or district roads unless approved by the visual specialists. This current layout is acceptable in this regard.	SE/Contract Manager	ECO
86.	Stockpiles to be demarcated and located within approved construction footprints.	Contractor	ECO
87.	Recycling and refuse bins to be provided to eliminate litter from the site.	Contractor	ECO
88.	Earth berms and planting to be used to visually screen the N1 bypass in places of close proximity to residential areas.	Project Company	ECO
89.	Traffic and other signage at the N1 bypass to be limited to only that which is essential.	SE/Contract Manager	ECO
90.	Where lighting is required at the N1 bypass, these are to have reflectors to avoid light spillage on adjacent areas.	SE/Contract Manager	ECO
Traffic:			
91.	All remedial work or modifications to any of the public roads shall be done in consultation with and have the approval of the local road's authority (as is standard practice, this will be finalised during and be a requirement of the municipal planning approval process).	SE/Contract Manager	ECO
92.	Post relevant road signage along affected routes.	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
93.	The developer shall ensure that the contractor erects temporary signs warning motorists of construction vehicles on the approaches to the access road.	SE/Contract Manager	ECO
94.	Create local WhatsApp Group, notifying other road users of expected deliveries and associated routes.	Contractor	ECO
95.	Create a local WhatsApp Group for local community and post notices of road conditions and proposed alternatives.	Contractor	ECO
96.	Ensure all vehicles are roadworthy, visible, adequately marked, and operated by an appropriately licenced operator.	Contractor	ECO
97.	The developer shall ensure that the contractor provides the necessary driver training to key personnel to minimise the potential of incidents on the public road network.	SE/Contract Manager	ECO
98.	A photographic record of the road condition should be maintained throughout the various phases of the development/s. This provides an objective assessment and mitigates any subjective view from road users.	Contractor	ECO
99.	Upgrade unpaved roads to a suitable condition for proposed construction vehicles.	Project Company	ECO
100.	The developer shall ensure that the condition of the roads impacted by construction of the development is left in a similar or better state once the construction phase is complete.	Project Company	ECO
101.	Reduce travel speed for construction vehicles on the gravel road to reduce dust.	Contractor	ECO
102.	Dust suppression of the roads in the immediate vicinity of the site where feasible.	Contractor	ECO
103.	Regular preventative maintenance of roads within the immediate vicinity of the site should be conducted over weekends to minimise the impact on the average construction period.	Contractor	ECO
104.	Ensure that all construction vehicles are roadworthy, visible, adequately marked, and operated by an appropriately licenced operator.	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
105.	Reduce speed at intersections and use appropriate traffic warning signs. Identify alternative routes where possible.	Contractor	ECO
Geotechnical:			
106.	The surfacing must be removed in the laydown areas and the ground rehabilitated.	Contractor	ECO
107.	Temporary berms and drainage channels to divert water, where required.	Contractor	ECO
108.	Rehabilitation of disturbed areas to be undertaken timeously.	Contractor	ECO
109.	Designs of the road and site drainage are undertaken correctly.	Contractor	ECO
110.	Only designated access routes are used for trafficking around the site.	Contractor	ECO
111.	Formal monitoring during construction should be undertaken on a weekly basis	SE/Contract Manager	ECO

4.2 NO-GO AREAS

Table 4-2 specifies measures relating to the management of No-Go areas.

Table 4-2: No-Go areas

Item	Requirement	Responsibility	Monitoring
1.	All works to be undertaken shall be within the boundary of the site. A 'no-go' area shall extend on either side of the working area i.e. all areas outside of the defined working area and designated access roads.	SE/Contract Manager	ECO
2.	The working area shall be demarcated in an appropriate manner determined by the SE.	SE/Contract Manager	ECO
3.	Where components of the development proposal traverse environmental sensitive areas identified by the ECO e.g. potential Riverine Rabbit habitat or aquatic water courses (within the limits prescribed by the specialists and as approved through the EA) these sensitive areas must be adequately demarcated, and all staff must take extra precaution when working there. The location of these	SE/Contract Manager - confirm manner of demarcation.	ECO

Item	Requirement	Responsibility	Monitoring
	<p>areas are informed by the environmental sensitivity mapping and any additional sensitive areas identified by the specialists during the pre-construction micro-siting. Demarcation of these areas must be adequate e.g. fencing consisting of wooden or metal posts at 3 m intervals with 1 plain wire strand tensioned horizontally at 900 mm from ground level. Visible objects that will not be damaged or blown away by the wind must be securely fastened to the wire at regular intervals to clearly show where it is. The specific manner that will be used must be determined and agreed to by the SE, Contractor, and ECO. The Contractor shall maintain the fence for the duration of construction and ensure that the visible objects do not become dislodged</p>		

4.3 EMERGENCY PREPAREDNESS

Table 4-3 specifies measures relating to emergency preparedness.

Table 4-3: Emergency preparedness

Item	Requirement	Responsibility	Monitoring
1.	Emergency preparedness shall form part of the Environmental Awareness and Induction Training and must be covered by the Health and Safety Contractor	Site Engineer & Contractor	ECO
2.	The Contractor shall determine appropriate procedures in the event of an emergency (e.g. medical emergencies, runaway fires, environmental incidents, site evacuation and staff assembly), and shall submit a Method Statement to the Contract Manager, Health and Safety Contractor and ECO for approval of the proposed procedures	Contractor	Site Engineer, ECO & Health and Safety Contractor
3.	<p>The following contact details shall be clearly displayed at the contractor's camp near a telephone, and provided to relevant staff:</p> <ul style="list-style-type: none"> • Emergency contact details for the local hospital, fire brigade, and police department. • A list of contact details for the ECO, Contract Manager and relevant authorities. 	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
	<ul style="list-style-type: none"> Contact details for the heritage authority (HWC) (in the event that a heritage discovery is made). 		
4.	First Aid Kits are to be strategically placed at the site office / camp, laydown areas, and on site where required. All staff are to be made aware of their locations and purposes and trained in their basic use.	Contractor	ECO
5.	Material Safety Data Sheets (MSDSs) shall be readily available on site for all chemicals and hazardous substances housed or used on site. Where possible and available, MSDSs should additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes.	Contractor	ECO
6.	Evacuation Plans shall: <ul style="list-style-type: none"> Be appropriately displayed at the Contractor's camp/s showing evacuation routes and assembly points. Be communicated to all staff as part of the Environmental Awareness and Induction Training. Include for the contingency plans to evacuate severely injured staff to designated medical facilities 	Contractor	ECO

4.4 ESTABLISHMENT OF SITE CAMP

The contractor must establish the site camp at the location indicated by the latest approved layouts. Table 4-4 specifies measures relating to the establishment of the site camp.

Table 4-4: Establishment of site camp

Item	Requirement	Responsibility	Monitoring
1.	The site camp must be appropriately demarcated/fenced.	Contractor	ECO
2.	The gate to the site camp must be locked at night (or at times indicated by the Site Engineer and Contractor) and unauthorised persons must not be allowed within the site camp area	Contractor	ECO
3.	Health and safety requirements must be adhered to	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
4.	Temporary fuel areas within the site camp must be in a demarcated bunded area and meet the specifications as defined in Section 4.11	Contractor	ECO
5.	The facilities that require surfacing or bunding are to be designed to engineering standards of sufficient capacity.	Site Engineer & Contractor	ECO
6.	The disturbance to topsoil shall be minimised, and compaction or removal of topsoil shall be restricted wherever possible	Contractor	ECO
7.	Should lights be installed at the contractor's camp for security purposes, then: <ul style="list-style-type: none"> • Any security lighting installed shall not cause a reasonably avoidable disturbance to other users of the surrounding area. • Lighting shall meet the requirements to mitigate impacts to bats as set out in the environmental sensitivities for pre-construction (see Section 3.2.1). • Lighting installed shall, as far as practically possible, be energy efficient and angled downwards. • Lighting shall be turned off when not in use or fitted with movement sensors (where lights only come on when required) or similar. 	Contractor	ECO
8.	Potable water shall be provided for drinking purposes at the main Contractor's camp and must be stored in an animal proof manner.	Contractor	ECO
9.	Should groundwater be used for human consumption then it must be treated to the required/appropriate standards that makes it safe for human use.	Contractor	ECO
10.	The main contractor's camp layout shall make provision for (where applicable): <ul style="list-style-type: none"> • Access off the road network and visitor / staff parking facilities. • Site office facilities and a structure to shelter security staff. • Ablution facilities and a potable water source. 	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
	<ul style="list-style-type: none"> • Designated cooking areas. • Hazardous material / chemical storage and fuel areas. • Equipment cleaning areas. • Waste storage and wastewater management infrastructure. • Plant parking facilities and a vehicle refuelling/maintenance area/s. • Emergency equipment storage areas including fire extinguishers and first aid kits. • Laydown areas, batching plant and materials storage. • Security fencing. • First aid station. 		

4.5 ENVIRONMENTAL AWARENESS TRAINING

Table 4-5 specifies the requirements for environmental awareness training.

Table 4-5: Environmental awareness training

Item	Requirement	Responsibility	Monitoring
1.	Environmental awareness training must be conducted for all staff and contractors on site as detailed in Section 2.7 of the EMPr.	ECO and on-going by SE/Contract Manager as needed	ECO

4.6 VEGETATION CLEARANCE

Table 4-6 specifies the requirements for vegetation clearing.

Table 4-6: Vegetation clearance

Item	Requirement	Responsibility	Monitoring
1.	Disturbances to any adjacent indigenous vegetation or habitat must be avoided and activities such as trampling, damage or collection of plants, other than for the purpose of plant rescue, are to be prohibited	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
2.	Clearance activities should be restricted to the immediate footprint of the infrastructure as far as possible and must be clearly demarcated	Contractor	ECO
3.	Maintain vegetation cover where possible and facilitate re-vegetation of cleared areas throughout the site as soon as possible.	Contractor	ECO
4.	Where possible vegetation in areas of disturbance must ideally be trimmed, and the soil/grass layer be left intact (i.e. not disturbing the soil).	Contractor	ECO
5.	Prior to clearing topsoil must be stripped (normally 100-150mm but may be deeper in certain areas – ECO to be consulted) and stored to be used during rehabilitation. Topsoil stripping must ideally take place in a phased approach to minimise the soil's exposure time to the elements, however this is not always practical. Topsoil stockpile erosion must be monitored by the ECO	Contractor	ECO
6.	Areas to be cleared must have topsoil removed first which should be set aside and used for covering disturbed areas during rehabilitation activities	Contractor	ECO
7.	Site clearing shall not commence until any required recovery exercises aimed at rescuing and relocating protected plant species or animals (e.g. tortoises) have been undertaken by the specialists on the areas earmarked for clearing	Contractor	ECO
8.	Minimise the time that stripped areas are exposed and the extent of areas exposed at any one time;	Contractor	ECO
9.	Any vegetation that is removed during construction activities may be chipped for reuse or be taken to a waste management facility that will process the waste prior to further reuse or disposal. The waste management hierarchy must be implemented as far as possible, and disposal of waste must be considered as a last resort. Any resulting waste that cannot be reused or recycled, must be disposed of at a duly authorised waste management facility. The relevant Municipality must be consulted for available options to deal with green waste	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
	and proof of this (where necessary) should be retained and available upon request.		

4.7 EROSION AND STORMWATER MANAGEMENT

Table 4-7 specifies the requirements for erosion and stormwater management.

Table 4-7: Erosion and stormwater management

Item	Requirement	Responsibility	Monitoring
1.	Erosion must be managed in accordance with the Stormwater and Erosion Management Plans included in Appendix L and M.	Contractor	ECO

4.8 ANIMAL RESCUE AND PROTECTION

Table 4-8 specifies the requirements for animal rescue and protection.

Table 4-8: Animal rescue and protection

Item	Requirement	Responsibility	Monitoring
2.	A search and rescue operation for reptiles and other vulnerable species shall be conducted before areas of intact vegetation are cleared. Animals must be removed from the working area should they be directly threatened by the vegetation clearance or construction activities.	Contractor with assistance from ECO or suitable specialist	ECO
3.	Snake handling must be done by an appropriately trained individual.	Contractor to acquire assistance from appropriately trained individual	ECO
4.	In terms of fencing and movement of fauna, the following must be implemented: <ul style="list-style-type: none"> Fencing (e.g. palisade) must provide appropriate opening for small animals to pass through (unless it is a confined area where animals must not get into for their own safety and where they can damage infrastructure e.g. substation etc)– bars 	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
	<p>placed 20cm apart should provide sufficient space for the movement of small animals whilst deterring humans;</p> <ul style="list-style-type: none"> If not electrified, the bottom wire of perimeter fence must be at least 15cm from the ground, and above 20cm if electrified (tortoises retreat into shell when shocked). 		
5.	Excavations and trenches must be inspected daily (first thing in the morning) to check whether any animals have been trapped. Any trapped animals must be removed and relocated to a safe location outside of the development footprint.	Contractor	ECO

4.9 MATERIAL HANDLING AND STOCKPILE MANAGEMENT

Table 4-9 specifies the requirements for material handling and stockpile management.

Table 4-9: Material handling and stockpile management

Item	Requirement	Responsibility	Monitoring
1.	The SE shall be advised of the areas that the Contractor intends to use for the stockpiling of both natural and manufactured materials. No stockpiling shall occur outside of the working or laydown areas (as designated by the engineer) and without the Engineer's / ECO's prior approval of the proposed stockpiling areas. Imported material must be free of litter, contaminants and / or exotic plant seed	Contractor	ECO
2.	The Contractor must ensure that material is not stockpiled inside or along the border of any water body (permanent or seasonal), including pans.	Contractor	ECO
3.	<p>The following measures will promote effective material and stockpile management:</p> <ul style="list-style-type: none"> Delivery drivers shall be informed of all delivery procedures and restrictions (including "no go" areas) and shall be supervised during offloading by someone with an adequate understanding of the relevant requirements of the EMPr; 	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
	<ul style="list-style-type: none"> • All manufactured and or imported materials shall, where reasonably possible, be stored within the contractor's camp and designated laydown areas; • Stockpiling areas shall be located close to the working area(s) or laydown areas to minimise disturbance to the environment and to avoid modification of drainage patterns; • Care shall be taken to ensure that the location of stockpiling areas will not cause damming of water or runoff, nor expose the stockpiled material to extreme erosive elements; • Stockpiled material (e.g. topsoil, soil, subsoil, and rocky material) shall be stable and well secured to avoid collapse and possible injury to site workers. Where required, appropriate precautions shall be taken, as informed by the ECO and SE, to limit the erosion and compaction of stockpiles. • Topsoil stockpiles shall be kept clear of weeds and alien invasive vegetation growth by regular weeding, or application of registered herbicides (only registered herbicides to be used and ECO to confirm that the herbicide is safe – see, http://www.invasives.org.za/, for more background); • Every effort shall be made to handle topsoil twice only: once to strip and stockpile, and once to replace, level, shape and scarify; • All stockpiles must be protected and located in flat areas where run-off will be minimised and sediment recoverable • The height of topsoil stockpiles must not exceed 1.5m; and • The height of gravel stockpiles must ideally not exceed 2m, however this is at the discretion of the site engineer depending on the characteristics of the area and gravel. 		

4.10 VEHICLE AND PLANT MAINTENANCE

Table 4-10 specifies the requirements for vehicle and plant maintenance.

Table 4-10: Vehicle and plant maintenance

Item	Requirement	Responsibility	Monitoring
1.	<p>The maintenance of all vehicles and equipment shall not take place within any sensitive areas and where possible and practical should take place in a designated bunded area of the contractor’s camp (preferably not in the field) on a sloping hardened surface with a suitable collection sump or suitable oil/water separator:</p> <ul style="list-style-type: none"> • The vicinity of such areas shall be monitored for fuel and oil spills, and these shall be promptly addressed; • All vehicles and plants shall be provided with a suitably sized service pan/drip tray to be used to effectively trap fuel leaks in the event of a breakdown or if a leak is noticed; • Drip trays shall be provided for all plant including stationary plants (such as compressors) and for “parked” plants (such as scrapers, loaders or any vehicle); and • Drip trays should be placed underneath stationary plant/machinery over night to capture any leaking substances. 	Contractor	ECO

4.11 HAZARDOUS SUBSTANCES AND HYDROCARBON MANAGEMENT

Table 4-11 specifies the requirements for hazardous substances and hydrocarbon management.

Table 4-11: Hazardous substances and hydrocarbon management

Item	Requirement	Responsibility	Monitoring
Hazardous Substances:			
1.	In the event of a significant spill or leak of hazardous substances (petrol and diesel) during construction, such incident(s) must be reported to all relevant authorities, including the Directorate: Pollution and Chemicals Management in accordance with section 30(5) of the	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
	National Environmental Management Act, 1998 (Act No. 107 of 1998), pertaining to the control of incidents.		
2.	Procedures detailed in the MSDS for hazardous substances present on site shall be followed in the event of an emergency situation (see Section 4.3).	Contractor	ECO
3.	Fuel or chemical storage areas must be kept away (100m) from any borehole well head.	Contractor	ECO
4.	Potentially hazardous substances shall be stored, handled and disposed of as prescribed by the Engineer and in compliance with all relevant regulations and MSDS. An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage shall be compiled and implemented. This shall include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.	Contractor	ECO
5.	The storage of hazardous substances (i.e., diesel, petrol, transformer oils and lubricants, etc.) should be located on impervious surfaces with bunds (to accommodate 110% of the maximum allowable liquid volume) around them to contain any fugitive spillages and/or leakage.	Contractor	ECO
6.	Hazardous wastes e.g. mixed cement shall only be disposed at landfill sites registered for hazardous wastes	Contractor	ECO
7.	All hazardous waste materials must be carefully stored as advised by the ECO	Contractor	ECO
8.	All necessary precaution measures shall be taken to prevent soil or surface water pollution from hazardous materials used during construction.	Contractor	ECO
9.	No hazardous waste may be buried or burned under any circumstances	Contractor	ECO
10.	The contractor must ensure that the employees are informed on how to responsibly dispose of any containers that contain or have contained hazardous substances	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
11.	All major spills of any materials, chemicals, fuels or other potentially hazardous or pollutant substances must be cleaned immediately, and the cause of the spill investigated. Significant spillages need to be reported in accordance with the legislative requirements	Contractor	ECO
12.	Spill kits must be available on site	Contractor	ECO
13.	Shutter oil and curing compound shall be stored and dispensed within a bunded area, and not located closer than 100m from river banks / water courses / drainage lines	Contractor	ECO
14.	Appoint appropriate contractors to remove any residue from spillages from site. Handling, storage and disposal of excess or containers of potentially hazardous materials shall be in accordance with the requirements of pertinent Regulations and Acts (e.g. Hazardous Substances Act, Number 15 of 1973).	Contractor	ECO
15.	In the unlikely case of a leak from the transformer or battery facility, the leak would be hazardous waste and should be removed by a registered hazardous waste removal service provider and disposed of at an appropriate hazardous waste disposal facility.	Contractor	ECO
16.	All liquid chemicals including battery storage liquids must be stored within secondary containment (bunds or containers or berms) that can contain a leak or spill. Such facilities must be inspected routinely and must have the suitable PPE and spill kits needed to contain the worst-case scenario leaks or spills in that facility, safely.	Contractor	ECO
Fuel (petrol and diesel) and Oil:			
17.	The fuel areas must be located at the site camp and shall adorn the appropriate warning signage as to provide notification of the associated risks and hazards	Contractor	ECO
18.	Where reasonably practical, equipment shall be refuelled at the fuel areas. If it is not reasonably practical, then the surface under the refuelling area shall be protected against pollution to the satisfaction of the Engineer and ECO and prior to any refuelling activities. No refuelling is	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
	<p>allowed within 100m of a river channel. Should a mobile fuel bowser and/or truck be used, all refuelling shall occur with appropriate measures in place to prevent spillages; these may include the use or drip trays, funnels, non-drip dispensing nozzles, and any other similar device. Regardless of the preventative measures in place, all fuel browsers and/or trucks shall carry a spill-kit that is sufficient in size to contain at least a 200-litre spill at all times.</p>		
19.	<p>Fuel areas management shall ensure limited risk to the environment:</p> <ul style="list-style-type: none"> • All liquid fuels and oils shall be stored in tanks with lids, which are kept firmly shut and adequately secured. The capacity of the tank shall be clearly displayed, and the product contained within the tank clearly identified. • Fuel storage tanks shall be kept on site only for as long as fuel is needed for construction activities, on completion of which they shall be removed. • The designated fuel storage and dispensing areas should have sufficient ground protection to prevent and contain leaks and spills. Refuelling and servicing of plant and equipment in field should be avoided. Runoff from the fuel areas must go through an oil/grease trap before being discharged, no soaps can be introduced in this system • Fuel shall be stored in drums or bowsers situated on a smooth impermeable surface (concrete or 250 micrometre (µm) plastic (plastic must have a minimum of a 5 cm layer of sand on top to prevent damage and perishing) within an earth bund. The impermeable lining shall extend to the crest of the bund and the volume inside the bund shall be 120% of the total capacity of all the storage tanks/bowsers (110% statutory requirement plus allowance for rainfall). A concrete impermeable storage and re-fuelling area can also be constructed. 	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
	<ul style="list-style-type: none"> There shall be adequate fire-fighting equipment at the fuel areas. Rainwater collectings in bunded areas shall be promptly removed (as detailed above) and dealt with as water containing waste. 		

4.12 DUST AND AIR QUALITY CONTROL

The Contractor shall take all reasonable measures to minimise the generation of dust as a result of construction activities to the satisfaction of the Engineer. The most successful measure would be to limit vegetation clearance as far as possible to maintain the natural crust on the soil and allow the vegetation to keep the soil intact. The Contractor's dust management planning should, as a minimum, take cognisance of the mechanisms that can be used for dust management detailed in Table 4-12 below.

Table 4-12: Dust and air quality control

Item	Requirement	Responsibility	Monitoring
1.	Dust management must comply with the National Dust Control Regulations (GN No. R. 827 of 1 November 2013)	Contractor	ECO
2.	Where deemed necessary by the Engineer dust suppression must employ chemical dust suppressants (i.e. Dustex® or similar) which are deployed on main haul roads in accordance with the supplier recommendations. This should be provisioned for in the Bill of Quantities and costed for by the Contractor.	Contractor	ECO
3.	Where possible, treated water should not be used for dust suppression.	Contractor	ECO
4.	Water from evaporation / sediment ponds should be recycled for dust suppression (provided uncontaminated by deleterious materials)	Contractor	ECO
5.	Sprays need to be applied at cleared areas should significant amounts of dust be generated. Moist or bound topsoil will reduce the potential for dust generation when tipped onto stockpiles.	Contractor	ECO
6.	Ensure that the travelling distance between the cleared area and topsoil piles is minimised	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
7.	Ensure exposed areas remain moist or bound through regular spraying during dry, windy periods;	Contractor	ECO
8.	Location and treatment of material stockpiles must take into consideration prevailing wind directions	Contractor	ECO
9.	Minimise the time that stripped areas are exposed and the extent of areas exposed at any one time;	Contractor	ECO
10.	Haulage vehicles may not leave the access roads or dedicated turning circles, as this may cause excessive dust generation	Contractor	ECO
11.	Reduce travel speeds when travelling on gravel roads in the surrounding area.	Contractor	ECO
12.	Adhere to a 40km/h/ 30km/h speed limits when travelling on wind farm roads.	Contractor	ECO
13.	The ECO must continually visually monitor dust at the site and recommend additional mitigation measures where and when required	Contractor	ECO
14.	The ECO must continually visually monitor exhaust fumes from vehicles and machinery and recommend additional mitigation measures where and when required.	Contractor	ECO

4.13 NOISE CONTROL

The Contractor shall take all reasonable measures to minimise the generation of noise as a result of construction activities to the satisfaction of the Engineer. The Contractor's noise management planning should, as a minimum, take cognisance of the mechanisms that can be used for noise management detailed in Table 4-13 below.

Table 4-13: Noise control

Item	Requirement	Responsibility	Monitoring
1.	Noise management must comply with the Western Cape Noise Control Regulations published in Provincial Notice 200/2013	Contractor	ECO
2.	Where practicable, mobile equipment should be fitted with broadband (white-noise generators/alarms), rather than tonal reverse alarms	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
3.	The use of vehicle horns should be minimized where possible	Contractor	ECO
4.	Ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures. Engine bay covers over heavy equipment could be pre-fitted with sound absorbing material. Heavy equipment that fully encloses the engine bay should be considered, ensuring that the seam gap between the hood and vehicle body is minimised	Contractor	ECO

4.14 SOLID WASTE MANAGEMENT

Table 4-14 specifies the requirements for solid waste management.

Table 4-14: Solid waste management

Item	Requirement	Responsibility	Monitoring
1.	Implement an integrated waste management approach in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), that addresses waste avoidance, reduction, re-use, recycling, recovery, treatment, and safe disposal as a last resort.	Contractor	ECO
2.	The relevant Municipality must be consulted to determine the best methods for dealing with waste generated during construction, so it best suits the specific waste infrastructure and capacity of the Municipality.	Contractor	ECO
3.	Audit waste segregation/disposal methods on a monthly basis and monitor waste separation weekly	Contractor	ECO
4.	Solid general waste and litter shall be disposed of into animal / scavenger- and weatherproof bins (with a lid / cover) that are secured from blowing over. The bins must be placed at strategic locations and emptied daily if not located in the site camp	Contractor	ECO
5.	The separation of waste on site must be undertaken (i.e separate wastes as general, hazardous or waste for recycling).	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
6.	Sufficient waste and recycle bins must be placed within the contractor's site camp(s) for the different waste stream generated from daily operations.	Contractor	ECO
7.	The Contractor shall remove the refuse collected from the working areas at least once per week. Refuse must be disposed of at a registered landfill site and disposal certificates kept on file.	Contractor	ECO
8.	The Contractor shall make provision for workers to pick up solid waste from the site on a daily basis. Burying or burning of solid waste is prohibited on site.	Contractor	ECO
9.	Construction waste/rubble must be disposed of at a licenced facility and disposal certificate kept.	Contractor	ECO

4.15 ABLUTION FACILITIES

Table 4-15 specifies the requirements for ablution facilities.

Table 4-15: Ablution facilities

Item	Requirement	Responsibility	Monitoring
1.	A sufficient number of chemical toilets shall be provided by the Contractor in the construction camp area and at appropriate locations approved by the SE/Contract Manager with regularly emptied conservancy tanks allowed at the site camp.	Contractor	ECO
2.	Temporary / portable toilets shall not be located within 100m from the top of the river banks / water courses / drainage lines.	Contractor	ECO
3.	Septic tanks and mobile toilets must be kept away (100m) from any borehole well head.	Contractor	ECO
4.	All temporary / portable toilets shall be secured to the ground to prevent them from toppling due to wind or any other cause.	Contractor	ECO
5.	Site staff shall not be permitted to use any stream, river, other open water body or natural water source adjacent	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
	to or within the designated site for the purposes of bathing, washing of clothing or as ablution facilities.		

4.16 CEMENT AND BATCHING PLANTS

Table 4-16 specifies the requirements for cement and batching plants.

Table 4-16: Cement and batching plants

Item	Requirement	Responsibility	Monitoring
1.	Where applicable, the location of the batching area (including the location of cement stores, sand and aggregate stockpiles) shall be as approved by the SE/Contract Manager and ECO.	Contractor	ECO
2.	The concrete/cement batching area shall be kept neat and clean at all times.	Contractor	ECO
3.	Concrete batching may not be undertaken within 100m of a watercourse.	Contractor	ECO
4.	Spilled and dried concrete within the batching area must be disposed of at an appropriate facility.	Contractor	ECO
5.	No batching activities shall occur directly on unprotected ground and the area must be bunded and lined with an impermeable lining such as concrete or 250 µm plastic sheet. If small satellite batching is required it must be carried out on batch plates.	Contractor	ECO
6.	Empty cement bags (if used) shall be stored in weatherproof containers to prevent windblown cement dust and water contamination and be disposed of on a regular basis as hazardous waste (refer to Section 7.9).	Contractor	ECO
7.	Where “readymix” 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 “readymix” delivery shall be immediately cleared and disposed of via the solid waste management system. “Readymix” trucks shall not be permitted to dump drum wash on site unless into a contaminated water pond which	Contractor	ECO

Item	Requirement	Responsibility	Monitoring
	must be fully rehabilitated at completion and the sediment collected for disposal.		

4.17 CONTAMINATED WATER

Table 4-17 specifies the requirements for contaminated water.

Table 4-17: Contaminated water

Item	Requirement	Responsibility	Monitoring
1.	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 that incorporates the recommendations made in the EMPr regarding handling of hazardous materials and liquids and protection of water resources and include collection facilities to be used to prevent pollution, as well as suitable methods of disposal of contaminated water.	Contractor	ECO
2.	The Contractor shall prevent the discharge of water contaminated with any pollutants, such as soaps, detergent, cements, concrete, lime, chemicals, glues, solvents, paints and fuels, into the environment.	Contractor	ECO
3.	The Contractor shall notify the SE/Contract Manager immediately of any pollution incidents on site.	Contractor	ECO
4.	Washing and cleaning of equipment must be done in designated wash bays, where rinse water is contained in evaporation/sedimentation ponds (to capture oils, grease cement and sediment).	Contractor	ECO

4.18 SITE TRAFFIC AND ACCESS

Table 4-18 specifies the requirements for site traffic and access.

Table 4-18: Site traffic and access

Item	Requirement	Responsibility	Monitoring
1.	Access to the site must be limited and controlled, and all construction staff and machinery must remain within the demarcated construction area.	Contractor	ECO
2.	All vehicles entering the site must adhere to speed limits for heavy (30km/h) and light vehicles (40km/h).	Contractor	ECO
3.	Implement the Traffic Management Plan	Contractor	Site Engineer

4.19 REVEGETATION AND REHABILITATION

Table 4-19 specifies the requirements for revegetation and rehabilitation.

Table 4-19: Revegetation and rehabilitation

Item	Requirement	Responsibility	Monitoring
1.	All disturbed areas must be rehabilitated in accordance with the Rehabilitation Management Plan (Appendix I).	Contractor	ECO
2.	Annual rehabilitation success feedback reports must be submitted to CapeNature annually for 3 to 4 years post construction.	Contractor	ECO

4.20 ALIEN PLANT MANAGEMENT

Table 4-20 specifies the requirements for alien plant management.

Table 4-20: Alien plant management

Item	Requirement	Responsibility	Monitoring
1.	Alien invasive plants must be managed in accordance with the Invasive Alien Plant Management Plan (Appendix F).	Contractor	ECO

4.21 BOREHOLES

Table 4-21 specifies the requirements for boreholes.

Table 4-21: Boreholes

Item	Requirement	Responsibility	Monitoring
1.	<p>For the utilisation of boreholes that may yield groundwater:</p> <ul style="list-style-type: none"> • Utilise the boreholes as per the recommended sustainable yields and avoid over abstraction of any one borehole. • Address any water quality problems at the various boreholes. This may require treatment or appropriate mixing. • Where possible rotate abstraction and distribute evenly between the boreholes to limit drawdown. • Monitor the borehole water levels and abstraction volumes. 	SE/Contract Manager & Contractor	ECO
2.	<p>Borehole monitoring will be essential at any successful boreholes, and this should include:</p> <ul style="list-style-type: none"> • Abstraction monitoring. Each borehole should be equipped with a flow meter that is read at least once a month. • Automated water level monitoring. Each borehole should be equipped with an observation pipe and a logger to allow for water level monitoring. Manual monitoring should also include borehole water level, field chemistry (EC) and abstraction rate (L/s) should be measured at each borehole on at least a monthly basis. 	SE/Contract Manager & Contractor	ECO
3.	<p>There should be no standing / open water immediately around the wellhead.</p>	Contractor	ECO

5. OPERATIONAL PHASE EMPR

Table 5-1 contains specific mitigatory measures recommended by specialists as they pertain to the operational phase. Recommendations from commenting authorities have also been included where relevant.

Table 5-1: Operational phase mitigation measures and/or activities

Item	Requirement	Responsibility	Monitoring
Terrestrial Ecology:			
1.	Adhere to the open space management plan which makes provision for the favourable management of the facility and the surrounding area for fauna	Project Company	HSE Team
2.	Monitoring of any fauna-related mortalities from roadkill, electrocutions, or other sources at the site. These should be reviewed annually and used to inform operational management and mitigation measures.	Project Company	HSE Team Ecologist
3.	A log should be kept detailing and fauna-related incidences or mortalities that occur on site, including roadkill, electrocutions etc. These should be reviewed annually and used to inform operational management and mitigation measures.	Project Company	HSE Team
4.	A Riverine Rabbit Monitoring Programme should be implemented at the site to evaluate the post-construction impact of the development on the Riverine Rabbit as well as other key fauna at the site. As there is some potential for noise and disturbance-related impacts on Riverine Rabbits, the development presents a clear opportunity to evaluate the degree to which Wind Farms are compatible with the maintenance and conservation of Riverine Rabbit populations within their boundaries. The monitoring programme should be conducted with input from EWT and should include preconstruction monitoring to establish a reliable baseline of Riverine Rabbit abundance and distribution at the site. This should be followed by matched post-construction monitoring to evaluate the potential negative impacts on the Riverine Rabbit population. It is estimated that each phase of the above monitoring would need to last approximately 1 year (not necessarily	Project Company	HSE Team Ecologist

Item	Requirement	Responsibility	Monitoring
	continuously, but in order to capture different seasons and different associated activity levels). The monitoring must be conducted in a manner which allows for reliable effect sizes and statistically-backed inferences to be made.		
5.	Funding to conduct the above monitoring and a feedback mechanism to improve future wind energy development in areas with Riverine Rabbits (i.e., input on guidelines for wind energy development in Riverine Rabbit areas). The running cost of such monitoring is estimated at approximately R200 000 per year. This excludes the initial outlay for any cameras and associated equipment. Assuming that 30 cameras are deemed sufficient, then this would amount to approximately R100 000 at current camera trap prices for a typical camera trap suitable for this application. In addition, this excludes any advanced statistical analyses required.	Project Company	HSE Team Ecologist
6.	The Applicant should, develop and fund a conservation initiative for the life of the wind farm in partnership with EWT or a similar qualified NGO with experience of Riverine Rabbit Conservation in the area. This initiative should focus on enhancing management of the most suitable Riverine Rabbit Riparian habitat in the broader Karoo with the aim of halting the current trend of degradation and the associated decline in the Riverine Rabbit population. The Applicant should make provision for R250,000 per annum towards this fund during the construction and operational phases of the wind farm commencing at the start of construction. The annual amount of R250,000 is applicable to the year 2022 and should be escalated in accordance with CPI each year after that.	Project Company	HSE Team
7.	All incidents involving Riverine Rabbits should be documented and reported to the local EWT field office in Loxton. If Rabbits are killed, the carcasses should be collected and provided to EWT for the collection of DNA and other samples.	Project Company	HSE Team
8.	Adhere to speed limits and exercise vigilance of tortoises crossing the roads.	Project Company	HSE Team

Item	Requirement	Responsibility	Monitoring
9.	Implement Karoo Dwarf Tortoise Monitoring Plan which will include for annual inspections along powerlines to 1) census crow numbers, 2) log crow nesting sites, and 3) log tortoise carcasses observed along the powerlines.	Project Company	HSE Team
10.	Based on the findings of the annual inspections, reactive measures such as crow culling and/or removal of nests may have to be implemented in consultation with the Avifauna specialist.	Project Company	HSE Team Ecologist Avifauna specialist
11.	Keep a log of tortoise roadkill mortalities. This log must be reviewed annually to inform operational management and mitigation measures.	Project Company	HSE Team Ecologist
12.	Annual monitoring and surveys for erosion. Disturbed areas near to drainage lines should receive priority in rehabilitation and operational phase monitoring.	Project Company	HSE Team
13.	Any erosion problems observed on-site should be rectified as soon as possible using the appropriate revegetation and erosion control works.	Project Company	HSE Team
Aquatic Ecology:			
14.	Stormwater control systems must be monitored in the first few months of use and then inspected on an annual basis during operation to ensure they are functional.	Project Company	HSE Team
15.	Any erosion / sedimentation must be resolved through whatever additional interventions maybe necessary (i.e., extension, energy dissipaters, spreaders, etc).	Project Company	HSE Team
16.	All alien plants within the greater region must be monitored and should it occur, these plants must be eradicated within the project footprints and especially in areas near the proposed watercourse crossings.	Project Company	HSE Team
17.	Monitoring of groundwater (abstraction volumes and water levels) will be required, but the exact requirements will be determined during the physical surveys of the boreholes.	Project Company	HSE Team
Bats:			

Item	Requirement	Responsibility	Monitoring
18.	A minimum of 2 years of operational bat mortality monitoring should be conducted from the start of the operation of the facility. The monitoring will enable a detailed mitigation schedule to be implemented as needed based on curtailment and acoustic deterrents. Refer to the Bat Mitigation Action Plan attached as Appendix G.	Project Company	HSE Team Bat Specialist
19.	For the duration of the lifetime of the facility, the impacts on bats must be audited/monitored by reliable methods of carcass searching and/or electronic devices capable of automatically counting bat mortalities. Such auditing should occur every 5 years (after the end of the initial 2-year operational study) for all turbines on site, and continuously for turbines where additional mitigations have been implemented.	Project Company	HSE Team Bat Specialist
20.	Bi-annual visits to the facility at night must be conducted for the operational lifetime of the facility, to assess the lighting setup and whether the passive motion sensors are functioning correctly. The bat specialist conducting the operational bat mortality monitoring must conduct these visits to site during nighttime to assess the placement and setup of outside lights on the facility. When lights are replaced and maintenance on lights is conducted, the Mitigation Action Plan (Appendix G) must be consulted.	Project Company	HSE Team Bat Specialist
Avifauna:			
21.	The facility must be monitored once operational in accordance with the most recent version of the best practice guidelines available at the time (Jenkins <i>et al.</i> , 2015, 2022 in prep). These guidelines currently state that a minimum of two years of monitoring must be completed, although if significant impacts are detected this will need to be extended. The results of this monitoring should feed into an Adaptive Management Plan for the facility which are included in this EMPr (refer to Appendix H).	Project Company	HSE Team
22.	Monitoring of breeding status of Verreaux's and Martial Eagles should be conducted in all breeding seasons as per the avifaunal operational monitoring programme.	Project Company	HSE Team

Item	Requirement	Responsibility	Monitoring
23.	Burrowing mammals represent prey for raptors. It is essential that the new Wind Farm does not create favourable conditions for such mammals in high-risk areas (eg piles of spoil). If such conditions are created, this will require reactive management during the operational phase.	Project Company	HSE Team
24.	The bird-turbine collision risk must be through the implementation of effective mitigation measures from commercial operation date (COD) onwards. Two potential options exist to our knowledge: blade painting; and shutdown on demand (either observer or technology led). Since it will be several years before the proposed Wind Farm is constructed a decision on which be taken within 6 months of the project achieving preferred bidder status. Any alternative that is identified in the interim that is approved by the bird specialist and which the specialist believes would achieve similar results to these other two options may also be considered.	Project Company	HSE Team
Agriculture:			
25.	Maintain the stormwater run-off control system. Monitor erosion bi-annually and remedy the stormwater control system in the event of any erosion occurring.	Project Company	HSE Team
26.	Facilitate re-vegetation of denuded areas throughout the site and monitor progress bi-annually	Project Company	HSE Team
Socio-economic:			
27.	A Code of Conduct should be established for the project, in addition: <ul style="list-style-type: none"> The Code of Conduct should identify what types of behaviour and activities by workers are not permitted taking account of the needs of surrounding landowners and communities residing in affected areas. All staff, contractors and members of the workforce must be made aware of the Code of Conduct during the recruitment process. 	Project Company	HSE Team

Item	Requirement	Responsibility	Monitoring
	<ul style="list-style-type: none"> Awareness training must be provided during their induction onsite and prior to commencement of work duties on site. Display the Code of Conduct in the operation and maintenance buildings and construction areas. 		
28.	The project must comply with the requirements of the REIPPPP bidding process which will have stringent requirements with regard to socio-economic development, enterprise development, BBE shareholding etc.	Project Company	HSE Team
29.	Community development should be guided by a community needs analysis, drawn up by a third party and based on local socio-economic conditions, a review of planning documents such as the IDP, and discussions with local and district-level government and community representatives. Interventions should be planned in collaboration with other energy developers in the area where relevant.	Project Company	HSE Team
30.	Close liaison with local and district-level municipal managers, local councillors and other stakeholders involved in socio-economic development is required to ensure that any projects are integrated into wider socio-economic development strategies and plans.	Project Company	HSE Team
31.	Setting targets for how much local labour should be used based on the needs of the project and the availability of existing skills and people that are willing to undergo training.	Project Company	HSE Team
32.	Opportunities for the training of unskilled and skilled workers from local communities should be maximized.	Project Company	HSE Team
33.	Using local sub-contractors where possible and requiring that contractors from outside the local area that tender also meet targets for how many locals are given employment.	Project Company	HSE Team
34.	Exploring ways to enhance local community benefits with a focus on broad-based BEE and preferential procurement.	Project Company	HSE Team

Item	Requirement	Responsibility	Monitoring
35.	Setting up a skills and services database in partnership with the local municipality and civil society for the local area before any hiring or contracting decisions are made. This can help to ensure fairness and limit potential interference in hiring processes.	Project Company	HSE Team
36.	An effective employee induction programme is essential to ensuring that new employees, some of whom will be unfamiliar with the responsibilities of maintaining employment, are adequately prepared and motivated to adjust to the lifestyle required of them. This programme should incorporate life skills training as well as basic financial literacy training.	Project Company	HSE Team
37.	Counselling services should be made available to employees to ensure that they have adequate guidance.	Project Company	HSE Team
38.	Avoiding potential service provider decisions that may lead to abuse or local dissatisfaction. For example, only appointing one accommodating rental agent or one catering supplier may lead to local dissatisfaction regarding the spreading of project benefits.	Project Company	HSE Team
39.	A complaints register should be available on site to any individual who may have a particular complaint with regards to the project.	Project Company	HSE Team
40.	The project company should implement a Tuberculosis and HIV/AIDS awareness programme for all workers at the outset of the operational phase.	Project Company	HSE Team
41.	Condoms should be freely available to employees and all contractor workers.	Project Company	HSE Team
42.	Close coordination with the district and local municipalities is encouraged.	Project Company	HSE Team
Heritage:			
43.	A CAA-approved warning system which only requires the red lights to come on when an aircraft is in the vicinity must be used to reduce the night-time impacts to the sense of place.	Project Company	HSE Team

Item	Requirement	Responsibility	Monitoring
44.	No maintenance activities to take place outside of the authorised footprint and all vehicles to remain on authorised roads and tracks.	Project Company	HSE Team
Noise:			
45.	The applicant investigates any reasonable and valid noise complaint if registered by a receptor staying within 2,000 m from an operational wind turbine. A complaints register must be kept on site. Refer to the Noise Management Plan (Appendix M).	Project Company	HSE Team
Shadow Flicker:			
46.	In the event of a complaint received, and an appropriate investigation confirms occurrence, then measures such as those outlined below will be explored with the residents or receptor owners to select the most suitable measures to prevent re-occurrence and protect residential amenity: <ul style="list-style-type: none"> Control at Receptor: The provision of blinds, shutters or curtains to affected receptors; Control on Pathway: for example, screening planting close to an affected receptor; and Control at Source: for example, shutdown of turbines at times when effects occur as a last resort. 	Project Company	HSE Team
Visual:			
47.	On-site signage to be discrete, and billboards prohibited. Signage to be fixed as low as possible, preferably against a backdrop to avoid intrusion on the skyline.	Project Company	HSE Team
48.	Security and other outdoor lighting to be fitted with reflectors to conceal the light source.	Project Company	HSE Team
49.	A CAA-approved warning system which only requires the red lights to come on when an aircraft is in the vicinity (on demand warning lights) must be used to reduce the night-time impacts to the sense of place.	Project Company	HSE Team
50.	Use of reflectors on area and security lighting to conceal light sources.	Project Company	HSE Team
Traffic:			

Item	Requirement	Responsibility	Monitoring
51.	Compile and implement an operational TMP. A draft Traffic Management Plan has been compiled as a guide from which a detailed TMP can be compiled, and is attached as Appendix N.	Project Company	HSE Team
52.	Reduce speed at intersections and use appropriate traffic warning signs. Identify alternative routes where possible. Request the assistance of local law enforcement.	Project Company	HSE Team
53.	Ensure that all site vehicles are roadworthy, visible, adequately marked, and operated by an appropriately licensed operator.	Project Company	HSE Team
Geotechnical:			
54.	Maintain drainage channels and other drainage structures such as culverts. Monitor for erosion and remediate and rehabilitate timeously.	Project Company	HSE Team
55.	Add the requirement for monitoring to the standard operating procedures for the site.	Project Company	HSE Team
Waste:			
56.	Implement an integrated waste management approach in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), that addresses waste avoidance, reduction, re-use, recycling, recovery, treatment, and safe disposal as a last resort.	Project Company	HSE Team
57.	The relevant Municipality must be consulted to determine the best methods for dealing with waste generated during operation, so it best suits the specific waste infrastructure and capacity of the Municipality.	Project Company	HSE Team
Hazardous Substances:			
1.	In the event of a significant spill or leak of hazardous substances (petrol and diesel) during the operational phase, such incident(s) must be reported to all relevant authorities, including the Directorate: Pollution and Chemicals Management in accordance with section 30(5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), pertaining to the control of incidents.	Project Company	HSE Team

6. DECOMMISSIONING PHASE EMPR

Table 6-1 contains specific mitigatory measures recommended by specialists as they pertain to the decommissioning phase. Recommendations from commenting authorities have also been included where relevant.

The decommissioning phase will commence when the facility has reached the end of its life, potentially between 20–25 years, and decommissioning activities are being implemented. It is likely that the decommissioning phase would require an environmental impact assessment process (including decommissioning EMPr) to be undertaken in compliance with the relevant legislation applicable at that time. The handling and disposal of waste generated as a result of decommissioning activities must also comply with the relevant legislation applicable at that time. Decommissioning activities can only take place once the necessary approvals and permits have been obtained.

Although it can be assumed that there will be similarities between construction and decommissioning activities, and thus also similarities in mitigation measures, it is unclear what technologies will be available for decommissioning in the future. As such this section only contains the specialist specific mitigatory measures identified as part of the EIA process for the wind farm. In future, these specialist specific mitigatory measures must be re-evaluated and included in the Decommissioning EMPr if these are found to still be applicable. General mitigation measures as included in the sections above would have to take into account the legislation applicable at the time, any potential new technologies and any agreements with landowners in terms of leaving infrastructure, such as roads, in place.

Table 6-1: Decommissioning phase mitigation measures and/or activities

Item	Requirement	Responsibility	Monitoring
Terrestrial Ecology:			
1.	All vehicles should adhere to a low-speed limit on site. Heavy vehicles should be restricted to 30km/h and light vehicles to 40km/h.	Project Company	HSE Team
2.	No excavated holes or trenches should be left open for extended periods as fauna may fall in become trapped.	Project Company	HSE Team
3.	Where any roads, cabling and/or overhead lines traverse areas mapped as High Riverine Rabbit habitat sensitivity, any remaining open and disturbed areas after decommissioning should be rehabilitated with local plant species appropriate for the affected habitat.	Project Company	HSE Team
4.	Should Riverine Rabbits be killed by traffic, then the traffic management to and from the site should be reviewed in collaboration with the EWT Drylands	Project Company	HSE Team

Item	Requirement	Responsibility	Monitoring
	Programme, to identify additional mitigation and avoidance that should be implemented to further reduce roadkill.		
5.	Ensure that riparian areas and other sensitive habitats near to the development footprint are clearly demarcated as no-go areas with appropriate signage and barriers.	Project Company	HSE Team
6.	Keep a log of tortoise roadkill mortalities.	Project Company	HSE Team
7.	Adhere to speed limits and exercise vigilance of tortoises crossing the roads.	Project Company	HSE Team
Aquatic Ecology:			
8.	Where large cut and fill areas are required these must be stabilised and rehabilitated during the construction process, to minimise erosion and sedimentation	Project Company	HSE Team
9.	All liquid chemicals including fuels and oil, including for the BESS, must be stored in with secondary containment (bunds or containers or berms) that can contain a leak or spill. Such facilities must be inspected routinely and must have the suitable PPE and spill kits needed to contain likely worst-case scenario leak or spill in that facility, safely.	Project Company	HSE Team
10.	Washing and cleaning of equipment must be done in designated wash bays, where rinse water is contained in evaporation/sedimentation ponds (to capture oils, grease cement and sediment).	Project Company	HSE Team
11.	Mechanical plant and bowsers must not be refuelled or serviced within 100m of a river channel.	Project Company	HSE Team
12.	All construction camps, lay down areas, wash bays, batching plants or areas and any stores should be more than 50 m from any demarcated water courses.	Project Company	HSE Team
13.	Littering and contamination associated with construction activity must be avoided through effective construction camp management.	Project Company	HSE Team

Item	Requirement	Responsibility	Monitoring
14.	No stockpiling should take place within or near a water course.	Project Company	HSE Team
15.	All stockpiles must be protected and located in flat areas where run-off will be minimised and sediment recoverable.	Project Company	HSE Team
Avifauna:			
16.	All decommissioning activities should be strictly managed according to generally accepted environmental best practice standards, so as to avoid any unnecessary impact on the receiving environment.	Project Company	HSE Team
Agriculture:			
17.	Implement an effective system of stormwater run-off control, where it is required - that is at any points where run-off water might accumulate. The system must effectively collect and safely disseminate any run-off water from all accumulation points and it must prevent any potential down slope erosion.	Project Company	HSE Team
18.	Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion.	Project Company	HSE Team
19.	Undertake a periodic site inspection to check and record that topsoil is being stockpiled or being re-spread where required on all areas disturbed or rehabilitated that month.	Project Company	HSE Team
Heritage:			
20.	Keep decommissioning duration as short as possible.	Project Company	HSE Team
21.	Ensure effective rehabilitation of all areas.	Project Company	HSE Team
Visual:			
22.	Disturbed areas rehabilitated / revegetated as soon as possible after the decommissioning phase.	Project Company	HSE Team
23.	Wind turbines and building structures removed at the end of the life of the project.	Project Company	HSE Team

Item	Requirement	Responsibility	Monitoring
24.	Hardstands and access roads no longer required to be ripped and regraded.	Project Company	HSE Team
25.	Exposed or disturbed areas revegetated and returned to grazing pasture or natural veld to blend with the surroundings.	Project Company	HSE Team
Socio-economic:			
26.	Setting targets for how much local labour should be used based on the needs of the applicant and the availability of existing skills and people that are willing to undergo training. Opportunities for the training of unskilled and skilled workers from local communities should be maximized.	Project Company	HSE Team
27.	Using local sub-contractors where possible and requiring that contractors from outside the local area that tender also meet targets for how many locals are given employment.	Project Company	HSE Team
28.	Exploring ways to enhance local community benefits with a focus on broad-based BEE and preferential procurement.	Project Company	HSE Team
29.	Setting up a skills and services database in partnership with the local municipality and civil society for the local area before any hiring or contracting decisions are made. This can help to ensure fairness and limit potential interference in hiring processes.	Project Company	HSE Team
30.	An effective employee induction programme is essential to ensuring that new employees, some of whom will be unfamiliar with the responsibilities of maintaining employment, are adequately prepared and motivated to adjust to the lifestyle required of them. This programme should incorporate life skills training as well as basic financial literacy training.	Project Company	HSE Team
31.	Counselling services should be made available to employees to ensure that they have adequate guidance.	Project Company	HSE Team

Item	Requirement	Responsibility	Monitoring
32.	Assisting smaller enterprises where possible in tendering for contracts and in accessing finance which are common constraints to their participation in projects.	Project Company	HSE Team
33.	Avoiding potential service provider decisions that may lead to abuse or local dissatisfaction. For example, only appointing one accommodating rental agent or one catering supplier may lead to local dissatisfaction regarding the spreading of project benefits.	Project Company	HSE Team
34.	As far as possible, avoid significant variation in salaries between various contractors for the same types of jobs. When variations are too high, the likelihood of dissatisfaction increases.	Project Company	HSE Team
35.	A 'locals first' policy with regard to decommissioning labour needs.	Project Company	HSE Team
36.	The community should be able to contact the site manager or his/her representative to report any issues which they may have. The site manager and his/her representative should be stationed within the area and should therefore be available on hand to deal with and address any concerns which may be raised.	Project Company	HSE Team
37.	A complaints register should be available on site to any individual who may have a particular complaint with regards to the decommissioning process.	Project Company	HSE Team
38.	<p>A Code of Conduct should be established for the project, in addition:</p> <ul style="list-style-type: none"> The Code of Conduct should identify what types of behaviour and activities by workers are not permitted taking account of the needs of surrounding landowners and communities residing in affected areas. All staff, contractors and members of the workforce must be made aware of the Code of Conduct during the recruitment process. 	Project Company	HSE Team

Item	Requirement	Responsibility	Monitoring
	<ul style="list-style-type: none"> Awareness training must be provided during their induction onsite and prior to commencement of work duties on site. Display the Code of Conduct in the operation and maintenance buildings and construction areas. 		
39.	The applicant and the contractor should implement a Tuberculosis and HIV/AIDS awareness programme for all workers at the outset of the decommissioning phase.	Project Company	HSE Team
40.	Arrangements must be made to enable workers from outside the area to return home over the weekends or /at regular intervals. This would reduce the risk posed by non-local construction workers to local family structures and social networks.	Project Company	HSE Team
41.	Condoms should be freely available to employees and all contractor workers.	Project Company	HSE Team
42.	The applicant should honour their commitment to spend R 100 000 per year during decommissioning to contribute to security initiatives in the affected areas.	Project Company	HSE Team
43.	The contractor should make the necessary arrangements for ensuring that all non-local construction workers are transported back to their place of residence once the construction phase is completed.	Project Company	HSE Team
44.	Close coordination with the municipality is required, including regular meetings.	Project Company	HSE Team
45.	No decommissioning workers, with the exception of security personnel, should be allowed to stay on the site overnight.	Project Company	HSE Team
46.	The movement of workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis.	Project Company	HSE Team

Item	Requirement	Responsibility	Monitoring
47.	The applicant should implement measures to assist and, if needed, fairly compensate potentially affected surrounding landowners whereby damages to farm property, stock theft or significant disruptions to farming activities can be minimized or reduced. Measures should be agreed on before decommissioning commences.	Project Company	HSE Team
Geotechnical:			
48.	The natural site topography must be restored as fully as possible, and landscaping and rehabilitation of disturbed areas must be undertaken timeously.	Project Company	HSE Team
49.	Temporary berms and drainage channels to divert surface water where needed. The natural site topography should be restored wherever possible. Use of designated access routes to minimise the disturbance in surrounding areas.	Project Company	HSE Team
50.	Weekly monitoring should be undertaken during the decommissioning stage and thereafter at four monthly intervals until final sign-off.	Project Company	HSE Team

APPENDIX A: PROJECT TEAM CVs AND QUALIFICATIONS

APPENDIX 1
EXPERTISE OF EAP AND PROJECT TEAM (CVS)

CURRICULUM VITAE



STUART HEATHER-CLARK

TECHNICAL DIRECTOR
AFRICA POWER SECTOR LEAD

Environmental Management Planning & Approvals,
Africa

QUALIFICATIONS

Masters	1996	Environmental Science
BSc (Hons)	1992	Civil Engineering

EXPERTISE

- Environmental and Social Impact Assessment
- Environmental Management Plans/Programmes
- Public Participation & Facilitation
- Environmental & Social Due Diligence
- Environmental & Social Screening & Site Selection
- Training and Capacity Building
- Strategic Environmental Assessment

Stuart has over 24 years of environmental and social consulting experience in Africa. Having worked on over 100 development projects in Africa, his key strength is identifying and managing ESG risks for major capital projects from the concept phase through to the pre-feasibility, feasibility and implementation phases.

Through leading Environmental & Social Screening Studies, Environmental & Social Impact Assessments and Environmental & Social Due Diligences for major capital project in over 13 African countries; Stuart has developed a deep appreciation of key sustainability challenges facing development in Africa. He has excellent project management skills with the ability to manage projects from the concept phase through to project completion.

Stuart has worked for and with a number of IFI's, DFI's and PE firms to identify and managing ESG risks of their investments in Africa. He has an integral knowledge of the Equator Principles and IFC Performance Standards and understands the expectations of lenders and financial institutions when it comes to managing ESG risks.

Stuart has worked across various sectors including O&G, mining, infrastructure and power. Over the past eight years he has focussed on the power sector leading projects for wind farms, solar PV plants, hydropower plants and gas to power plants. He has an integral understanding of the Independent Power Producers (IPP) process in South Africa and several other African countries.

PROJECTS

All projects

Environmental and Social Impact Assessment for a 20MW solar PV plant and transmission line, Gigawatt Global, Liberia, (2020)

Project Director for the ESIA a 20MW solar PV plant and associated transmission line. The ESIA includes biodiversity, social and heritage baseline studies, stakeholder engagement and compilation of an ESIA Report and ESMP. The ESIA will be aligned with the IFC Performance Standards.

ESIA for an 80-200 MW wind farm development, Mphepo Power, Zambia (2019-20)

Project Director for the ESIA for the development of a wind farm in Zambia. The ESIA included terrestrial and aquatic, social, heritage, noise and visual baseline studies, stakeholder engagement and compilation of an ESIA Report and ESMP. The ESIA was aligned with the IFC Performance Standards.

<p>Environmental and Social Impact Assessment for a Road Upgrade, QGMI, Ghana, (2019-20)</p>	<p>Project Director for the Scoping Phase of the Environmental and Social Impact Assessment process for the proposed Winneba Obetsebi-Lamptey Flyover (Phase 2) project in Accra, Ghana in collaboration with local consultants. The project included additional visual impact assessment, air quality modelling and noise modelling. All work undertaken to IFC Performance Standards.</p>
<p>Environmental and Social Impact Assessment (ESIA) for the Gamsberg Mine Zinc Smelter, Black Mountain Mine (Vedanta), South Africa (2019-20)</p>	<p>Project Director for the ESIA for a new zinc smelter and associated infrastructure to beneficiate the 250 000 to 300 000 tpa of zinc concentrate produced at the Gamsberg Zinc Mine Phase-1 concentrator plant. The ESIA included extensive baseline studies including biodiversity, social, air quality, noise, visual, hydrology, geohydrology, and climate change. The process included extensive stakeholder engagement during the scoping and impact assessment phase.</p>
<p>ESIA Scoping Phase for the desalination plant and water carrier system, NamWater, Windhoek Namibia (2019-20)</p>	<p>Team member for the ESIA Scoping Phase for the proposed desalination plant and water carriage system to secure water supply to the central coast, Windhoek and en-route users. The Scoping Process included extensive stakeholder engagement and the Scoping Report was aligned with the KfW Sustainability Guidelines and World Bank Environmental and Social Standards.</p>
<p>Environmental & Social Due Diligence for 5MW solar PV plant, Confidential Client, Namibia (2019)</p>	<p>Project Director for an Environmental and Social (E&S) Due Diligence (Red Flags only) of a 5 MW solar PV facility located near Outapi, Namibia.</p>
<p>Environmental & Social Screening Study for 20MW solar PV plant, CIGenCo, Eswatini (2019)</p>	<p>Project Director for an Environmental and Social (E&S) Screening Study of two potential sites for development of solar PV projects as part of CIGenCo’s bid as part of the Eswatini Independent Power Producers Policy (ESIPPP).</p>
<p>Permitting Strategy and Planning for the Rovuma LNG Project in Mozambique, ExxonMobil, Mozambique (2018-2019)</p>	<p>Team member supporting Exxon with the permitting strategy and plans for the Rovuma LNG Project in northern Mozambique.</p>
<p>Environmental and Social Impact Assessment (ESIA) Gap Analysis for a 50MW solar PV Plant, Volt Renewable, Zimbabwe (2018)</p>	<p>Environmental lead for the review of the locally approved EIA against the IFC Performance Standards. Gaps were identified and an Environmental and Social Action Plan (ESAP) developed to close the gaps.</p>
<p>Environmental and Social Impact Assessment (ESIA) Gap Analysis for a 5-star hotel development, Motal-Engil, Zimbabwe (2018)</p>	<p>Environmental lead for the review of the locally approved EIA against the IFC Performance Standards. Gaps were identified and an Environmental and Social Action Plan (ESAP) developed to close the gaps.</p>

<p>Environmental and Social Screening Study for a 100MW hybrid HFO and Solar PV Power Plant for a mine in Mali, Confidential client (2018)</p>	<p>Environmental lead for the screening of environmental and social risks for the development of a solar PV plant on a mine in Mali.</p>
<p>Environmental and Social Screening Study for 3 x 40MW solar PV plants, Confidential Client, GETFIT Zambia (2018)</p>	<p>Project Manager for an environmental and social screening study for 3 x solar PV sites in Zambia. The Screening Study included the review of desk top information and site visits to assess environmental and social risks. A comparative analysis was undertaken to select the site with the least environmental and social risks. This was combined with the technical analysis to select the preferred site to be taken into more detailed studies.</p>
<p>Environmental and Social Impact Assessment for a 40MW solar PV farm, Enel Green Power, South Africa (2017)</p>	<p>Project Director for an Environmental and Social Impact Assessment for a 40MW solar PV plant in South Africa. The study included scoping and stakeholder engagement, various specialist studies and the compilation of an ESIA Report and ESMP.</p>
<p>Environmental and Social Impact Assessment for 2 run-of-river Hydropower Plants and associated transmission lines in Northern Zambia, Globeleq, Zambia (2017)</p>	<p>Project Director for an Environmental and Social Impact Assessment for 2 run-of-river hydropower plants and associated transmission lines on the Kalungwishi River in Northern Zambia. The study included scoping and stakeholder engagement, various specialist studies including environmental flow, heritage, social, biodiversity, visual, noise and other studies. All work was undertaken to IFC Performance Standards. The project was put on hold after the baseline and Scoping Phase.</p>
<p>Environmental and Social Screening Study for an 212MW HFO Power Plant, Confidential Client, Angola (2017)</p>	<p>Project Director for an Environmental and Social Screening Study for a 212MW HFO Power Plant in Angola. The study included noise and air quality baseline sampling, soil and groundwater baseline sampling, community health screening, and the compilation of a detail legal register and compliance road map.</p>
<p>Environmental and Social Screening Study for a Hydropower Plant in Gabon, Confidential Client, Gabon (2017)</p>	<p>Environmental and Social Screening Study for a Hydropower Plant in Gabon, Confidential Client, Gabon, 2017</p>
<p>Environmental and Social Due Diligence (ESDD) for two Solar PV and two Wind Farm Projects South Africa, Confidential Client, South Africa (2017)</p>	<p>Project Director for the ESDD for two Solar PV and two Wind Farm Projects in South Africa.</p>
<p>Environmental, Health and Safety Risk assessment of four Solar PV sites in South Africa, Enel Green Power, South Africa (2017)</p>	<p>Project Director for the EHS Risk Assessments.</p>
<p>Environmental and Social Impact Assessment for a 100MW to 250MW solar PV Plant, Globeleq, Zambia (2016-17)</p>	<p>Project Director for an Environmental and Social Impact Assessment for a 100MW to 250MW solar PV plant in Zambia. The study included the analysis of key environmental and social impacts, compilation of an ESIA and ESMP reports and stakeholder engagement.</p>

Environmental and Social Screening Study for a solar PV Plant, Confidential client, Zambia (2016)	Project Director for an Environmental and Social Screening Study for the establishment of solar PV power plant in Zambia. The study included the analysis of key environmental and social risks including regulatory, biodiversity and social risks.
Environmental and Social Due Diligence, Six Solar PV Farms, Confidential Client, South Africa (2016)	Project Director for an ESDD for six solar pv farms in South Africa. The ESDD was undertaken against SA Legislation and Regulations and IFC Performance Standards.
Environmental and Social Impact Assessment for a CCGT Power Plant, ArcelorMittal, South Africa (2016)	Project Director for an Environmental and Social Impact Assessment study for the establishment of a CCGT power plant for ArcelorMittal in Saldanha Bay, South Africa. The ESIA includes detailed specialist studies including air emissions modelling, noise modelling, biodiversity and heritage assessment. Full stakeholder engagement is also part of the scope of work.
Environmental and Social Management Plans, Wind Farm Development, Confidential Client, Kenya (2016)	Project Director and involved in advising the client on various strategies including vantage point bird monitoring and management plan development.
Environmental and Social Screening Study of potential solar PV sites, Confidential Client, Ivory Coast (2016)	Environmental and Social Screening Study of potential solar PV sites, Confidential Client, Ivory Coast, 2016
Environmental and Social Impact Assessment for the Tete-Macuse Railway Line and Macuse Power Development, Italthai, Mozambique (2015-17)	Project Director for the Environmental and Social Impact Assessment (ESIA) for the proposed Tete-Macuse railway line and Macuse Port development for the export of coal from Tete Province in Mozambique. The project included the development of over 700km of railway line and a new port development.
Strategic Environmental Assessment for the supporting infrastructure for the Baynes Hydropower Project, Baynes PJTC, Namibia/Angola (2014-15)	Project Director for the Strategic Environmental Assessment of the associated infrastructure for the Baynes hydropower project. The SEA covered the assessment of access roads for construction, transmission lines routing in Angola and Namibia and locations of an airfield.
Cumulative Impact Assessment of the development of numerous hydropower plants on the Kwanza River, Odebrecht, Angola (2014-15)	Project Director for the Cumulative Impact Assessment of the development of a number of hydropower plants on the Cuanza River in Angola.
Environmental and Social Impact Assessment for the Batoka Gorge Hydropower Project, ZRA, Zambia/Zimbabwe (2014-15)	Advisor to the ESIA team undertaking the Environmental and Social Impact Assessment (ESIA) for the proposed Batoka Gorge Hydropower Plant on the Zambezi River below the Victoria Falls. The project includes the construction of a dam wall, hydropower plants, transmission lines and associated infrastructure. The ESIA is being conducted in alignment with the IFC Performance Standards and the World Bank Safeguard Policies.
Environmental and Social Impact Assessment for the Rehabilitation of the Kariba Dam Wall, ZRA, Zambia/Zimbabwe (2014-15)	Project Director for the Environmental and Social Impact Assessment (ESIA) for the proposed Kariba Dam Rehabilitation Project. The project includes the rehabilitation of the plunge pool and spillway of the dam wall. The project is being funded by the World Bank, African Development Bank and the EU.

<p>Environmental and Social Due Diligence (ESDD) for a 98 MW wind farm in South Africa, Confidential Client, South Africa (2015)</p>	<p>Project Director for the ESDD.</p>
<p>Environmental and Social Due Diligence (ESDD) for a 2 x 75 MW solar pv farm in South Africa, Confidential Client, South Africa (2015)</p>	<p>Project Director for the ESDD.</p>
<p>Environmental and Social Due Diligence (ESDD) for a 74 MW wind farm in South Africa, Confidential Client (2015)</p>	<p>Project Director for the ESDD.</p>
<p>Environmental and Social Screening Study for a CCGT Power Plant, Confidential Client, South Africa (2015)</p>	<p>Project Director for an Environmental and Social Screening study for the establishment of a gas power plant in Saldanha Bay, South Africa. The screening study outputs included a permitting strategy, environmental opportunities and constraints maps, and input into the site selection process.</p>
<p>Environmental and Social Impact Assessment for Floating Power Plants in the Port of Richards Bay, Department of Energy IPP Office, South Africa (2015-16)</p>	<p>Project Director for the ESIA for the establishment of Floating Power Plants in the Ports of Richards Bay in South Africa. The ESIA includes detailed specialist studies including marine outfall modelling, air emissions modelling and marine ecology studies. Full stakeholder engagement is also part of the scope of work.</p>
<p>Environmental and Social Impact Assessment for Floating Power Plants in the Port of Richards Bay, Department of Energy IPP Office, South Africa, (2015-16)</p>	<p>Project Director for the ESIA for the establishment of Floating Power Plants in the Ports of Saldanha in South Africa. The ESIA includes detailed specialist studies including marine outfall modelling, air emissions modelling and marine ecology studies. Full stakeholder engagement is also part of the scope of work.</p>
<p>Environmental and Social Impact Assessment for LNG Import Terminal in the Port Richards Bay for the Gas to Power Programme, Department of Energy IPP Office, South Africa (2015-16)</p>	<p>Project Director for the ESIA for the establishment of LNG Import Terminals as part of the DoE’s Gas to Power Programme in South Africa. The ESIA includes detailed specialist studies including marine outfall modelling, air emissions modelling and marine ecology studies. Full stakeholder engagement is also part of the scope of work.</p>
<p>Environmental and Social Impact Assessment for LNG Import Terminal in the Port Saldanha for the Gas to Power Programme, Department of Energy IPP Office, South Africa, (2015-16)</p>	<p>Project Director for the ESIA for the establishment of LNG Import Terminals as part of the DoE’s Gas to Power Programme in South Africa. The ESIA includes detailed specialist studies including marine outfall modelling, air emissions modelling and marine ecology studies. Full stakeholder engagement is also part of the scope of work.</p>
<p>Environmental and Social Screening study for the establishment of an CCGT power plant in the Ports of Richards Bay, Confidential client, South Africa (2015)</p>	<p>Project Director for an Environmental and Social Screening Study for the establishment of a CCGT power plant in Richards Bay, South Africa. The study included the analysis of key environmental and social risks including air emissions, effluent emissions, biodiversity (terrestrial and marine) and social issues. The assessment applies to the power plant site, transmission line routing and pipeline routing and compares the opportunities and constraints associated with the two locations.</p>

<p>Environmental and Social Screening study for the establishment of an CCGT power plant in the Port of Saldanha, Confidential client, South Africa (2015)</p>	<p>Project Director for an Environmental and Social Screening Study for the establishment of a CCGT power plant in Saldanha Bay, South Africa. The study included the analysis of key environmental and social risks including air emissions, effluent emissions, biodiversity (terrestrial and marine) and social issues. The assessment applies to the power plant site, transmission line routing and pipeline routing and compares the opportunities and constraints associated with the two locations.</p>
<p>Environmental and Social Screening study for the establishment of an SCGT power plant in the Ports of Saldanha, Confidential client, South Africa (2015)</p>	<p>Project Director for an Environmental and Social Screening Study for the establishment of an SCGT power plant in the Port of Saldanha. The study included the analysis of key environmental and social risks including air emissions, effluent emissions, biodiversity (terrestrial and marine) and social issues. The assessment applies to the power plant site, transmission line routing and pipeline routing.</p>
<p>Environmental and Social Impact Assessment for the Burgan Oil Fuel Storage Depot in the Port of Cape Town, Burgan Oil, South Africa (2014-15)</p>	<p>Project Director for the ESIA for the Burgan Oil Fuel Storage Depot in the Port of Cape Town.</p>
<p>Millennium Challenge Account – Malawi: Infrastructure Development Project – Energy Sector (hydropower plants, transmission and distribution lines and substations), MCC, Malawi (2014-15)</p>	<p>Environmental Lead for the Independent Engineer to review all the Contracting Engineers environmental and social studies associated with the Infrastructure Development Project. The project includes the upgrade and development of new power infrastructure including hydropower plants, transmission lines, distribution lines and substations.</p>
<p>Strategic Environmental Assessment of the New Town Integrated Development Zone, TFM Mining, Katanga Province, DRC (2014)</p>	<p>Project Director for the Strategic Environmental Assessment of the New Town Integrated Development Zone undertaken for Tenke Fungurume Mining (TFM) in Katanga Province, DRC.</p>
<p>Environmental and Social Impact Assessment (ESIA) for the Gamsberg Zinc Mine, South Africa, Black Mountain Mine (Vedanta) (2012-13)</p>	<p>Project Director for the Environmental and Social Impact Assessment for a new Zinc Mine in the Northern Cape Province in South Africa. The ESIA includes the assessment of the mine and all associated infrastructure including waste rock dumps, tailing dams, processing plant, transmission lines, a new township development, upgrade of a water pipeline and associated water treatment facilities, and transport options to the Port of Saldanha via both road and rail. The ESIA is being undertaken as an integrative process to meet various environmental legal requirements including National Environmental Management Act (NEMA): EIA Regulations, NEM: Waste Act, NEM: Air Quality Act, NEM: Biodiversity Act, National Heritage Resource Act, National Water Act and the Minerals Petroleum Resources Development Act. The process includes various specialist studies, full stakeholder engagement as well as integration with a Biodiversity Off-sets process.</p>
<p>Environmental and Social Impact Assessment for the Expansion of Transnet's existing Manganese Ore Export Railway Line and Associated Infrastructure, South Africa (2012)</p>	<p>Project Director for the ESIA for the Expansion of Transnet's existing Manganese Ore Export Railway Line and Associated Infrastructure in the Northern and Eastern Cape, South Africa.</p>

<p>Ore Line Expansion Project for the Sishen-Saldanha Ore Line and Port of Saldanha, various Mining Companies and Transnet, South Africa (2011-2012)</p>	<p>Project Director for the Environmental and Social Screening Study for the Pre-feasibility Phase of the Ore Line Expansion Project. This included compiling a detail Environmental and Social Design Criteria Report together with initial Stakeholder Engagement. A detailed multi-criteria assessment for various port and stockpile options was undertaken. The project included upgrading over a 1000 km of railway line and upgrading the port facilities including stockpiles, stacker-reclaimers, conveyors and ship loading facilities. The stakeholder engagement process was specifically designed to obtain buy-in from stakeholder who were strongly opposed some components of the port and rail expansion.</p>
<p>Strategic Environmental Assessment for the Mozambican Regional Gateway Programme, MRGP, Mozambique, Malawi, Zambia, Zimbabwe (2012)</p>	<p>Project Director for the SEA of the MRGP. The MRGP aims to support the improvement of the Southern African transport (roads, rail and ports), regional infrastructure network, which uses Mozambique as a gateway for international trade. The MRGP geographic scope encompasses the Beira and Nacala Transport Corridors and the respective links to the Maputo and Limpopo Corridors. The SEA identified environmental and social issues that need to be considered in the long terms planning an implementation of the rail and port infrastructure that makes up the Beira and Nacala Transport Corridors.</p>
<p>Strategic Environmental Assessment (SEA) for the coastline of Mozambique, MICOA, Mozambique (2012)</p>	<p>Adviser on the SEA for the coast of Mozambique. The SEA aims to identify potential conflicts between various uses of the coastal zone and to recommend strategic interventions to facilitate sustainable development within the coastal zone. Various users of the coastal zone that are being considered include off-shore oil and gas operations, coastal mining, tourism, conservation and artisanal and industrial fishing.</p>
<p>Environmental and Social Screening Study for port options in Pemba Bay, Anadarko, Mozambique (2012)</p>	<p>Project Lead for an Environmental and Social Screening Study for various port options in Pemba Bay. The screening study includes a multi-criteria assessment of various port locations taking into account marine and terrestrial ecology, social issues, land ownership, legal aspects and physical marine conditions.</p>
<p>Environmental and Social Impact Assessment for a LPG import and distribution facility, Sunrise Energy, South Africa (2011-2012)</p>	<p>Project Director for the Scoping/EIA for a LPG importation, storage and distribution facility which includes a marine offloading facility in Saldanha Bay, a pipeline and a storage facility. The environmental permitting process required the liaison with local and provincial environmental authorities, co-ordination of specialist studies, public participation and impact assessment.</p>
<p>Environmental and Social Screening Study for a Mine development in Angola, Confidential Client, Angola (2011-2012)</p>	<p>Project Director for the Environmental and Social Screening Study for the Concept Phase for a new mine development in Angola. The study included identifying environmental and social risks to the project and costing a full ESIA according to IFC Performance Standards and Equator Principles.</p>
<p>Equator Principles and IFC Performance Standards Training, Vedanta Resources Plc, Zambia (2012)</p>	<p>Lead facilitator of a 5-day training course on the implementation of the Equator Principles and IFC Performance Standards for a number of Vedanta's mining operations across Southern Africa, Europe and Australia.</p>
<p>Environmental and Social Impact Assessment for the upgrade of the Principe Airport, HBD, Principe (2011-2012)</p>	<p>Project Director for the Environmental and Social Impact Assessment for the upgrade of the airport in Principe.</p>
<p>EIA for a 380MW renewable energy facility north of Touwsrivier in the Western Cape (2010-2011)</p>	<p>Project Director for the Scoping/EIA for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.</p>

EIA for a 170MW renewable energy facility east of Touwsrivier in the Western Cape (2010-2011)	Project Director for the Scoping/EIA for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
EIA for a 670MW renewable energy facility south of Sutherland in the Western and Northern Cape (2010-2011)	Project Director for the Scoping/EIA for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process requires the liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
EIA for a 500MW renewable energy facility south of Beaufort West in the Western Cape (2010-2011)	Project Director for the Scoping/EIA for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
EIA for a 120MW renewable energy facility south east of Victoria West in the Northern Cape (2010-2011)	Project Director for the Scoping/EIA for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
EIA for a 225MW wind farm in the Richtersveld, Western Cape (2011)	Project Director for the Scoping/EIA for a proposed wind farm. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
EIA for a 750MW wind farm in the Roggeveld, Western Cape and Northern Cape (2011) Director	Project Director for the Scoping/EIA for a proposed wind farm. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
EIA for a 225MW renewable energy facility between Vredenburg and Velddrif in the Western Cape (2010-2011)	Project Director for the Scoping/EIA for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
Environmental and Social Impact Assessment for the Lesotho Highland 150 MW Wind Power Project, Breeze Power, Lesotho (2011)	Project Director for the Scoping Phase of the Environmental and Social Impact Assessment for a 150MW wind farm development in Lesotho. The Scoping Phase included the analysis of available information to identify key environmental and social risks associated with the siting of the wind farm.
Environmental Screening Study for a Wind Farm Development in the Southern Cape, South Africa (2011)	Project Director for the Environmental Screening Study for a wind farm development in the Southern Cape.
Environmental and Social Due Diligence for a Wind Farm Development in Coega, Electrawinds, South Africa (2011)	Project Director for the Environmental and Social Due Diligence for a wind farm development in the Coega.

Environmental and Social Impact Assessment for Venetia Diamond Mine, De Beers, South Africa (2011)	Project Director for the Scoping and ESIA for the proposed new underground mine and EMP consolidation for existing mining activities. The ESIA was undertaken as an integrative process to meet various environmental legal requirements including National Environmental Management Act (NEMA): EIA Regulations, NEM: Waste Act, NEM: Air Quality Act, NEM: Biodiversity Act, National Heritage Resource Act, National Water Act and the Minerals Petroleum Resources Development Act.
Environmental and Social Impact Assessment for a river barging project on the Zambezi River, Riversdale Mining, Mozambique (2010-2011)	Project Director for the project which includes the assessment of environmental and social impacts associated with dredging over 500km of the Zambezi River. The project includes full stakeholder engagement, coordination of various specialist studies with extensive field work and the integration of all information into an ESIA report and ESMP.
EIA for two solar PV plant development, South Africa (2010)	Project Director of the EIA for the development of two solar PV plants in the Northern Cape and Free State Provinces of South Africa. ERM undertook the required studies to obtain environmental approval for these developments, including specialist studies such as landscape and visual and cultural heritage assessments, and stakeholder engagement.
Basic Assessment for the installation of wind measuring masts on six sites in the Western Cape and two sites in the Northern Cape (2010)	Project Director for the Basic Assessments to install wind measuring masts at eight sites in South Africa. The scope of work included the submission of the application, public participation, preparation of an EMP and submission of the Basic Assessment report.
EIA for a 100MW renewable energy facility north of Velddrif in the in the Western Cape (2010)	Project Director for the Scoping process for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required the liaison with local, provincial and national environmental authorities, co-ordination of specialist studies and public participation.
EIA for a 300MW renewable energy facility east of Lambert's Bay in the Western Cape (2010)	Project Director for the Scoping process for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies and public participation.
External adviser and reviewer for an ESIA for a wind farm development in the Eastern Cape, Confidential Client, South Africa (2010)	Adviser and reviewer for an EIA for the development of a wind farm in the Eastern Cape.
Environmental Advisor Environmental and Social Impact Assessment for the Mphanda Nkuwa Hydropower Project in Mozambique (2010)	Advisor for the ESIA for the Mphanda Nkuwa Hydropower Project in Mozambique. The core service was to advise the project team on international standards such as the IFC Performance Standards and World Commission on Dams.
Environmental Sensitivity Study of the Durban Airport Site Expansion Project , South Africa, Transnet (2010)	Project Director for the Environmental Sensitivity Study for the proposed dig-out port currently being considered by Transnet at the Durban International Airport Site. The aim of this assessment was to determine the biophysical, natural and social opportunities and constraints to the development of the dig-out port, as well as provide a strategic overview of the environmental context of the site. In addition, the sensitivity study provided strategic guidance in terms of the environmental due process and licensing requirements with respect to the National Environmental Management Act, and associated legislation.

<p>ESIA for a new high voltage overhead transmission power line in Cameroon, AES Sonel, Cameroon (2007- 2009)</p>	<p>Project Director for the Environmental and Social Impact Assessment and a full Resettlement Action Plan for a new electricity distribution project, comprising a 113km overhead power line, for AES Sonel. As Project Director, Mr Heather-Clark was responsible for client liaison, quality control and final review of all reports.</p>
<p>Advisor to the Environmental and Social Impact Assessment for the Baynes Hydropower Project in Namibia and Angola (2009)</p>	<p>Project Advisor for the Environmental and Social Impact Assessment for the proposed Baynes Hydropower Project on the Kunene River. The ESHIA process is being conducted in accordance to the Angolan EIA Regulations, the Namibian EIA Regulations, the World Bank Safeguard Policies and the IFC performance standards.</p>
<p>Environmental and Social Impact Assessment for the upgrade of a 1100 km railway line in South Africa, Transnet (2008- 2009)</p>	<p>Project Director for the Environmental and Social Impact Assessment for the upgrade of a commodities railway line across South Africa. The project included a number of specialist studies, managing subcontractors, interfacing with the railway engineering team, report writing, managing an extensive stakeholder consultation process, client liaison and management of project finances.</p>
<p>Environmental and Social Impact Assessment for the services corridor associated with the development of a greenfield CTL Plant, Sasol, South Africa (2009)</p>	<p>Project Director for an ESIA of a services corridor to support the development of a greenfield CTL plant development in South Africa. The ESHIA process was conducted in accordance to the South African EIA Regulations and the IFC performance standards.</p>
<p>Environmental and Social Impact Assessment for 2D seismic exploration project in the Rovuma Basin, Petronas, Mozambique (2009)</p>	<p>Project Director for the ESIA for the offshore seismic exploration activities in Blocks 3 & 6, situated in the Rovuma Basin off the coast of Mozambique. The exploration activities comprise 2D seismic surveys in deepwater.</p>
<p>Environmental and Social Screening Study for a river barging project on the Zambezi River, Riversdale Mining, Mozambique (2009)</p>	<p>Project Director for the project which included the assessment of environmental and social risks associated with dredging over 500km of the Zambezi River. The project included reviewing existing information, mapping key sensitivities and facilitating a specialist workshop in order to develop Terms of Reference for detailed baseline studies that will be required should the project proceed to a full ESIA.</p>
<p>Equator Principled and IFC Performance Standards Review and Training, African Housing Solutions, South Africa (2009)</p>	<p>Lead reviewer for the ESIA and Resettlement Policy Framework, for a housing development in Nigeria, against the Equator Principles and IFC Performance Standards. Mr Heather-Clark was responsible for reviewing the ESIA Report and for presenting a 2 ½ day training course on the Equator Principles and IFC Performance Standards.</p>
<p>Environmental Assessment for the dredging and disposal of dredge spoil at the Port of Saldanha, Transnet, South Africa (2008)</p>	<p>Project Director for this project and was responsible for guidance of technical studies which included dredging studies and marine sediment contamination characterization. The study included the assessment of dredge spoil dumping alternatives. Stakeholder engagement included an important component of the project.</p>
<p>Environmental and Social Screening Study, Port of Saldanha, Transnet, South Africa (2008)</p>	<p>Project Director for the screening study which included an assessment of alternative berth options for the export of iron ore at the iron ore terminal at the Port of Saldanha, South Africa. The work included ongoing interaction with the port engineering and design teams, together with stakeholder engagement.</p>

<p>ESIA for an Early Production System (EPS) and Power Plant for Kaiso-Tonya Area, Exploration Area 2, Tullow Uganda Operations Pty Ltd, Uganda (2007-08)</p>	<p>Project Director for the project which included a full ESIA for an Early Production System and associated Power Plant in the Kaiso-Tonya area on the banks of Lake Albert, Uganda. The intent of the project is to produce oil (and small amounts of gas) which will be converted into electrical power and distillate products (kerosene and diesel) for consumption within Uganda. The electrical power will be fed into the main grid supplementing the Ugandan electrical power grid while the distilled products (diesel and kerosene) will be used to displace the currently imported fuels. The ESIA included a detailed assessment of alternative sites for the proposed EPS and power plant, together with various environmental and social baseline studies and stakeholder engagement.</p>
<p>ESIA monitoring studies for Sasol’s Off-shore gas exploration activities in Inhambane and Sofala Provinces, Mozambique, Sasol Petroleum Sofala & Empresa Nacional de Hidrocarbonetos (2007-08)</p>	<p>Project Director for an environmental monitoring survey programme for Sasol’s offshore hydrocarbon exploration activities. Monitoring studies included seismic noise modelling and monitoring, dugong surveys, artisanal fish catch monitoring, coral reef surveys and monitoring, sea turtle monitoring and tourism monitoring.</p>
<p>Strategic Environmental and Social Overview and ESIA’s for offshore exploration well drilling activities in Blocks 2 and 3A, Lake Albert, Uganda. Tullow Oil Plc and Heritage Oil and Gas Limited (2006- 2008)</p>	<p>Project Director for this project. The project involved undertaking a strategic overview study of Lake Albert that provided background information on the limnological (physical, chemical and biological) features of the lake as well as environmental and socio-economic resources (such as nature reserves, tourism nodes, prime fishing areas etc). It also presented areas of environmental risk and opportunity associated with oil explorations on, and immediately adjacent to, the lake. The strategic overview provided a framework within which ESIA’s were undertaken for the offshore drilling project. A site selection study was undertaken for onshore support infrastructure. Baseline studies included shoreline sensitivity mapping, oil spill modelling, water and sediment quality surveys, fish and fisheries surveys, socio-economic surveys and terrestrial ecology surveys. An extensive public participation process was undertaken as part of the ESIA’s.</p>
<p>Environmental and Social Baseline Assessment for a green fields coal mine and CTL plant development, Sasol, South Africa (2008)</p>	<p>Project Director the environmental and social baseline studies to support the evaluation of sites for potential development of a green field’s coal mine and associated CTL Plant in South Africa. Mr. Heather-Clark has assisted with review and quality control of the various baseline studies.</p>
<p>Development of guideline document for the integration of environmental and social issues into the project lifecycle for mine development, De Beers, South Africa (2008)</p>	<p>Team member of the project team that assisted the client in developing a detailed guideline document for the integration of social and environmental issues into mine planning. This included all phases of the planning process from Concept through to Pre-feasibility, Feasibility and Implementation. Mr Heather-Clark, as lead facilitator, presented a 2 day training course on these guidelines, to mine planners and engineers.</p>
<p>EIA for a Metal Recovery Plant and Slag Crushing, Screening and Weathering facility at Arcelor Mittal Saldanha Works, MultiServ, South Africa (2007 – 2008)</p>	<p>Project Director for the EIA, including a public consultation process and the following specialist studies: air quality, groundwater, noise impact assessment, botanical and archaeology studies and a traffic impact assessment. Mr Heather-Clark was responsible for client liaison, quality control and final review of all reports.</p>

Implementation of the Equator Principles for Standard Bank's Project Financing Processes, Standard Bank, South Africa (2008)	Lead facilitators for Equator Principles and IFC Performance Standards training to assist Standard Bank in adopting the Equator Principles. An assessment system (based on the IFC Performance Standards) to link with Standard Bank's project finance transaction life-cycle was developed. This involved the development of "tools" and guidance documents to form a system, together with training on the use of the system for all project finance staff.
Comparative review of EIAs undertaken by ERM globally for electricity utilities, Eskom, South Africa (2007)	Project Director for this project. The project included research to provide Eskom with an overview of different EIA governance systems and approaches to managing EIAs in other countries, as well as identifying trends in EIA practice.
Environmental and Social Screening and Qualitative Risk Assessment Western Ports and Rail Corridor, Transnet, South Africa (2007)	Project Director involved in identifying environmental and social risks associated with future port development in the Port of Saldanha, Port of Cape Town and Port of Mossel Bay. The scope of the study included the review of previous EIAs, SEAs and other planning documents to identify environmental and social drivers and assess their risk to future port planning, development and operations. As the environmental team, ERM interacted on a regular basis with the port engineering and design teams to develop a port development framework for a 30 year planning period.
Environmental and Social Screening and Qualitative Risk Assessment Central Ports and Rail Corridor, Transnet, South Africa (2007)	Project Director involved in identifying environmental and social risks associated with future port development in the Port of East London, Port of Port Elizabeth and Port of Ngqura. The scope of the study included the review of previous EIAs, SEAs and other planning documents to identify environmental and social drivers and assess their risk to future port planning, development and operations. As the environmental team, ERM interacted on a regular basis with the port engineering and design teams to develop a port development framework for a 30 year planning period.
Environmental and Social Screening and Qualitative Risk Assessment Eastern Ports and Rail Corridor, Transnet, South Africa (2007)	Project Director involved in identifying environmental and social risks associated with future port development in the Port of Durban and Port of Richards Bay. The scope of the study included the review of previous EIAs, SEAs and other planning documents to identify environmental and social drivers and assess their risk to future port planning, development and operations. As the environmental team, ERM interacted on a regular basis with the port engineering and design teams to develop a port development framework for a 30 year planning period.
EIA of the Moatize Coal Mine and associated railway line and deep water port infrastructure, CVRD, Tete Province, Mozambique (2006-2007)	Project Coordinator and Cost Controller on this project. ERM was commissioned by CVRD, a Brazilian Mining Company, to undertake environmental studies related to the green fields development of a coal mine in Tete Province, Mozambique. The project included the development of a power plant, railway line and port for the export of coal.
Corporate Social Responsibility Strategy development for a leading South African retailer, South Africa (2006)	Lead facilitator for this project. The project involved identifying and prioritising the company's sustainability issues and defining a strategy to address these issues. The process was driven by the need for the company to be listed on the Johannesburg Stock Exchanges SRI Index.
Research project on the effects of water scarcity on the fresh produce supply to a major South Africa retailer, South Africa (2006)	Project Leader coordinated a group of researchers to identify water scarce areas and to plot these against the location of fresh produce suppliers for a major retailer in South Africa. This researched form a core component of the companies Sustainability Strategy.
Independent Environmental Advisers to the Financing Parties of the Gautrain Rapid Rail Link project, Bowman Gilfillan (2006)	Independent Environmental Advisers to the Financing Parties, provided review and advisory services through Bowman Gilfillan on Environmental Management Plans for the Gautrain Rapid Link project.

<p>ESIA for seismic surveys and exploration well drilling and testing in Blocks 16 and 19 off the coast of Mozambique, Sasol Petroleum Sofala & Empresa Nacional de Hidrocarbonetos (2005 – 2006)</p>	<p>Project Manager for the ESIA which involved undertaking an ESIA and compiling EMPs for offshore exploration activities in Blocks 16 & 19, situated to the east of the Bazaruto Archipelago National Park, off the coast of Mozambique. The exploration activities comprised 2D and 3D seismic surveys in deepwater and shallow water as well as exploration well drilling and testing activities.</p>
<p>EIA for the upgrade and expansion of the existing sinter plant at Vanderbijlpark, ArcelorMittal, South Africa (2006)</p>	<p>Project Director for the EIA and stakeholder engagement process to meet South African requirements. This included coordination of the technology review, air quality, health and waste management specialist studies and compilation of the integrated Scoping and EIA Report.</p>
<p>Review of Sustainability Report and Sustainability Management System, Confidential, South Africa (2004)</p>	<p>Lead reviewer of the Sustainability Report of a leading retailer in South Africa and providing adhoc advice on sustainability issues. This included compiling a monthly news letter to staff on relevant sustainability issues facing the retail industry in South Africa.</p>
<p>EIA of a proposed expansion of the Container Terminal Stacking area at the Port of Cape Town, National Ports Authority, South Africa (2003-2004)</p>	<p>Project Manager for this EIA. The project included the expansion of the Cape Town container terminal into the sea through dredging 1 million m3 of material for reclamation. The project included a detailed study on alternative sources for fill material and other studies which focused on marine archaeology, coastal erosion, marine hydrodynamics and water quality, visual, noise and traffic. The EIA included full stakeholder engagement throughout the EIA process.</p>
<p>Environmental Site Suitability Study for a manganese smelter, Asia Minerals Limited (2004)</p>	<p>Part of the project team that undertook a preliminary site selection process for a manganese smelter by identifying key environmental and social issues for potential sites within Southern Africa. Sites included the Belualane Industrial Park (Mozambique) and Richards Bay, the Coega Industrial Development Zone (IDZ) and Saldanha (South Africa).</p>
<p>DFID funded project to assess progress towards meeting the water related targets of the Millennium Development Goals, DIFD, Zambia (2004)</p>	<p>Country Coordinator for Zambia on this project. The project included detailed stakeholder surveys secondary data analysis to establish the countries progress towards meeting the Millennium Development Goals, specifically related to water supply and sanitation.</p>
<p>Roll-out of ISO14001 and OHSAS18001 management systems to 2 industrial sites in South Africa, Confidential, South Africa (2004)</p>	<p>Project Manager responsible for undertaking ISO14001 training at two industrial sites. The project formed part of a global initiative to have several industrial sites throughout Africa and Europe ISO14001 certified.</p>
<p>Strategic Environmental Assessment (SEA) for the Port of Cape Town, National Ports Authority of South Africa, South Africa (2003)</p>	<p>Project Manager for this project and played a lead role in directing the course and outcome of the SEA. The SEA focussed on key environmental and social opportunities and constraint to the future long term development of the Port of Cape Town. A Sustainability Framework was developed to address key opportunities and constraints and to set up long terms monitoring programs. A key component of this study was to understand the Port-City linkages and developing mechanisms to ensure that port planning was supported by city planning and visa-versa.</p>
<p>Strategic Environmental Assessment (SEA) for the Port of Richards Bay, National Ports Authority of South Africa, South Africa (2003)</p>	<p>Project Adviser for this project and played a lead role in directing the course and outcome of the SEA. The SEA focussed on key environmental and social opportunities and constraint to the future long term development of the Port of Cape Town. A Sustainability Framework was developed to address key opportunities and constraints and to set up long terms monitoring programs. A key component of this study was to understand the Port-City linkages and developing mechanisms to ensure that port</p>

	<p>planning was supported by city planning and visa-versa.</p>
<p>E&S Due Diligence of the Phase 2 Maputo Port Revitalisation and Rehabilitation Project, Standard Corporate Merchant Bank, Mozambique (2003)</p>	<p>Environmental Adviser to the Standard Corporate Merchant Bank for the review of the EIA and Risk Assessment studies undertaken for the Phase 2 Maputo Port Revitalisation and Rehabilitation Project. The EIA was reviewed against the Mozambican and International Best Practice guidelines and detailed recommendation made on how to manage the environmental risks associated with the revitalisation project.</p>
<p>National Oil Spill Contingency Plan for Cameroon, funded by the World Bank, Cameroon Government, Cameroon (2003)</p>	<p>Part of the team that compiled a comprehensive Oil Spill Contingency Plan for Cameroon (OSCP). The OSCP form a core component of the Chad Cameroon Pipeline and included contingency plans for both on land and marine based spills. The OSCP was compiled according to the IPEACA guidelines and was reviewed by the World Bank.</p>
<p>EIA/SEA Capacity Building, Environmental Public Authority (EPA), State of Kuwait (2003)</p>	<p>Lead facilitator for a 2 day training course on SEA and EIA for the Environmental Public Authority (EPA) of the State of Kuwait.</p>
<p>Training Workshop on Strategic Environmental Assessment for South Eastern Africa and the Western Indian Ocean Island States, SEACAM, Mozambique (2003)</p>	<p>Lead course facilitator for the SEA training course funded by SEACAM. The training course included the principles of SEA, SEA process and case studies of SEA's in Southern Africa.</p>
<p>Improving the Effectiveness of EIA and the Potential of SEA in Southern Africa: Case Study on SEA of the National Commercial Ports Policy and SEA for the Port of Cape Town, World Bank/SAIEA, Namibia (2003)</p>	<p>Presenter of two case studies on SEA at a regional workshop funded by the World Bank and SAIEA.</p>
<p>Environmental Impact Assessment for the Eskom SABRE-GEN wind turbine test facility, Eskom, South Africa (2002)</p>	<p>Project Manager for the EIA. The EIA included stakeholder engagement throughout the process and included the following specialist studies: visual assessment, bird strike modelling and noise assessment.</p>
<p>Strategic Environmental Assessment: Scoping Phase Port of Richards Bay, National Ports Authority of South Africa, South Africa (2002)</p>	<p>Project Leader and integrative writer for the Scoping Phase of the SEA for the Port of Richards Bay. This phase included detailed stakeholder consultation to identify opportunities and constraints to long term port development at the Port of Richards Bay.</p>
<p>White Paper on National Commercial Ports Policy, National Ports Authority, South Africa 2002</p>	<p>Lead reviewer of the White Paper on National Commercial Ports Policy for South Africa. The review focussed on the integration of environmental and social issues into the port planning process. Mr Heather-Clark made a formal submission and presentation to the Portfolio Committee on Transport in the South African Parliament.</p>

Environmental Liability and Risk Assessment for the Multi-Purpose Terminal at the Port of Saldanha, National Ports Operations, South Africa (2002)	Project Manager for the project. The purpose of the project was to identify key environmental risks associate with the material handling at the Multi-Purpose Terminal at the Port of Saldanha.
Environmental Overview of South Africa's major ports with special reference to future container terminal development, National Ports Authority Container Terminal Strategy, National Ports Authority, South Africa (2002)	Project Manager for the comparative assessment of the relative environmental sensitivity of the seven commercial ports in South Africa with reference to future container terminal development. The study included a detail review of secondary environmental information of all the ports, the identification of specific environmental criteria and the use of these criteria to rank each port in terms of its sensitivity to future container terminal development.
Review of the EIA undertaken for the Maputo Port Privatisation and Rehabilitation Project, Development Bank of Southern Africa (DBSA), South Africa (2002)	Environmental Adviser to the Development Bank of Southern Africa to review the Phase 1 EIA for the Maputo Port Privatisation and Rehabilitation Project. The review was undertaken against the Mozambican EIA Regulations and International Best Practice.
Oil Spill Contingency Plan, Agip Angola oil operations, Angola, (2002)	Team member of the team to develop an oil spill contingency plan according to the IPEICA International Guidelines.
Ecologically Sustainable Industrial Development Programme, United Nations Industrial Development Organisation (UNIDO), Tanzania (2002)	Team member of the project team appointed to review the Industrial Development Strategy for Industrial Development in Tanzania. The focus of the project was to integrate environmental and social issues into the programme.
Environmental Audit and Assessment of the Socio-economic Impacts of the Trans-Kgalagadi Highway, Botswana, Development Bank of Southern Africa, Botswana (2002)	Lead reviewer of the EIA and EMP implementation for the Trans-Kalagadi corridor in Botswana. The review included site visits, detailed interviews and review of secondary data and records.
World Bank EIA Project Management Training Course, World Bank/SAIEA, Zambia (2002)	Lead facilitator for the 5 day EIA Project Management Training Course. The course was presented to 20 African delegates from southern Africa. The course focused on the practical aspects of EIA project management including budgeting and scheduling an EIA, contract negotiations with clients, managing specialist studies, managing the public participation phase and compiling an integrated EIA report. The course formed part of a Southern Africa capacity building initiative lead by the SAIEA.
Environmental screening study for the establishment of a deep-water port at Ponta Dobela, Confidential Client, Mozambique (2001)	Team member of the project team who undertook a screening study to identify environmental, social and economic issues and show stoppers associated with the development of a deep-water port on the coast on Mozambique.
ESIA of the proposed seismic survey in licence area 2814a on the continental shelf of Namibia, Shell Exploration and Production Namibia B.V., Namibia (2001)	Team member of the ESIA for the offshore seismic exploration project. The ESIA included all issues associated with seismic surveys including seismic noise impacts on marine mammals, oil spill modelling and general environmental management issues.

<p>Environmental Impact Review for the abandonment of the Cuntala Well Protector Platform off the coast of Angola (Block 2), Texaco Panama Inc., Angola (2001)</p>	<p>Team member of the project team who developed a decommissioning plan for a well protector platform off the coast of Angola.</p>
<p>Legal, Technical and Economic Feasibility Study for the Commercialisation of the SSF Association Milnerton Tank Farm and its links to the Port of Cape Town, SFF, Cape Town (2001)</p>	<p>Project Manager for this project.</p>
<p>ESIA of the Phase 2 expansion of the Mozal Aluminium Smelter and Matola Port Terminal in Maputo, BHP Billiton, Mozambique (2000-2001)</p>	<p>Project Manager and integrative writer for this ESIA. The EIA included an assessment of the expansion of the port terminal at the Port of Matola and a review of the Phase 2 expansion of the aluminium smelter. All reports together with the EIA process were reviewed and approved by the International Finance Corporation (IFC).</p>
<p>Scoping Phase of the Environmental Impact Assessment for the expansion of the Container Terminal at the Port of Cape Town, Portnet, South Africa (2000)</p>	<p>Project Manager for the EIA for the expansion of the container terminal at the Port of Cape Town. The project included the dredging of 1 million m3 dredge material to provide fill for the expansion of the port. Specialist studies that were required included coastal dynamic modelling, hydrodynamic modelling to assess water quality issues associated with dredging, marine archaeological issues, marine ecology issues, traffic, visual and noise.</p>
<p>Strategic Integrated Port Planning, Port of Saldanha, Transnet (1998)</p>	<p>Project Manager for the Strategic Integrated Port Planning process for the Port of Saldanha. The process culminated in the first Port Development Framework for the Port of Saldanha which integrated environmental and social issues into the port planning process. It included the identification and inclusion of environmental and social opportunities and constraints into the future port planning and development.</p>
<p>Environmental Impact Assessment for the PPC Slag Grinding Mill within the Saldanha Steel Complex, PPC (1998)</p>	<p>Project Manager for the EIA for PPC slag grinding mill. The EIA included a number of specialist studies and comprehensive stakeholder engagement.</p>

MEMBERSHIPS	
CEAPSA	Certified as an Environmental Practitioner with the Interim Certification Board for Environmental Assessment Practitioners of South Africa (2006)
IAIAsa	Member of the International Association for Impact Assessment South Africa
IAIA International	Member of the International Association for Impact Assessment
PUBLICATIONS	
	Sep 2007: Co-author of case study for IIEDs ‘User Guide’ to effective tools and methods for integrating environment and development. South African case study: Role of environmental and social screening in informing the conceptual design and planning of large-scale projects in the pre-feasibility stage.
	Aug 2003: Author of a case study on the SEA for the Port of Cape Town, contained in “The Status and Potential of Strategic Environmental Assessment” by Barry Dalal-Clayton and Barry Saddler, DRAFT 17 September 2003.
	March 2002: Strategic Integrated Port Planning: Moving from EIA to SEA. International Conference on Coastal Zone Management and Development, Kuwait 18 to 20 March 2002.
	Nov 2000: Sustainable Port Development: Report on the preparatory seminar for Africa. 7th International Conference of the International Association for Cities and Ports, Marseilles – France.
	Mar 2000: The development of Strategic Environmental Assessment in South Africa: Journal of Impact Assessment and Project Appraisal, Vol 18, Number 3, pg 217-223. September 2000.
	April 1999: Integrating environmental opportunities and constraints into Port Planning, Development and Operation. 5th International Conference on Coastal and Port Engineering in Developing Countries, Cape Town, 19 to 23 April 1999.

CURRICULUM VITAE



LIANDRA SCOTT-SHAW

SENIOR ENVIRONMENTAL CONSULTANT

Environmental Management, Planning and Approvals, South Africa

QUALIFICATIONS

Pr.Sci.Nat	2017	Professional Natural Scientist (Ecological Science), South African Council for Natural Scientific Professions
BSc Hons.	2009	BSc Honours (Ecological Science), University of KwaZulu Natal
BSc	2008	BSc (Biological Science), University of KwaZulu Natal

EXPERTISE

- Environmental Impact Assessment
- Environmental licensing
- Environmental Compliance monitoring and auditing
- Vegetation Impacts Assessment and permitting
- Diatom Biomonitoring

Liandra joined SLR in March 2021 in her capacity as Senior Environmental Consultant and has over 8 years' experience as an Environmental Assessment Practitioner within the environmental consulting field. She has degrees in Biological and Ecological Science and has expertise in a wide range of environmental disciplines, including Environmental Impact Assessments, Environmental Management Programmes, Environmental Compliance Monitoring & Auditing and Vegetation Assessments and Diatom Biomonitoring.

She has been responsible for the management of a wide range of projects, including environmental authorisations, compliance monitoring and auditing, vegetation assessments and permitting and diatom biomonitoring.

Over the last few years Liandra's focus has been in the renewable energy sector. Specifically involved with Environmental Impact Assessments and specialist management for the Risk Mitigation Independent Power Producer Procurement and Renewable Energy Independent Power Producer Procurement Programmes (RMIPPPP and REIPPPP).

A sample of Liandra's recent project experience, is provided below.

PROJECTS

RENEWABLE ENERGY

Oya Energy Hybrid Facility EIA and Grid Connection BA (2020-2021)

Completed the Environmental Impact Assessment, Basic Assessment, and associated Amendment Processes for the 128MW facility, which included powerlines, wind energy facility (WEF), solar photovoltaic (PV), Battery Energy Storage System (BESS) and fuel-based generators (FBG).

Liandra project managed the processes and assisted the client in compiling and submitting the bid for RMIPPPP. The project is a preferred bidder for the RMIPPPP

Kudusberg Wind Energy Facility (WEF) Amendment (2020-2021)

Completed the Amendment Process for getting the facility bid ready, this included finalizing layouts and EMPrs.

Droogfontein 3 PV BESS BA (2020)

Completed the Basic Assessment for Battery Energy Storage System (BESS). Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.

<p>Mierdam PV BESS BA (2020)</p>	<p>Completed the Basic Assessment for Battery Energy Storage System (BESS). Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.</p>
<p>Dwarsrug WEF BESS BA (2020)</p>	<p>Completed the Basic Assessment for Battery Energy Storage System (BESS). Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.</p>
<p>Platsjambok East PV BESS BA (2020)</p>	<p>Completed the Basic Assessment for Battery Energy Storage System (BESS). Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.</p>
<p>Platsjambok West PV BESS BA (2020)</p>	<p>Completed the Basic Assessment for Battery Energy Storage System (BESS). Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.</p>
<p>Loeriesfontein 3 PV BESS BA (2020)</p>	<p>Completed the Basic Assessment for Battery Energy Storage System (BESS). Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.</p>
<p>Grid connection for between the Dwarsrug WEF to Loeriesfontein PV</p>	<p>Completed the Basic Assessment for the Grid connection. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.</p>
<p>Tooverberg Wind Energy Facility (WEF) EIA and Grid Connection BA (2018-2019)</p>	<p>Assisted in completing the EIA and BA Processes for the facility. Liandra undertook technical and report writing and client liaison when the original project manager left.</p>
<p>Rondekop Wind Energy Facility (WEF) EIA (2018-2019)</p>	<p>Completed the EIA Process for the facility. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.</p>
<p>Umsobomvu PV Project EIAs (x3) and Grid Connections Bas (x3) near Noupoot and Middelburg, Eastern and Northern Cape Provinces (2018-2020)</p>	<p>Completed the Amendment Process for the facilities. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.</p>
<p>Amendments for the proposed development of the Hartebeest Leegte Wind Farm near Loeriesfontein, Northern Cape Province (2019)</p>	<p>Completed the Amendment Process for the facility. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.</p>
<p>Amendments for the development of the Graskoppies Wind Farm and grid near Loeriesfontein, Northern Cape Province (2019)</p>	<p>Completed the Amendment Process for the facility. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.</p>

<p>Amendments for the proposed development of the Ithemba Wind Farm near Loeriesfontein, Northern Cape Province (2019)</p>	<p>Completed the Amendment Process for the facility. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.</p>
<p>Amendments for the proposed development of the Xha! Boom Wind Farm near Loeriesfontein, Northern Cape Province (2019)</p>	<p>Completed the Amendment Process for the facility. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.</p>
<p>Amendment for the Proposed Beaufort West Wind Farm, Western Cape Province (2019)</p>	<p>Completed the Amendment Process for the facility. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.</p>
<p>Amendment for the Proposed Trakas Wind Farm, Western Cape Province (2019)</p>	<p>Completed the Amendment Process for the facility. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.</p>
<p>Amendments for the Proposed Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province</p>	<p>Completed the Amendment Process for the facility. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.</p>
<p>Amendments for the Grid Connections for Graskoppies, Haratebeest Leegte, Itemba and !Xha Boom Wind Energy Facilities near Loeriesfontein, Northern Cape Province</p>	<p>Completed the Amendment Process for the facility. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.</p>
<p>Regulation 54 Audits (2019)</p>	<ul style="list-style-type: none"> • Darling Wind Energy Facility, Western Cape Province • Great Kei Wind Energy Facility, Eastern Cape Province • Motherwell Wind Energy Facility, Eastern Cape Province • Ncora Wind Energy Facility, Eastern Cape Province • Nqamakwe Wind Energy Facility, Northern Cape Province • Peddie Wind Energy Facility, Eastern Cape Province • Ukomeleza Wind Energy Facility, Eastern Cape Province • Umsobomvu Wind Energy Facility, Northern and Eastern Cape Provinces
<p>MEMBERSHIPS</p>	
<p>SACNASP</p>	<p>Registered with South African Council for Natural Scientific Professions as a Professional Natural Scientist (Pr.Sci.Nat) in Environmental Science (117442)</p>
<p>IAIASa</p>	<p>Member of the International Association of Impact Assessors (3624)</p>

PUBLICATIONS

Lang P, Taylor J, Bertolli L, Lowe S, Dallas H, Kennedy MP, Gibbins C, Sickingabula H, Saili, Day J, Willems F, Briggs JA and Murphy KJ 2013. Proposed procedure for the sampling, preparation and analysis of benthic diatoms from Zambian rivers: a bioassessment and decision support tool applicable to freshwater ecoregions in tropical southern Africa. Africa, Caribbean, Pacific-European Union Project Report.

Martins S, Kennedy M, Lowe S, Lang P, Briggs J, Dallas H, Taylor J, Bertolli L, Gibbins C, Soulsby C, Day J, Sickingabula H, Saili H, Kapungwe E, Willems F, Mbulwe F, Murphy K. 2013. SAFRASS Methodology Manual.

Shrader AM, Bell C, Bertolli L and Ward D 2012. Forest or the trees: at what scale do elephants make foraging decisions? *Acta Oecologica* 42: 3-10.

Lang P, Taylor J, Bertolli L, 2012. River diatom biodiversity assessments in Zambian rivers: a SAFRASS conservation perspective. European Congress of Conservation Biology, Glasgow.

Martins S, Kennedy M, Lowe S, Lang P, Briggs J, Dallas H, Taylor J, Bertolli L, Gibbins C, Soulsby C, Day J, Sickingabula H, Saili H, Kapungwe E, Willems F, Mbulwe F, Murphy K. 2012. SAFRASS Photographic guide to the Aquatic Macroinvertebrates of Zambia. European Union Project Report

CURRICULUM VITAE



STEPHAN JACOBS

ENVIRONMENTAL CONSULTANT

EMPA, Durban

QUALIFICATIONS

B.Sc. Hons	2014	Environmental Management and Analysis
B.Sc.	2012- 2013	Environmental Sciences

EXPERTISE

- Environmental Impact Assessments (EIAs), particularly Renewable Energy developments
- Basic Assessments (BAs), particularly Renewable Energy developments
- Environmental Compliance Monitoring

Stephan has six years of experience in undertaking Environmental Impact Assessment (EIA) and Basic Assessment (BA) processes for various types of projects. For the majority of his career he has focussed on renewable energy projects which form part of South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) as well as the 2020 Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP). He was one of the main consultants who worked on the EIA for a project that was chosen as a preferred bidder as part of the December 2020 RMIPPPP and which will be Africa's largest hybrid energy facility once constructed. Stephan also has experience in undertaking and facilitating public participation and stakeholder engagement processes, particularly for renewable energy developments. He has in the past undertaken field work and the compilation of reports for specialist studies such as Surface Water and Visual Impact Assessments. Stephan also has considerable experience in Environmental Compliance and Auditing and have acted as an Environmental Control Officer (ECO) for several infrastructure projects.

PROJECTS

BAs for four (4) Substations, Linking Substations and associated 132kV Power Lines, South Africa, South Africa, Mainstream Renewable Power Developments (2016-2018)

BASIC ASSESSMENTS (BAs) FOR RENEWABLE ENERGY PROJECTS

Environmental Consultant assisting Project Leader / Lead Environmental Consultant to undertake four (4) BA processes for four (4) Substations, Linking Substations and Associated 132kV power lines to serve four (4) respective 235MW wind farms in the Northern Cape Province. The BAs included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna monitoring, visual, social, noise, geotechnical, transportation and heritage baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of BA Reports and EMPs. EMI and RFI assessments were also undertaken.

<p>BA for a 264MW WEF, South Africa, ENERTRAG (2017-2019)</p>	<p>Environmental Consultant assisting project Leader / Lead Environmental Consultant to undertake a BA process for a 264MW Wind Energy Facility (WEF) and associated infrastructure near Touws River in the Western Cape Province. Also assisted in facilitating public participation process. The BA included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna and bat monitoring, visual, social, noise, geotechnical, transportation, heritage and Palaeontology baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of a BA Report and EMPr.</p>
<p>BA for an On-site Eskom Substation and 132kV Power Line to serve a 264MW Wind Energy Facility (WEF), South Africa, ENERTRAG (2017-2019)</p>	<p>Environmental Consultant assisting project Leader / Lead Environmental Consultant to undertake a BA for an on-site Eskom substation and 132kV power line to serve a 264MW Wind Energy Facility (WEF) near Touws River, Western Cape Province. Also assisted in facilitating public participation process. BA included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna and bat monitoring, visual, social, noise, geotechnical, transportation, heritage and Palaeontology baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of a BA Report and EMPr.</p>
<p>BA for 132kV Power Line, South Africa, G7 Renewable Energies (2020 – 2021)</p>	<p>One (1) of the Lead Environmental Consultants undertaking the BA process for a 132kV power line to serve renewable energy facilities near Matjiesfontein, Western and Northern Cape Provinces. Also took part in facilitating public participation process. BA included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna monitoring, visual, social, noise and heritage baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of a BA Report and EMPr.</p>
<p>BA for 132kV Powerlines between an authorised PV Solar Energy Facility, Wind Energy Facility and a Substation, South Africa, Mainstream Renewable Power (2020)</p>	<p>Environmental Consultant assisting Project Leader / Lead Environmental Consultant to undertake the BA process for 132kV Powerlines between authorised PV Solar Energy and Wind Energy facilities, and from the authorised Wind Energy Facility to an authorised Substation. Project located near Loeriesfontein in the Northern Cape Province of South Africa. BA included several baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of a BA Report and EMPr.</p>
<p>BA for four (4) 9.9MW Solar PV Plants, two (2) 132kV power lines and associated infrastructure, South Africa, Confidential Client (2020-2021)</p>	<p>Lead Environmental Consultant and Public Participation Facilitator undertaking four (4) BA and Public Participation processes for four (4) 9.9MW Solar Photovoltaic (PV) Plants, which included two (2) 132kV power lines, and associated infrastructure near Leeudoringstad in the North West Province. BAs included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna monitoring, visual, social, geotechnical, transportation, heritage and Palaeontology baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of BA Reports and EMPrs.</p>
<p>BA for 132/11kV Solar Plant Substation, South Africa, Confidential Client (2020-2021)</p>	<p>Lead Environmental Consultant and Public Participation Facilitator undertaking a BA and Public Participation process for 132/11kV Solar Plant Substation near Leeudoringstad in the North West Province. BA included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna monitoring, visual, social, geotechnical, transportation, heritage and Palaeontology baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of a BA Report and EMPr.</p>

<p>BA for 800MW Solar PV Facility, South Africa, G7 Renewable Energies (2020)</p>	<p>One (1) of the Lead Environmental Consultants undertaking the BA process for an 800MW Solar Photovoltaic (PV) Facility and associated Infrastructure near Matjiesfontein, Western Cape Province. Also assisted in facilitating the Public Participation process. BAs included soils & agricultural potential, air quality, terrestrial and aquatic biodiversity, avifauna and bat monitoring, visual, social, geotechnical, transportation, glint and glare, noise, heritage, cultural landscapes and Palaeontology baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of a BA Report and EMPr. A major hazardous installation assessment was also undertaken.</p>
	<p>ENVIRONMENTAL IMPACT ASSESSMENTS (EIAs) FOR RENEWABLE ENERGY PROJECTS</p>
<p>EIAs for four (4) 235MW Wind Farms South Africa, Mainstream Renewable Power Developments (2016-2018)</p>	<p>Environmental Consultant assisting Project Leader / Lead Environmental Consultant to undertake four (4) EIA processes for four (4) 235MW wind farms near Loeriefontein in the Northern Cape Province. Also assisted in facilitating the Public Participation process. EIAs included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna and bat monitoring, visual, social, noise, geotechnical, transportation and heritage baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of EIA Reports and EMPrs. EMI and RFI assessments were also undertaken. EMI and RFI assessments were also undertaken.</p>
<p>EIA for a 325MW Wind Energy Facility South Africa, G7 Renewable Energies (2018-2019)</p>	<p>Environmental Consultant assisting Project Leader / Lead Environmental Consultant undertake EIA process for a 325MW Wind Energy Facility between Matjiesfontein and Sutherland, Northern Cape Province. EIA included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna and bat monitoring, visual, social, noise, transportation and heritage (including palaeontology, archaeology & cultural landscape) baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of an EIA Report and EMPr.</p>
<p>EIAs for three (3) 400MW Solar PV Energy Facilities, South Africa, EDF Renewables South Africa (2018-2020)</p>	<p>Project Leader / Lead Environmental Consultant and Public Participation Facilitator undertaking three (3) EIA and Public Participation processes for three (3) solar PV energy facilities, including associated infrastructure, with capacities up to 400MW respectively. EIAs included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna monitoring, visual, social, transportation, heritage and palaeontology baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of EIA Reports and EMPrs.</p>
<p>EIA for 301MW Hybrid Energy Facility and associated infrastructure, South Africa, G7 Renewable Energies (2020-2021)</p>	<p>One (1) of the Lead Environmental Consultants and main Public Participation Facilitator undertaking the EIA and Public Participation processes for a 301MW Hybrid Energy Facility. Hybrid Energy facility consists of a solar PV facility, BESS and Fuel-Based Generator Facility (FBGF). EIA included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna and bat monitoring, visual, social, transportation, geotechnical, heritage and palaeontology, glint and glare, air quality and climate change baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of an EIA Report and EMPr. A major hazardous installation assessment was also undertaken. <i>Preferred bidder project as part of December 2020 RMIPPPP and will be Africa’s largest hybrid energy facility once constructed.</i></p>
	<p>PART 1 ENVIRONMENTAL AUTHORISATION (EA) AMENDMENT PROCESSES FOR RENEWABLE ENERGY PROJECTS</p>

<p>Part 1 EA Amendment Process for an authorised 140MW Wind Energy Facility, South Africa, Mainstream Renewable Power (2020-2021)</p>	<p>One (1) of the Lead Environmental Consultants undertaking the Part 1 EA amendment process for an authorised 140MW Wind Energy Facility near Loeriesfontein in the Northern Cape Province. Amendments were administrative and therefore only an application was required to be submitted to the Department.</p>
<p>Part 1 EA Amendment Process for four (4) authorised PV Solar Energy Facilities, South Africa, Mainstream Renewable Power (2020-2021)</p>	<p>One (1) of the Lead Environmental Consultants undertaking the Part 1 EA Amendment Processes for four (4) authorised PV Solar Energy Facilities near Loeriesfontein and Prieska in the Northern Cape Province. Amendments were administrative and therefore only an application was required to be submitted to the Department.</p>
<p>PART 2 ENVIRONMENTAL AUTHORISATION (EA) AMENDMENT PROCESSES FOR RENEWABLE ENERGY PROJECTS</p>	
<p>Part 2 EA Amendment Process for a 140MW WEF and associated infrastructure, South Africa, BTE Renewables (formally known as BioTherm Energy) (2018-2019)</p>	<p>Project Lead / Lead Environmental Consultant undertaking the Part 2 EA amendment process for an authorised 140MW WEF near Copperton in the Northern Cape Province. Amendment included increasing the turbine specifications (i.e., hub height and rotor diameter) and generation output. Amendments included further assessment in terms of the Path Loss and Risk Assessment which was undertaken as part of the original EIA processes. Process also included stakeholder engagement (i.e., public participation) and EMPr updates.</p>
<p>Part 2 EA Amendment Processes for three (3) 140 MW Wind Farms, South Africa, Mainstream Renewable Power (2018-2019)</p>	<p>One (1) of the Lead Environmental Consultants undertaking the respective Part 2 EA Amendment processes for two (2) authorised 140 MW Wind Farms near Beaufort West in the Western Cape Province and one (1) authorised 140MW Wind Farm near Loeriesfontein in the Northern Cape Province. Amendments involved increasing the turbine hub height and rotor diameters. Avifauna, Bat, Noise and Visual specialists were commissioned to assess the impacts of the proposed amendments. Process included stakeholder engagement (i.e., public participation) and EMPr updates.</p>
<p>Part 2 EA Amendment Processes for four (4) 235MW Wind Farms, South Africa, Mainstream Renewable Power (2018-2019)</p>	<p>One (1) of the Lead Environmental Consultants undertaking the respective Part 2 EA Amendment processes for four (4) authorised 235MW Wind Farms near Loeriefontein, Northern Cape Province. Amendments involved increasing the turbine hub height and rotor diameters. Avifauna, Bat, Noise and Visual specialists were commissioned to assess the impacts of the proposed amendments. Process included stakeholder engagement (i.e., public participation) and EMPr updates.</p>
<p>Part 2 EA Amendment Process for a 325MW WEF and Associated Infrastructure, South Africa, G7 Renewable Energies (2020-2021)</p>	<p>One (1) of the Lead Environmental Consultants undertaking the Part 2 EA Amendment process for an authorised 325MW WEF and associated Infrastructure, between Matjiesfontein and Sutherland in the Western and Northern Cape Provinces. Amendments involved splitting an authorised WEF into two (2) separate WEFs, one (1) northern WEF and one (1) southern. Soils & agricultural potential, avifauna, bat, terrestrial ecology, heritage, palaeontology, noise, socio-economic, surface water, transport and Visual specialists were commissioned to assess the impacts of the proposed amendments. Process included stakeholder engagement (i.e., public participation) and EMPr updates.</p>

	VISUAL IMPACT ASSESSMENTS (VIAs) FOR RENEWABLE ENERGY PROJECTS
VIA for a 75MW Solar PV Plant, South Africa, BTE Renewables (formally known as BioTherm Energy) (2015)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report as part of the VIA for a 75MW Solar PV Plant near Copperton in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.
VIAs for three (3) 75MW Solar PV Energy Facilities, South Africa, BTE Renewables (formally known as BioTherm Energy) (2016)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment reports as part of the VIAs for three (3) 75MW Solar PV Energy Facilities near Vryburg in the North West Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA reports. Reports were reviewed and approved by the Visual specialist appointed for the projects.
VIAs for the proposed construction of a 400kV Substation and associated 400kV Power Line, South Africa, BTE Renewables (formally known as BioTherm Energy) (2016)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment reports for the VIAs for a 400kV Substation and associated 400kV power line near Vryburg in the North West Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA reports. Reports were reviewed and approved by the Visual specialist appointed for the projects.
VIAs for two (2) 75MW Solar PV Energy Facilities, South Africa, BTE Renewables (formally known as BioTherm Energy) (2016)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment reports for the VIAs for two (2) 75MW Solar PV Energy Facilities near Lichtenburg in the North West Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA reports. Reports were reviewed and approved by the Visual specialist appointed for the projects.
VIAs for two (2) 132kV Substations and associated 132kV power lines, South Africa, BTE Renewables (formally known as BioTherm Energy) (2016)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment reports for the VIAs for two (2) 132kV substations and associated 132kV power lines near Lichtenburg in the North West Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA reports. Reports were reviewed and approved by the Visual specialist appointed for the projects.
VIA for a 3000MW Wind Farm, South Africa, Confidential Client (2017)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for a 3000MW Wind Farm and associated infrastructure near the town of Richmond in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the projects.

<p>VIA for two (2) 140MW Wind Energy Facilities, South Africa, BTE Renewables (formally known as BioTherm Energy) (2016)</p>	<p>Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment reports for the VIAs for two (2) 140MW Wind Energy Facilities near Copperton in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA reports. Reports were reviewed and approved by the Visual specialist appointed for the projects.</p>
<p>VIA for a 132kV substation and associated 132kV power line, South Africa, BTE Renewables (formally known as BioTherm Energy) (2016)</p>	<p>Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for a 132kV substation and associated 132kV power line near Copperton in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.</p>
<p>VIA for a 400kV substation and 400kV power line, South Africa, BTE Renewables (formally known as BioTherm Energy) (2016)</p>	<p>Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for a 400kV Substation and 400kV power line near Copperton in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.</p>
<p>VIAs for four (4) 235MW Wind Farms, South Africa, Mainstream Renewable Power (2016-2017)</p>	<p>Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment reports for the VIAs for four (4) 235MW Wind Farms near Loeriesfontein in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA reports. Reports were reviewed and approved by the Visual specialist appointed for the projects.</p>
<p>Basic VIAs for four (4) 33kV/132kV Substations, 132kV Linking Substations and associated 132kV Power Lines, South Africa, Mainstream Renewable Power (2016-2017)</p>	<p>Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment reports for the Basic VIAs for four (4) 33/132kV substations, 132kV linking substations and associated 132kV power lines near Loeriesfontein in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA reports. Reports were reviewed and approved by the Visual specialist appointed for the projects.</p>
<p>VIA for a 315MW Wind Energy Facility, South Africa, Phezukomoya Wind Power (2017)</p>	<p>Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for a 315MW Wind Energy Facility near Noupoot in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.</p>
<p>VIA for a 390MW Wind Energy Facility, South Africa, San Kraal Wind Power (2017)</p>	<p>Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for a 390MW Wind Energy Facility near Noupoot in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.</p>

<p>VIA for two (2) 4.5MW Wind Energy Facilities, South Africa, Mulilo Renewable Project Developments (2018)</p>	<p>Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment reports for the VIAs for two (2) 4.5MW Wind Energy Facilities near Kuruman in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA reports. Reports were reviewed and approved by the Visual specialist appointed for the projects.</p>
<p>Basic VIA for supporting electrical infrastructure to two (2) 4.5MW Wind Energy Facilities, Mulilo Renewable Project Developments (2018)</p>	<p>Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment reports for the Basic VIAs for supporting electrical infrastructure to two (2) 4.5MW Wind Energy Facilities near Kuruman in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA reports. Reports were reviewed and approved by the Visual specialist appointed for the projects.</p>
<p>VIA for a 325MW Wind WEF, South Africa, G7 Renewable Energies (2018)</p>	<p>Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for a 325MW WEF between Matjiesfontein and Sutherland in the Northern and Western Cape Provinces. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.</p>
<p>Basic VIA for an up to 132kV Power Line and Associated Infrastructure for the Rooipunt Solar Thermal Power Plant, South Africa, SolarReserve SA (2016)</p>	<p>Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the Basic VIA for an up to 132kV power line and associated infrastructure for the Rooipunt Solar Thermal Power Plant near Upington in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.</p>
<p>Basic VIA for an up to 132kV Power Line and Associated Infrastructure for the proposed Kalkaar Solar Thermal Power Plant, South Africa, SolarReserve SA (2016)</p>	<p>Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the Basic VIA for an up to 132kV power line and associated Infrastructure for the proposed Kalkaar Solar Thermal Power Plant near Kimberly in the Free State and Northern Cape Provinces. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.</p>
<p>VISUAL IMPACT ASSESSMENTS (VIAs) FOR INFRASTRUCTURE PROJECTS</p>	
<p>VIA for Nsoko Msele Integrated Sugar Project, Swaziland, Confidential Client (2015)</p>	<p>Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for the Nsoko Msele Integrated Sugar Project in Swaziland. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.</p>

<p>VIA for Tinley Manor South Banks Beach Enhancement Solution, South Africa, Tongaat Hulett Developments (2015)</p>	<p>Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for the Tinley Manor South Banks Beach Enhancement Solution in the KwaZulu-Natal Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.</p>
<p>VIA for Mlonzi Hotel and Golf Estate Development, South Africa, Confidential Client (2018)</p>	<p>Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for the Mlonzi Hotel and Golf Estate Development near Lusikisiki in the Eastern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.</p>
<p>VIA for Assagay Valley Development, South Africa, Confidential Client (2018)</p>	<p>Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for VIA for the Assagay Valley Development in the KwaZulu-Natal Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.</p>
<p>VIA for Kassier Road North Development, South Africa, Confidential Client (2018)</p>	<p>Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for the Kassier Road North Development in the KwaZulu-Natal Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.</p>
<p>ENVIRONMENTAL CONTROL OFFICER (ECO) MONITORING / AUDITING PROJECTS</p>	
<p>ECO for Polokwane IRPTS, South Africa, Polokwane Municipality (2015)</p>	<p>Acted as ECO for the Polokwane Integrated Rapid Public Transport System (IRPTS) project in the Limpopo Province. Tasks involved undertaking monthly site inspections / audits of the site camp and construction site to ensure compliance with the conditions of the EA and recommendations set out in the EMPr. Also attended monthly site meetings with project team and reported back on environmental non-compliances (including recommendations). Also involved with the compilation of monthly audit reports which were submitted to Project Team and relevant environmental department.</p>
<p>ECO for Phase 1 and Phase 2 of Newmarket Retail Development, South Africa, Rejem Property Development (2015-2016)</p>	<p>Acted as ECO for Phase 1 and Phase 2 of the Newmarket Retail Development in the Gauteng Province. Tasks involved undertaking monthly site inspections / audits of the site camp and construction site to ensure compliance with the conditions of the EA and recommendations set out in the EMPr. Also attended monthly site meetings with project team and reported back on environmental non-compliances (including recommendations). Also involved with the compilation of monthly audit reports which were submitted to Project Team and relevant environmental department. Also regularly liaised with relevant environmental department.</p>

<p>ECO for NuPay Office Block at Newmarket Retail Development, South Africa, Rejem Property Development (2017-2018)</p>	<p>Acted as ECO for the NuPay Office Block development at the Newmarket Retail Development in the Gauteng Province. Tasks involved undertaking monthly site inspections / audits of the site camp and construction site to ensure compliance with the conditions of the EA and recommendations set out in the EMPr. Also attended monthly site meetings with project team and reported back on environmental non-compliances (including recommendations). Also involved with the compilation of monthly audit reports which were submitted to Project Team and relevant environmental department. Also regularly liaised with relevant environmental department.</p>
<p>ECO for Decathlon Building at the Newmarket Retail Development, South Africa, Rejem Property Development (2018)</p>	<p>Acted as ECO for the construction of the Decathlon Building at the Newmarket Retail Development in the Gauteng Province. Tasks involved undertaking monthly site inspections / audits of the site camp and construction site to ensure compliance with the conditions of the EA and recommendations set out in the EMPr. Also attended monthly site meetings with project team and reported back on environmental non-compliances (including recommendations). Also involved with the compilation of monthly audit reports which were submitted to Project Team and relevant environmental department. Also regularly liaised with relevant environmental department.</p>
<p>ECO for external road upgrades at the Newmarket Retail Development, South Africa, Rejem Property Development (2018)</p>	<p>Acted as ECO for the external road upgrades at the Newmarket Retail Development in the Gauteng Province. Tasks involved undertaking monthly site inspections / audits of the site camp and construction site to ensure compliance with the conditions of the EA and recommendations set out in the EMPr. Also attended monthly site meetings with project team and reported back on environmental non-compliances (including recommendations). Also involved with the compilation of monthly audit reports which were submitted to Project Team and relevant environmental department. Also regularly liaised with relevant environmental department.</p>
<p>ECO for Netcare Alberton Hospital Development as part of the Greater Newmarket Development, South Africa, Rejem Property Development (2019-2020)</p>	<p>Acted as ECO for the Netcare Alberton Hospital Development as part of the Greater Newmarket Development in the Gauteng Province. Tasks involved undertaking monthly site inspections / audits of the site camp and construction site to ensure compliance with the conditions of the EA and recommendations set out in the EMPr. Also attended monthly site meetings with project team and reported back on environmental non-compliances (including recommendations). Also involved with the compilation of monthly audit reports which were submitted to Project Team and relevant environmental department. Also regularly liaised with relevant environmental department.</p>
<p>ECO for Kwagqikazi TVET College Campus Development, South Africa, Department of Higher Education (2021)</p>	<p>Acted as ECO for the Kwagqikazi TVET College Campus Development in Nongoma, KwaZulu-Natal Province. Tasks involved undertaking monthly site inspections / audits of the site camp and construction site to ensure compliance with the conditions of the EA and recommendations set out in the EMPr. Also reported back on environmental non-compliances (including recommendations). Also involved with the compilation of monthly audit reports which were submitted to Project Team and relevant environmental department.</p>

<p>ECO for Greytown TVET College Campus Development, South Africa, Department of Higher Education (2021)</p>	<p>Acted as ECO for the Greytown TVET College Campus Development in Greytown, KwaZulu-Natal Province. Tasks involved undertaking monthly site inspections / audits of the site camp and construction site to ensure compliance with the conditions of the EA and recommendations set out in the EMPr. Also reported back on environmental non-compliances (including recommendations). Also involved with the compilation of monthly audit reports which were submitted to Project Team and relevant environmental department.</p>
<p>ECO for Vulamehlo Rural Housing Project, South Africa, Confidential Client (2021)</p>	<p>Acted as ECO for the Vulamehlo Rural Housing Project in the KwaZulu-Natal Province. Tasks involved undertaking site inspections / audits of the site camp and construction site every month as duty of care, in accordance with the National Environmental Management Act (Act No. 107 of 1998). Also reported back on environmental non-compliances (including recommendations). Also involved with the compilation of audit reports which were submitted to Project Team.</p>
<p>ECO for Ntuzuma D Phase 2 and 3 Housing Projects, South Africa, Confidential Client (2021)</p>	<p>Acted as ECO for the Ntuzuma D Phase 2 and 3 Housing Project, within the eThekweni Municipality of the KwaZulu-Natal Province. Tasks involved undertaking monthly site inspections / audits of the site camp and construction site to ensure compliance with the conditions of the EA and recommendations set out in the EMPr. Also attended monthly virtual site meetings with project team and reported back on environmental non-compliances (including recommendations). Also compiled monthly audit reports which were submitted to Project Team and relevant environmental department.</p>
<p>BASIC ASSESSMENTS (BAS) FOR INFRASTRUCTURE PROJECTS</p>	
<p>BA for a Non-Motorised Transport (NMT) Training and Recreational Park adjacent to the Peter Mokaba Stadium, South Africa, Confidential Client (2015)</p>	<p>Graduate Environmental Consultant assisting Project Leader / Lead Environmental Consultant to undertake a BA process for a Non-Motorised Transport (NMT) Training and Recreational Park adjacent to the Peter Mokaba Stadium in Polokwane within the Limpopo Province. The BA included terrestrial and aquatic biodiversity, visual, social and heritage baseline studies, stakeholder engagement and compilation of a BA Report and EMPr.</p>
<p>BA for expansion of the Tissue Manufacturing Capacity at the Twinsaver Kliprivier Operations Base, South Africa, Twinsaver Group (2016)</p>	<p>Graduate Environmental Consultant assisting Project Leader / Lead Environmental Consultant to undertake a BA process for the expansion of the Tissue Manufacturing Capacity at the Twinsaver Kliprivier Operations Base in the Gauteng Province. The BA included surface water, heritage and air-quality baseline studies, stakeholder engagement and compilation of a BA Report and EMPr.</p>
<p>BA for new SPAR Distribution Centre in Port Elizabeth, South Africa, the SPAR Group (2018)</p>	<p>Environmental Consultant assisting Project Leader / Lead Environmental Consultant to undertake the BA process for the construction of a new SPAR Distribution Centre at Redhouse in Port Elizabeth. The BA included surface water, heritage and air-quality baseline studies, stakeholder engagement and compilation of a BA Report and an EMPr.</p>
<p>ENVIRONMENTAL SCREENING / ENVIRONMENTAL REVIEW / ENVIRONMENTAL DUE DILIGENCE PROJECTS</p>	

<p>Environmental Review of Xakwa Coal Operations, South Africa, Confidential Client (2021)</p>	<p>Graduate Environmental Consultant assisting Project Leader / Lead Environmental Consultant to undertake an environmental review and provide a professional opinion for the Xakwa Coal Operations, adjacent to the Eastside Junction Development. Tasks involved reviewing the activities associated with the proposed project and providing feedback (in the form of a report) whether there are any environmental constraints and/or fatal flaws preventing development.</p>
<p>Environmental Due Diligence for the Woodlands and Harrowdene Office Parks, South Africa, Growthpoint Properties (2016)</p>	<p>Graduate Environmental Consultant assisting Project Leader / Lead Environmental Consultant to undertake an environmental due diligence for the Woodlands and Harrowdene Office Parks in Woodmead within the Gauteng Province. Tasks involved undertaking a site visit at the Woodlands and Harrowdene Office Parks and providing feedback / confirmation whether there are any non-compliance issues from an environmental perspective. Also involved reviewing future planned activities within office parks and providing feedback whether there are any environmental constraints and/or fatal flaws preventing future development.</p>
<p>SURFACE WATER ASSESSMENTS FOR INFRASTRUCTURE PROJECTS</p>	
<p>Surface Water Assessment for Steve Thswete Local Municipality, South Africa, Steve Thswete Local Municipality (2015)</p>	<p>Assisted Surface Water Specialist with undertaking Surface Water Assessment for the Steve Thswete Local Municipality within the Mpumalanga Province. Tasks involved undertaking the desktop screening and assisting with the compilation of a surface water impact assessment report.</p>
<p>Surface Water Delineation and Assessment for a coal Railway Siding and associated road upgrade, South Africa, Confidential Client (2015)</p>	<p>Assisted Surface Water Specialist with undertaking a Surface Water Delineation and Assessment for a coal Railway Siding at the Welgedacht Marshalling Yard and associated Milner Road Upgrade within the Ekurhuleni Metropolitan Municipality. Tasks involved undertaking the desktop screening and assisting with the compilation of a surface water impact assessment report.</p>

APPENDIX B: METHOD STATEMENT EXAMPLE

METHOD STATEMENT

CONTRACT:

DATE:

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

--

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

--

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

--

WHAT MATERIALS WILL BE USED?

--

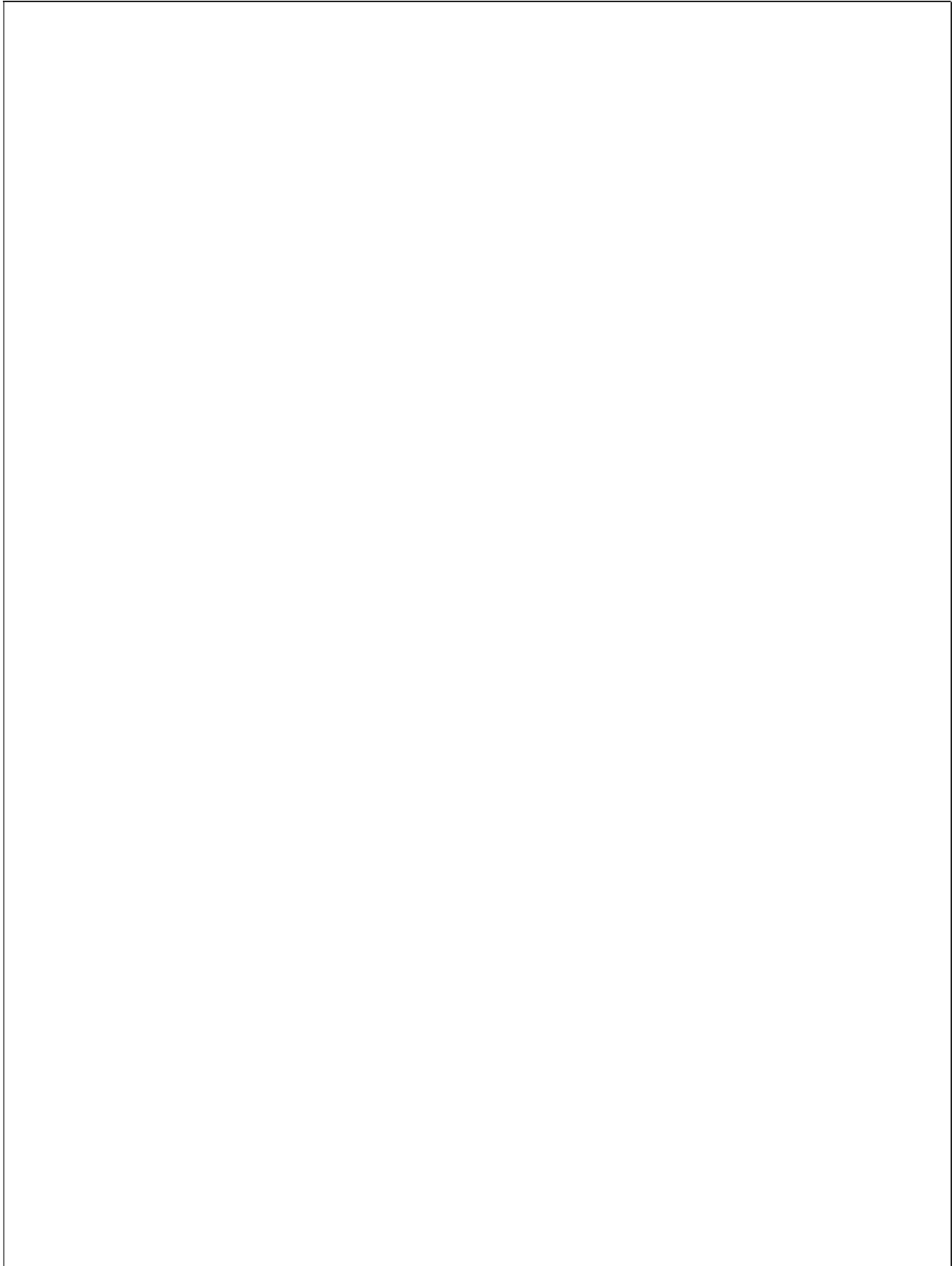
WHAT TYPE OF EQUIPMENT/MACHINERY WILL BE USED?

--

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

START DATE:	END DATE:
--------------------	------------------

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



**Note: Please attach extra pages if more space is required.*

DECLARATION

1) CONTRACTOR

I understand the contents of this Method Statement and the scope of the works required of me. I further understand that this Method Statement may be amended on application to other signatories and that the ER will audit my compliance with the contents of this Method Statement:

(Signed) (Print Name)
Dated: _____

2) ENVIRONMENTAL CONTROL OFFICER

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

(Signed) (Print Name)
Dated: _____

3) SITE ENGINEER

The works described in this Method Statement are approved:

(Signed) (Print Name)
Dated: _____

APPENDIX C: ENVIRONMENTAL AWARENESS AND INDUCTION PLAN

Example of Environmental Awareness Course Content – Hoogland Wind Farms

1. What is the environment?
 - Soil
 - Water
 - Plants
 - People
 - Animals
 - Air we breathe
 - Buildings, cars & houses

2. Why must we look after the Environment?
 - It affects us all as well as future generations
 - We have a right to a healthy environment
 - A contract has been signed
 - Disciplinary action (e.g. stop works or fines issued)

3. How do we look after the environment?
 - Report problems to your supervisor/ foreman
 - Team work
 - Follow the rules in the EMPr

4. Working Areas
 - Workers & equipment must stay inside the site boundaries at all times

5. Rivers and Streams
 - Do not swim in or drink from streams
 - Do not throw oil, petrol, diesel, concrete or rubbish in any stream
 - Do not work in streams without direct instruction
 - Do not damage the banks or vegetation of any stream

6. Animals
 - Do not injure or kill any animals on the site (if you see a snake, remain still)
 - Manager to arrange that animals on site are removed as per the requirements of the EMPr

7. Trees and Flowers
 - Do not damage or cut down any trees or plants without permission
 - Do not pick flowers

8. Smoking and Fire

- Put cigarette butts in a rubbish bin
- Do not smoke near gas, paints or petrol
- Do not light any fires
- Know the positions of fire- fighting equipment
- Report all fires

9. Petrol, Oil and Diesel

- Work with petrol, oil & diesel in marked areas
- Report any petrol, oil & diesel leaks or spills to your supervisor
- Use a drip tray under vehicles & machinery
- Empty drip trays after rain
- Throw away contents

10. Dust

- Try to avoid producing dust as far as practically possible
- Use water or chemicals as instructed by the engineer to decrease dust generation

11. Noise

- Do not make loud noises around the site, especially near homes
- Report or repair noisy vehicles

12. Toilets

- Use the toilets provided
- Report full or leaking toilets

13. Eating

- Only eat in demarcated eating areas
- Never eat near a river or stream
- Put packaging & leftover food into rubbish bins

14. Rubbish

- Do not litter put all rubbish (especially cement bags) into the bins provided
- Report full bins to your supervisor
- The responsible person should empty bins regularly

15. Trucks and Driving

- Always keep to the speed limit
- Drivers - check & report leaks and vehicles that belch smoke

- Ensure loads are secure & do not spill especially when crossing the river

16. Emergency Phone Numbers

- Know all the emergency phone numbers
- See front of EMPr for a list

17. Fine and Penalties

- Fines and penalties can be issued by the engineer (in consultation with the ECO) for serious and repetitive environmental misconduct

18. Problems – what must you do?

- Do not ignore small issues
- Report any problems or issues to your supervisor or manager who will liaise with the engineer and ECO
- Don't be afraid to ask questions
- Don't make assumptions
- If you doubt, rather don't, and get clarification from the appropriate staff members

APPENDIX D: FOSSIL CHANCE FIND PROTOCOL

PALAEONTOLOGICAL CHANCE FOSSIL FINDS PROTOCOL

HOOGLAND NORTHERN WIND FARM CLUSTER and GRID CONNECTION south of Loxton, Western Cape	
Province & region:	Wind Farms and Grid Connections: Western Cape (Central Karoo District): Beaufort West Local Municipality Offsite watercourse crossing upgrades applicable to the Northern Wind Farm Cluster only: Northern Cape (Namakwa and Pixley Ka Seme Districts): Karoo Hoogland and Ubuntu Local Municipalities
Responsible Heritage Resources Agency	Western Cape: Heritage Western Cape (Contact details: Heritage Western Cape. 3 rd Floor Protea Assurance Building, 142 Longmarket Street, Green Market Square, Cape Town 8000. Private Bag X9067, Cape Town 8001. Tel: 021 483 5959 Email: ceoheritage@westerncape.gov.za)
	Northern Cape: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za
Rock unit(s)	Abrahamskraal & Teekloof Formations (Lower Beaufort Group), Late Caenozoic alluvium
Potential fossils	Fossil vertebrate bones, teeth, trace fossils including burrows, trackways, petrified wood, plant-rich beds in the Lower Beaufort Group bedrocks. Fossil mammal bones, teeth, horn cores, freshwater molluscs, plant material in Late Caenozoic alluvium.
ECO/ESO protocol	1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (<i>N.B.</i> safety first!), safeguard site with security tape / fence / sand bags if necessary.
	2. Record key data while fossil remains are still <i>in situ</i> : <ul style="list-style-type: none"> • Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo • Context – describe position of fossils within stratigraphy (rock layering), depth below surface • Photograph fossil(s) <i>in situ</i> with scale, from different angles, including images showing context (<i>e.g.</i> rock layering)
	3. If feasible to leave fossils <i>in situ</i> : <ul style="list-style-type: none"> • Alert Heritage Resources Agency and project palaeontologist (if any) who will advise on any necessary mitigation • Ensure fossil site remains safeguarded until clearance is given by the Heritage Resources Agency for work to resume
	3. If <i>not</i> feasible to leave fossils <i>in situ</i> (emergency procedure only): <ul style="list-style-type: none"> • <i>Carefully</i> remove fossils, as far as possible still enclosed within the original sedimentary matrix (<i>e.g.</i> entire block of fossiliferous rock) • Photograph fossils against a plain, level background, with scale • Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags • Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist • Alert Heritage Resources Agency and project palaeontologist (if any) who will advise on any necessary mitigation
	4. If required by Heritage Resources Agency, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.
	5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Resources Agency
Specialist palaeontologist	Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (<i>e.g.</i> museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Resources Agency. Adhere to best international practice for palaeontological fieldwork and Heritage Resources Agency minimum standards.

APPENDIX E: PLANT RESCUE AND PROTECTION PLAN

**HOOGLAND 1 WIND FARM:
PLANT RESCUE & PROTECTION PLAN**



PRODUCED FOR RED CAP HOOGLAND 1 (PTY) LTD

August 2022

MANAGEMENT PLAN OBJECTIVES

The purpose of the Hoogland 1 Wind Farm plant rescue and protection plan is to implement avoidance and mitigation measures to reduce the impact of the development of the Hoogland 1 Wind Energy Facility on listed and protected plant species and their habitats during construction and operation. This subplan is a requirement of the EIA process and is also required in order to ensure compliance with national and provincial legislation for vegetation clearing and any required destruction or translocation of provincially and nationally protected species within the footprint of the Wind Farm.

The Plan first provides some legislative background on the regulations relevant to listed and protected species, followed by a summary of the protected species and genera as listed by the relevant legislation and then an identification of species present at the site and actions that should be implemented to minimise impact on these species and comply with legislative requirements.

IDENTIFICATION OF SPECIES OF CONSERVATION CONCERN

Plant species are protected at the national level as well as the provincial level and different permits may be required for different species depending on their protection level. At the national level, protected trees are listed by DAFF under the National List of Protected Trees, which is updated on a regular basis. Any clearing of nationally protected trees requires a permit from DAFF. Based on the results of the field assessment and EIA for the Hoogland 1 Wind Farm, there are however no protected tree species within the development footprint.

At the provincial level, all species red-listed under the Red List of South African plants (<http://redlist.sanbi.org/>) are protected and a clearing permit is required from CapeNature before any vegetation clearing can be conducted at the site. It is important to note that a preconstruction walk-through survey of the site would be required before construction to inform the site clearing permit.

MITIGATION & AVOIDANCE OPTIONS

The primary mitigation and avoidance measure that must be implemented at the preconstruction phase is the Preconstruction Walk-Through of the development footprint. This defines which and how many individuals of listed and protected species are found within the final development footprint. While some turbine and road micro-siting at this stage is possible, some impact on

protected and listed species is generally inevitable. The walk-through should provide a reliable estimate of the number of listed and protected species that occur within the development footprint and which cannot be avoided. This information is required for the DAFF (if required) and CapeNature Flora permits which must be obtained before construction can commence.

Where listed plant species fall within the development footprint and avoidance is not possible, then it may be possible to translocate the affected individuals outside of the development footprint. However, not all species are suitable for translocation as only certain types of plants are able to survive the disturbance. Suitable candidates for translocation include most geophytes and succulents. Although there are exceptions, the majority of woody species do not survive translocation well and it is generally not recommended to try and attempt to translocate such species. Recommendations in this regard would be made following the walk-through of the facility footprint before construction, where all listed and protected species within the development footprint will be identified and located.

RESCUE AND PROTECTION PLAN

Preconstruction

- Identification of all listed species which may occur within the site, based on the SANBI SIBIS database as well as the specialist EIA studies for the site and any other relevant literature.

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

- A walk-through of the final development footprint by a suitably qualified botanist/ecologist to locate and identify all listed and protected species which fall within the development footprint. This should happen during the flowering season at the site which depending on rainfall is likely to be during late summer or potentially spring as well (March-April or September- October). The important point is that the preconstruction walk-through should take place under acceptable conditions that allows for the location and identification of species of concern.
- A walk-through report compiled following the walk-through which identifies areas where minor deviations to roads and other infrastructure can be made to avoid sensitive areas and important populations of listed species. The report should also contain a full list of localities where listed species occur within the development footprint and the number of affected individuals in each instance, so that this information can be used to comply with the permit conditions.

- A permit to clear the site and relocated species of concern is required from CapeNature before construction commences.
- Once the required permits have been issued, there should be a search and rescue operation of all listed species which have been identified in the walk-through report as being suitable for search and rescue within the development footprint that cannot be avoided. Affected individuals should be translocated to a similar habitat outside of the development footprint and marked for monitoring purposes. Those species suitable for search as rescue should be identified in the walk-through report. It is important to note that a permit is required to translocate or destroy any listed and protected species even if they do not leave the property.
- It is generally not recommended to house rescued plants within a nursery or similar facility. Plants should ideally be translocated directly from their current location to their final destination.

Construction

- Vegetation clearing should take place in a phased manner, so that large cleared areas are not left standing with no activity for long periods of time and pose a wind and water erosion risk. This will require coordination between the contractor and ECO, to ensure that the ECO is able to monitor activities appropriately.
- All cleared material should be handled according to the Revegetation and Rehabilitation Plan and used to encourage the recovery of disturbed areas.
- ECO to monitor vegetation clearing at the site. Any deviations from the plans that may be required should first be checked for listed species by the ECO and any listed species present which are able to survive translocation should be translocated to a safe site.
- All areas to be cleared should be demarcated with construction tape, survey markers or similar. All construction vehicles should work only within the designated area.
- Plants suitable for translocation or for use in rehabilitation of already cleared areas should be identified and relocated before general clearing takes place.
- Any listed species observed within the development footprint that were missed during the preconstruction plant sweeps should be translocated to a safe site before clearing commences.
- Many listed species are also sought after for traditional medicine or by collectors and so

the EO should ensure that all staff attend environmental induction training in which the legal and conservation aspects of harvesting plants from the wild are discussed.

- The ECO should monitor construction activities in sensitive habitats such as in dune areas carefully to ensure that impacts to these areas are minimized.

Operation

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

MONITORING & REPORTING REQUIREMENTS

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

- Preconstruction walk-through report detailing the location and distribution of all listed and protected species. This should include a walk-through of all infrastructure including all new access roads, turbine locations, turbine service areas, underground cables, power line routes, buildings and substations. The report should include recommendations of route adjustments where necessary, as well as provide a full accounting of how many individuals of each listed species will be impacted by the development.
- Permit application to CapeNature as required. This requires the walk-through report as well as the identification and quantification of all listed and protected species within the development footprint. The permit is required before search and rescue can take place. Where large numbers of listed species are affected a site inspection and additional requirements may be imposed by CapeNature or DEFF as part of the permit conditions. All documentation associated with this process needs to be retained and the final clearing permit should be kept at the site.
- Active daily monitoring of clearing during construction by the ECO to ensure that listed species and sensitive habitats are avoided. All incidents should be recorded along with the remedial measures implemented.
- Post construction monitoring of plants translocated during search and rescue to evaluate

the success of the intervention. Monitoring for a year post-transplant should be sufficient to gauge success.

APPENDIX F: INVASIVE ALIEN PLANT MANAGEMENT PLAN

Hoogland North Wind Farms
Alien Plant Species Management Plan
August 2022

PURPOSE

The purpose of the Hoogland North Wind Farms Alien Plant Management Plan is to provide a framework for the management of alien and invasive plant species during the operation of the construction and operation of the wind energy facility. The broad objectives of the plan include the following:

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

PROBLEM BACKGROUND & LEGISLATIVE CONTEXT

Alien plants require management because they replace indigenous vegetation leading to loss of biodiversity and change in landscape function. Potential consequences include loss of biodiversity, loss of grazing resources, increased fire risk, increased erosion, loss of wetland function, impacts on drainage lines, increased water use etc. In recognition of these impacts, South Africa has legislation in place which requires landowners to clear or prevent the spread of certain declared weeds from their properties.

NEMBA provides the invasive status classification, as outlined in the Alien and Invasive Regulations and Species list (2014), for all identified alien invasive plant species. These plants can be classified as Category 1a, 1b, 2 or 3 species. The description of the abovementioned classifications are:

Category 1a plants

Category 1a Listed Invasive Species are those species listed in terms of section 70(1)(a) of NEMBA as species which must be combatted or eradicated.

A person in control of a Category 1a Listed Invasive Species must-

- Comply with the provisions of section 73(2) of NEMBA;
- Immediately take steps to combat or eradicate listed invasive species in compliance with sections 75(1), (2) and (3) of NEMBA; and
- allow an authorised official from the Department to enter onto land to monitor.

Category 1b plants

Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of NEMBA as species which must be controlled.

A person in control of a Category 1 b Listed Invasive Species must control the listed invasive species in compliance with sections 75(1), (2) and (3) of the Act:

- If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.
- A person must allow an authorised official from the Department to enter onto the land to monitor, assist with or implement the control of the listed invasive species, or compliance with the Invasive Species Management Programme contemplated in section 75(4) of the Act.

Category 2 plants

Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of NEMBA as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be.

- Unless otherwise indicated in the Notice, no person may carry out a restricted activity in respect of a Category 2 Listed Invasive Species without a permit.
- A landowner on whose land a Category 2 Listed Invasive Species occurs or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit.
- If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.
- Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area, must, for purposes of these regulations, be considered to be a Category 1 b Listed Invasive Species and must be managed according to Regulation 3 of NEMBA.
- Notwithstanding the specific exemptions relating to existing plantations in respect of Listed Invasive Plant Species published in Government Gazette No. 37886, Notice 599 of 1 August 2014 (as amended), any person or organ of state must ensure that the specimens of such Listed Invasive Plant Species do not spread outside of the land over which they have control.

Category 3 plants

Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of Act, as specified in the Notice.

- Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3 of NEMBA.

- If an Invasive Species Management Programme has been developed in terms of section 75(4) of NEMBA, a person must control the listed invasive species in accordance with such programme.

ECOLOGICAL CONTEXT

Alien species are adept at taking advantage of disturbance and many of their traits are linked to this ability. This usually includes the ability to produce large amounts of seed or being flexible in terms of their size, growth form or reproductive strategy. Alien plant control strategies therefore need to focus on these key attributes while management practices need to ensure that they do not create circumstances under which alien species are encouraged or can thrive. Perhaps the most important aspects in this regard are minimizing disturbance and ensuring the retention and recovery of indigenous vegetation as far as possible.

While the site is currently largely free of alien species it is not possible or practical to prevent alien species from entering the site as seed or spreading into disturbed areas from existing localized infestations. As such, some alien infestation is almost certain to occur, at least in some places and by some species. The disturbance created during construction will render the site vulnerable to invasion for some time thereafter and it is likely that many alien species from the local species pool will invade the site during or immediately after construction.

In the short-term, soil disturbance is likely to be the dominant driver of alien invasion at the site. While, in the long-term the distribution of runoff is likely to be a key driver as those areas which receive water will be wetter and likely to contain a higher alien abundance. As disturbance is the major initial driver of alien species invasion, keeping the disturbance footprint to a minimum is a key element in reducing alien invasion risk and severity. Wherever possible, the indigenous vegetation should be left intact as this will significantly reduce the likelihood of alien invasion as well as other degradation problems such as erosion.

Certain habitats and environments are more vulnerable to alien plant invasion and are likely to bear the brunt of alien plant invasion problems at the site. In addition, construction activities and changes in water distribution at the site following construction are also likely to increase and alter the vulnerability of some parts of the site to alien plant invasion. Areas at the site which are likely to require specific attention include the following:

- Wetlands, drainage lines and other mesic areas;
- Cleared and disturbed areas such as road verges, areas of cut and fill along roads, crane pads and construction footprints etc.;
- Construction camps and lay-down areas which are cleared or are active for an extended period; and
- Areas which receive runoff from roads, crane pads and other hardened areas.

General Clearing and Guidance Principles

- Alien control programs are long-term management projects and should include a clearing plan which includes follow up actions for rehabilitation of cleared areas. Alien problems at the site should be identified during pre-construction surveys of the development footprint. This may occur simultaneously to other required searches and surveys. The clearing plan should then form part of the pre-construction reporting requirements for the site.
- The plan should include a map showing the alien density & indicating dominant alien species in each area.
- Lighter infested areas should be cleared first to prevent the build-up of seed banks.
- Pre-existing dense mature stands ideally should be left for last, as they probably won't increase in density or pose a greater threat than they do currently.
- Collective management and planning with neighbours may be required in the case of large woody invaders as seeds of aliens are easily dispersed across boundaries by wind or water courses.
- All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing.

Clearing Methods

- Different species require different clearing methods such as manual, chemical or biological methods or a combination of both.
- However, care should be taken that the clearing methods used do not encourage further invasion. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum. Fire is not a natural phenomenon in the area and fire should not be used for alien control or vegetation management at the site.
- The best-practice clearing method for each species identified should be used. The preferred clearing methods for most alien species can be obtained from the Working for Water Website. <http://www.dwaf.gov.za/wfw/Control/>

Use of Herbicides for Alien Control

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

- Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- All care must be taken to prevent contamination of any water bodies. This includes

due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.

- Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of in a suitable site.
- To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation.
- Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.
- The appropriate health and safety procedures should also be followed regarding the storage, handling and disposal of herbicides.

ALIEN MANAGEMENT ACTIONS & ACTIVITIES

In order to maintain the site free of alien weeds and trees, the following plan should be implemented during construction and operation.

Construction Phase Activities

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

Construction Phase Actions/Activities	Frequency
The ECO is to provide permission prior to any vegetation being cleared for development.	Daily
Clearing of vegetation should be undertaken in stages or sections as the work front progresses – mass clearing should not occur unless the cleared areas are to be surfaced or prepared immediately afterwards.	Weekly
Where cleared areas will be exposed for some time, these areas should be protected with packed brush, or appropriately battered with fascine work. Alternatively, jute (Soil Saver) may be pegged over the soil to stabilise it.	Weekly
Cleared areas that have become invaded can be sprayed with appropriate herbicides provided that these are such that break down on contact with the soil. Residual herbicides should not be used.	Monthly
Although organic matter is frequently used to encourage regrowth of vegetation on cleared areas, no foreign material for this purpose should be brought onto site. Brush from cleared areas should be used as much as possible. The use of manure or other soil amendments is likely to encourage invasion.	Weekly
Clearing of vegetation is not allowed within 32 m of any wetland, 80 m of any wooded area, within 1:100 year floodlines, in conservation servitude areas or on slopes steeper than 1:3, unless permission is granted by the EO for	Weekly

specifically allowed construction activities in these areas. The work area should be clearly marked with construction or similar tape to demarcate the area to which vegetation disturbance and construction activity is to be confined.	
Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment.) Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.	Weekly
Alien vegetation regrowth on areas disturbed by construction must be controlled throughout the entire site during the construction period. The alien plant removal and control methods used should adhere to best-practice for the species involved. Such information can be obtained from the Working for Water website.	Monthly
Pesticides may not be used. Herbicides may be used to control listed alien weeds and invaders only	Monthly
Clearing activities must be contained within the affected zones and may not spill over into demarcated No Go areas. Wetlands and other sensitive areas should remain demarcated with appropriate fencing or hazard tape and signage indicating their no-go status posted. These areas are no-go areas (this must be explained to all workers) that must be excluded from all development activities.	Daily

Monitoring Actions - Construction Phase

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

Monitoring Action	Indicator	Frequency/Period
Document alien species present at the site	List of alien plant species	Pre-construction
Document alien plant distribution	Alien plant distribution map	Bi-annually
Document & record alien control measures implemented	Record of clearing activities	Bi-annually
Review & evaluation of control success rate	Decline in documented alien abundance over time	Bi-annually

Operational Phase Activities

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

Operational Phase Action/Activity	Frequency
Surveys for alien species should be conducted regularly. Every 6 months for the first two years after construction and annually thereafter. All aliens identified should be cleared.	Every 6 months for 2 years and annually thereafter
Where areas of natural vegetation have been disturbed by construction activities, revegetation with indigenous, locally occurring species should take place where the natural vegetation is slow to recover or where repeated invasion has taken place following disturbance.	Biannually, but revegetation should take place at the start of the rainy season
Areas of natural vegetation that need to be maintained or managed to reduce plant height or biomass, should be controlled using methods that leave the soil protected, such as using a weed-eater to mow above the soil level.	When necessary
No alien species should be cultivated on-site. If vegetation is required for aesthetic purposes, then non-invasive, water-wise locally-occurring species should be used.	When necessary

Monitoring Actions - Operational Phase

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

Monitoring Action	Indicator	Frequency/Period
Document alien plant distribution and abundance	Alien plant distribution map	Annually
Document & record alien control measures implemented	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Annually

Document rehabilitation measures implemented and success achieved in problem areas	Decline in vulnerable bare areas over time	Annually
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Appendix 1. Recommended Alien Plant Clearing & Control Protocols

- a) The appropriate alien management strategy pertinent to the situation/environment should be identified and implemented.
- b) The Alien Plant Management Plan for alien vegetation includes three phases:
 - I. **Initial control:** drastic reduction of the existing population;
 - II. **Follow-up control:** reduction of seedlings, root suckers and coppice growth;
 - III. **Maintenance control:** sustain low alien plant numbers/density with low annual costs. At this phase, alien plants must no longer be considered a problem. Monitor the situation two-three times each year (spring, mid-summer and autumn) to avoid alien plant re-infestation, spread and densification, and thereby avoid increased control costs.

Initial Control

1. Fell trees - control stumps - plant grass

- a) Fell trees, treat stumps, remove wood and if necessary, rehabilitate. This strategy is suitable where infestations are easily accessible and can be harvested (i.e. for firewood, charcoal, building materials, mulch production). It is also suitable for trees that need removal for utility or aesthetic purposes or where they pose a potential hazard to waterways, building structures, etc.
- b) **Control Method for trees:** Use chainsaws, bow-saws, brush cutters or cane knives to fell trees and saplings. Stump height should be less than 15 cm. Apply a registered herbicide mix with hand sprayers, paint brushes or knapsack sprayers at low pressure, using solid cone nozzles. Use a suitable dye to ensure that stumps are not missed.
 - I. **Cut stump treatment:** Apply the recommended herbicide mixed in water to the cut surface of stumps. Do NOT spray the sides of stumps. Apply herbicide mix up to one hour after felling or the cut wood will seal.
 - II. **Total Stump treatment:** Apply the recommended herbicide mixed in diesel to the cut surface, down the sides of stumps and to any exposed roots. The herbicide mix can be applied even several days after felling. Ensure herbicide can be mixed with diesel.
 - III. **Stump treatment with herbicide plugs:** After felling, make holes in the stumps and insert plugs containing the herbicide, which is released into the stumps.
- c) **Control method for seedlings, saplings and coppice:** In a mixed age stand, where there are young plants and coppice growth, cut the plants with a brush cutter and treat the stumps. Hand pull seedlings. Do not spray foliage as many plants may be

damaged during felling and may not absorb enough of the herbicide for effective control. Untreated plants can be controlled with foliar herbicide during follow-up work.

- d) Disposal of brushwood: Where wild fires are a potential hazard, spread out the brushwood evenly over a large area. Avoid large heaps as this is a fire hazard and burning will cause breakdown of the soil structure. Trees that cannot be utilised should be controlled standing to avoid burning large amounts of wood lying on the soil surface.
- e) Rehabilitation: Sow grass and/or shrubs in the bare soil around the stumps immediately after the first reliable rains. Spread brushwood over the buried seed to aid seedling establishment. Brushwood can be used as fences/barriers and pegged to stabilise slopes where necessary.

a) **Control for shrubs** Alien shrubs less than 1 m tall

- I. Foliar application of a registered herbicide is required.
- II. When dense seedling growth of uniform height is present use knapsack sprayers with flat fan nozzles.
- III. Use solid cone nozzles for seedlings of uneven height, coppice growth, root suckers and short saplings.
- IV. Rehabilitate cleared areas with locally-occurring species if necessary.

b) **Alien shrubs taller than 1 m**

- I. **Mechanical Control pre-treatment**: Where shrubs are taller than 1.5 m, the height must be reduced by cutting, using sharpened hoes, cane knives or motorised brush cutters. For large areas of dense growth, use a tractor-mounted gyro-mower (set as low as possible) after slashing or cutting plants, either treat the freshly cut stumps or allow re-growth to knee height and then spray with a suitable registered herbicide.
- I. **Cutting for stump treatment**: This is suitable for low - medium density infestations but is usually not practical for high density infestations. Slash plants below 15 cm in height for stump application. Control the stumps immediately after cutting the plants. Stump application is best during the active growing season.
- II. **Cutting from coppice treatment**: This is suitable for medium - high density infestations. Slash plants at a convenient height (e.g. knee height for foliar application to coppice re-growth). Cutting dense plants is good winter work but is tiring so must be well organised. Spray coppice re-growth during the active growing season, when there is enough leaf cover to absorb the herbicide.
- III. **Flattening**: Roll empty 200L metal drums or place large pieces of corrugated iron

to make paths through dense thickets of plants (e.g. Bramble). This increases access for foliar or stump application.

IV. **Cut pathways:** This increases access for control work.

V. **Mechanical uprooting:** Uprooting of shrubs with mattocks results in soil disturbance, especially where large plants are present in dense thickets. Use only where not susceptible to erosion or where soil can be stabilised effectively.

c) **Disposal of small amounts of cut material:** Small amounts of cut top growth material do not impede access for follow-up control work. Leave the material to act as a mulch and to decompose, or spread over planted grass seed to aid seedling establishment. This adds organic material to the soil.

d) **Disposal of large amounts of cut material:** Cut the plants and use long poles/branches to roll the material away from stumps. Where cut material hampers access for follow-up control, roll into heaps and burn. Alternatively, spread large amounts of cut material over a large area for a cool burn. This avoids hot intense fires that would destroy the soil surface. Burn during the wet season for a cooler burn.

Rehabilitation: Avoid sowing on compacted soil or soil with a 'crust' as the seed will be washed away after the first rains. In such cases light soil disturbance is necessary e.g. using rakes for broadcast sowing or sharp-pointed hoes for row sowing. Sow suitable grass species on bare soil. Cover the buried seed with small amounts of cut top growth material to aid grass establishment. The material retains moisture in the soil, traps soil after heavy rains, and by rotting contributes organic material to the soil to aid seedling establishment.

1 Chemical control of alien herbs:

a) There are many herbaceous alien (soft/non-woody) species present and likely to occur sporadically throughout the operational phase of the development.

b) Alien herbs are called *broadleaf weeds* and some have pre- and post-emergent herbicides registered for their control.

c) However, where alien herbs are associated with woody alien plants, herbicides registered for control of woody aliens are often also used for control of broadleaf weeds.

d) Alternatively, glyphosate is used, as this is often registered for both woody and non-woody species. Glyphosate is a post-emergent (foliar applied) herbicide that is inactivated by soil.

Rehabilitation: Alien herbs usually occur in disturbed areas, where rehabilitation is not generally a high priority. However, in some situations, rehabilitation with grass or shrubs is required for control of alien herbs. However, only indigenous grasses and/or shrubs growing in the study area should be used for such rehabilitation.

Perennial grasses are often planted after a disturbance to stabilise the soil and suppress

alien herbs. Alternatively creeping species (such as *Cynodon dactylon*) that have good soil binding ability to prevent erosion. Planting a quick-growing grass on bare soil results in a dense rapid cover that successfully competes with establishing alien herbs.

Follow-up control

Follow up control of alien seedlings, saplings and coppice re-growth is essential to achieve and sustain the progress made with initial control work. If this phase is neglected, the cleared area will soon become infested with dense alien vegetation again, arising either from re-invasion by the original species or from invasion/encroachment by another species.

Follow-up control is essential to prevent alien seedlings suppressing planted or colonizing grasses. Before starting initial control operations in new infestations, all required follow-up control and rehabilitation work must be completed or in progress in areas initially prioritised for clearing and rehabilitation.

Follow-up control should combine the following methods:

- a) Chemical control methods (always use registered herbicides);
- b) Mechanical control methods, and
- c) Available biological control agents

Evaluate and select methods for follow-up control work according to species, and the type and density of re-growth.

2. Control methods for dense re-growth

Dense re-growth may arise after initial control operations, as seedlings, root suckers or stump coppices. For example, wattle seedlings are stimulated to germinate after fire or seedlings may arise from a high seed bank in the soil.

- a) Do not uproot or hoe out dense seedlings. This would result in soil disturbance that promotes germination and flushes of alien seed growth.
- b) Do not cut plants to control stumps where stump density is high. Stump application would be impractical with many untreated stumps.
- c) Instead cut tall dense re-growth with brush cutters or bush knives. Remove top growth to allow access for foliar spray of coppice re-growth.

3. Control methods for low-medium density re-growth

Areas with low-medium density re-growth are considered high priority for control as neglect of these areas will result in densification and spread that is more costly to control. Large areas of low-density growth can be controlled rapidly

- a) **Cut plants and control the stumps:** Stump height should be less than 15 cm. Use a

recommended registered herbicide. Apply the herbicide mix with hand sprayers, paint brushes or knapsack sprayers at low pressure, using solid cone nozzles. Use a suitable dye to ensure no stumps are missed. For cut stump treatment, apply the herbicide mixed in water to the cut surface of stumps. Do NOT spray the sides of the stumps. Apply the herbicide within 1 hour of cutting the plants before the wound seals. For total stump treatment, apply a herbicide mixed with diesel to the cut surface, down the sides of stumps and to exposed roots. The herbicide mix can be applied up to several days after cutting the plants.

b) Foliar spray on coppice re-growth and saplings: Re-growth can be sprayed up to a height of 1 m. Apply the herbicide in knapsack sprayers using solid cone nozzles with a suitable dye to avoid over- or under-spraying.

c) Mechanical control options:

- I. Hand pull seedlings when the soil is wet, using gloves to protect the hands.

Maintenance Control

Aim to keep the area stabilised by maintaining a good grass or shrub cover. Prevent further soil disturbance. Annual inspection of vegetation cover and alien plant re-growth is essential. Follow-up and maintenance control work each year will protect the planted plant cover. If this is neglected, the rehabilitated area will revert to dense patches of alien plants, resulting in increased control costs and loss of indigenous cover.

Integrated Control

Areas should be ranked into high, medium and low priority work areas, where high priority areas would be controlled first.

1. High Priority Areas for control

a) Low density infestations

- I. Start maintenance control in areas with low alien plant numbers, targeting especially mature seed-producing trees (identifiable by the presence of flowers during the flowering season and/or presence of seed), or parent trees that are a source of seed to the site. This may include trees outside of the site, within a minimum of 100 m from the site boundary.
- II. Maintenance control is rapid and cost effective.
- III. This will protect the natural vegetation that is already there, prevent formation of thickets, and halt encroachment (spread) of alien plants into surrounding areas.

b) Areas near the top of slopes, water courses, steep bare slopes or long bare slopes

- I. Start control at the top end of water courses or at the top of slopes.

- II. This prevents seed spreading downstream or downhill to infest new areas.
- III. Plant grasses and/or shrubs on bare soil, especially on steep slopes or long bare slopes, to prevent erosion.

c) Areas where initial control work is completed and re-growth is present

- I. Complete major follow-up control and rehabilitation work in all areas before starting initial control in new infestations.
- II. Control of seedlings protects newly planted vegetation.
- III. Failure to control re-growth results in densification and spread of infestations, with increased control and loss of vegetation cover.
- IV. Continued maintenance is a long-term on-going exercise to prevent re-infestation.

d) Newly disturbed areas

- I. Areas where mechanical disturbance (such as removal of alien plants) or loss of vegetation cover has occurred provides an ideal seed bed for pioneer alien plant seedling establishment.
- II. This re-growth should be controlled while still less than 0.5 m tall.
- III. If this is neglected, re-growth will become taller and more dense, resulting in more costly control work and loss of vegetation cover.

e) Edges of dense spreading infestations

- I. Confine infestations when there are insufficient funds to control the whole infestation and where the alien plants are likely to spread and invade neighbouring areas.
- II. To prevent spread, control trees, saplings, seedlings, coppice re-growth or shrubs in a 5 - 10 m wide strip around the edges of such infestations to confine them.
- III. Move inwards from the edges with control work as funds become available.

f) Low density areas inside dense infestations

- I. Thin inside infestations to prevent densification (i.e. control all low-density areas inside the infestations to encourage grass growth. This will break up the large infestations into several smaller infestations that are more easily controlled.
- II. Natural vegetation will gradually spread into the controlled areas as the alien plants die or are removed. The direction of grass spread therefore follows the control work, as the alien plants die. Sow seed in bare soil for a more rapid ground cover, especially on steep slopes or on easily eroded soil.
- III. Monitor confined and thinned infestations 2 - 3 times each year. Repeat follow-up control operations as required, to ensure the controlled areas remain clear of re-growth and that the planted vegetation has established and remains healthy. Seedling re-growth will be evident in spring and early summer while re-growth and

coppice will be easily observed in summer. When a re-infestation is observed it should be controlled immediately.

4. Low priority areas for control

- a) Stabilised areas where there is a healthy dense vegetation cover, and any alien plants are very sparse, difficult to detect and with little or no impact at present. Monitor alien plant growth and grass cover 2-3 times a year to ensure timely maintenance work.
- b) Areas where dense infestation could become worse. Confine these dense infestations to prevent spread into new areas.
- c) Areas where alien plants have little or no impact.

Thus, **high priority** areas are identified where resources should be concentrated to achieve the desired aims. Control in these areas gives the greatest total benefit, and allows the best use of the limited available resources.

The **low priority** areas would consume resources with little benefit, and should therefore be ignored or re-evaluated each year for attention at a later date.

APPENDIX G: BAT MITIGATION ACTION PLAN

Mitigation Action Plan
to minimise and monitor bat mortalities
during the operational phase

For the proposed Hoogland 1 & 2 Wind Farms
(Hoogland Northern Cluster), Western Cape



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29 July 2022

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1 INTRODUCTION

This Mitigation Action Plan must be immediately implemented once the Hoogland 1 or Hoogland 2 wind farm is operational, and must be consulted during the bat mortality monitoring study and for the operational lifetime of the facility. The bat specialist conducting the operational bat monitoring may overwrite this Mitigation Plan only if more applicable bat activity and climate data are available for specific problematic turbines or areas of the site.

The levels of mitigation and its specifications may need to be adjusted according to the results of the operational monitoring, based on robust scientific data. This is an adaptive management approach, and it is crucial that any changes to this initial proposed mitigation schedule that are recommended by the appointed bat specialist be implemented as soon as practically possible.

2 RECOMMENDED MITIGATION OPTIONS

The following options are recommended to minimise bat mortalities:

2.1 Minimisation of light pollution

A mitigation to consider in the design of the Hoogland 1 and Hoogland 2 facilities is to keep artificial lighting to a minimum on the infrastructure (OHM buildings and on wind turbines), while still adhering to safety and security requirements. For example, this can be achieved by having floodlights down-hooded, installing passive motion sensors onto lights around buildings and possibly utilising lights with lighting colours (also referred to as lighting temperatures) that attract fewer insects. Light pollution will impact bat feeding habits and species compositions negatively, by artificially discouraging photophobic (light averse) species and favouring species that readily forage around insect-attracting lights.

The likelihood of bats being killed by moving turbine blades increases significantly when they are attracted to their proximity when it has become an improved foraging airspace, due to the presence of artificial light.

2.2 Curtailment to prevent freewheeling

Freewheeling occurs when the turbine blades are rotating in wind speeds below the generator cut-in speed (also called the **manufacturer's cut-in speed**), thus no electricity is being produced and only some blade momentum is maintained.

Since bat activity tends to be negatively correlated with wind speed, it means that high numbers of bats are likely to be flying and impacted on in low wind speeds where freewheeling will be occurring. If turbine blades are feathered below the generator cut-in speed to prevent freewheeling, it can result in a very significant reduction of bat mortalities with minimal energy production loss.

2.3 Curtailment that increases the cut-in speed

The activity levels of South African bats generally decrease in weather conditions with increased wind speeds. However, in scenarios where above sustainable numbers of bats are being killed, and these bats fly in wind speeds above the turbine manufacturer's cut-in speed, the turbine's computer control system (referred to as the Supervisory Control and Data Acquisitions or SCADA system) can be programmed to a cut-in speed higher than the manufacturer's set speed. The new cut-in speed will then be referred to as the **mitigation cut-in speed** and can be determined from studying the relationship between preconstruction or operational long term (12-month) bat activity patterns on site and wind speed. This sustainable threshold of bat mortalities will be calculated according to the *South African Bat Fatality Threshold Guidelines* (MacEwan, *et al.*, Edition 2, October 2018).

Turbines are curtailed in this manner by means of blade feathering, to render the blades motionless in wind speeds below the mitigation cut-in speed.

2.4 Acoustic bat deterrents

This technology is developed well enough to be tested on site and may be recommended during operational monitoring, if mortality data indicate bat mortalities above the sustainable threshold for the wind farm. This threshold will be calculated according to the *South African Bat Fatality Threshold Guidelines* (MacEwan, *et al.*, Edition 2, October 2018). Initial experiments with this technology on wind farms in South Africa are yielding positive results that may indicate the effectiveness of the devices in the correct scenarios.

Current data on the South African trials is still limited to a small sample set, and the technology will not necessarily be effective in all mitigation scenarios and for all bat species. Therefore, it should be considered and tested on a case-by-case basis, and it is highly recommended that adequate monitoring continues concurrently, to assess the effectiveness of the devices in reducing bat mortalities.

3 MITIGATION ACTION PLAN

3.1 Step 1: Minimisation of light pollution (refer to Section 2.1)

During the planning phase for the Hoogland 1 and Hoogland 2 wind farms it must become mandatory to only use lights with low sensitivity motion sensors that switch off automatically when no persons are nearby, to prevent the creation of regular insect gathering pools. This applies to the turbine bases (if applicable) and other infrastructure/buildings. Aviation lights should remain as required by aviation regulations. Floodlights should be down-hooded and where possible, lights with a colour (lighting temperature) that attract less insects should be used. This mitigation Step is a simple and cost-effective strategy to effectively decrease the chances of bat mortality on site.

Bi-annual visits to the facility at night must be conducted for the operational lifetime of the facility, to assess the lighting setup and whether the passive motion sensors are functioning correctly. The bat specialist conducting the operational bat mortality monitoring must conduct these visits to site during nighttime to assess the placement and setup of outside lights on the facility. When lights are replaced and maintenance on lights is conducted, this Mitigation Action Plan must be consulted.

3.2 Step 2: Appointment of bat specialist to conduct operational bat mortality monitoring

As soon as the Hoogland 1 or Hoogland 2 wind farm facility becomes operational, a bat specialist must be appointed to conduct a minimum of 2 years of operational bat mortality monitoring. The methodology of this monitoring must comply with the *South African Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy Facilities - 2nd Edition June 2020* (Aronson *et al.* 2020), or any newer version of the applicable guidelines that may be in force at the start of operation of the facility.

The results of the bat mortality study may be used to develop mitigation measures focused on specific problematic turbines.

3.3 Step 3: Curtailment to prevent freewheeling (refer to Section 2.2)

Based on high bat activity detected during the 12-month preconstruction study, from 1 November to 31 March every night for the lifetime of the facility, curtailment must be applied to all turbines by ninety-degree feathering of blades below the **manufacturer’s cut-in speed**, so it is exactly parallel to the wind direction and minimises freewheeling blade rotation as much as possible without locking the blades. This can significantly lower probability of bat mortalities. Influence on productivity is minimal since no power is generated below the manufacture’s cut-in speed.

3.4 Step 4: Additional mitigation by curtailment or acoustic deterrents (refer to Sections 2.3 and 2.4)

If mitigation steps 1 – 3 are followed, and the bat mortality monitoring study detects bat mortalities that are above the sustainable threshold for the Hoogland 1 or Hoogland 2 wind farm, then additional mitigation will need to be implemented to bring bat mortalities to or below the sustainable threshold. According to the *South African Bat Fatality Threshold Guidelines* (MacEwan, *et al.*, Edition 2, October 2018), this threshold is calculated by considering the hectare size of the wind farm area of turbine influence and the value of 2% of bats/10ha/year for the ecoregion that the wind farm is located in, to give an annual number of sustainable bat mortalities that is acceptable for the wind farm. The area of turbine influence of a wind farm is dictated by the turbine layout and is a tight fitting polygon around the turbine layout. In this version of the guidelines the acceptable sustainable threshold is calculated as 0.2 bats/10ha/annum for the Nama Karoo ecoregion which both Hoogland 1 and Hoogland 2 wind farms are located in. The calculated annual acceptable sustainable threshold of bat mortalities for each wind farm is indicated in **Table 3-1** below. Note that a newer version of the Threshold Guidelines or another similar applicable document may be adopted during the operation of the wind farm.

Table 3-1: The sustainable acceptable mortality thresholds of the proposed Hoogland North wind farms.

	Area of influence of wind turbines (hectares)	Acceptable annual mortality of bats
Hoogland 1	7 290	$0.2 \times (7290/10)$ $= 0.2 \times 729.0$ = 146 bats
Hoogland 2	8 549	$0.2 \times (8549/10)$ $= 0.2 \times 854.9$ = 171 bats
Hoogland 1 & 2	15 839	$0.2 \times (15839/10)$ $= 0.2 \times 1583.9$ = 317 bats

Such additional mitigation measures may be to curtail problematic turbines according to the **mitigation cut-in speed** (Section 2.3), and/or to utilise acoustic deterrents on problematic turbines (Section 2.4).

Preliminarily, it is advised that any additional mitigation measures that may be required be applied during the months of November to March, and must be applied to any turbines or group of turbines identified as causing the wind farm's mortalities to be above the sustainable threshold levels. This time period is based on high bat activity months as detected during the 12-month preconstruction study.

The bat specialist conducting the operational bat monitoring may recommend other time periods for additional mitigation, based on robust mortality data. If required, the bat specialist may make use of climatic data to allow for an active and adaptable mitigation schedule.

3.5 Step 5: Auditing of bat mortalities for the lifetime of the facility

During the implementation of mitigation Steps 1 – 4, it is crucial for the facility to determine and monitor bat mortalities in order to implement, maintain and adapt mitigations as efficiently as possible. For the duration of the lifetime of the facility, the impacts on bats must be audited/monitored by reliable methods of carcass searching and/or electronic devices capable of automatically counting bat mortalities. Such auditing should occur every 5 years (after the end of the initial 2-year operational study) for all turbines on site, and continuously for turbines where mitigations discussed in Step 4 (Sections 2.3 and 2.4) are implemented.

APPENDIX H: AVIFAUNA MONITORING PLAN AND ADAPTIVE MANAGEMENT PLAN

HOOGLAND WIND FARMS

1 DURING & POST CONSTRUCTION BIRD MONITORING FRAMEWORK

(extracted from Wildskies' Avifaunal Impact Assessment, 2022)

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. However this is purely the 'before' baseline and aside from providing input into turbine micro-siting, it is not very informative until compared to post construction data. The following programme has therefore been developed to meet these needs. It is recommended that this programme be implemented by the wind farm if constructed. The findings from operational phase monitoring should inform an adaptive management programme to mitigate any impacts on avifauna to acceptable levels. In particular, any Verreaux's Eagle fatalities should be reported to Dr Megan Murgatroyd in order to close the feedback loop back to the VERA modelling performed for this site.

During construction monitoring

It will be necessary to monitor the breeding status and productivity of the nesting raptors during all breeding seasons during construction. This can be done by a minimum of 3 specialist visits to the nest site per breeding season, or close enough to observe the birds without disturbing them. Detailed requirements as follows:

- Independent avifaunal specialist to make 3 visits to nest site in each breeding season (May to October) during construction.
- Breeding status & productivity to be determined.
- Any response by eagles to construction disturbance to be documented.

Operational phase monitoring

The intention with operational phase bird monitoring is to repeat as closely as possible the methods and activities used to collect data pre-construction. This work will allow the assessment of the impacts of the proposed facility and the development of active and passive mitigation measures that can be implemented in the future where necessary. One very important additional component needs to be added, namely mortality estimates through carcass searches under turbines. The following programme has therefore been developed to meet these needs, and should start as soon as possible after the 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) should inform the programme design at the time.

Live bird monitoring

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.

- The 24 walked transects of 1km each that have been done during pre-construction monitoring on the site should be continued.

- The 4 vehicle based road count routes on the site should be continued, and conducted twice on each site visit.
- The focal sites on the site should be monitored. If any sensitive species are found breeding on site in future these nest sites should 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 should be carefully plotted and documented.
- The 14 Vantage Points already established on the overall site should 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. A total of 72 hours direct observation per Vantage Point should be conducted per year.
- The activities at the control site should be continued, i.e. 2 Vantage Points, 3 Walked Transects, 1 Vehicle Based transects, and Focal Sites.

Bird Fatality estimates

This is now an accepted component of the post construction monitoring program and the newest guidelines (Jenkins *et al*, 2015) will be used to design 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). 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 should also be measured.

Fatality searches should be conducted as follows:

- The area surrounding the base of turbines should be searched (up to a radius equal to 75% of the maximum height of turbine) for collision victims.
- All turbines on the wind farm should be searched at least once a week (Monday to Friday).
- Any suspected collision casualty should be comprehensively documented (for more detail see Jenkins *et al*, 2015).
- A team of carcass searchers will need to be employed and these carcass searchers will work on site every day searching the turbines for mortalities.
- It is also important that associated infrastructure such as power lines and wind masts be searched for collision victims according to similar methods. This should be done seasonally.

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

The above programme should be reported on quarterly to the wind farm operator, who should submit these reports to the DFFE and BirdLife South Africa. These reports should include a comparison of actual measured fatality rates with those predicted by this study.

2 ADAPTIVE MANAGEMENT PLAN FOR AVIFUANA (extracted from Wildskies' Avifaunal Impact Assessment, 2022)

The adaptive management plan aims to manage the impact of the proposed facility on birds to the extent that the impacts are acceptable and sustainable for the species populations.

It is important to for each project to have an adaptive management plan in place before operations, so that once operational, managements' response to any bird fatalities is clearly structured. Fatalities of Red Listed birds are typically rare events, but each with high consequence. As a result trends and patterns are often not evident at a level useful for decision making. At the proposed projects, fatality thresholds have been set for the high risk bird species. Adaptive management will be triggered when these thresholds are exceeded.

Adaptive management strategies should follow a set of clear sequential actions, specifically:

1. Conduct a review to determine the primary reasons why a threshold was exceeded.
2. Review the effectiveness of existing mitigation in light of the findings and determine whether a revised mitigation strategy is required and if so design revised mitigation.
3. If needed, define a revised threshold or limit of acceptable change.
4. Define the actions that will be taken if the new threshold or limit of acceptable change is exceeded.

This process is iterative, and the breaching of successive thresholds should be matched by an increase in the measures to protect and promote the viability of priority bird populations. If thresholds are repeatedly exceeded, despite mitigation efforts, off set options will need to be considered. Adaptive management responses are not limited to exceeded thresholds and may be triggered in response to other events such as:

- Evidence of an increased risk to a population from other non-project sources. For example, evidence of increased persecution during the operational phase of the wind farm may lead to reassigning a priority bird with an annual fatality threshold to a zero fatality threshold.
- An elevated risk situation, such as a temporary and unforeseen abundance of a risk species on site. For example, increased livestock/wildlife around turbines may result in an observed increase in raptor activity in the area.
- A near-miss incident, in which no fatality occurred but existing mitigation failed to prevent the risk. For example a raptor present on site and observed flying through rotor airspace.

The Adaptive Management Plan for the project described here provides a clear procedure and timeframe for evaluating fatalities and responding to exceeded thresholds. Following the framework allows the project to clearly demonstrate its' safeguarding record for priority birds.

Fatality thresholds at the project fall into four different categories:

1. Zero fatality thresholds for priority birds
2. Annual fatality thresholds for priority birds (threshold >zero)
3. Extreme event thresholds – for unforeseen once off situations
4. Elevated risk situations

Adaptive management response strategies for each threshold category are described below.

Table 1: Adaptive management response strategies for threshold categories

Species Category	Species	Annual Fatality Threshold	Reporting process for recorded fatality	Management response
Zero fatality threshold species	Verreaux's Eagle Martial Eagle Ludwig's Bustard	0	Fatality reported by field search team to avifaunal specialist within 24hrs of discovery. Incident Report compiled by specialist & submitted to site management within 48hrs.	Meeting/call held within 1 week of incident. Details & timing of any adaptive management response agreed & documented.
Annual Fatality Threshold species	Jackal Buzzard Karoo Korhaan	10	Thresholds assessed at 6-months and 12 months based on species specific corrected fatality rate estimate results.	Appropriate adaptive management for an exceeded threshold agreed at management meeting within 1 month of the completing of a semi-annual report.
Extreme Event Thresholds	Any species	For practical reasons, such as the need for a quick decision in the field to minimize the scale of this type of extreme event the threshold is set to a single fatality event that exceeds 10 individuals of one or more species.	A threshold is set to manage the risk of multiple-fatalities occurring as a single fatality event e.g. resulting from migratory activity or extreme weather. This type of event may be particularly relevant to species that occur in flocks.	The Adaptive management protocol for exceeding extreme event thresholds follows the same procedure as for zero-fatality thresholds.
Elevated Risk Situations	Any species	If site staff observe an increase in priority bird activity that could result in exceeded thresholds, even if no fatalities have occurred For e.g. a severe hailstorm kills numerous lambs and attracts raptors to feed.	Site should inform Avifaunal specialist immediately. Specialist should assess the maximum number of birds at risk and estimate how long the risk is likely to persist and likelihood of fatalities during this period. Specialist should then arrange a call/meeting with site management within 48 hours of the event.	Meeting to agree on any necessary action necessary to reduce immediate risk of fatalities along with a timescale for implementing the action. In this situation (even if no fatalities occurred) an incident report should be completed to document details of the elevated risk situation, the action taken and the outcome of the action
Near-miss Incidents	Any species	All near-miss incidents involving a priority species observed by fatality search teams or any site staff should be reported to site management/avifaunal specialist following the same procedure and timescales as for Elevated Risk Situations.		

APPENDIX I: REHABILITATION MANAGEMENT PLAN

HOOGLAND 1 WIND FARM - REHABILITATION AND REVEGETATION PLAN



PRODUCED FOR RED CAP HOOGLAND 1 (PTY) LTD

August 2022

Background & Purpose

The purpose of the Hoogland 1 Wind Farm revegetation and rehabilitation plan is to ensure that areas cleared or impacted during construction activities of the proposed facility are rehabilitated with a plant cover that reduces the risk of erosion from these areas as well as restores ecological function to these areas as far as possible. The intention of the plan is not to provide a fully operational plan with detailed method statements and approaches, but rather to outline the principles that should underpin the operational implementation plan with rehabilitation actions that the appointed contractor would apply at the site during and immediately after construction.

Rehabilitation Goals

It is important to define a rehabilitation benchmark and end-goal against which relative rehabilitation success at a site can be measured. The Society for Ecological Restoration (2002) provides eight objectives for a restored ecosystem:

- It should contain characteristic species that occur in the reference system;
- It should comprise largely of indigenous species;
- The functional groups necessary for continued stability must be present or have the potential to colonise;
- The physical environment must be conducive for the establishment of species that will lead to stability;
- It functions normally for its stage of development;
- It is integrated into a larger ecological matrix;
- Potential threats to the system's stability are eliminated;
- It is self-sustaining to the same degree as the reference system.

The above goals are fairly broad and the discussion that follows will provide details on how these goals can be achieved and what indicators can be used to measure progress towards these goals.

Rehabilitation Targets

Although the overall goal of rehabilitation is provided above, it is common practice to set measurable targets against which progress can be measured and evaluated. Parameters that are usually measured include indicators of plant community structure and composition such as similarity to a reference area, species richness, species diversity, vegetation cover, species dominance, vertical structure and functional diversity of the vegetation. Important considerations with regards to setting such targets include ensuring that they are achievable, and secondly, that they change appropriately over time. In other words, there should be different targets for a parameter based on the time since rehabilitation. Targets for vegetation cover should be set as follows in reference to the baseline cover of the undisturbed vegetation:

- Year 1: 20%
- Year 2: 40%
- Year 3: 60%

Assuming that the background vegetation cover is 40% as typically occurs in the study area, the actual plant cover that would represent the above targets are as follows:

- 8% Cover
- 16% Cover
- 24% Cover

These targets must be closely tied into the monitoring schedule to provide references against which the effectiveness of monitoring can be measured. The ultimate goal should be to achieve approximately 80% of the background perennial plant cover.

Much has been made of species richness targets for rehabilitation. However, in most situations, these are not directly relevant as the emphasis should be on restoring ecological function. It is not practical or cost effective to attempt to restore high levels of plant biodiversity within a short time frame. Once some ecological function is restored, species richness will slowly increase and ultimately the effectiveness of rehabilitation in restoring species richness can only be evaluated after 10 or more years after rehabilitation. However, it is important to note that rehabilitation with a variety of species provides increased resilience to drought and other pressures. As a result, rehabilitation with single-species stands is not recommended and at least 3-4 species should be used in any area.

Plant Species Suitable for Rehabilitation at Hoogland 1

No alien species should be used for rehabilitation within areas of natural vegetation. Although some of these are easy to establish, in the long-run, they retard the return of the indigenous species and do not contribute to meeting rehabilitation goals. Although the species selected for use in rehabilitation should come from the local indigenous species pool, not all species are equally suitable for use in rehabilitation. The primary criteria for selection are practical and economic which usually dictate the ease with which species can be established. This includes survival rates, with establishment success being measured in the field at least a year after planting, once plants can be considered established and self-sustaining. Although there are not large numbers of species which are suitable for rehabilitation, it is important to select a mix of functional types or growth forms (i.e. a mix of grasses, low shrubs and tall shrubs) as this adds structural diversity to the rehabilitated areas and also increases resilience.

In terms of which species are considered suitable for use in rehabilitation and revegetation at the site, it is useful to consider what attributes such species should or should not have. For example, species which grow tall or which might quickly generate a high fire danger are considered unsuitable for use near infrastructure due to the risks and management problems they may cause. In addition, annual species which flourish only after rains are also considered unsuitable as these would be absent in dry periods, leaving the soil exposed and vulnerable to erosion. The following general criteria have been identified as being important or useful in

the selection of species for use in revegetation and rehabilitation. Some of these are considered essential criteria and others are considered desirable.

Essential Criteria:

- **Only perennial species should be used.** Short-lived species may flourish after rains but die out shortly thereafter. In addition, such species may function to keep more desirable perennial species out through depressing their growth and establishment.
- **Only naturally occurring species are considered.** Species which do not naturally occur in the area are not considered viable options for use at the site.
- **No toxic or weedy species to be used.** Any species which are considered toxic to animals or people are not suitable candidates for use.

Desirable Criteria:

- **Commercial availability of seed.** Ideally a species should have seed commercially available so that large quantities of seed can be purchased and used to establish the species across the site.
- **Ease of propagation.** For species that cannot be easily propagated from seed or for which seed is not commercially available, it is important that these species can be easily propagated vegetatively or by other means using standard nursery propagation techniques.
- **Ease of establishment.** Species used should be relatively easy to establish on-site, preferably using methods that be used across a broad area, such as standard agricultural planters or seed spreaders.
- **Ease of management.** Species used should be relatively easy to manage and should not pose a risk of become a problem at the site through establishing dense thickets, producing excessive biomass or otherwise hindering the daily operation of the plant.

Suitable Plant Species

A variety of species are identified below as potential candidates for use in rehabilitation and revegetation at the site. It is important to note that in practice several of these species should be used in conjunction to increase establishment success and account for differences in establishment between species that are likely to occur on different soil substrates and moisture conditions. In addition, there are likely to be different requirements and management objectives for different parts of the site. For example, in some areas the vegetation may need to be kept and controlled at a shorter level than other areas where taller vegetation may be acceptable. There are also likely to be places where it is desirable to establish taller woody species for landscaping, visual mitigation or other purpose. As such, a variety of species have been recommended, ranging from prostrate- growing grasses to large trees, which can all be used depending on the specific area and required purpose. For each species identified, some background on the species is provided as well as possible uses and advantages and disadvantages of each species. For ease of interpretation, these have been categorised into

the following growth forms: Grasses, Low Shrubs and Tall Shrubs.

Table 1. Table of species identified as being indigenous to the site and considered suitable for rehabilitation and revegetation purposes. This list is intended as a guide and additional species can also be used if available.

Low Shrubs	Tall Shrubs	Perennial Grasses
<ul style="list-style-type: none"> • <i>Pentzia incana</i> • <i>Pentzia globosa</i> • <i>Tripteris sinuata</i> • <i>Hermannia cuneifolia</i> • <i>Eriocephalus ericoides</i> • <i>Ruschia spinescens</i> 	<ul style="list-style-type: none"> • <i>Lycium cinereum</i> • <i>Salsola aphylla</i> • <i>Diospyros austro-africana</i> 	<ul style="list-style-type: none"> • <i>Eragrostis lehmanniana</i> • <i>Cynodon dactylon</i> • <i>Themeda triandra</i> • <i>Digitaria eriantha</i> • <i>Eragrostis obtusa</i> • <i>Stipagrostis ciliata</i>

Monitoring and Evaluation

The primary purpose of monitoring should be to inform and enable adaptive management interventions and improve rehabilitation outcomes. As such, monitoring must be linked to targets, their associated measurement intervals as well as what actions are triggered when a target has not been met. There should thus be a clearly defined feedback between monitoring outcomes and consequent rehabilitation actions. A critical component of monitoring is detailed record keeping and associated data management.

There are various approaches to monitoring and parameters that can be measured. It is however important that these are relevant and practical to measure. Simple indicators such as plant cover and species richness are usually the most simple and reliable to measure, with a variety of published and well-known sampling methods.

As rehabilitation success is unpredictable in arid environments, monitoring and follow-up actions are important to achieve the desired cover and soil protection. The following basic monitoring schedule with associated remedial actions is recommended:

- Re-vegetated areas should be monitored every 6 months for the first 18 months following construction. Thereafter, monitoring should be conducted annually until such time as the target areas have attained the desired benchmark vegetation cover.
- Re-vegetated areas showing inadequate surface coverage (less than 20% within 12 months after re-vegetation) should be prepared and re-vegetated;
- Any areas showing erosion, should be re-contoured and seeded with indigenous shrubs or succulents present in the local area.

Conclusions & Recommendations

When selecting species for revegetation and rehabilitation it is important to select species that are readily available or which can be readily propagated for this purpose. In addition, the primary determinant of revegetation success is survival of plants early on after germination or establishment. As such it is essential to select species which have a high probability of survival and which are naturally adapted to the conditions of the area. Timing is also likely to be important as rehabilitation during or immediately prior to the dry season is likely to result in significantly less success than rehabilitation early on during the wet season. The sandy soils of the site are generally poorly developed sandy soils with the result that soil limitations on rehabilitation success are likely to be relatively low and natural regeneration of vegetation on cleared areas is likely to be relatively rapid. As in most environments, the natural regeneration of vegetation can be significantly enhanced and reduce the need for active rehabilitation if effective topsoil management is implemented during the construction phase of the project. However, especially within the areas of dune fynbos, alien invasion is likely to be a problem within the cleared areas and as such, the rehabilitation plan needs to be closely allied and aligned with the alien management plan.

It is important to note that there is no single choice of plant species which can meet all rehabilitation and revegetation requirements. A mix of species provides for greater resilience in the face of an unpredictable environment where rainfall and climate vary substantially and affect different species in a different manner. In general 3-4 species should be used in any areas requiring rehabilitation and preferably, these should include a variety of growth forms such that greater vegetation structural diversity is achieved. Finally, it is important that monitoring be used firstly to check progress towards the identified rehabilitation targets and secondly be used to inform and trigger actions that may need to be implemented where these targets are not being met.

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APPENDIX J: OPEN SPACE MANAGEMENT PLAN

HOOGLAND 1 WIND FARM – OPEN SPACE MANAGEMENT PLAN



PRODUCED FOR RED CAP HOOGLAND 1 (PTY) LTD

August 2022

OPEN SPACE MANAGEMENT PLAN - PURPOSE

The purpose of the Hoogland 1 Wind Farm Open Space Management Plan is to provide a framework for the integrated management of the natural and semi-natural areas within and adjacent to the Hoogland 1 Wind Farm during the daily operational activities. The footprint of the facility will occupy a small proportion of the site, but impacts resulting from the construction and operational activities of the facility may extend beyond the required footprint and impact biodiversity within the site more generally. The goal of the Open Space Management Plan is to reduce the ecological footprint of the Wind Energy Facility through ensuring that the facility operates in a biodiversity-compatible manner and does not have a long-term negative impact on the local environment.

PROBLEM OUTLINE

The Wind Farm is located within a matrix of intact natural vegetation with a variety of free-roaming wildlife as well as livestock. Alien plant invasion, soil erosion, motor vehicle impacts, noise and disturbance generated by operational activities and human disturbance are potential impacts that may occur on an on-going basis at the site and extend beyond the actual footprint of the development. The purpose of the plan is therefore to ensure that the facility operates in a biodiversity compatible manner and does not have a long-term negative impact on the local environment.

RELATION TO OTHER SUBPLANS

During construction, there are a variety of subplans developed as part of the EMPr for the development that are aimed at ensuring that construction occurs in a responsible and biodiversity-compatible manner. This includes the Plant Rescue and Protection Plan, Revegetation and Rehabilitation Plan and Alien Management Plan. The purpose of the Open Space Management Plan is to ensure that all the different plans are aligned, and that additional measures are implemented during the operation of the facility to ensure that negative environmental impacts of the development are minimised.

OPEN SPACE MANAGEMENT SUBPLAN

The following elements are considered part of the Open Space Management Subplan:

Access Control:

- Access to the facility should be strictly controlled.
- All visitors and contractors should be required to sign-in.
- Signage at the entrance should indicate that disturbance to fauna and flora is strictly

prohibited.

- If there are fenced-off parts of the facility such as substations, O&M buildings etc., these should be fenced with a single fence with electrified strands only on the inside of the fence and not the outside, if required at all.

Prohibited Activities:

The following activities should not be permitted within the facility by anyone except as part of the other management programmes of EMPr for the development.

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

Alien Plant Control

- Alien invasive plants should be controlled according to the Alien Invasive Management Plan.
- No non-locally occurring or alien plants should be established or brought onto the site.

Erosion Management

The facility should be inspected every 6 months for erosion problems or more frequently in the event of exceptional rainfall events. All erosion problems should be rectified according to the Erosion Management Subplan.

Faunal Management

The site will remain a semi-natural environment with a full complement of resident natural fauna, including a variety of mammals, reptiles and frogs that may be impacted by day-to-day activities at the site. The management of the facility should be aimed at trying to minimise interactions between wildlife and the facility in terms of its staff, infrastructure and activities.

- Bird monitoring and mitigation should occur according to the Avifauna Monitoring Programme.
- Snakes & Reptiles

- There are likely to be a variety of snakes present at the site including venomous species such as Puff Adder and Cape Cobra. They may be attracted to certain features such as buildings if these provide shelter or contain an abundance of prey species such as rodents.
- Snakes encountered within the facility may pose a danger to staff and should be allowed to move off on their own in the case of snakes encountered on roads or other areas within the 'veld' or be removed unharmed to safety by a suitably qualified person in the case where these pose a danger to humans.
- All vehicles should give way to snakes and tortoises crossing roads. There are a lot of access roads at the site and reptiles will be crossing these on a regular basis and the potential for mortality resulting from being 'run over' is high. All vehicles entering the site must adhere to reduced speed limits for heavy (30km/h) and light vehicles (40km/h).
- The Karoo Dwarf Tortoise is an important species present at the site and the management should ensure that potential impacts on this species are kept to a minimum. This includes removing crow nests from overhead lines within the site and also ensuring the roads traversing Karoo Dwarf Tortoise habitat do not trap small tortoises on the road through the presence of a step at the edge of the road or similarly prevent tortoises from crossing the road due to obstacles at the road margin.
- Mammals
 - Resident fauna should not be habituated by feeding them scraps or other foodstuffs and it is not necessary to provide such species with water either as most arid fauna are independent of water. As such, it is also important that all waste at the site is handled appropriately and kept in closed bins not accessible to fauna.
 - Some species are vulnerable to being hit by motor vehicles including Steenbok, Bat-eared Fox and Hares and Riverine Rabbits. All vehicles on the site should adhere to a low speed limit heavy (30km/h) and light vehicles (40km/h) and give way to any mammals on the roads, especially if there is any driving on the site at night.
 - All incidents should be recorded on a log maintained by the Environmental Officer, so that additional mitigation measures can be implemented if there are any specific areas where regular incidents occur.
 - Any Riverine Rabbits accidentally killed, or fatalities encountered should be collected and provided with the location they were found to the EWT officer in Loxton. There is likely to be an active Riverine Rabbit Monitoring Programme active within the site during operation and the results of this should be fed into the management of the site as relevant.
 - If there is any post-construction trenching or similar activity at the site, any trenches and holes excavated should not be left open for extended periods as fauna can fall in a become trapped. Trenches should have ramps of soil present where fauna can escape or should be excavated incrementally so that they are used only as required and do not stand open for extended periods.

- General Faunal Mitigation
 - Night-lighting at the site should be kept to a minimum. Artificial lights affect invertebrates and migrating birds and also attract bats and birds. If any parts of the site need to be lit at night for security or other reasons, then all lighting should be downward-directed low-UV type lights (such as most LEDs and HPS bulbs), which are less attractive to insects.
 - Any chemical, fuel, oil or other spills should be cleaned in the appropriate manner as related to the nature and extent of the spill. Contaminated soil should be removed from the site.

Integrated & Adaptive Management

The management of the facility should meet with the landowner and other relevant local managers to review the management of the facility on a regular basis. Records of such meetings should be maintained including decisions and management outcomes resulting from such meetings. The Open Space Management plan should be reviewed annually for the first three years post-construction to evaluate the effectiveness of management actions so that these can be adapted as appropriate.

Monitoring & Evaluation

- As the integrating framework for the environmental management of the site, the Open Space Management Plan should ensure that all monitoring and associated record keeping is conducted according to the schedules of the respective subplans.
 - As the issues at the site are likely to change over time, the Open Space Management Plan should be evaluated on an annual basis for the first three years of operation and then every 3 years or more regularly if required. Where specific problems arise, persons with relevant expertise should be brought in to advise the management of the site and update the Open Space Management Plan.
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APPENDIX K: STORMWATER MANAGEMENT PLAN

HOOGLAND WIND FARMS & GRID CONNECTIONS
STORMWATER MANAGEMENT PLAN

June 2022

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APPENDIX C – METHOD STATEMENTS

- 1. ROADS**
- 2. EXCAVATION**
- 3. CONCRETE**

STORMWATER MANAGEMENT PLAN

1 SCOPE

This report deals with the management and control of stormwater and soil erosion the Hoogland Wind Farm North and South Clusters near Beaufort West, located in the Western Cape Province. This report must be updated with all relevant conditions related to Storm Water Management contained in the Environmental Authorisation (if authorised) and Water Use License (if authorised), as well as any site specific conditions that result from the micro-siting walk through with relevant specialists. Note where relevant this will also apply to any associated works, such as substations, access along grid connections or road upgrades needed within the greater region, that will be carried out by the respective project.

2 GENERAL SITE CONDITIONS

Rainfall for the sites ranges from 122mm per annum (Loxton) to 392 (Beaufort West) (<https://en.climate-data.org>) with peak rainfall occurring the warm summer months. The micro-sited access roads and associated infrastructure as well as the hardstand areas will be overlaid on the topography for the site prior to the start of construction and will be detailed in the final design process.

Due to the nature of the soil (shales and clays) as well as the steep topography in parts of the site, there is a risk of erosion, opposed to the fact that some areas are dominated by flat plains created by alluvial fans and floodplains / depressions, which tend to accumulate water. Thus stormwater management will need to cater for diversion of runoff in some areas or prevent accumulation of standing water in others.

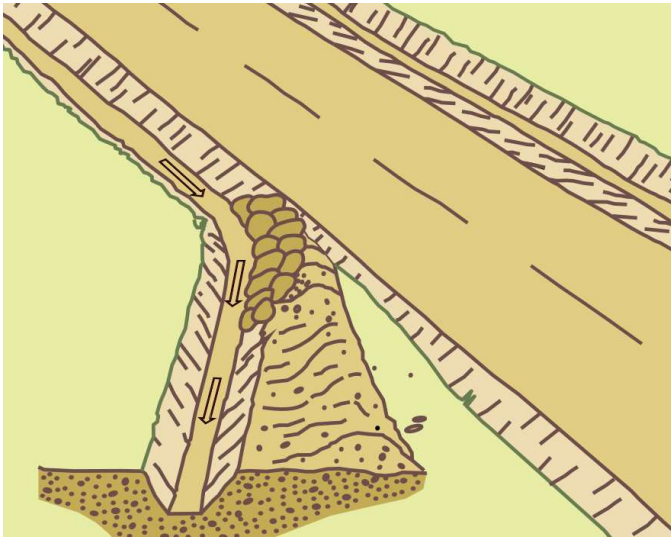
In areas of sensitive vegetation, watercourses and near wetlands, special care must be taken to minimize the impact of construction activities.

High rates of infiltration are not expected which will result in high run-off volumes, coupled to the fact that vegetation is sparse, which will increase run-off rates if not controlled.

3 ROAD CONSTRUCTION AND STORMWATER MANAGEMENT

The site access roads have been designed with a 6 m wide gravelled travelling surface and 2% crossfall across the width of the road. Typically a 450 mm deep side drain is to be constructed on the lower side of the road where required. Mitre drains (or off-shoot drains) lead water from the side drains away to lower lying areas next to the road.

A typical mitre drain is shown in the figure below:



These types of drains must be provided at regular intervals along the roads to disperse accumulated water away from the road. Typical spacing of mitre drains is as per the table below:

Mitre Drain Intervals		
Road gradient (%)	Interval should not exceed (m)	When discharging the water into farmlands
12	40	20 to 50 metres, wherever possible into the boundaries between farmlands
10	80	
8	120	
6	160	
4	200	
1-2	50 if excessive silting may occur	

Steep topography in parts of the site and maximum road gradient specification of 8% above may require some deep cuts and high fills to ensure accessibility for the delivery vehicles to all turbine locations. Banks in cut and fill scenarios should have slopes of minimum 1:2 (V:H) to limit erosion and improve slope stability. In these areas special attention is required to minimize erosion. Storm water drains should be utilised along the tops of high fills to limit runoff down these slopes.

Straw and / or local vegetation (mulch) produced during the clearing phase as stabilization is proposed for all the disturbed construction areas. This limits wind and (to a limited extent) water erosion and promotes quick re-growth.

Stone pitching and gabions and further methods allowed for steep slopes and energy dissipation (where required) to assist in breaking the energy of the water and to limit erosion in the site.

Stormwater pipe crossings are to be installed at low points in the roads to accommodate runoff effectively in areas where construction will interfere with the natural watercourses. For work on the stream crossings bidim geotextile will be utilised on either side of the crossing during construction to prevent excessive levels of silt and any potential contaminants entering the adjacent wetland.

Headwalls and erosion protection should be provided. Please refer to the Roads and Excavation Method Statements in **Appendix C1 & C2** for specific detail.

A proposed typical cross section of the roads is attached as **Appendix A**.

4 TURBINE PLATFORMS AND FOUNDATIONS

Platforms are to be created at each turbine location to facilitate the erection of the turbines. These platforms will be approximately 80 m long and 40 m wide with a maximum slope of 1% in any direction. Turning shunts and laydown areas are also to be provided where required. The final levels of these platforms should be within 1,1 m of the top of the foundation pedestal level to ensure sufficient crane height during the turbine erection process. The platform areas and turning shunts are to be gravelled in a similar way to that of the roads. Side drains with mitre drains should be provided along the edges of these to deal with stormwater runoff in these areas. Erosion protection similar to what is required along the roads should also be provided as and where required. The drainage and erosion protection at these locations are site specific and should best be approved on site by the Engineer. Please refer to Roads, Excavation and Concrete & Blinding Method Statements in **Appendix C1, C2 & C3** for specific detail

A proposed general layout and cross section of the platforms is attached as **Appendix B**.

5 GROUND AND SURFACE WATER CONTAMINATION PREVENTION

Pollution of ground and/or surface water as a result of construction activities should be prevented.

Pollution could result from:

- Contaminated runoff from construction camps, released by accident or otherwise.
- Discharge of contaminated construction water, chemicals, oils, fuels, sewage, runoff from stockpiles, solid waste and general litter.
- Use of paint, cold galvanizing or washing of paint brushes

Runoff from the site camp should be accommodated overland and not be accumulated to promote appropriate infiltration into the soil. All polluted runoff should be contained and treated by providing designated and properly designed and constructed washing areas for all equipment.

This water should be collected to a specific point and treated as hazardous waste. This should not take place in close proximity to any natural watercourses or sensitive areas.

For work on any stream crossings, bidim geotextile will be utilised on either side of the crossing during construction to prevent excessive levels of silt and any potential contaminants entering the adjacent wetland. Please refer to the Roads Method Statement in **Appendix C1** for specific detail.

Ablution facilities should be properly maintained and managed as per the requirements of the Environmental Management Programme (EMPr) and WUL (if authorised).

6 GENERAL EROSION CONTROL

All areas where erosion can occur should be provided with proper erosion protection and/or stabilization methods. Rip-rap, straw / mulch (preferred) stabilization, gabions and stone pitching should be provided where deemed necessary. Frequent monitoring and repairing of erosion prone areas should be undertaken during and after construction.

Topsoil stockpiles should conform to the required height and slope restrictions to reduce the risk of erosion in these areas, as detailed in the EMPr

Preventative measures should be taken to ensure that no material is washed into and/or deposited in watercourses and/or sensitive areas. Mitre drains should be kept clean and free of any solid waste or debris.

7 TRAINING

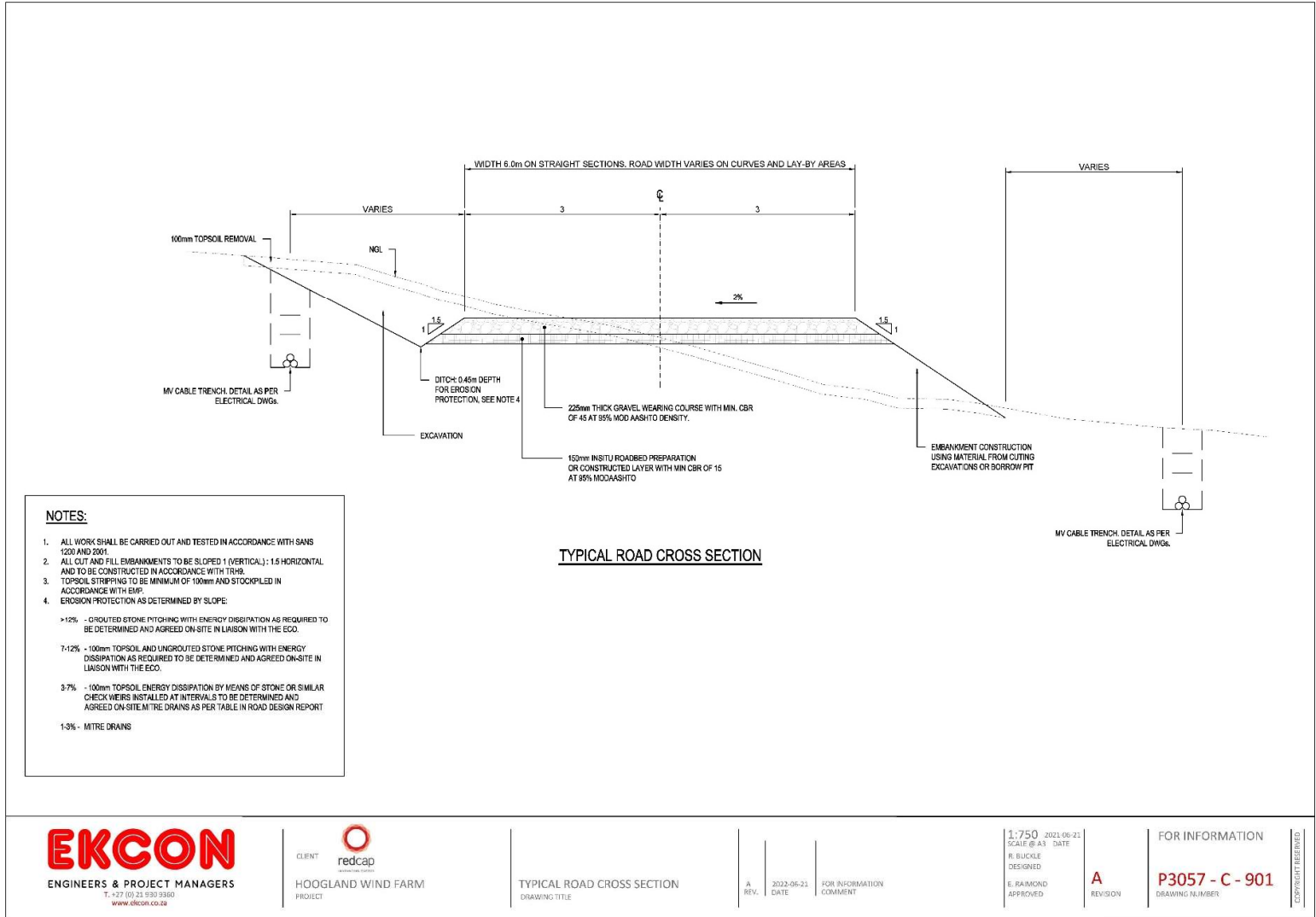
As part of their induction training, all workers on site should be made aware of the importance of stormwater management and the minimization of erosion. This should form part of the environmental awareness training and be included in the induction training material distributed to them.

8 MONITORING AND REPORTING

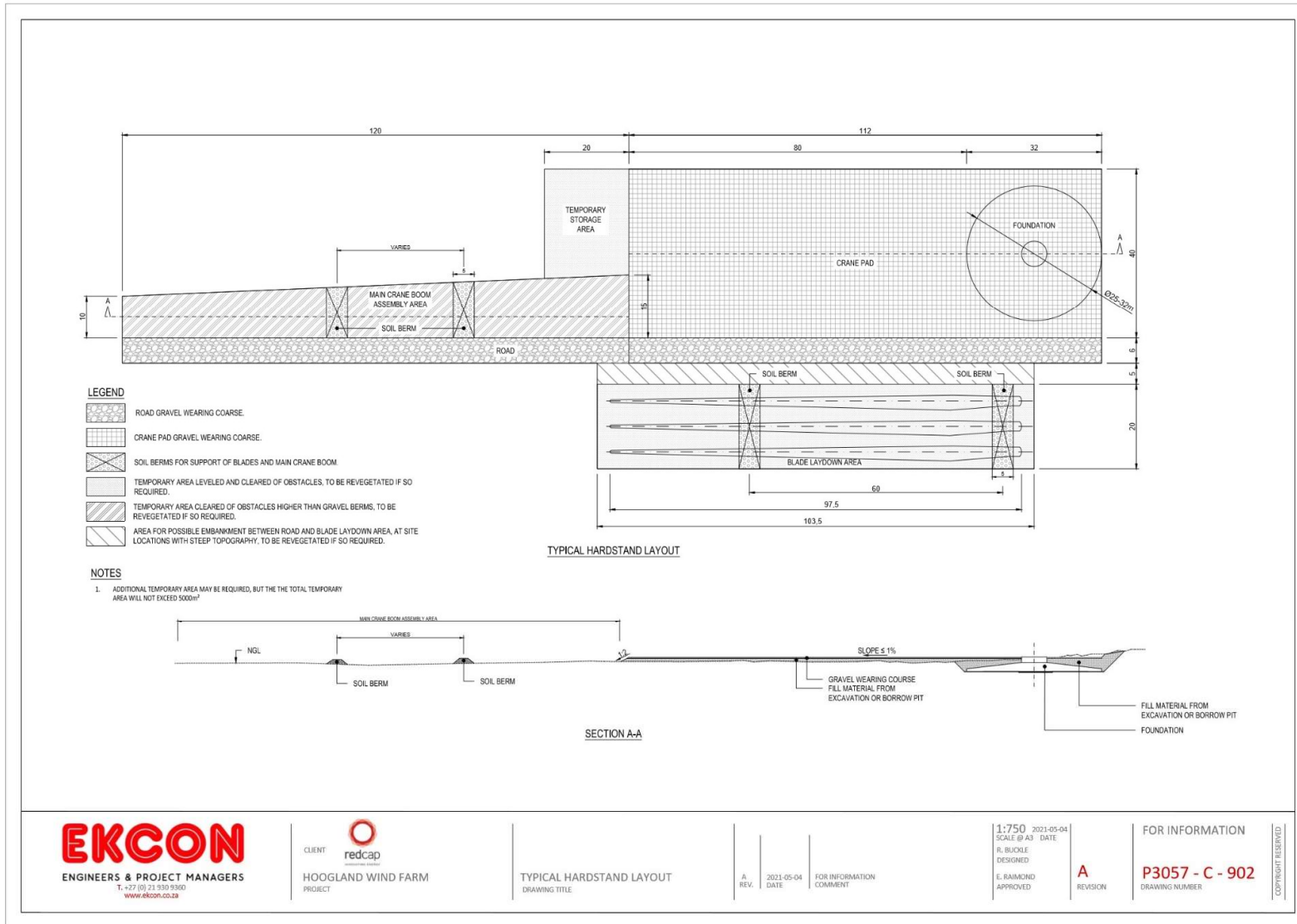
The Environmental Control Officer should monitor the implementation of the stormwater management plan on a daily basis. This includes all stormwater management features such as mitre drains, discharge areas, pipe culverts, water crossing and all erosion protection measures. This should be audited during routine site audits to ensure compliance to the stormwater management plan.

This document may be updated and amended as required during preconstruction, construction and post construction phases.

APPENDIX A – TYPICAL ROAD CROSS SECTION



APPENDIX B – TYPICAL PLATFORM LAYOUT AND CROSS SECTION



APPENDIX C – METHOD STATEMENTS

1. ROADS

DRAFT

Method Statement - Access Road Construction

1. Applicability

This Method Statement covers the construction of Access Routes and Roads necessary for the development, including upgrading and resurfacing of existing roads.

2. Type of construction activity

Excavation, construction and maintenance of access roads to the wind turbines (WTGs), site camp, laydown areas,

3. Timing of Activities

Throughout the construction period

4. Materials to be used

- Top soil
- Suitable in-situ material
- Imported G5/G6 gravel wearing course and G7 selected layer
- Water
- Crushed stone, geotextile materials, wire gabion/reno matress boxes for erosion protection, straw stabilisation, mulch from chipping

5. Equipment and staffing requirements

- TLB's
- excavators
- dumpers
- tippers
- water carts
- graders
- rollers
- compactor
- Drivers
- foreman
- survey staff
- general workers

6. Methodology and or specifications to prevent impacts

6.1 Access Road Specifications

- The roads within the wind farm site will take the routes agreed in the approved final micrositied layout plan.
- The design requirements are for a road capable of carrying large vehicles approximately 70 to 80 m long with axle weights of up to 20t.
- The surface will be an imported and compacted G5/G6 gravel wearing course.
- The roads will not be surfaced but would be designed to standards that ensure control of water and integrity of the road materials with limited maintenance.
- The road width will be increased proportionately for bends and passing/turning places.
- The road alignment and gradients will be set out to fit existing landforms as far as possible and shall be marked out prior to commencement of the works.
- Roadside drains shall have a depth of approximately 450 mm below the edge or roadway and a minimum longitudinal gradient of about 0,5%.
- Settlement ponds and barriers will be provided in and adjacent to the drains to avoid pollution and sedimentation of watercourses.
- Erosion protection will be implemented in disturbed areas with steep gradients to limit ground erosion in these areas.
- Direct drainage from roadside drains into watercourses will be minimized if and where applicable
- Cut-and-fill operations will be designed to achieve a good balance where possible and will be designed to cause the minimum amount of impact to the area.
- Topsoil will be used to dress the slopes and verges if required.

6.2 Existing Road-Track Widening

- Widening will be undertaken in line with National/Provincial/Municipal specifications.
- A walk-over will be conducted and any soft or rutted areas identified and dealt with prior to any large construction plant arriving.
- Sections of road requiring minor widening will be excavated to a suitable formation.
- Several sections of track will require widening in areas with steep cross falls. Areas requiring fill to be placed to comply with longitudinal gradients will be designed to minimise the overall footprint of the embankment.
- Site-won material will be placed and compacted in layers to the required profiles. Areas in cuttings will be designed to cut more into the high side to minimise the impact of the road widening.
- Additional G5/G6 gravel wearing course might be required and will be imported as/when needed

6.3 New Access Track Construction

- The new access road construction will follow the same design principle as the road widening.
- Areas of cut-and-fill will be designed to achieve a suitable balance.
- Track footprints will be designed to cause the minimum of disruption.
- Where the removal of trees is required, the area will be felled according to the Vegetation and Landscaping Plan and in line with standard procedures, and where appropriate, the stumps will be removed. In areas clear of trees the area will be cleared of all vegetation. All topsoil will be stockpiled in windrows along the edges of the roads for use during reinstatement. Material removed from cuttings will be hauled to fill areas where suitable.
- Suitable material from cut or quarry/borrow pit will be spread and compacted in layers to the designed levels. An imported layer of compacted G5/G6 gravel wearing course will be constructed as the surfacing layer.
- Drainage ditches will be provided on either side of the tracks, where and if required, and culverts crossings will be provided if and where necessary to optimize stormwater flow.

6.4. Existing Roads- Stream Crossings

- A walk-over will be conducted and any soft or rutted areas identified and dealt with prior to any large construction plant arriving.
- Activity is to be strictly limited to existing road width. “No Go” demarcations are to be erected on either side of track.
- 1.5 m wide bidim geotextile to be spanned along the length of road on either side to prevent any material entering wetlands/streams.
- Suitable material from cut or quarry/borrow pit will be spread and compacted in layers to the designed levels. An imported layer of compacted G5/G6 gravel wearing course will be constructed as the surfacing layer.
- Bidim geotextile containing trapped material to be carefully removed by hand from site and content disposed of at facility approved by ECO.

6.5 Turbine hardstands

- Areas of cut-and-fill will be designed to achieve a suitable balance.
- Track footprints will be designed to cause the minimum of disruption.
- Where the removal of trees is required, the area will be felled according to the Vegetation and Landscaping Plan and in line with standard procedures, and where appropriate, the stumps will be removed. In areas clear of trees the area will be cleared of all vegetation. All topsoil will be stockpiled in windrows along the edges of the hardstands for use during reinstatement. Material removed from cuttings will be hauled to fill areas where suitable.
- Suitable material from cut or quarry/borrow pit will be spread and compacted in layers to the designed levels. An imported layer of compacted G5/G6 gravel wearing course will be constructed as the surfacing layer.

- Drainage ditches will be provided on either side of the hardstands, where and if required.

6.6 Dust Control

- Refer to specifications in the Dust Control Method Statement.

6.7 Rehabilitation

- Rehabilitation activities will take place in accordance with the Rehabilitation Method Statement.
- Following the completion of the earthworks phase, the edges of the access roads will be top-soiled with topsoil material from site to permit the establishment of vegetation along the side of the track. The vegetation will start to green the edges of the tracks, reducing future scour.
- As the track will have limited use during the operational phase, impact during operational phase will negligible.

7. Compliance

Compliance to the specifications will be monitored by the Environmental Site Officer on a daily basis. Any non-compliance will be reported to the Site Agent and will further be recorded in the daily site environmental diary and reported to the Environmental Control Officer in terms of weekly reporting.

8. Water

All water required (dust suppression, etc.) will be drawn from temporary storage tanks.

9. Emergency or disaster incident and reaction procedures

Refer to Emergency Incident Method statement

10. Additional Information

Nil.

2. EXCAVATION

DRAFT

Method Statement – Excavation, Trenching & Backfilling

1. Applicability

This Method Statement covers the excavation requirements for the development of the Hoogland Wind Farms.

2. Type of construction activity

Excavation, construction, installation activities including access roads to the wind turbines (WTGs), site camp, laydown areas, substation and associated infrastructure.

3. Timing of Activities

Throughout the construction period

4. Materials to be used

- Top Soil
- Subsoil
- Stockpiles
- Layerworks
- Borrow material

5. Equipment and staffing requirements

- TLB's
- Excavators
- Dumpers
- Rollers
- Tippers
- Water trucks
- Compactors
- Drivers
- Foreman,
- Survey staff
- General workers

6. Methodology and or specifications to prevent impacts

6.1 Stormwater Management

During construction with a particular focus on excavation the Contractor shall protect areas susceptible to erosion by installing all the necessary temporary and permanent drainage works as soon as possible.

6.2 Clearing and Stockpiling of Topsoil and Vegetation

- Clearing and grubbing of topsoil will be carried out to a depth of approximately 150 mm, where applicable.
- Topsoil will be pushed into stockpiled in windrows adjacent to the particular works activity and maintained for reuse during rehabilitation.
- Topsoil stockpile will be free-draining and protected from erosion.
- Topsoil stockpiles will not exceed 2 m in height.
- Topsoil will not be mixed with other materials, such as building rubble, rock etc.
- Topsoil is to be handled twice only – once during clearing and stockpiling and once during rehabilitation
- The stockpiles shall be monitored, and dampened when necessary to control dust.
- No driving of vehicles on the topsoil stockpiles will be permitted.
- No blanket clearing of vegetation will permitted.
- All “no go” areas will be avoided as not to disturb the existing vegetation/natural features.

6.3 Earthworks/Roadworks

- On completion of the removal of the topsoil, the existing material shall be excavated to boxcut level.
- Material will be excavated using an excavator which will be operated by a competent person and transported with trucks to the stockpile areas on site.
- Layerworks will then be imported and tipped within the roadway.
- Road layers will be processed using a grader, and will be operated by a competent operator.

6.4 Trenching

- The trenches shall be excavated by an excavator.
- Topsoil and subsoils will be placed separately
- The excavated material will be placed one side of the trench.
- The same side of the trench will be utilized for access to the trench for materials.
- Once the construction is completed the trenches shall be backfilled utilizing the excavated material.
- Excess material shall be removed and spoiled at approved site.
- Dimensions of trench are typically 1 m deep and 0.6 m wide
- Trenching to occur only within existing road over stream crossings
- Trenching over any stream crossings to be supervised by ECO
- Ensure trench is demarcated, signed and safe if left unattended

6.5. Backfilling

- Backfilling to commence once cable has been installed, inspected and signed off by client.
- Ensure the trench is free from any objects that can cause damage to the cable or equipment.
- Install bedding soil and spread evenly across the trench

- Install blanket soil and spread soil evenly across cable. Care must be taken not to damage the cable.
- Install first layer of backfill. Spread evenly and stamp down
- Install danger warning tape according to specifications and drawing
- Install remainder of backfill and ensure it is spread evenly.
- Compact backfill at layers of approximately 300 mm
- Install topsoil and make good the area of excavation
- All unsuitable backfill material to be removed to approved spoil site

7. Water

Any water requirements to be supplied from temporary storage tanks on site.

8. Rehabilitation

Refer to Rehabilitation Method Statement.

9. Compliance

Compliance to the specifications will be monitored by the Environmental Site Officer on a daily basis. Any non-compliance will be reported to the Site Agent and will further be recorded in the daily site environmental diary and reported to the Environmental Control Officer in terms of weekly reporting.

10. Emergency or disaster incident and reaction procedures

Refer to Emergency Incident Method Statement.

11. Additional Information

Nil.

3. CONCRETE & BLINDING

DRAFT

Method Statement – Concrete & Blinding

1. Introduction

This Method Statement covers the procedures of structural concrete and blinding activities for the WTG foundation for the development of the Hoogland Wind Farms. This method statement must be updated prior to the commencement of the relevant construction activities.

The proposed construction activities will in general consists of the following:

- Concrete Pumping
- Formwork
- Placing of Concrete

2. Applicable Specifications and Standards

- Environmental Management Programme
- Environmental Authorization
- ISO 14001
- SABS 1200
- Waste Management Plan
- Emergency Procedure Plan

3. Timing of Activities

Throughout the construction period

4. Resources

- Supplier Concrete Trucks
- Flow master PC 709 D Static pump with all its pipes
- Stationery planet Booms
- Water
- Poker vibrators - Electrical vibrating equipment
- Generator with drip tray
- Light stands. (Night Work if needed)
- Small power tools
- Drip trays
- Spill kits

5. Identification of activities and resultant impacts that may result from the activity

Activity	Impacts
----------	---------

Concrete, fuel and oil spillages	Contamination of surface water features, erosion, siltation, increased turbidity
Hazardous substance handling	Health hazard to workers

6. Plant inspection and operator training

All plant will be inspected as per safety procedures prior to the start of the work. Operator medical and competency certificates from an approved training institution must be provided prior to the start of the work.

7. Methodology and or specifications to prevent impacts

7.1. Structural Concrete

Concrete Pumping

- The approved ready mix concrete from our supplier will be delivered to the specific WTG foundation of the day.
- A concrete boom pump will be used to distribute the pump mix in to the structure to ensure proper distribution of the product throughout the base.

Formwork

- Type 1 & Type 2 Steel shutters will be installed according to their design.

Placing of Concrete

- The delivery of concrete will be continuous and of suitable design to allow for pumping as well as ease of passage through the rebar.
- High frequency electrical vibrator equipment of sufficient quantity will be used to compact concrete.
- Temporary false forms will be will installed for level control on the slopes.
- Concrete placed on slopes will be placed from the bottom to the top to avoid concrete shearing from slipping.
- Concrete will be struck off using conventional rake floats and possible power floats.
- Sufficient standby equipment will be available during the proposed poor dates.
- Heat of hydration will be monitored by means of thermocouples' in the concrete.
- Special thermal blankets will be placed for 7 days after initial set to control the heat of hydration
- Thermal blankets will also assist with the curing of the concrete

7.2 Blinding

Preparation for concrete blinding

- All loose material present should be removed by means of a broom.
- If required by the Engineer water can be sprayed on the surface to suppress dust prior to activity.
- Once approval for blinding is given (after inspection by the Geotechnical Engineer) the operation may commence.

Formwork

- Dimensions of the area of blinding will be controlled by means of flexi steel shutter sections at the appropriate height.

Placing Blinding

- Blinding will be discharged directly at designated area.
- The concrete truck will reverse down the constructed ramp and discharged its contents starting from the furthest point.
- The concrete will be compacted using the appropriate vibrating equipment.
- Concrete will be struck off using conventional rake floats and possible power floats.
- Finishing and curing of concrete will occur as per specification.

8. Training Requirements

Induction Training

- All personnel relevant to the operation will be inducted and the methodology will be discussed. Task planners to be signed

Specific Training

- The relevant personnel will receive training on the different small plant which will be used during the operation.

Safety Toolbox

- All employees relating to the activity shall be made aware of the possible risks that may occur during the operation as per approved Risk Assessment.
- A circle meet will be held with all the responsible parties prior to the operation.

9. Water

- All water required (batching, etc.) will be drawn from temporary storage tanks.

10. Control of Substances Hazardous to Health

The goal is to identify possible risks and implement a safe system by means of developing a standard safety procedure for this specific operation. Site specific risk assessments identify the potential hazards, associated risks and mitigating controls relating to casting of concrete will be compiled. Staff will be trained on the content of this risk assessment prior to the commencement of the activity and records are retained on site.

In addition to risk assessment training, all employees will receive site specific Site, health, safety and environmental induction prior to commencement of work.

All employees will be issued and be required to use the necessary PPE as determined by the activity risk assessment for example Eye protection, Safety Harnesses if required, Gumboots, Hard hats and Plastic Gloves.

Standard Procedures

- A checker will control the movement of the all ready mix trucks supplying the concrete pump.
- Employees working on heights are required to wear a harness.
- All employees working at heights should be cleared medically.
- The relevant PPE will be worn at all times.
- Base stations will be present at the relevant WTG foundations. This should include a toilet, first aid kit, drinking water, smoking area and communication radio.
- Concrete mixer trucks will deliver and discharged the ready mix concrete.
- Shutter oil will be stored in clearly marked containers.
- Diesel will be transported in diesel bowser / drip trays to be used when filling plant.
- All concrete spills will be cleaned and returned to the concrete batch plant and placed in the designated waste area
- Shutter oil spills to be cleaned using spill kits
- Diesel spills to be cleaned using spill kits
- Ready Mix trucks to be cleaned or washed out at designated cleaning area

11. Emergency Procedures

Refer to Emergency Response Method Statement and Health and Safety Management Plan

Emergency Incidence Avoidance

- Environmental awareness induction will be given to all employees
- Only trained personnel will handle dangerous substances and goods
- All dangerous goods will be stored in secure areas

Spillages

In the event that a spill occurs on site, the following immediate action will be taken to limit the amount of spill by isolating and controlling/stopping the source.

- Appropriate actions will be undertaken to prevent/contain contamination of ecologically sensitive area.
- The spill will be contained by applying absorbent material and, in the case of spillage to a watercourse, by the use of booms.
- A spill kit which contains absorbent pads, bags, etc. will be carried on every refueling vehicle.
- All spills should be treated with a matter of urgency.
- In the event of an oil spillage contaminated soil must be removed and stored in a skip dedicated to hazardous waste. The soil will then be disposed of at a registered hazard waste disposal site by the appointed waste disposal service provider.
- The Site Agent, ESO and ECO will be informed of the incident as soon as possible and a spill/incident report will be made out.

12. Compliance Monitoring and Record Keeping

The tasks carried out during that day will be summarised in the daily diary and sent to the Site Agent for approval.

Awareness to this method statement will be established through training sessions at the beginning of each day and keeping of attendance registers.

Concrete will be checked and signed off by the Resident Engineer on completion.

Equipment necessary to test the concrete quality will be available at the site laboratory. Results from the concrete supplier will thus be verified.

Delivery notes from the supplier will be kept at the site office for record keeping.

Compliance to the specifications will be monitored by the Environmental Site Officer on a daily basis. Any non-compliance will be reported to the Site Agent and will further be recorded in the daily site environmental diary and reported to the Environmental Control Officer in terms of weekly reporting.

APPENDIX L: EROSION MANAGEMENT PLAN

HOOGLAND 1 WIND FARM EROSION MANAGEMENT PLAN



PRODUCED FOR RED CAP HOOGLAND 1 (PTY) LTD

August 2022

PURPOSE

The purpose of the Hoogland 1 Wind Farm erosion management plan is to implement avoidance and mitigation measures to reduce the erosion potential and the likely impact of erosion associated with the construction and operational phases of the proposed development. As part of the management plan, measures to protect hydrological features from erosion damage are included.

SCOPE & LIMITATIONS

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

RELEVANT ASPECTS OF THE SITE

The study area is characterised by generally undulating topography with local ridges and scattered koppies formed due to the presence of erosion-resistant rocks. Steep, cliff-like ground runs east-west through Hoogland 2 tapering into Hoogland 1. Shallow sloping ground is present between the ridges and koppies with the slope of the ground steepening near and at the positive topographic features.

Northward-draining ephemeral streams occur in several areas in Hoogland 1 Wind Farm and these are commonly fed during periods of rainfall from a local dendritic array of streamlets, but local trellis-type drainage patterns are also present.

The project is situated at approximately 1 400 to 1 500 meters above sea level (mamsl).

The land type data shows the dominant soils to be shallow soils with low to medium agricultural sensitivity on underlying rock or hard-pan carbonate.

BACKGROUND

Types of Erosion

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

Raindrop impact

This is the erosion that occurs due to the “bomb blast” effect of raindrop impact. Soil particles can be blasted more than a meter into the air. Apart from loosening soil particles, the effect can also break soil aggregates apart and form a clay seal on the surface which resists infiltration and results in increased levels of runoff. This effect is most important when large areas of exposed soils are present. If the site is cleared, then this effect will play an important role as it results in the soil surface becoming sealed which reduces infiltration and increases runoff, leading to erosion.

Sheet erosion

This is the removal of a shallow and uniform layer of soil from the surface. It is caused initially by raindrop splash and then by runoff. Sheet erosion is often difficult to see as no perceptible channels are formed. Accumulated sediment at the bottom of the slope is often the only indicator. This is likely to be an important erosion type at the site given the gently sloping nature of the site and the susceptible soils.

Rill erosion

This is the removal of soil from the surface whereby small channels or rills up to 300mm are formed. It is caused by runoff concentrating into depressions, wheel tracks etc. This type of erosion usually occurs on lower slopes and at the site, it is likely to occur on the deeper soils which occur towards the drainage line which forms the southern boundary of the site.

Gully erosion

This is the removal of soil from the surface and sub-surface caused by concentrated runoff eroding channels greater than 300mm deep. Gully erosion often begins as rill erosion which is not addressed. As with rill erosion, the southern boundary of the site is likely to pose the greatest risk for gully erosion.

Wind erosion

Wind erosion results from soil particles being picked up, bounced or moved by the wind. Wind erosion is primarily a problem in arid areas and may affect sands soils as well as fine-textured soils.

Vegetation cover is usually an effective barrier to wind erosion, but large soils losses or degradation can occur in disturbed areas or on croplands. Given the high clay fraction in the soils at the site, it is not likely that wind erosion will be a significant influence at the site, except perhaps in disturbed areas where there is exposed soil.

Erosion at the site

Given the slope and other characteristics of the site, the major types of erosion likely to be apparent at the site are sheet erosion and rill erosion, which if unchecked would lead to gully erosion.

Promoting Factors

Rainfall characteristics

High-intensity, short-duration storm events have much greater erosion potential than low intensity, longer duration storm events with the same runoff volume. Intense storms produce larger raindrops, and are more likely to break up the soil and dislodge particles. Rainfall for the site is ~300mm per year with a high degree of variability and with rainfall distributed throughout the year.

Soil erodibility

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

Length and steepness of slope

Steeper slopes cause runoff flow velocities to increase, resulting in increased erosion. As the slope length increases the opportunity for runoff to concentrate and achieve an erosive velocity also increases. Given the steep slopes in parts of the site, there is opportunity for flow from different sources to accumulate and increase in erosive power.

Soil surface cover

Soil surface cover such as vegetation and mulch protect the soil surface from raindrop impact, reduce flow velocity, disperse flow, and promote infiltration and the deposition of sediment. This is a basic principle underlying many erosion-control approaches which aim to modify the surface characteristics in order to reduce the flow velocity and reduce the potential for erosion. In this regard it is important to note that many of the practices which are used to enhance rehabilitation potential are also useful in reducing erosion potential.

EROSION AND SEDIMENT CONTROL PRINCIPLES

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

- Protect the land surface from erosion.
- Intercept and safely direct run-on water from undisturbed upslope areas without allowing it to cause erosion within the site or become contaminated with sediment.
- Progressively revegetate or stabilise disturbed areas.
- Prevent damage to hydrological features such as drainage lines or wetlands, either within or adjacent to the site.

These goals can be achieved by applying the following principles:

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

ON-SITE EROSION MANAGEMENT

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

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

- Soil loss will be greater during wet periods than dry periods. Intense rainfall events outside of the wet season, such as occasional unseasonal showers can also however cause significant soil loss. Therefore, precautions to prevent erosion should be present throughout the year.
- Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilization. Therefore, the gap between construction activities and rehabilitation should be minimized. Allied to this the fact that topsoil does not store well and should preferably be used

within a month or at most within 3 months to aid in the revegetation and rehabilitation of disturbed areas.

- Phased construction and progressive rehabilitation are important elements of the erosion control strategy.
- The extent of disturbance will influence the risk and consequences of erosion. Therefore, large areas should not be cleared at a time, especially in areas such as slopes where the risk of erosion is higher.

SPECIFIC RECOMMENDATIONS TO REDUCE EROSION POTENTIAL AND DEGRADATION OF WETLANDS AND DRAINAGE SYSTEMS

The construction of access roads, other infrastructure as well as cable trenching may impinge on wetlands and drainage systems and thus precautions should be taken in these situations to reduce their potential impact.

Concentration of flows into downstream areas

- Road crossings over drainage lines, streams and wetlands can impact downstream ecosystems. Crossings that result in narrowing of the downstream system can concentrate flows and channel water downstream. This may result in a loss of wetland function, and result in the drying out and shrinkage of the wetland area. Erosion and increased vulnerability to invasion of drier banks by alien vegetation may occur.
- Culverts should be adequately spaced such that they do not result in shrinkage of downstream wetlands. Where roads cross minor drainage channels, a single culvert may be adequate, aligned with the downstream drainage line. Where more substantial wetland systems are intercepted by a road, sufficient culverts should be provided such that downstream shrinkage of wetland width does not occur. Moreover, culverts should be aligned, as far impossible, with existing, natural channels.
- All crossings of drainage systems should ensure that both surface and shallow subsurface flows can be accommodated where appropriate and that unnatural channelisation does not occur downstream.

Runoff concentration

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

- Runoff from road surfaces is usually channeled off of the road surface towards the downslope side of the road. On steep slopes, the volumes and velocity of runoff generated may result in

erosion of the surrounding areas. Therefore, specific measures to curb the speed of runoff water is usually required in such areas, such as rock beds or even gabions. In addition, these areas should be monitored for at least a year after construction to ensure that erosion is not being initiated in the receiving areas. Once erosion on steep slopes has been initiated, it can be very difficult to arrest.

Diversion of flows

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

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

MONITORING REQUIREMENTS

Construction Phase

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

Monitoring Action	Indicator	Time frame
Identify all river and drainage line crossings affected by the development	Map of sites of potential concern	Preconstruction
Monitor cleared areas for erosion problems	Record of monitoring site, problems encountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events otherwise.
Monitor vegetation clearing activities near sensitive areas such as wetlands or drainage lines	Activity log of monitoring actions and any mitigation and avoidance measures implemented	Monthly during the rainy season and following significant rainfall events otherwise.
Monitor revegetated and stabilised areas	Record of monitoring site, problems encountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events otherwise.

Operational Phase

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

Monitoring Action	Indicator	Time frame
Monitor for the development of new erosion problems across the site, with a focus on areas where water has been diverted or collected from upslope onto downslope areas	Map of erosion problem areas	Bi-Annually for first 5 years after construction and annually thereafter.
Document erosion control measures implemented	Records of control measures and their success rate.	Bi-Annually for first 5 years after construction and annually thereafter.
Document the extent of erosion at the site and the remedial actions implemented	Decline in erosion and vulnerable bare areas over time	Bi-Annually for first 5 years after construction and annually thereafter.

APPENDIX M: NOISE MANAGEMENT PLAN

HOOGLAND WIND FARMS

HOOGLAND NORTHERN WIND FARMS: NOISE MONITORING PLAN

(extracted from Enviro Acoustic Research's Noise Impact Assessment, 2022)

Environmental Noise Monitoring can be divided into two distinct categories, namely:

- Passive monitoring – the registering of any complaints (reasonable and valid) regarding noise; and
- Active monitoring – the measurement of noise levels at identified locations.

While the total projected noise levels may be less than 45 dBA (with the recommended mitigation measures), the projected noise levels will exceed the rural rating levels, with the projected noise level exceeding 42 dBA (at NSR18 and 19). In addition, should a reasonable and valid noise complaint be registered, the holder of the EA should investigate the noise complaint as per the guidelines below. These guidelines should be used as a rough guideline as site specific conditions may require that the monitoring locations, frequency or procedure be adapted.

1 MEASUREMENT LOCALITIES AND FREQUENCY

Once-off noise measurements are recommended at the location of Noise Sensitive Receptors (NSRs) 18 (Remainder of Farm 6 Slangfontein on Hoogland 1) and 19 (Portion 1 of Farm 5 – Duikerfontein (Midlands) on Hoogland 1) before the construction phase starts, to establish the existing ambient sound levels.

Once the wind farm is operational, noise measurements should be repeated to assess the noise levels at these receptors. The procedures are described in the sub-section below. Should there be a noise complaint, once-off noise measurements must be conducted at the location of the person that registered a valid and reasonable noise complaint (NSR staying within 2 000 m from construction, operational or decommissioning activities). The measurement location should consider the direct surroundings to ensure that other sound sources cannot influence the reading.

2 MEASUREMENT PROCEDURES

Ambient sound measurements should be collected as defined in SANS 10103:2008, though measurements in terms of ETSU-R97 are highly recommended. Due to the variability that naturally occurs in sound levels at most locations, it is recommended that semi-continuous measurements are conducted over a period of at least 120 hours, covering at least five night-time (22:00 – 06:00) periods. When a noise complaint is being investigated, measurements should be collected during a period or in conditions similar to when the receptor experienced the disturbing noise event.

APPENDIX N: TRAFFIC MANAGEMENT PLAN

RED CAP ENERGY

HOOGLAND NORTHERN WIND FARM CLUSTER

PROJECT TRAFFIC MANAGEMENT PLAN



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1 INTRODUCTION

1.1 GENERAL

A Traffic Management Plan (TMP) for roadwork sites provide a means of planning and implementing how all likely road users will be safely and efficiently guided through a roadworks site and ensure the network performance is not unduly impacted, for the duration of the works.

Road users are not limited to motorists - they include construction personnel, pedestrians, cyclists and emergency vehicles. Management of work on roads requires consideration of all road user needs and obligations and attention should not focus just on the management of vehicular traffic through, past or around the work site.

Traffic Management is the management of occupational safety and network performance risks associated with work activities undertaken in a traffic environment. Risk management and the elements of the risk management process form the basis of this guideline. TMPs are prepared in advance of the works being conducted and should be subject to reviewing and/or auditing before and after implementation.

A traffic management plan is a “living document” and needs to be continually reviewed and updated as operational requirements and site conditions change, all changes to the document will be communicated to all affected parties.

*This document has been prepared for exclusive use on the Hoogland Northern Wind Farms project. **This document forms the platform from which the Contractor shall, together with all other relevant site-specific documents, develop the necessary traffic management plan for the various works to be undertaken.***

The successful implementation of a TMP requires time, effort, common sense and a lot of commitment by the contract management team.

1.2 PURPOSE AND OBJECTIVES

This TMP is an overarching document covering proposals to be adopted for the accommodation of traffic and the management of construction transport/traffic during construction works of this development.

The purpose of this management plan is to ensure the safety of construction personnel, the general public, pedestrians and traffic, by undertaking the following:

- *Provide, maintain and update an effective TMPs.*
- *Meet the requirements of the client and project site.*
- *Ensure traffic is accommodated for optimal flow and safety during the construction phase of this project.*
- *Aim to achieve zero incidents.*
- *Aim to achieve zero environmental incidents.*
- *Define clear tasks, authorities and responsibilities with regard to the control of hazards.*
- *Ensure compliance with legal and other project site requirements.*
- *Keep traffic delays to a minimum.*
- *Maintain satisfactory property access.*
- *Minimise disruption to businesses.*
- *Minimise disturbance to the environment.*

- *Provide accessibility to Emergency Rescue Vehicles*

The overall objectives of the plan are to ensure that optimal and safe flow of traffic is maintained during construction, and to reduce road accidents during all the phases of the project and to minimize personal exposure and property damage. It must be noted that this plan is a living document and will be updated when necessary and in particular during construction to reflect new developments on the project.

This document should be developed in conjunction with the South African Road Traffic Signs Manuals (Volume 1 to 5), together with all other relevant site-specific documents.

The Contractor responsible for all construction activities which interacts, in any way with traffic on private or public roads shall be required to compile and submit to the Client for acceptance, a detailed TMP for each area work is to be undertaken, which includes but is not limited to the following:

- *Working at intersections on public road network, i.e., at the entrances of the developments;*
- *Detours of the public road network, i.e., when the public road needs to be realigned;*
- *When stringing cables over public roads;*
- *Road construction on the development itself;*
- *Management of the traffic within the development.*

2 PROJECT DESCRIPTION

2.1 SITE LOCATION

Red Cap Energy (Pty) Ltd aims to develop four Wind Farms north of Beaufort West within the Central Karoo District Municipality of the Western Cape. The proposed wind farms are the Hoogland Wind Farm 1 and Hoogland 2 Wind Farm, constituting the Northern Cluster, and Hoogland 3 Wind Farm and Hoogland 4 Wind Farm, constituting the Southern Cluster. Collectively referred to as the Hoogland Wind Farms.

The Northern Cluster is approximately 80 km north of Beaufort West and about 20 km south of Loxton. Land use of the site and surrounding properties comprise of low-density livestock farming (grazing). The total area of the Northern Cluster is in the order of approximately 34 000 ha.

The proposed wind farms straddle the TR05801 (R381) (North South orientation), DR02315 (East West orientation), and the OP08880 (Eastern extension of the DR02315). The road network of the public roads in this area is shown in [Figure 1](#).

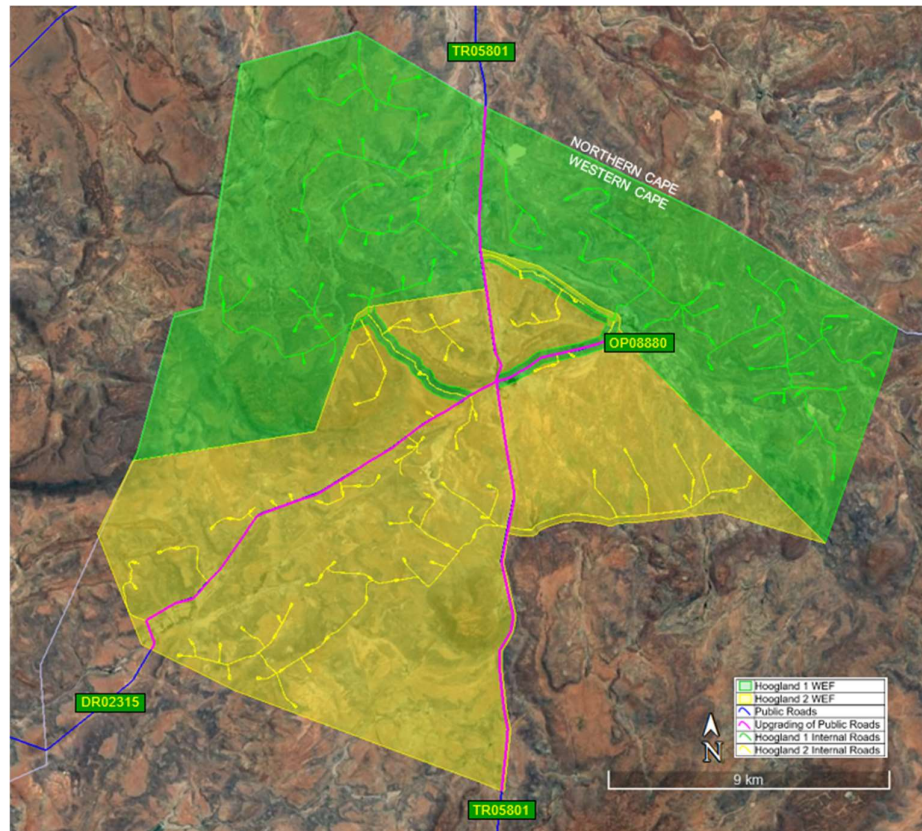


Figure 1 - Site Location

2.2 EXTENT OF THE WORKS

The temporary road works on the public road network associated with this development, include;

- upgrading of the entrances from the public road network to Hoogland 1 and Hoogland 2 Wind Farms;
- upgrading of the public roads TR05801, DR02315, and OP08880, within the boundaries of the developments, which could include, but not limited to, road realignment, watercourse crossings, stringing of transmission cables over roads, etc.;
- upgrading various sections of the public road network and intersection for the delivery of abnormal loads.

The construction of roads, platforms, terraces, laydown areas, on the construction site are on private property and shall also be subjected to the requirements of this TMP.

2.3 SPECIFICATIONS FOR TMP

The Contractor is to submit a detailed TMP to the Engineer for approval, for each area where the relevant works is to be undertaken.

Specifications will be strictly in accordance with the South African Road Traffic Signs Manual Volume 2, Chapter 13 and in accordance with the relevant specifications of the contract documents, specific sections of the contract document relating to Traffic Accommodation.

The Contractor must ensure that provision is made for access by emergency vehicles, at all times.

2.4 STATUTORY REQUIREMENTS

Traffic management is risk management and the principals, employers and persons in control of workplaces have a statutory duty under the Occupational Health and Safety Act, and Mine Health and Safety Act; to identify hazards, assess risks and consider means to mitigate the risk exposure.

Due to the size of the components to be delivered to site, it is envisaged that these loads will be classified as abnormal loads in terms of the Road Traffic Act (Act No 29 of 1989). Thus, the necessary permit will have to be obtained from the relevant authority, in advance. All vehicles must comply with the Administrative Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads.

Legal and other provisions

The current versions of the following documents and legislative provisions apply to those planning to conduct work within the road reserve of any public road, or to manage traffic for an event:

- *National Road Traffic Act (Act No 93 of 1996),*
- *Local Government: Municipal Systems Act (Act 32 of 2000),*
- *Occupational Health and Safety Act (Act 85 of 1993),*
- *Mine Health and Safety Act (Act 29 of 1996),*
- *Compensation for Occupational Diseases Act (Act 130 of 1993), and*
- *NEMA (Act 107 of 1998).*

3 TRAFFIC MANAGEMENT

As each roadwork site is unique, individual TMPs are required for each site and may also be required for individual work activities during the term of the works (Note: for some routine/repetitive type works a generic TMP may be appropriate). It needs to be remembered that the TMP is a Risk Management Plan and consists of:

- *Documentation of the risk assessment for the project and the procedures and practices that will be utilised to manage the risk exposure. Importantly, the risk assessment process should be undertaken as the first step in the preparation of a TMP and the outcomes from the risk assessment used to develop appropriate strategies for managing and mitigating risks.*
- *Traffic control diagrams (TCD's) which outline signage and devices and their placement. TCD's should be drawn clearly and unambiguously indicate all traffic controls required for each and every stage of the works.*

Traffic management measures are to be adopted at road works. In order to have efficient and safe site operations, a systematic break-down of a site into standardized sub-components is necessary. This will allow the Site Construction Manager to understand the traffic operation on the site. These sub-components could be hundreds of meters in length at major sites, or a few meters in length at localized sites. These standardized sub-components are discussed in detail below.

3.1 WARNING AREA

An area of the construction site, in this case a portion of the road, which is utilized to alert motorists of any impending temporary conditions that will require particular care other than what would normally be expected.

When the construction site is on or directly adjacent to a road, a stepped reduction in speed will inevitably be required within this area. This stepped reduction should occur

in 20 km/h decrements and at reasonable intervals (minimum 200 meters) until the speed for which the traffic control is designed is indicated. This final speed limit should be repeated at least once within the area of the traffic accommodation as good practice.

The length of the advance warning area should relate directly to measured approach speeds, and a reasonable distance must be allowed for speed reduction. In situations of high traffic volumes, a generous length will be required as more time is needed to take in the sign message and to react accordingly. The advance warning area will become longer in the event of a combination of higher approach speeds and high traffic volumes.

3.2 TRANSITION AREA

This is the area in which the motorist is required to take an action.

This area of the construction site can be defined as where there is a shift of position on the roadway without a reduction in the number of lanes (diversion), the merge of two lanes into one (lane drop), or crossing of the central median (crossover), or entering a detour that is completely separate from the construction works.

The transition area must be clearly demarcated using delineator plates and should conform to the layout, if any, depicted on the guidance signs preceding it. In more complex road works, these should be broken down into a number of standard transition areas. Care should be taken that no signage for subsequent transition conditions is included within a specific transition area. The length of a transition area will depend on the approach speed of traffic and the amount of shift in alignment involved by the transition.

3.3 STABILISING AREA

The purpose of a stabilising area is to allow traffic flow to stabilise after negotiating a transition area, and before reaching another change of condition. In the instance of where more than one transition area is required to achieve the final traffic configuration, the signing of subsequent transitions should be located within the stabilising area(s). The stabilising area is normally defined by delineator plates.

3.4 BUFFER ZONE

The buffer zone is normally located between a transition area and the actual work area. In a situation involving more than one transition area, the buffer zone will occur after the transition area closest to the work area. The buffer zone can be relatively short, but should be a minimum of 50 meters.

The principal function of a buffer zone is to separate traffic from the workers at the site in the interests of worker safety. The provision of a longitudinal buffer zone, together with a lateral buffer zone, should be considered as fundamental to effective worker safety.

3.5 WORK AREA

The work area can be adequately defined by delineators in less complex conditions. However, where there is a risk to traffic or workers for vehicles entering the work area, temporary barriers of a standard sufficient to prevent vehicle penetration should be put in place. In the event that traffic is located well away from the work area, then little action is required along the length of the work area other than to protect the workers and construction vehicles. All work directly adjacent to the road shall be adequately barricaded to provide protection to the Contractor's personnel.

3.6 TERMINATION AREA

This area involves the return of traffic to normal flow conditions. For simple cases, a relatively short taper or delineator signs will suffice. In more complex situations, a reverse crossover may be required. This should follow the same principles given for such conditions at the commencement of the construction works.

4 RESPONSIBILITIES

This section outlines the responsibilities of the key construction personnel with regarding to the TMP, to ensure the safety of construction personnel and the road users that pass through the work areas. The roles defined below will need to be amended, as applicable, to suit the Contractors construction organogram for the project.

4.1 SITE CONSTRUCTION MANAGER

The Site Construction Manager shall be ultimately responsible for the TMP and its compliance with the Road Traffic Act. The Site Construction Manager will ensure that the TMP is suitably resourced with people, equipment, facilities and systems and be responsible for the co-ordination of the engineering, procurement and construction activities, relevant policies, methods and the implementation of the TMP. The Site Construction Manager shall

- *ensure that all rules and procedures defined in the TMP are adhered to.*
- *encourage sound work practices and avoid those that are off a high-risk nature.*
- *ensure all employees comply with the TMP.*

4.2 PROJECT ENGINEER

The Project Engineer is responsible for the development of the Traffic Management Plan for all elements of the project.

4.3 SITE SUPERVISORS

The Supervisors will continuously liaise with the Developer and the Health, Safety, Environment and Quality (HSEQ) department during the construction phase to ensure the required equipment are in place, and are safe to use.

4.4 HSE OFFICER

The Health, Safety and Environment (HSE) Officer will be responsible for all issues related to health, safety and environment and to see that employees conform to the requirements as laid down by the South African Occupational Health and Safety and Environmental Acts, and/or those acts applicable to South Africa.

4.5 TRAFFIC SAFETY OFFICER

The Contractor shall appoint a suitably trained and experienced person as the project Traffic Safety Officer (TSO). The TSO will be the responsible person for the arrangements and maintenance of all accommodation of traffic measures required for the duration of the contract. The TSO will liaise daily with the Project Engineer in order to maintain acceptance of the traffic arrangements.

The traffic safety officer will perform the following duties:

- *responsible for ensuring that temporary traffic accommodation measures on site meet requirements during the time that there is Traffic Accommodation on site,*

- *compile and maintain a daily record of traffic signs installed and the traffic sign sequences during the execution of the contract,*
- *control traffic safety to ensure the safe movement of personnel, visitors and plant on site including the wearing of high visibility clothing, the operation of amber flashing lights, and the display and cleanliness of "construction vehicle" signs*
- *responsible for keeping all road signs, barriers and delineators clean and visible at all times,*
- *maintain a daily traffic management site diary,*
- *undertake at least 2 daily inspections,*
- *submit layout diagrams to the Project Engineer detailing location of half-width/shoulder closures, signage, barriers, etc.,*
- *train flagmen and laborers, and/or arrange for external SETA-approved training, as required,*
- *ensure the road is clear at the end of each day of work,*
- *determine provisions for breakdown assistance and emergency response on site*
- *compile records of traffic accidents which are in any way connected with construction activities,*
- *handle complaints from stakeholders with regard to traffic safety and report on such matters to the Project Engineer,*
- *ensure that all road signs, barricades, delineators, flagmen and speed controls are maintained, clean and effective and that courtesy is extended to vehicles and pedestrians at all times, and*
- *ensure that traffic and pedestrian management requirements, layouts, diagrams and drawings will be available on-site as a source of reference and to assist with daily inspections and enforcement.*

4.6 STOP/GO TRAFFIC CONTROLLERS

The Contractor shall appoint traffic controllers who are suitably qualified and trained, and shall

- *control traffic at control points,*
- *maintain contact with the opposite Stop/Go controller,*
- *ensure smooth flow of traffic, and*
- *ensure no danger to construction personnel or pedestrians.*

4.7 FLAG PERSONS

The primary function of a Flag Person is to guide the flow of traffic (general public vehicles, loaders, dozers, trucks, excavators, etc.) safely and expeditiously through or around work areas or where traffic lanes are intermittently blocked. Flag Persons play an imperative role in the awareness of road users and therefore must always be observant of the traffic flow. A Flag Person needs to be constantly vigilant and aware of their surroundings. The use of cell phones by Flag Persons whilst on duty is strictly forbidden. Failing to comply with this procedure will result in disciplinary action.

The duties of a Flag Person shall include, inter alia

- *responsible for ensuring approaching traffic is clearly warned of the restrictions/change in environment,*
- *Flag Persons will be deployed individually and will take up positions on the shoulder of the road being controlled and with sufficient lateral clearance to*

ensure their safety and eliminate the possibility of being struck by passing vehicles, and

- *Flag Persons will never be permitted to stand in a live lane. Those found doing so will face disciplinary action and may be removed from the site. This will constitute a near miss under the health and safety system on site.*

5 RECOMMENDED MITIGATION MEASURES

5.1 GENERAL SAFETY MEASURES

Traffic management during construction and operation is essential. To address potential risks, the following measures are recommended:

- *Impose and enforce speed limits of all vehicles operating on internal routes, taking into account any other specialist recommendations in the EMPr.*
- *All employees and Contractors are required to wear the appropriate Personal Protective Equipment (PPE) for their areas of operation.*
- *Establishment of safe sight distances, including within construction areas and construction camp sites.*
- *Prepare a detailed plan for signage around the construction areas to facilitate traffic movement, provide directions to various components of the works, and provide safety advice and warnings.*
- *Provide details regarding maximum permissible vehicular speeds on each section of the site.*
- *Plan to move as far as possible heavy, wide or slow-moving loads at times when traffic volume on the roads concerned is at its lowest.*
- *Employ haulage vehicles, which are suitable in all respects for the intended purpose, and are not overloaded.*
- *Regularly inspect the access roads conditions and, whenever necessary, repair damages related to construction traffic.*
- *Personnel authorised to the construction areas shall be briefed on traffic regulations applicable to the construction areas.*
- *Provide training and undertake testing of heavy equipment operators and drivers, including vision tests, with records kept of all training.*
- *Create traffic awareness to the local people and inform parents to keep children from exposing themselves to traffic in the construction area.*
- *Maintain records of all accidents involving project vehicles and implement a traffic complaint and corrective action procedure.*
- *Define operation times for various construction activities on the public road networks, taking into account any other specialist recommendations in the EMPr.*

5.2 CONSTRUCTION VEHICLE MAINTENANCE AND SAFETY

The following mitigation measures are recommended in terms of vehicle safety standards:

- *All vehicles shall be road worthy and licensed.*
- *Vehicles shall be subject to daily inspections.*
- *The name of the company employing the workers should be visibly placed on the vehicle.*
- *Smoking inside the vehicle is prohibited as clearly stated by “No Smoking” signs.*

- A contact number should be clearly placed on the vehicle for remarks and complaints.
- Vehicles should be driven according to the speed signs on the road.
- All the seats should have safety belts.
- All vehicles are to be fitted with a first aid kit with easy access. The kit should be placed in a visible place.
- All vehicles are to be fitted with one fire extinguisher of at least 5 kg each, placed at the back of the vehicle.
- All other requirements for construction vehicles shall be complied with in terms of the project specifications of the contract document.

5.3 TYRE SELECTION AND REPLACEMENT

The life of tyres depends to a large extent on the manner in which the vehicle is driven. Excessive speed, braking or acceleration will cause tyres to deteriorate. If tyres are repeatedly driven against kerbs or large stones the walls of these tyres gradually weaken. Similarly, if tyres are not maintained at the manufacturer's recommended pressures, accelerated wear will occur. All tyres should be regularly checked and evidence of inspections available if requested.

All tyres should be maintained as per the manufacturer's specifications and/or recommendations. Each driver is responsible for daily checks of tyres conditions. Daily check sheets are to be completed and recorded, and worn tyres are to be reported immediately following the inspection.

5.4 MONITORING

The following guidelines are to be followed for completing daily/weekly checks.

Daily

- Check tyres visually.
- Ensure that all lights, indicators, and flashing lights are operating correctly. It is an offence to drive if vehicle lights are not functioning properly.
- Ensure horn and reverse horn (if applicable) is operating correctly.
- Ensure that the vehicle has sufficient fuel.
- Clean the windscreen, all windows, mirrors, headlamps and all other light lenses.
- Check the engine oil level daily and before setting out on a long journey.

Weekly

- Check and correct the tyre pressure and tread wear including the spare wheel. Keep to the pressures recommended in the manufacturer's handbook.
- Check the battery. Keep the terminals clean and ensure that all connections are secure.
- Check the radiator water - anti-freeze mixture level weekly and/or before setting out on a long journey.
- Top up the windscreen washer reservoir at least once a week. Check the action of the windscreen wipers and the condition of the wiper blades at the same time.
- Check the clutch fluid and brake fluid reservoirs (where fitted).

General Service and Maintenance

- Preventative maintenance through inspection and regular servicing can reduce the defect rate and help improve reliability. It is, therefore, important that all vehicles are properly maintained.

- *Vehicles must be serviced in line with the manufacturer's recommendations. These are outlined in the service book, which accompanies each vehicle.*

Seat Belts

- *All seats in vehicles shall be fitted with seat belts.*
- *The operability of all seat belts shall be checked on a daily basis.*
- *The wearing of seat belts is compulsory and is the responsibility of the driver.*

Drivers

- *All escort and light vehicle drivers must meet the national driving requirements and hold a valid driving license for the type and class of vehicle being driven or operated.*
- *The heavy-duty drivers must meet the national driving requirements and hold a valid driving license for the heavy-duty vehicles being driven or operated.*
- *Each driver is responsible for the condition of their own vehicle (fines/penalties and bans will be administered internally).*
- *Drivers must meet the minimum national driving standards and any additional project or site requirements must be followed and adhered to.*

5.5 VIOLATIONS AND ACCIDENTS

The aim of reporting and investigating incidents is to determine the cause and prevent reoccurrence. It is the responsibility of all employees and Contractors to report accidents, incidents and near misses at any place of work to their immediate Site Manager/Supervisor or Foreman. It is then the duty of that Manager/Supervisor or Foreman to ensure that appropriate entries are made in the Accident Book and, at the earliest opportunity, to inform the construction manager of the incident and, where applicable, the client's representative. It is the responsibility of the construction manager to initially investigate incidents or delegate the responsibility for such investigation to another competent person. If the incident is major or there is a fatality, then the Regional HSQE Department shall also be involved. It is the responsibility of the construction manager to ensure that recommendations arising from investigations are implemented.

6 EMERGENCY PLANNING

Contact details of emergency services will be conveyed to all necessary personnel, thus ensuring that in the event of an incident occurring, the necessary service/s are informed immediately. Provision will be made to ensure that in the event of an incident occurring, access to the site will be available and accessible to emergency services to travel through the site where the incident occurred.

Table 1 provides a list of contact numbers for emergency services in the vicinity of the site. At the commencement of the contract, the Contractor shall confirm the contact numbers and jurisdiction of the services, since both Loxton and Victoria West fall within the Northern Cape, while the construction site falls within the Western Cape.

Table 1 - Emergency Numbers

Name	Beaufort West	Loxton	Victoria West
Ambulance Services	10177		053 621 0196 10177 or 1022
Community Response			
Disaster Management	023 449 1000 023 414 4467		
Department of Roads Infrastructure Services	Mr Koopman 023 449 1000 andre@skdm.co.za		
Eskom			
ER24	084 124		
Fire Department	023 414 8176		10177
Hospitals	023 414 8200		053 621 0610
Police Services	10111 023 414 8800		10111 053 621 2000
Municipality	023 414 8100	053 381 3091 083 384 8223	053 621 0026
Netcare 911	082 911		
Snake/Scorpion/Spider Bite Hotline	021 931 6129		
Traffic Department (local)	023 414 3409		
Traffic Department (provincial)			

7 REVIEW OF THIS PLAN

The Contractor must, on a regular basis, monitor the effectiveness of traffic management during the contract against the specifications in the approved traffic management plan, and initiate appropriate amendments/corrective measures should they be required. To this end, the local road authorities will be involved in regular discussions with the Engineer and Contractor to continuously improve the Traffic Management Plan, so as to minimise travel delays to the public, maintain a safe traffic way and minimise the risk of pedestrian/motor vehicle accidents.

APPENDIX O: FIRE MANAGEMENT PLAN

Hoogland North Wind Farms

Fire Management Plan

August 2022

Background & Context

The National Veld and Forest Fires Act states that it is the landowner's responsibility to ensure that the appropriate equipment as well as trained personnel are available to combat fires. While fires are not a regular occurrence within the Hoogland North Wind Farms sites, fires may occasionally occur because of lightning strikes, electrical shorts or inadvertent runaway fires of human origin. In addition, fuel load is to some degree dependent on recent climatic conditions and fire risk may increase significantly following exceptionally wet summers, whereas in most years, there is insufficient fuel load to carry a fire for any extended distance. Although the presence of personnel on the wind farm and some of the infrastructure present would function to increase fire risk due to anthropogenic causes, the wind farm also reduces the risk of fires spreading due to the turbine access roads which represent effective barriers to most fires and also provide effective access to the area for fire-fighting.

The purpose of the Hoogland North Wind Farms Fire Management Plan is to:

- Minimise the risk of anthropogenic fires within the wind farm.
- Ensure that adequate measures are taken to reduce the risk of fire starting from project infrastructure.
- Ensure that adequate equipment is available to combat fires when they occur and ensure that there are staff present with the appropriate training to use such equipment safely and effectively.

The requirement risk management and mitigation measures are outlined below, for the construction and operational phases of the development.

Construction

- a) No burning of waste will be permitted on site.
- b) Suitable precautions will be taken when working with welding or grinding equipment near potential sources of combustion.
- c) All staff on site will be made aware of general fire prevention and control methods, and the name of the responsible person to be alerted to the presence of a fire.
- d) Have on site fire-fighting equipment and ensure that designated personnel are educated how to use it and the procedures to be followed in the event of a fire.
- e) Identify the relevant authorities and structures responsible for fighting fires in the area if present, and shall liaise with them regarding procedures should a fire commence.
- f) Ensure that all the necessary telephone numbers etc. are posted at conspicuous and

relevant locations in the event of an emergency.

- g) Should a contractor be found responsible for the outbreak of a fire, he shall be liable for any associated costs.
- h) No open fires shall be allowed on site for the purpose of cooking or warmth. Bona fide braai fires (such braai fires shall be limited to the traditional "month end" braais and not individual daily cooking fires) may be lit within the construction camp or site.
- i) The Contractor shall take all reasonable steps to prevent the accidental occurrence or spread of fire. The Contractor shall appoint a fire officer who shall be responsible for ensuring immediate and appropriate action in the event of a fire. The Contractor shall ensure that all site personnel are aware of the procedure to be followed in the event of a fire. The appointed fire officer shall notify the Fire and Emergency Services in the event of a fire and shall not delay doing so until such time as the fire is beyond his / her control.
- j) The Contractor shall ensure that there is basic fire-fighting equipment on site at all times. This equipment shall include fire extinguishers and beaters. The Contractor shall pay the costs incurred by organizations called to put out fires started by himself/herself, his/her staff or any sub-contractor. The Contractor shall also pay the costs incurred to reinstate burnt areas as deemed necessary by the RE.
- k) Any work that requires the use of fire may only take place at that designated area and as approved by the RE. Fire-fighting equipment shall be available in these areas.
- l) The Contractor shall ensure that the telephone number of the local Fire and Emergency Service are displayed at the site offices.

The Contractor is to ascertain the fire requirements and shall submit a fire contingency plan Method Statement to the ECO.

Operation

Extensive firebreaks are not recommended as a fire risk management strategy at the site. The aridity of the site and the low vegetation cover means that fires are not a common occurrence and firebreaks would generate more negative impact through erosion risk than warranted by the fire risk reduction they would entail. Rather targeted risk management should be implemented around vulnerable or sensitive elements of the facility such as substations or other high-risk components, that are vulnerable to fires themselves or which pose a potential ignition source risk. Within such areas, the extent over which management action needs to be applied is relatively limited and it is recommended that firebreaks are created by mowing/brush-cutting and that burning to create firebreaks is not used as this in itself poses a risk of runaway fires. Where such firebreaks need to be built such as around substations, guard stations and other sensitive areas, a strip of vegetation 5 - 10 m wide can be cleared manually and maintained relatively free of vegetation through manual clearing on an annual basis. However, if alien species colonise these areas, more regular clearing should be implemented.

The following actions and activities are recommended for the operational phase:

Any requirements of the local Fire Protection Association must be adhered to in consultation with the relevant landowners as per the requirements of the National Veld and Forest Firelegislation which may include:

- a) Formation of a Fire Protection Association (FPA);
- b) Duty to prepare and maintain firebreaks;
- c) Requirements for firebreaks;
- d) Readiness for fire-fighting;
- e) Actions to fight fires.
- f) Cleared firebreaks are to be positioned and prepared in such a way as to cause the least disturbance to soil and biodiversity. Firebreaks should be largely free from combustible material, e.g. prunings and leaf litter. The removed material should be removed from the site or used in rehabilitation efforts to combat erosion or encourage revegetation in low-risk areas away from infrastructure.
- g) Ensure fire-fighting equipment is maintained and in good working order before the start of each fire season.
- h) Smoking outside of designated safe areas must not be permitted. Flicking of cigarette butts into adjacent vegetation must not be permitted.
- i) Suitable signage must be provided on site, including entrance warning of fire risk and warnings not to flick cigarette butts into vegetated areas.

APPENDIX P: BESS DESIGN MITIGATION

AFRICAN OFFICES

South Africa

CAPE TOWN

T: +27 21 461 1118

JOHANNESBURG

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Namibia

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