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Appendix C:
Environmental Mangagement Programme

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

PROPOSED BOTTERBLOM WIND ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE ON THE REMAINDER OF THE FARM SOUS 226, NEAR LOERIESFONTEIN IN THE NORTHERN CAPE

March 2022

NAME OF APPLICANT: FE Botterblom (Pty) Ltd

PREPARED BY: Enviro-Insight CC

PROJECT DETAILS

REPORT TITLE:	PROPOSED BOTTERBLOM WIND ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE ON THE REMAINDER OF THE FARM SOUS 226, NEAR LOERIESFONTEIN IN THE NORTHERN CAPE
REPORT STATUS:	DRAFT ENVIRONMENTAL IMPACT REPORT
DEA REFERENCE NO.:	14/12/16/3/3/2/2098
APPLICANT:	FE BOTTERBLOM PTY LTD
EAP:	ENVIRO-INSIGHT CC CORNÉ NIEMANDT PR.SCI.NAT. IAIASA MEMBER
EAP:	ENVIRON-INSIGHT CC RONELL KUPPEN BSC (HONORS) GEOGRAPHY
DATE	MARCH 2022

When referenced this report should be cited as: Enviro-Insight CC. (2022). Draft Environmental Management Programme for Botterblom Wind Energy Facility, Loeriesfontein, Northern Cape.

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ABBREVIATIONS

BID	Background Information Document
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIR	Environmental Impact Report
EMFs	Environmental Management Framework
EMPr	Environmental Management Programme
ESA	Ecological Support Area
GIS	Geographical Information System
GNR	Government Notice Regulation
ha	Hectare
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IUCN	International Union for Conservation of Nature
NEM: BA	National Environment Management: Biodiversity Act (Act 10 of 2004)
NEM: WMA	National Environmental Management: Waste Management Act (Act No. 59 of 2008)
NEMA	National Environmental Management Act (Act 107 of 1998) (as amended)

NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NWA	National Water Act
PPP	Public Participation Process
SACNASP	South African Council for Natural Scientific Professions
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SDP	Spatial Development Plan
SCC	Species of Conservation Concern

DEFINITIONS AND TERMINOLOGY

Activity: means an activity identified in any notice published by the Minister or MEC in terms of section 24D(1)(a) of the NEMA as a listed activity or specified activity

Alternatives: in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to the—

(a) property on which or location where the activity is proposed to be undertaken;

(b) type of activity to be undertaken;

(c) design or layout of the activity;

(d) technology to be used in the activity; or

(e) operational aspects of the activity;

and includes the option of not implementing the activity;

Application: an application for an environmental authorisation in terms of Chapter 4 of the EIA Regulations (2014 as amended).

Biodiversity: Variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems.

Cumulative impact: in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

Development: the building, erection, construction or establishment of a facility, structure or infrastructure, including associated earthworks or borrow pits, that is necessary for the undertaking of a listed or specified activity, but excludes any modification, alteration or expansion of such a facility, structure or infrastructure, including associated earthworks or borrow pits, and excluding the redevelopment of the same facility in the same location, with the same capacity and footprint.

Development footprint: any evidence of physical alteration as a result of the undertaking of any activity.

Environmental authorisation: The Competent Authority's grant or denial of permission to undertake the proposed activity. Previously referred to as the Record of Decision (RoD).

EAP: an environmental assessment practitioner as defined in section 1 of the NEMA.

EMPr: an environmental management programme contemplated in regulation 23 of the EIA Regulations (2014 as amended).

Environmental Impact Assessment: a systematic process of identifying, assessing and reporting environmental impacts associated with an activity and includes basic assessment and S&EIR.

Mitigation: to anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible.

Registered interested and affected party: in relation to an application, means an interested and affected party whose name is recorded in the register opened for that application in terms of regulation 42 of the EIA Regulations (2014 as amended).

Significant Impact: an impact that may have a notable effect on one or more aspects of the environment or may result in noncompliance with accepted environmental quality standards, thresholds or targets and is determined through rating the positive and negative effects of an impact on the environment based on criteria such as duration, magnitude, intensity and probability of occurrence.

Specialist*:* a person that is generally recognised within the scientific community as having the capability of undertaking, in conformance with generally recognised scientific principles, specialist studies or preparing specialist reports, including due diligence studies and socio-economic studies. A specialist needs to be professionally registered (e.g. with the South African Council for Natural Scientific Professions).

1 INTRODUCTION

FE Botterblom (Pty) Ltd (hereafter the Applicant) is proposing the development of a wind energy facility (WEF) and associated infrastructure on a site located approximately 53 kilometers (km) north of Loeriesfontein in the Northern Cape province of South Africa. The proposed development, to be known as Botterblom WEF, will have a generation capacity of up to 240MW which will feed into the National Grid. Enviro-Insight CC (hereafter Enviro-Insight) has been appointed to undertake the requisite environmental impact assessment (EIA) process for the WEF as required in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA), as amended, on behalf of the Applicant.

The proposed study area for the WEF development is located approximately 53km north of Loeriesfontein, 85 km west of Brandvlei and 160 km southeast of Springbok in the Northern Cape. The site can be reached via unsurfaced Granaatboskolk / Zout Dwaggas Road, which branches off the R357. The Botterblom WEF footprint is approximately 5 736 hectares (ha) and will be located on a Portion of the Remainder of the Farm Sous 226 (21-digit Surveyor General code: C01500000000022600000) The Khobab WEF is located directly north while Loeriesfontein2 WEF is located north-east of the study area.

The Botterblom WEF will consist of up to 35 wind turbines, with a generation capacity of between 4.5 and 7.5 MW per turbine, depending on the available technology at the time. Each turbine will have a hub height of up to 150m and a rotor diameter of up to 175m. The final turbine model to be utilised will only be determined closer to the time of construction, depending on the technology available at the time. Additional ancillary infrastructure to the WEF would include underground and above-ground cabling between project components, onsite substation/s, Battery Energy Storage Systems (BESS), foundations to support turbine towers, internal/ access roads (up to 10 m in width) linking the wind turbines and other infrastructure on the site, and permanent workshop area and office for control, maintenance and storage. As far as possible, existing roads will be utilised and upgraded (where needed) with the relevant stormwater infrastructure and gates constructed as required. The perimeter of the proposed WEF may be enclosed with suitable fencing. A formal laydown area for the construction period, containing a temporary maintenance and storage building along with a guard cabin will also be established.

Additionally, a power line with a capacity of up to 132kV is required. At this stage, options are still being considered for either the construction of a new line to feed into the Helios substation or connect with existing lines. This associated electrical infrastructure will require a separate Environmental Authorisation and is being conducted as a part of a separate Basic Assessment (BA) process. More details will be provided in the Final Environmental Impact Assessment Report (FEIAr).

1.1 APPLICANT DETAILS

Table 1-1: Applicant Contact Details

Applicant	FE BOTTERBLOM PTY LTD
Contact Person	Ralf Grass
Address	60 Hennie Winterbach Street Panorama Western Cape 7500
Telephone	+27 21 013 3614
Email	ralf.grass@energyteam.co.za / millard.kotze@genesis-eco.com

1.2 PROJECT TEAM

1.2.1 Environmental Assessment Practitioner (EAP)

Client has appointed Enviro-Insight CC as an independent Environmental Assessment Practitioner (EAP) to undertake an environmental authorisation process for the proposed Botterblom WEF. Enviro-Insight CC has no vested interest in the proposed project and hereby declares its independence as required by the EIA Regulations (2014, as amended). For purposes of this report, the following person may be contacted at Enviro-Insight CC:

Table 1-2: Enviro-Insight contact details

Company	Enviro-Insight CC
Contact Person	Corné Niemandt / Ronell Kuppen
Purpose	Project consultant and EAP
Address:	Unit 8 Oppidraai Office Park, 862 Wapadrand Road, Wapadrand Security Village, Pretoria, 0081
Telephone:	012 807 0637
Email:	corne@enviro-insight.co.za / ronell@enviro-insight.co.za

1.2.1.1 Qualifications and Memberships (Appendix F)

Mr. Niemandt holds a *M.Sc.* degree in Plant Science from the University of Pretoria (2015) and is registered as a professional scientist (*Pr.Sci.Nat.*) with the South African Council for Natural Scientific Professions (SACNASP) and is a member of the International Association for Impact Assessment South Africa (IAIAsa).

Ms. Kuppen has an BSc (Honours) degree in Geography, with approximately 10 years' experience in the environmental consulting field, ranging from EIA's, WULAS and Public Participation.

1.2.1.2 Summary of past experience (Appendix F)

Mr. Niemandt has over five years' experience as an environmental consultant, compiling and managing several environmental authorisation reports, including Environmental Management Programmes (EMPr), rehabilitation plans and environmental auditing. This included fieldwork, data collection, preparation of permits and licensing studies, compliance monitoring and community engagement, and project managing interdisciplinary teams and contractors. In addition, he has also compiled over 45 terrestrial biodiversity reports in South Africa. Mr. Niemandt has operated in several African countries, including South Africa, Mozambique, Tanzania and Liberia.

Ms. Kuppen has approximately 10 years' experience in the environmental consulting field, ranging from EIA's, WULAS and Public Participation and ECO's

1.2.2 Specialists

Specialist studies is being undertaken to address the key issues that require further investigation to address the impacts of the development on the receiving environment. The specialist studies involve the gathering of data relevant to identifying and assessing impacts that may occur as a result of the proposed project. The specialists will also recommend appropriate mitigation or optimisation measures to minimise potential negative impacts or enhance potential benefits, respectively.

Enviro-Insight has selected a team of highly experienced specialists in order to execute this in a professional and impartial manner. The project team, specifically the sub-consultants, is indicated in

Table 1-3: EIA Project Team.

Specialist Assessment	Company	Professional Specialist
Terrestrial Biodiversity and Sensitive Animal Species	Enviro-Insight CC	Sam Laurence Luke Verburgt
Sensitive Plant Species	Enviro-Insight CC	Corné Niemandt
Heritage Impact Assessment and Palaeontological Impact Assessment	Beyond Heritage	Jaco van der Walt Ruan van der Merwe Prof Marion Bamford
Noise Compliance Statement and Screening Noise Report	Enviro Acoustic Research (EARES)	M.de Jager Johan Maré
Site Sensitivity verification and Agricultural Compliance Statement	Johann Lanz Soil Scientist	Johann Lanz

Aquatic Specialist Biodiversity, Wetland and Riparian Assessment	WaterMakers	Willem Lubbe Bryon Grant
Social Impact Assessment	Wat se Horak Pty Ltd Trading as HCV Africa	Stephen George Horak
Transport Impact Assessment	Innovative Transport Solutions (ITS)	Christoff Krogscheepers, Pr. Eng Pieter Arangie Tarshia Williams
Visual Assessment	LOGIS	Lourens du Plessis
Avifauna Assessment	Enviro-Insight CC	Samuel Laurence
Bat Impact Assessment	Enviro-Insight CC	Low de Vries Luke Verburgt Alex Rebelo Sam Laurence

Neither Enviro-Insight nor any of its sub-consultants are subsidiaries of *FE Botterblom Pty Ltd,* nor is *FE Botterblom Pty Ltd* a subsidiary to Enviro-Insight. Enviro-Insight, its sub-consulting specialists, do not have any interests in secondary or downstream developments that may arise out of the authorisation of the proposed project.

1.3 OBJECTIVES OF THE ENVIRONMENTAL MANAGEMENT PROGRAME

The objective of the EMPr is to provide measures to mitigate and manage construction, operation and decommissioning activities in order to minimize potential negative impacts on the surrounding environment. This is achieved by:

- Assigning environmental impact mitigation responsibilities to key personnel,
- Developing specific action plans designed to ensure mitigation,
- Managing and auditing the specified action plans, and
- Managing stakeholder involvement.

Integrated Environmental Management Principles (IEM) have been used as a foundation for the development of this EMPr and must be strictly applied during its implementation. The EMPr serves as a standalone document to be disseminated to and used by the contractors and other stakeholders involved in the construction phase.

1.3.1 Assigned responsibility

In order for the EMPr to be effectively implemented the following professional inputs will be required:

- Applicant – Responsible for the following:
  - Ensuring that the engineer and contractors comply with the approved EMPr.
  - Ensuring compliance with the provisions for duty of care and remediation of damage in accordance with section 28 of the National Environmental Management Act (NEMA), (No. 107 of 1998) and its obligations regarding the control of emergency incidents in terms of Section 30 of NEMA.
  - Notifying GDARD of any incident as defined in subsection 30(1)(a) of NEMA.
- Project Manager – Responsible for the following:
  - Appointing the appropriately qualified contractor to co-ordinate, supervise and expedite different action plans.
  - Ensuring adherence to the GDARD's conditions of authorization and any other laws and standards relevant to the construction of the facility.
  - Ensuring all elements of the work undertaken are properly and competently directed, guided and executed at appointed stages of the project.
  - Ensuring the adherence to statutory safety, health and environment (SHE) standards and ensuring the construction activities comply with the EMPr.
  - Monitoring the site on a daily basis to ensure compliance.
  - Overall responsibility and accountability for the site during the construction phase.
  - Avoiding and / or mitigating adverse impacts on the environment by the appropriate design and construction.
  - Ensuring transparency in their operation and environmental management of the site.
  - Managing the contractor's compliance and ensure documentation management.
  - Ensuring that the contractor has a copy of the EMPr and all agreed Method Statements.
- Contractors - Responsible for the following:
  - Managing and operating their activities with due care and diligence.
  - Complying with all elements of the EMPr.
  - Ensuring that stakeholder interest is reported to the ECO.
  - Maintaining relevant documentation for review by the ECO.
- ECO - (Environmental Control Officer) is responsible for the following:
  - Determining the conformance of the site with the EMPr criteria and compliance with the conditions of the EMPr.
  - Liaising with the GDARD and I&APs, if required.
  - Identification of possible areas of improvement during construction.
  - Undertaking on-going monitoring of the construction site through regular site visits and record key findings. This includes photographic monitoring of the construction site. The frequency of these visits will be determined by the progress and complexity of the project.

- Advising the Project Manager and the contractors on environmental matters during the construction phase of the development.
- Monitoring implementation of the EMPr by the contractor.
- Advising the project manager on environmental impacts and provide appropriate recommendations to address and rectify these matters.
- Ensuring that the conditions stipulated in the EA and any other laws and standards relevant to the construction are being complied with.

1.3.2 Names and Telephone Numbers of Contact Persons

NAME	DESIGNATION	ORGANISATION	CONTACT NUMBER
	Applicant	FE BOTTERBLOM PTY LTD	+27 21 013 3614
Corné Niemandt Ronell Kuppen	**Independent Environmental Practitioner**	Enviro-Insight CC	012 807 0637
	Environmental Control Officer		
	DFFE Compliance	DFFE Official	
	Municipality	Hantam Municipality	027 662 8600
	DWS Official	DWS	012 392 1406
	Fire Department	Silverton Fire Station	027 341 8500
	Emergency Response		10177, 027 341 8029
	Police	SAPS	10111 – General 027 341 1481
	Emergency Spill Response	Abzorbit (24 Hour response)	24 hr Emergency Response 083 269 8790 083 2536618

1.3.3 Compliance

A copy of the EMPr must be available on site at all times. Compliance with all elements of the EMPr must be reviewed on a daily basis by the site engineer and all responsible parties must sign the acceptance letter in Appendix 1. In addition, it must be noted as per the Environment Conservation Act and the National Environmental Management Act No 107 of 1998 (Section 28) offending parties will be held financially accountable for any pollution or environmental damage.

1.3.4 Monitoring

The key to a successful EMPr is appropriate monitoring and review to ensure effective functioning of the EMPr and to identify and implement corrective measures in a timely manner. Monitoring for non-compliance must be done on a daily basis (using attached appendices) by the contractors under the guidance of the Project Manager / Environmental Officer / Engineer. An appropriately timed audit report should be compiled by the independent ECO. Paramount to the reporting of non-conformance

and incidents is that appropriate corrective and preventative action plans are developed and adhered to. Photographic records of all incidents and non-conformances must be retained.

1.3.5 Applicable Legislation

The following environmental legislation must be adhered to:

- Constitution of South Africa (Act No. 108 of 1996)	- Environment Conservation Act (Act No 73 of 1989)
- National Environmental Management Act (Act No 107 of 1998) – NEMA	- National Forests Act (Act No. 84 of 1998)
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004)	- National Environmental Management: Air Quality Act (Act No. 39 of 2004)
- National Heritage Resources Act (Act No 25 of 1999)	- National Water Act (Act No 36 of 1998)
- Hazardous Substances Act (Act No. 15 of 1973)	- Protected species – provincial ordinances
- Occupational Health and Safety Act (Act No 85 of 1993)	- Construction Regulations 2003
- National Standards (SANS10103-2003)	- Gauteng Province Noise Control Regulations-Provincial Notice, 5479 of 1999

1.3.6 Layout of the EMPr

This EMPr is site and impact specific. Sections 1 and 2 are introductory sections whilst Section 3 forms the bulk of the report. Section 3 has been designed so that each element is investigated for the different phases of development (i.e. construction, operation and decommissioning). The layout of this EMPr allows for the users to quickly and efficiently locate and use relevant sections as the need arises, e.g. In the event of a diesel spill on site the contractor can quickly locate and apply Section 3.7 of the EMPr.

2 DESCRIPTION OF THE PROPOSED PROJECT

2.1 NATURE AND EXTENT OF PROPOSED PROJECT

The proposed study area for the WEF development is located approximately 53km north of Loeriesfontein, 85 km west of Brandvlei and 160 km southeast of Springbok in the Northern Cape. The site is located within the Hantam Local Municipality which forms part of the Namakwa District of Northern Cape in South Africa.

The site can be accessed via unsurfaced Granaatboskolk / Zout Dwaggas Road, which branches off the R357 (Figure 2-1). The Botterblom WEF footprint is approximately 5 736 hectares (ha) and will be located on a Portion of the Remainder of the Farm Sous 226 (21-digit Surveyor General code: C01500000000022600000). The Khobab WEF is located directly north while Loeriesfontein2 WEF is located north-east of the study area.

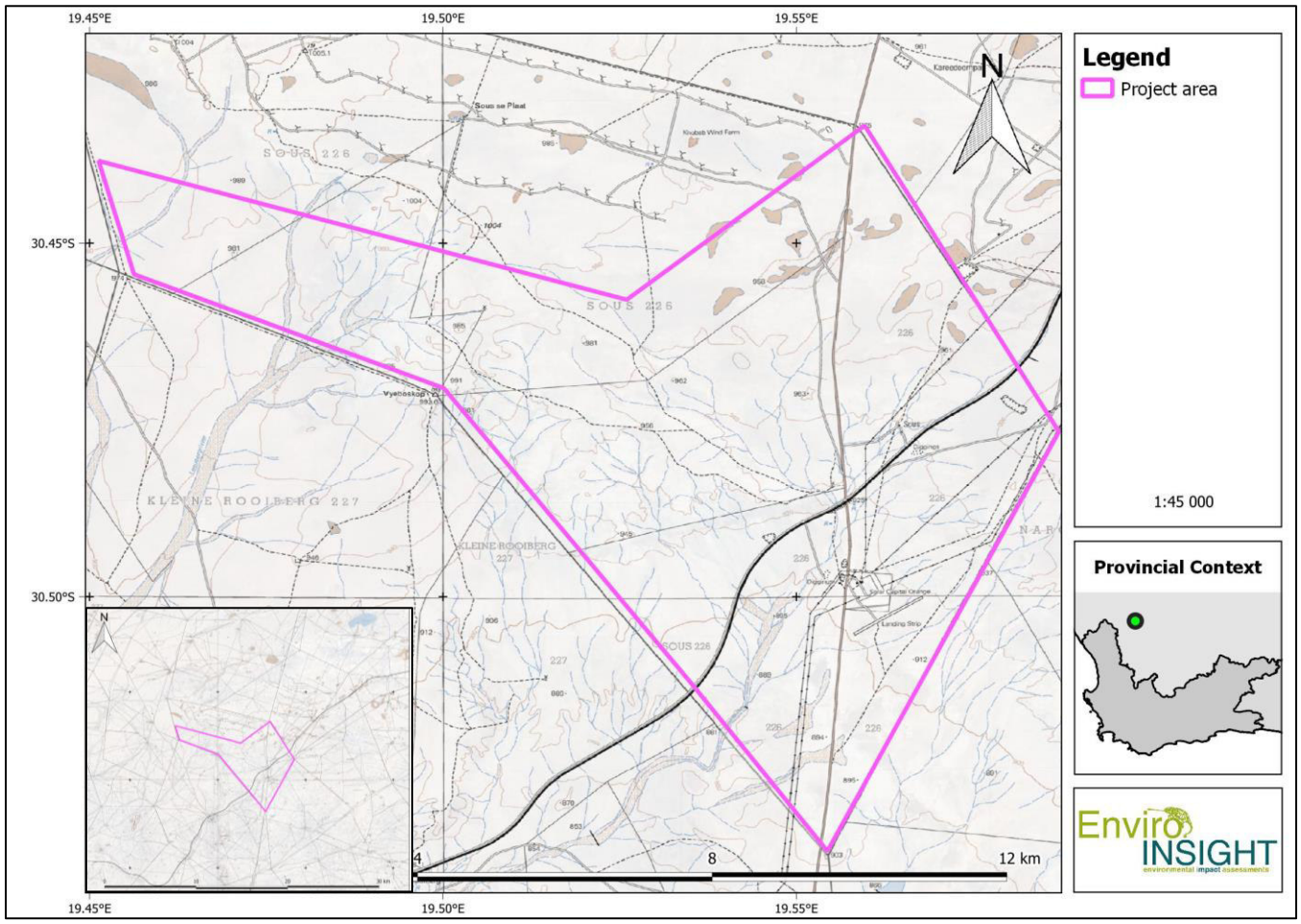

Figure 2-1: Topographical Map of the study area.

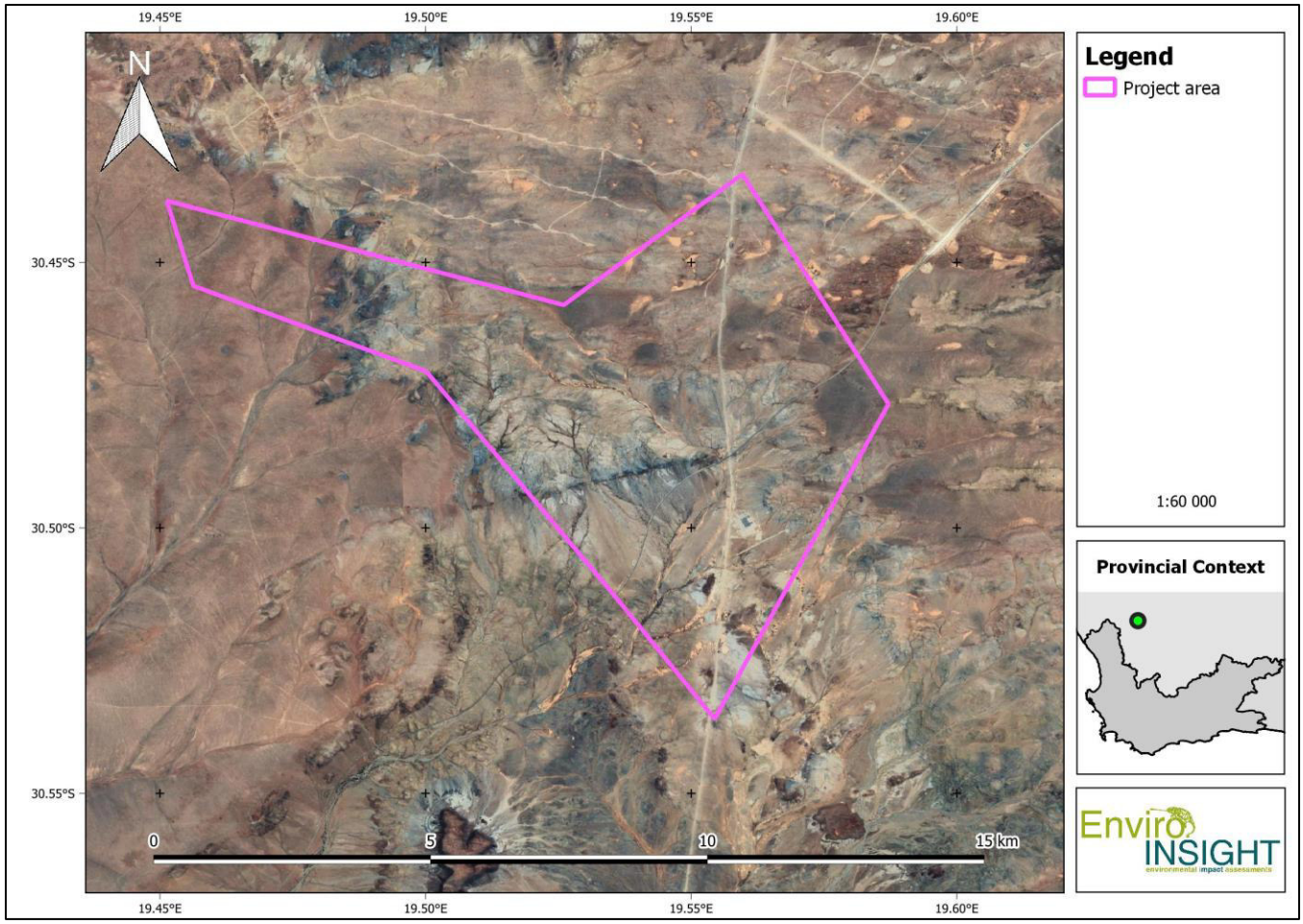

Figure 2-2: Aerial Map of the site

Table 2-1: Project Location Details.

Development Footprint	5 736 hectares		
21-digit Surveyor General code	C01500000000022600000		
Physical address and Farm Name	Portion of the Remainder of the Farm Sous 226		
Coordinates of the boundary of the property	POINT-A	30°26'0.49"S	19°33'31.69"E
	POINT-B	30°28'36.30"S	19°35'15.49"E
	POINT-C	30°32'11.20"S	19°33'16.05"E
	POINT-D	30°28'15.98"S	19°29'58.76"E
	POINT-E	30°27'18.20"S	19°27'20.64"E
	POINT-F	30°26'31.24"S	19°27'6.35"E
	POINT-G	30°27'29.01"S	19°31'33.25"E

	POINT-A	30°26'0.49"S	19°33'31.69"E
	Middle Point	30°28'47.74"S	19°32'52.24"E
Local Municipality	Hantam Local Municipality		
District Municipality	Namakwa District Municipality		

2.2 PROJECT DESCRIPTION

The Applicant is responding to the growing electricity demand within South Africa, the current infrastructure failure which disrupts sufficient electricity supply, and the increasing pressure on countries to reduce their reliance on fossil fuels, by addressing the need for sustainable renewable energy in the country. Accordingly, the Applicant is proposing the development of a commercial WEF and associated infrastructure on the remainder of the farm Sous, located north of Loeriesfontein, to add new capacity to the national electricity grid.

The proposed study area for the WEF development is located approximately 53km north of Loeriesfontein, 85 km west of Brandvlei and 160 km southeast of Springbok in the Northern Cape. The site can be reached via unsurfaced Granaatboskolk / Zout Dwaggas Road, which branches off the R357 (Figure 1-1). The Botterblom WEF footprint is approximately 5 736 hectares (ha) and will be located on a Portion of the Remainder of the Farm Sous 226 (Figure 1-2). The Khobab WEF is located directly north while Loeriesfontein2 WEF is located north-east of the study area.

The proposed Botterblom WEF will consist of up to 35 wind turbines, with a generation capacity of between 4.5 and 7.5 MW per turbine, depending on the available technology at the time. Each turbine will have a hub height of up to 150m and a rotor diameter of up to 175m. The final turbine model to be utilised will only be determined closer to the time of construction, depending on the technology available at the time. The optimal positioning (taking into account the energy generating potential) for each turbine will be determined once all the environmental sensitivities have been determined in the EIA phase. The final layout design and development footprint will be included in the EIA report.

The components of the WEF and associated infrastructure are as follows:

- up to 35 wind turbines, with a generation capacity of between 4.5 and 7.5 MW per turbine (depending on the available technology at the time),
- turbines will have a hub height of up to 150m and a rotor diameter of up to 175m. The final turbine model to be utilised will only be determined closer to the time of construction (depending on the technology available at the time),
- onsite substation/s of 100mX100m (33/132kV) to facilitate the connection between the WEF and Helios substation,
- a Battery Energy Storage System (BESS),
- concrete foundations to support turbine towers,
- cabling between turbines, to be laid underground where practical,
- internal/ access roads (up to 10 m in width) linking the wind turbines and other infrastructure on the site,

- permanent workshop area and office for control, maintenance and storage, and
- temporary laydown areas during the construction phase (which will be rehabilitated).

The components of a typical wind turbine subsystem are depicted by Figure 2-1 and Figure 2-2, which entails:

- Rotor (consisting of hub and blades), which are the portion of the wind turbine that collect energy from the wind and convert the wind's energy into rotational shaft energy to turn the generator. The speed of rotation of the blades is controlled by the nacelle, which has the ability to turn the blades to face into the wind and change the angle of the blades to make the most use of the available wind. The maximum rotor diameter for the Albany WEF turbines is approximately 175 m, with blade lengths of 87.5m.
- Nacelle – The nacelle contains a set of gears and a generator. The generator converts the turning motion of a wind turbines blade (mechanical energy) into electricity. The nacelle is also fitted with brakes, so that the turbine can be switched off during very high winds, such as during storm events, which prevents the turbine from being damaged
- Tower – The rotor and nacelle are mounted on top of a tower. The tower (either steel or concrete) is constructed to hold the rotor blades off the ground (structural support) and also raises the hub so that its blades safely clear the ground and can reach the stronger winds at higher elevations. The tower must also be strong enough to support the wind turbine and to sustain vibration, wind loading, and the overall weather elements for the lifetime of the turbine. The maximum hub height of the Botterblom WEF turbines is approximately 150m.
- Electronic equipment such as controls, electrical cables, ground support equipment, and interconnection equipment.

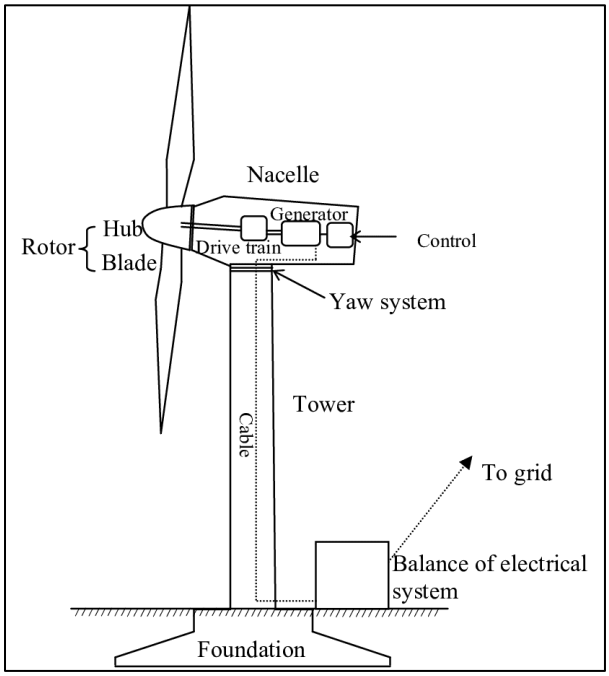

Figure 2-3: Simplified diagram of the main components of a horizontal axis wind turbine. Source: Albadi (2010).

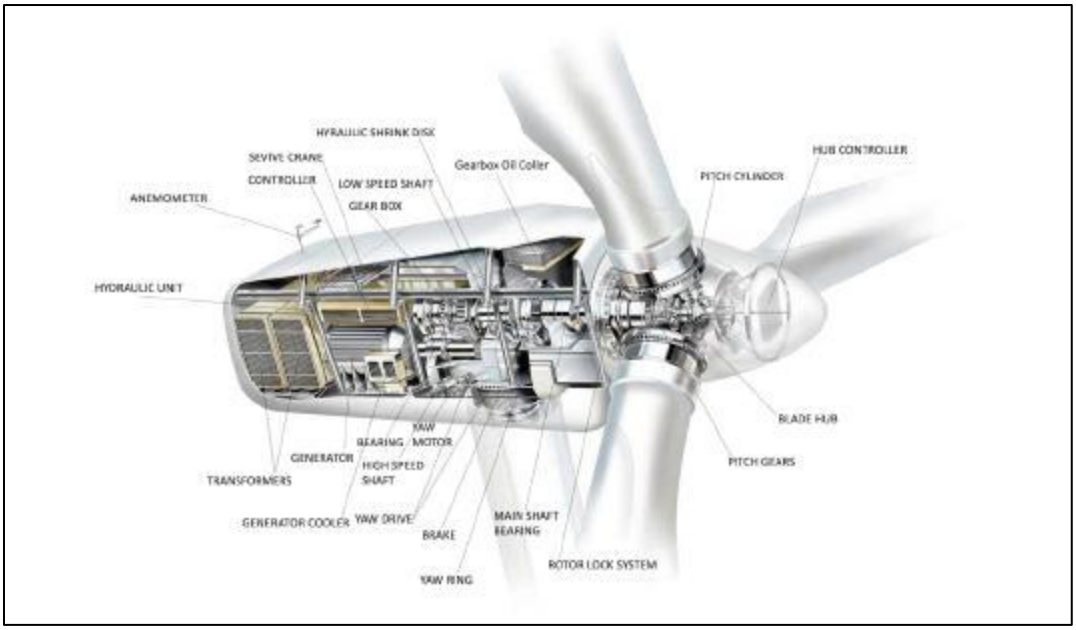

Figure 2-4: Industrial Wind turbine components diagram. Source: The Renewable energy Hub[2].

2.3 ALTERNATIVES

2.3.1 Layout Alternatives

Three layout alternatives were considered for the project. Alternative 3 was disregarded from an early start of the project, due to sensitivities identified by the specialists during the scoping phase.

The three proposed layout alternatives are as follow:

- Alternative 1 – 32 Turbines (Figure 2-5)
- Alternative 2 – 30 Turbines (Figure 2-6)
- Alternative 3 – 54 Turbines (Figure 2-7)

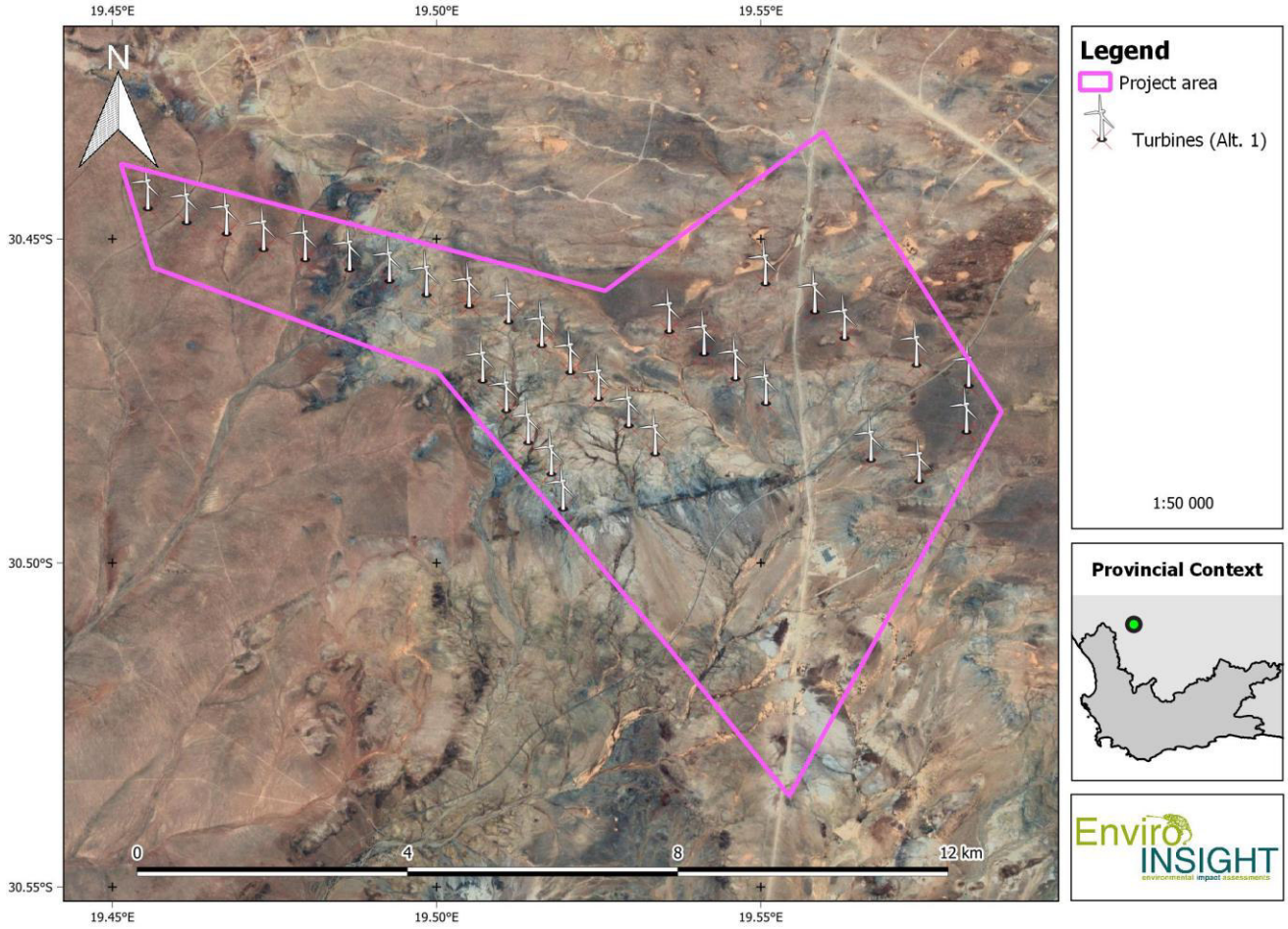

Figure 2-5: Alternative 1

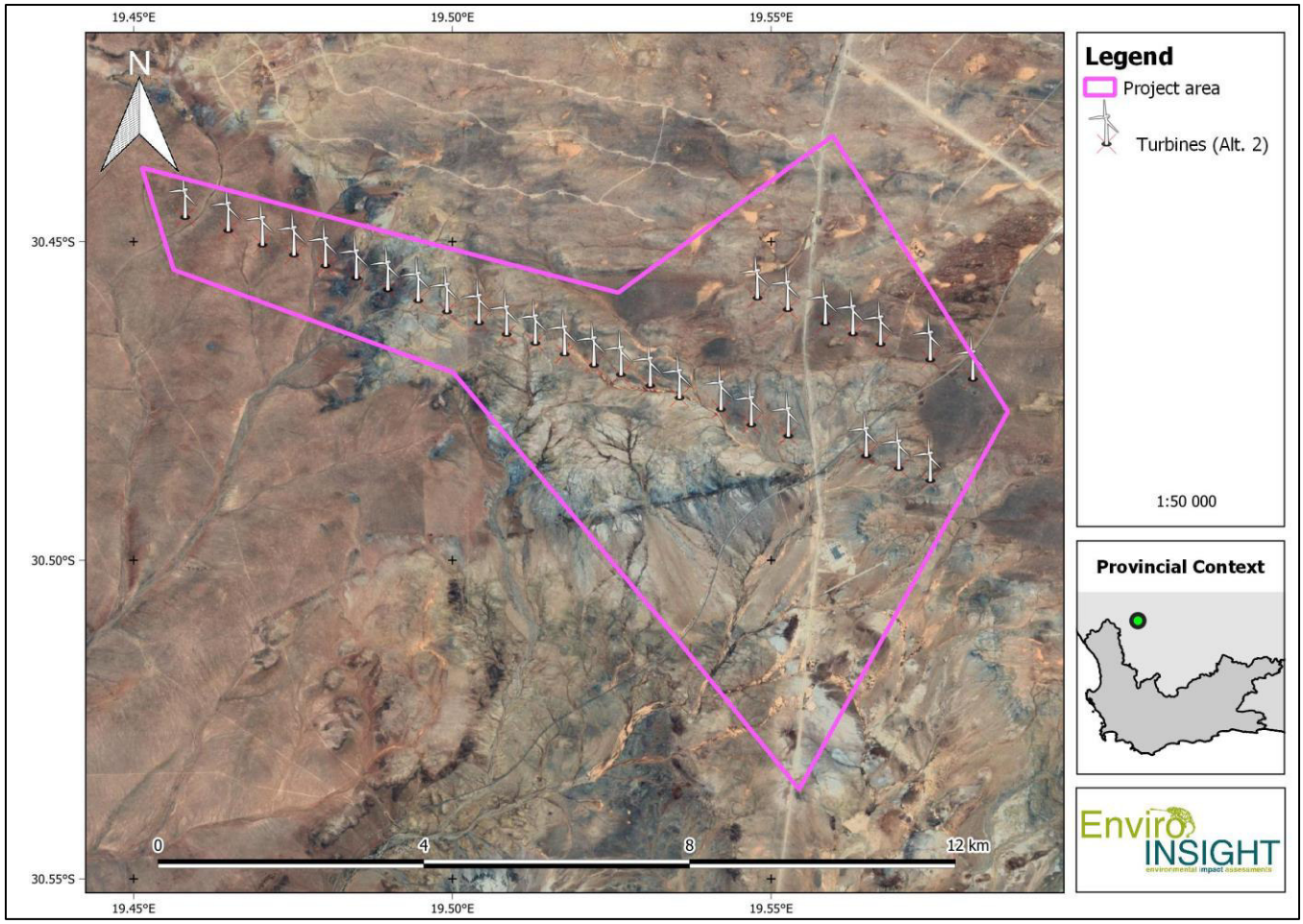

Figure 2-6: Alternative 2

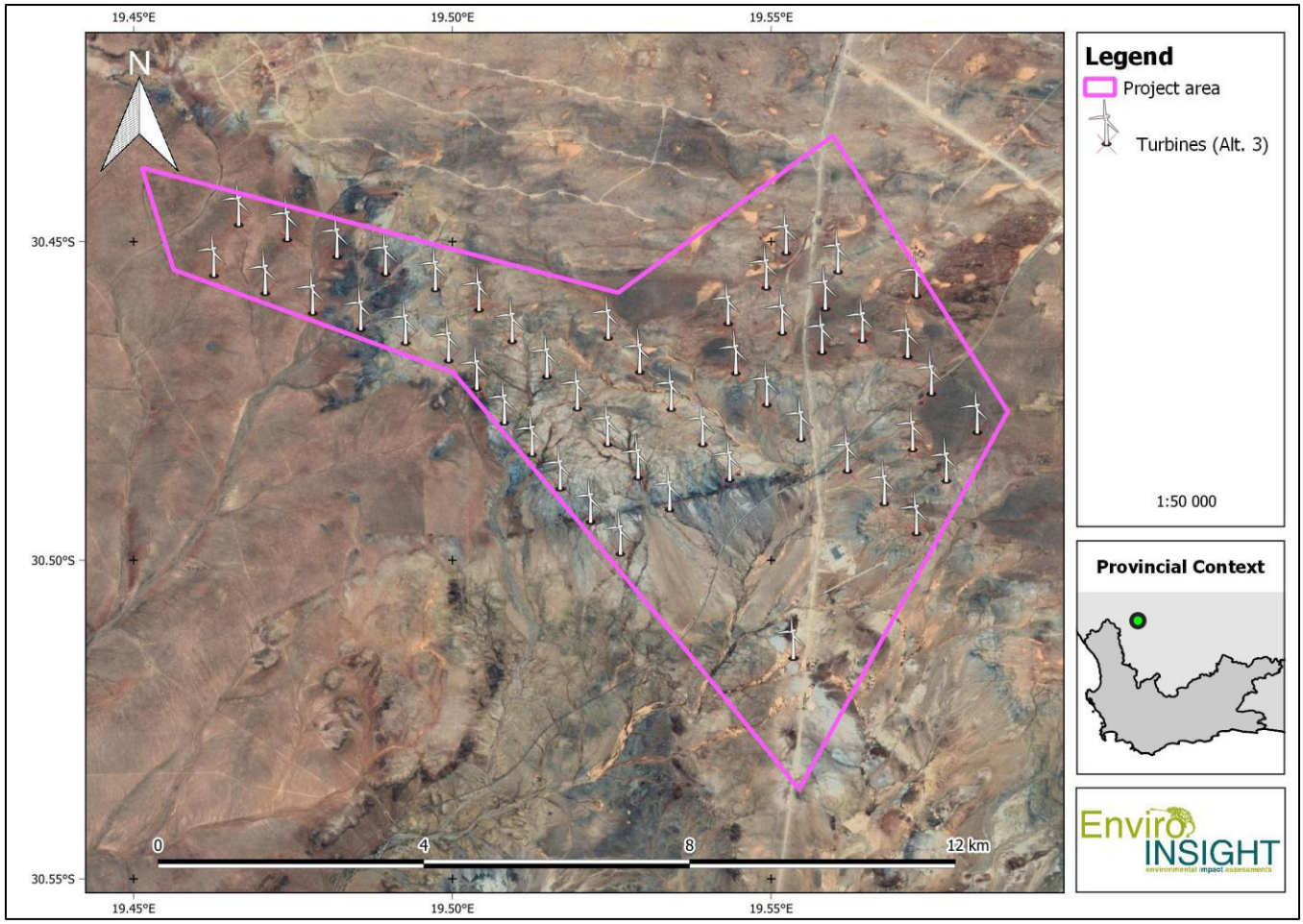

Figure 2-7: Alternative 3

2.3.2 The "No-Go" Alternatives

It is required to consider the "no-go" option in the EIA process. The "no-go" alternative refers to the current status quo and the risks and impacts associated with it. Some existing activities may carry risks and may be undesirable (e.g. an existing contaminated site earmarked for a development). The no-go is the continuation of the existing land use, i.e. maintain the status quo.

2.4 SUMMARY OF IMPACTS

Aspect	Impact	Post Mitigation
Planning and Construction		
Terrestrial Biodiversity	Habitat Loss and Fragmentation	Low – Medium
	Loss of species of conservation concern	Low - Medium
	Alien and invasive plant species	Low
	Increased risk of erosion and flash floods.	Low
	Disturbances or displacement impacts on fauna including traffic, noise and dust.	Low
Avifauna	Habitat destruction	Low
	Destruction or disturbance of bird roosts	Low
Bats	Habitat destruction	Low
	The destruction or disturbance of bat roosts	Very Low
Aquatic	Sedimentation of watercourse	
	Alt 1	Low
	Alt 2	Low
	Alt 3	Medium
	Exposure to erosion	
	Alt 1	Low
	Atl 2	Low
	Alt 3	Medium
	Potential increase in invasive vegetation	
	Alt 1	Low
	Alt 2	Low
	Alt 3	Medium
	Pollution of water resources	
	Alt 1	Low
	Alt 2	Low
	Alt 3	Medium
Agricultural	Loss of agricultural potential by occupation of land	Medium
	Loss of agricultural potential by soil degradation	Low
	Dust impact	Low
	Enhanced agricultural potential through increased financial security for farming operations	High Positive
Visual	Visual impact of construction on sensitive visual receptors in close proximity to the proposed WEF	Low
	Visual impact on observers (residents and visitors) in close proximity to the proposed wind turbine structures	High
	Visual impact on observers travelling along roads in close proximity to the proposed wind turbine structures.	High
	Visual impact on observers travelling along the roads and residents at homesteads within a 5 – 10km radius of the wind turbine structures	High
	Visual impact on observers travelling along the roads and residents at homesteads within a 10 – 20km radius of the wind turbine structures	Medium
	Visual impact of lighting at night on sensitive visual receptors.	Moderate
	Visual impact of the ancillary infrastructure.	Low
	The potential impact on the sense of place of the region.	Low

Heritage	Impact on Waypoint 20 and 22	Low
	Impact on other recorded heritage resources	Low
Social	Employment, business opportunities and skills development impact rating	High Positive
	Construction workers on site and in local area impact rating	Low
	Influx of job seekers to the area	Low
	Impacts on farms, farmers and their workers	Low
	Impact of construction vehicles	Moderate
	Impact on farming activities	Moderate
	Additional pressure on services	Low
	Loss of sense of place	High
	Noise, dust and visual impacts	Low
Traffic	Increased Traffic Volumes	
	Alt 1	Low
	Alt 2	Low
	Alt 3	Low
	Heavy Loads during the construction phase	
	Alt 1	Low
	Alt 2	Low
	Alt 3	Low
General	Stormwater Management	Low
	Hunting / Fishing by construction workers.	Low
	Degradation and contamination of the surrounding environment by construction activities, cement, hydrocarbons and other hazardous materials.	Low
	Potential disturbance or unearthing of graves or disturbance to other heritage resources during the construction phase.	Low
	Improper storage and disposal of solid waste.	Low
	Littering around the site.	Low
	Improper disposal of rubble i.e.: burying or neglecting building rubble resulting in direct mechanical damage to surrounding vegetation and untidiness of the site.	Low
	Lack of toilet facilities resulting in unsanitary conditions.	Low
	Improper disposal of toilet waste from chemical toilets resulting in contamination of the surrounding environment	Low
	Increase waste to landfill site.	Low
	Risk of spills from construction equipment (oils, fuels, cement etc.) contaminating soil and the watercourse.	Low
	Dust Generation and control	Low
	Degradation of existing service infrastructure, e.g. roads, electricity.	Low
Operation		
Terrestrial Biodiversity	Direct faunal impacts due to operation.	Low
	Alien and invasive plant species	Low
Avifauna	Bird mortalities	Medium
	Disruption of bird migratory pathways	Low
Bats	Bat mortalities	Low
	Artificial light	Very Low
	Disruption of bat migratory pathways	Low
Aquatic	Altered Hydrologic Regime	
	Alt 1	Low

	Alt 2	Low
	Alt 3	Medium
Agriculture	Protection of soil resources	Low
Visual	Visual impact on observers (residents and visitors) in close proximity to the proposed wind turbine structures	High
	Visual impact on observers travelling along roads in close proximity to the proposed wind turbine structures.	High
	Visual impact on observers travelling along the roads and residents at homesteads within a 5 – 10km radius of the wind turbine structures	Medium
	Visual impact on observers travelling along the roads and residents at homesteads within a 10 – 20km radius of the wind turbine structures	Low
	Visual impact of shadow flicker on sensitive visual receptors in close proximity to the proposed WEF.	Moderate
	Visual impact of lighting at night on sensitive visual receptors.	Low
	Visual impact of the ancillary infrastructure.	Low
	The potential impact on the sense of place of the region.	High
	Visual impact of wind farms on the visual quality of the landscape.	High
Social	Renewable energy infrastructure and clean renewable energy	High Positive
	Creation of employment and business opportunities	High Positive
	Generation of income for landowner	High Positive
	Social Economic Development and Enterprise Development	High Positive
	Visual impacts and associated impact on sense of place	Moderate
	Impact on property values	Low
	Impact on tourism	Moderate
	Noise	Low
Traffic	Increased Traffic Volumes	
	Alt 1	Low
	Alt 2	Low
	Alt 3	Low
Socio-Economic Wake Analysis	Impact on CD by Loeriesfontein WEF (L1 and L2): Change in the contribution towards CD due to the wake losses caused by the Botterblom WEF	Low
	Impact on CD by Khobab WEF (L1 and L2): Change in the contribution towards CD due to the wake losses caused by the Botterblom WEF	Low
	Impact on CD by Kokerboom 1 WEF (L1 and L2): Change in the contribution towards CD due to the wake losses caused by the Botterblom WEF	Low
	Impact on CD by Kokerboom 2 WEF (L1 and L2): Change in the contribution towards CD due to the wake losses caused by the Botterblom WEF	Low
	Impact on CD by Kokerboom 3 WEF (L1 and L2): Change in the contribution towards CD due to the wake losses caused by the Botterblom WEF	Low
	Impact on CD by Kokerboom 4 WEF (L1 and L2): Change in the contribution towards CD due to the wake losses caused by the Botterblom WEF	Low
	Impact on CD by Botterblom WEF (L1 and L2): Change in the contribution towards CD due to the wake losses caused by the Botterblom WEF	High
	Cumulative impact on CD (L1 and L2): Change in the contribution towards CD due to the wake losses caused by the Botterblom WEF	High
Decommissioning		

Terrestrial Biodiversity	The ecological impacts associated with the decommissioning phase will be similar to those listed in the construction phase and the associated mitigations measures must be updated and implemented to reduce potential adverse impacts	
Agriculture	Protection of soil resources	Low
Visual	Visual impact on observers (residents and visitors) in close proximity to the proposed wind turbine structures	High
	Visual impact on observers travelling along roads in close proximity to the proposed wind turbine structures.	High
	Visual impact on observers travelling along the roads and residents at homesteads within a 5 – 10km radius of the wind turbine structures	Medium
	Visual impact on observers travelling along the roads and residents at homesteads within a 10 – 20km radius of the wind turbine structures	Low
	Visual impact of the ancillary infrastructure.	Low
	The potential impact on the sense of place of the region.	High
Social	Deconstruction of the infrastructure and recycling	Moderate
	Loss of jobs and associated income	Moderate
Traffic	Heavy Loads during the decommissioning phase	
	Alt 1	Low
	Alt 2	Low
	Alt 3	Low

2.5 COMPOSITE SENSITIVITY MAP

The combined sensitivity map was based on the findings from all specialist assessments and inputs from all stakeholders. The following relevant features were included, which are considered "no-go" areas (i.e. no development make occur in these areas):

- Avifauna: 4 and 5 km nest buffers
- Watercourses: 32m buffer
- Bats: Sensitive and important habitats, including a 200m buffer
- Plants: 200m buffer around sensitive species

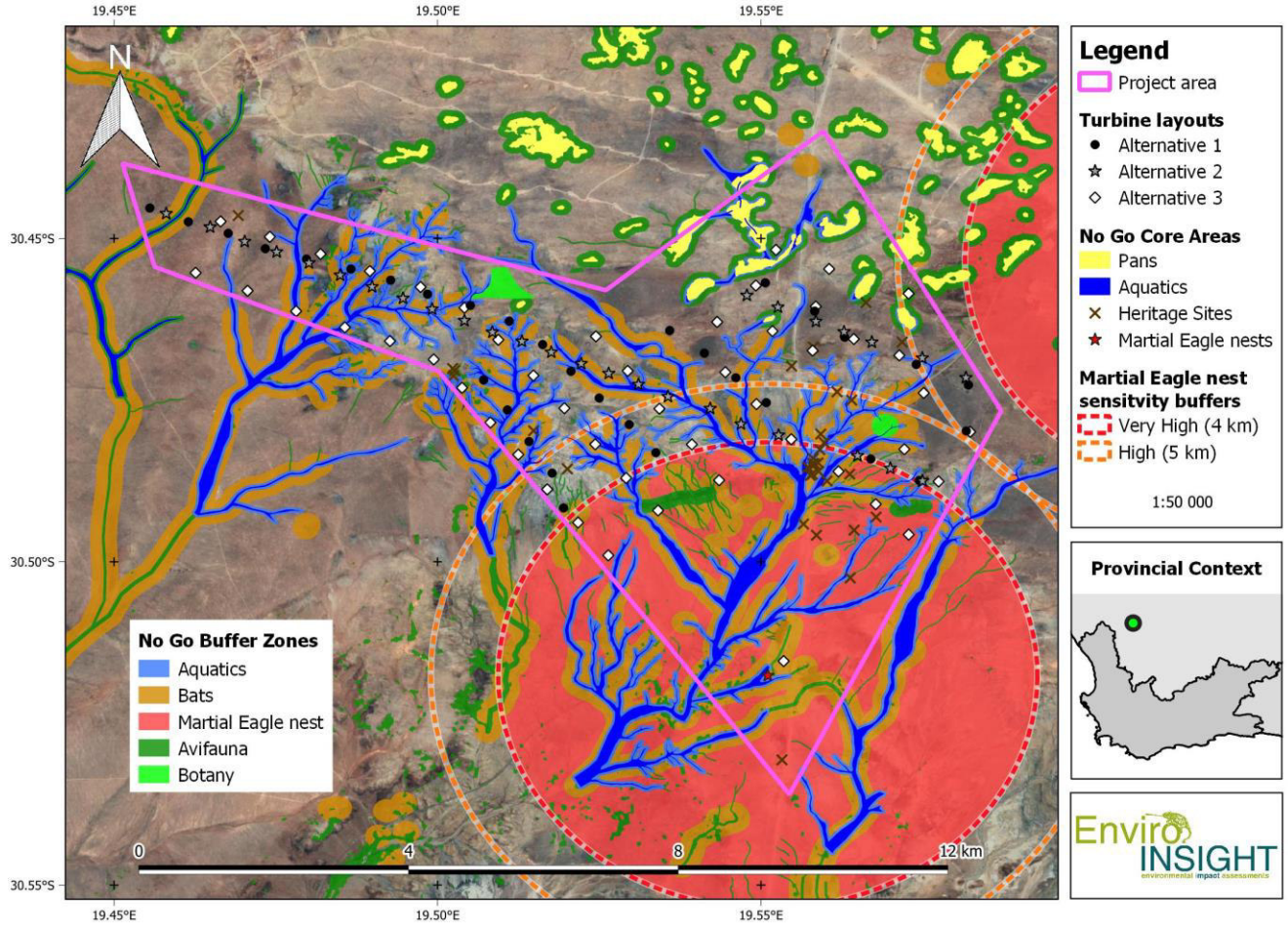

Figure 2-8: Sensitivity analysis indicating no-go areas for all alternative layouts considered.

2.6 REGIONAL AREA

The proposed development will be located approximately 53km north of Loeriesfontein, 90 km west of Brandvlei and 105 km southeast of Springbok within the Hantam Local Municipality in the Northern Cape Province (Figure 2.2). The proposed wind farm can be accessed the via the R358 regional road towards Kliprand which lies south of the site. The centre point and corner co-ordinates for the development site are included in Table 5-1. The Project has a total footprint of approximately 5 736 ha situated on a Portion of the Remainder of the Farm Sous 226 (21 digit Surveyor General code: C01500000000022600000). The existing Khobab WEF is located directly north while Loeriesfontein2 WEF is located north-east of the study area.

2.7 TOPOGRAPHY

The area lies at a height of approximately 900 to 950 meters above sea level. The topography in the immediate vicinity of the site proposed for the wind farm is characterised by a flat to gently undulating landscape with gentle slopes (typical of much of

the Karoo). North and north-east within the development footprint the presence of a number of pans signals that the topography is very flat and thus very poorly drained. In certain parts of the wider study area is characterised by the presence of localised hills / ridges / koppies which create areas of localised hilly topography. In addition, the Klein and Groot Rooiberg and Leeuwberg koppies can also be found within the wider area and form an area of localised hilly topography. The slope percentage grid was derived from the 20m SUDEM and classified into 4 categories for LandCare. The slope percentage for the majority of the development footprint is considered flat with localised steep slopes.

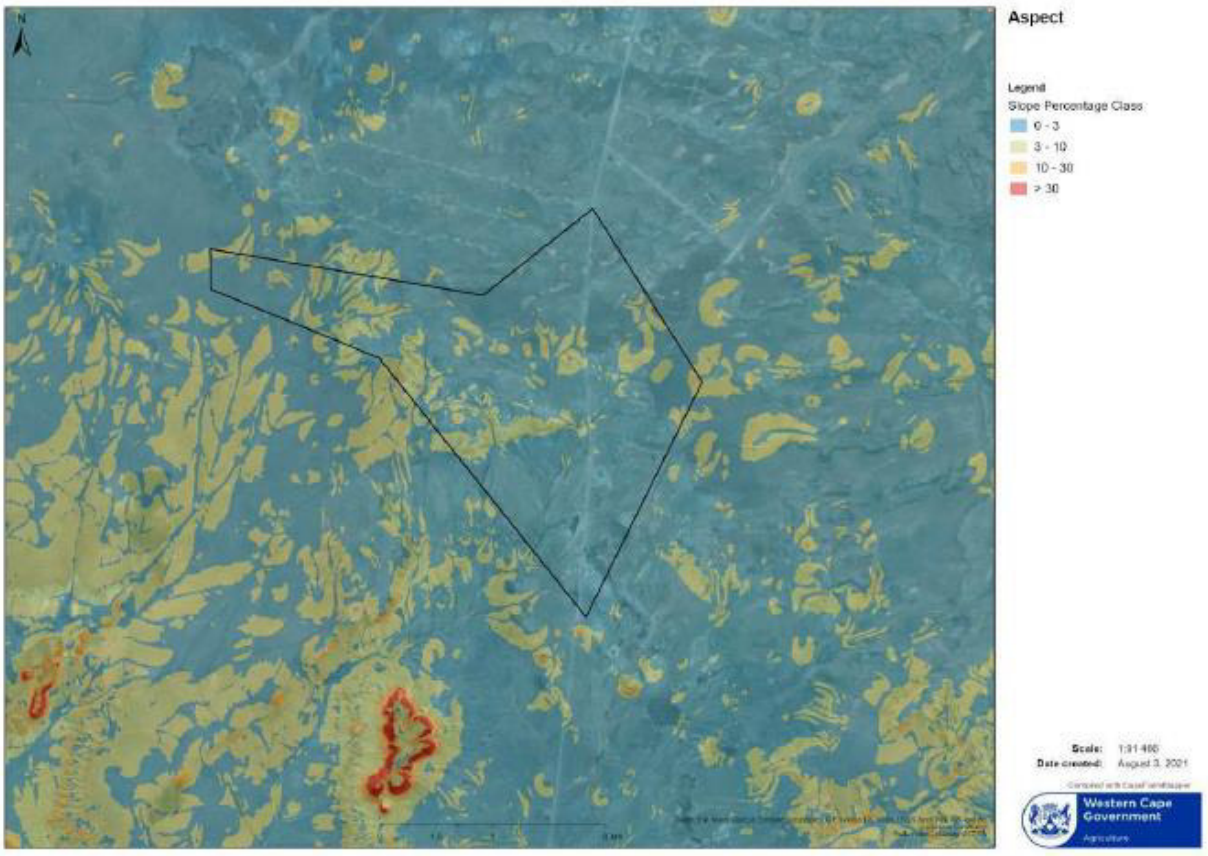

Figure 2-9: Slope Percentage Class. (Source: Stellenbosch University, WCDOA, accessed from CapeFarmMapper ver 2.6).

2.8 GEOLOGY

The underlying geology is shale of the Ecca and Dwyka Groups of the Karoo Supergroup with tillite of the Dwyka Group and dolerite intrusions. Several formations intersect with the development footprint (Figure 6-2), including grey shale with interbedded siltstones in the upper part (Tiegerberg), dolerite, minor ultrabasic rocks (Karoo Dolerite suite), grey shale, tuff, minor sandstone, chert, black (white-weathering) carbonaceous shale (Collingham and Whitehill) and dark grey-green shale (Prince Albert).

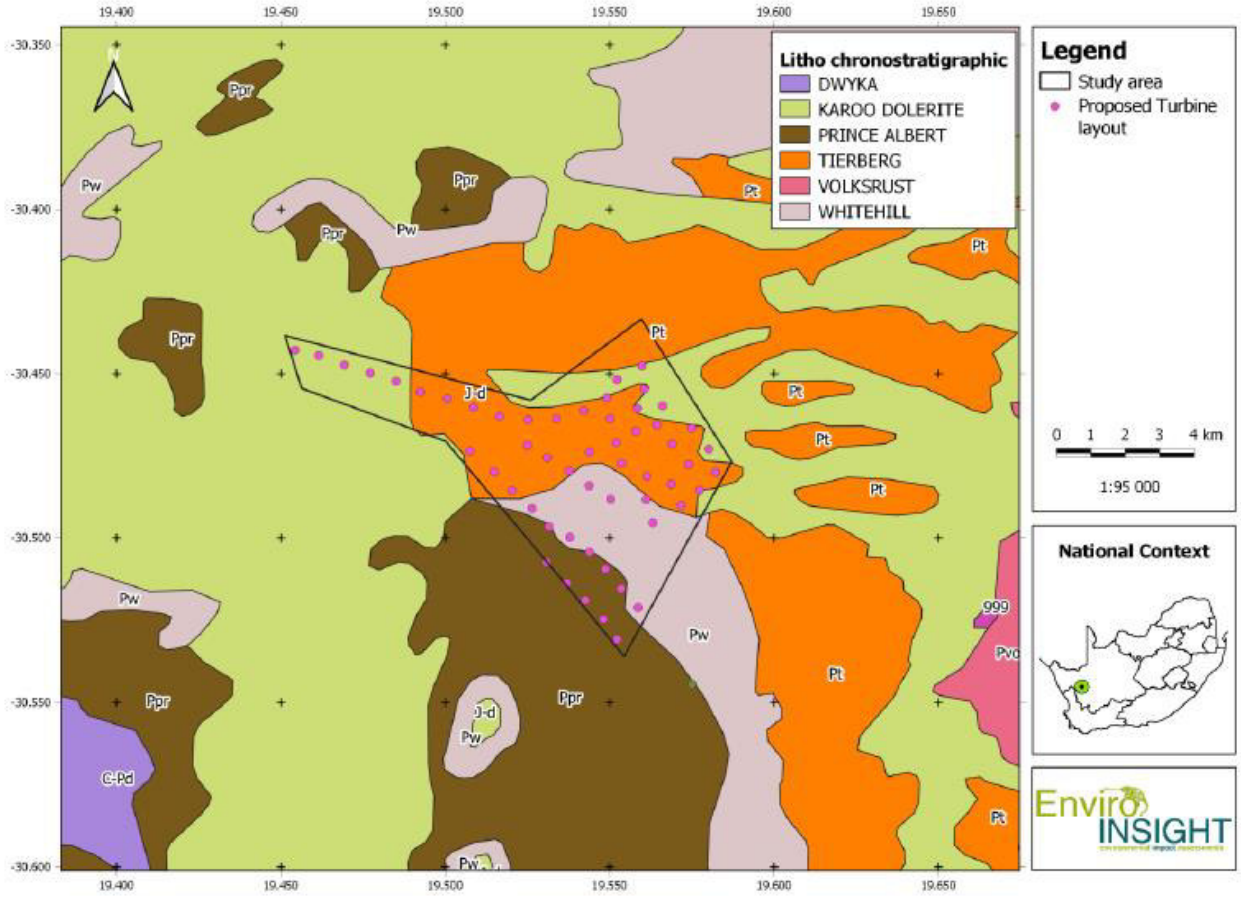

Figure 2-10: Geological Classification of the development footprint.

2.9 LAND USE

Much of the land use in the wider study area is classified as bare (Other) with bare riverbed material embedded within it and dry pans towards the north. Vegetated areas include open woodland, low shrubland (Nama Karoo), sparsely wooded grassland and natural grassland. Other land uses within the study area include industrial (Helios substation) and extraction sites for open cast mines. Major roads (road from Loeriesfontein) and railway with associated infrastructure traverse the study area (Figure 6-4). Sheep farming is the dominant activity in the area even though the arid nature of the climate restricts stocking densities which has resulted in relatively large farms across the area. There is no livestock grazing activities on the study area, and the landowner has not utilised the study area for any other purposes. Furthermore, the area is sparsely populated, and human-related infrastructure is largely restricted to isolated farmsteads and gravel access roads. There are no farmsteads that are occupied on the study area

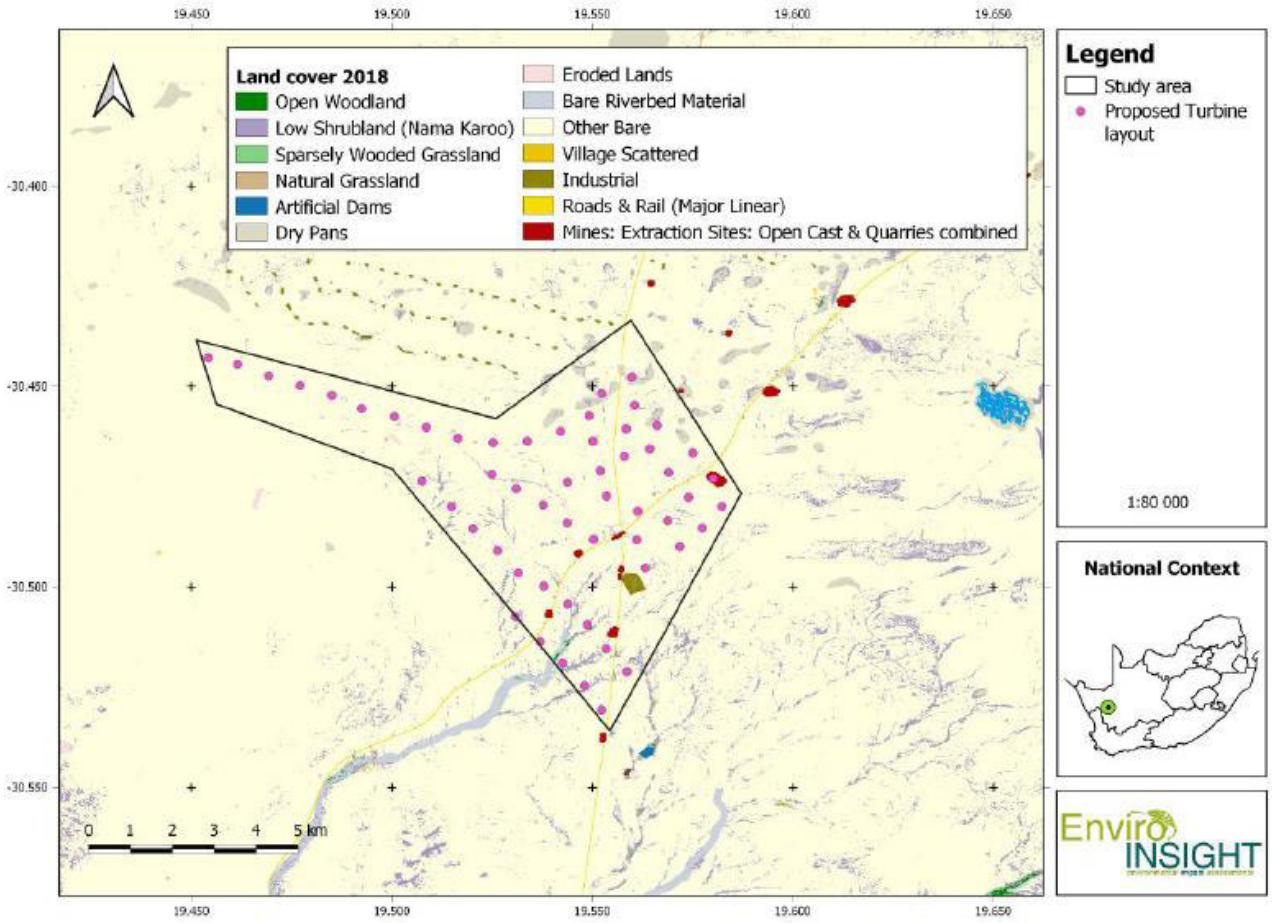

Figure 2-11: Land use in the region of the study area.

2.10 CLIMATE

The area is dominated by the Cape Winter Season (cold fronts, resulting in soft, misty showers) and is characterised by semi-arid climatic conditions, with most of the rain falling at the start of autumn and during the winter. Rainfall for the area is given as a very low 147 mm per annum (Figure 6-5), while the mean annual temperature is 17.8ºC (Figure 6-6).

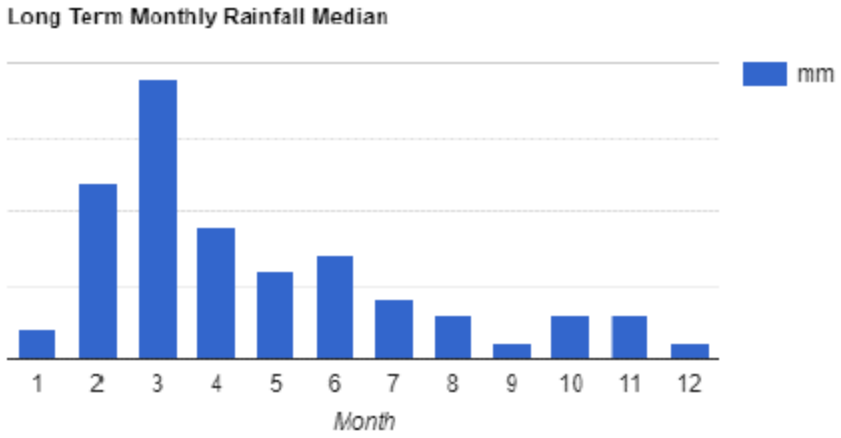

Figure 2-12: Land use in the region of the study area.

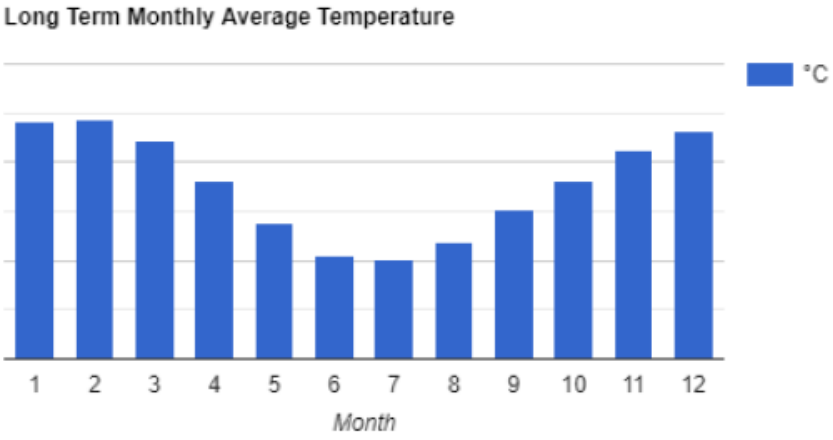

Figure 2-13: Land use in the region of the study area.

3 IMPACT ASSESSMENT

3.1 METHODOLOGY

Direct, indirect and cumulative impacts of the issues that will be identified during the specialist investigations will assessed in terms of these standard rating scales to determine their significance. The rating system used for assessing impacts (or when specific impacts cannot be identified, the broader term issue should apply) is based on six criteria, namely:

- **Status** of impacts – determines whether the potential impact is positive (positive gain to the environment), negative (negative impact on the environment), or neutral (i.e. no perceived cost or benefit to the environment). Take note that a positive impact will have a low score value as the impact is considered favourable to the environment;
- **Spatial extent** of impacts – determines the spatial scale of the impact on a scale of localised to global effect. Many impacts are significant only within the immediate vicinity of the site or within the surrounding community, whilst others may be significant at a local or regional level. Potential impact is expressed numerically on a scale of 1 (site-specific) to 5 (global);

- **Duration** of impacts – refers to the length of time that the aspect may cause a change either positively or negatively on the environment. Potential impact is expressed numerically on a scale of 1 (project duration) to 5 (permanent);
- **Frequency of the activity**– The frequency of the activity refers to how regularly the activity takes place. The more frequent an activity, the more potential there is for a related impact to occur.
- **Severity** of impacts – quantifies the impact in terms of the magnitude of the effect on the baseline environment, and includes consideration of the following factors:
    - The reversibility of the impact;
    - The sensitivity of the receptor to the stressor;
    - The impact duration, its permanency and whether it increases or decreases with time;
    - Whether the aspect is controversial or would set a precedent;
    - The threat to environmental and health standards and objectives;
- **Probability** of impacts –quantifies the impact in terms of the likelihood of the impact occurring on a percentage scale of <5% (improbable) to >95% (definite).
- **Confidence** – The degree of confidence in predictions based on available information and specialist knowledge:
    - Low;
    - Medium; or
    - High.

In addition, each impact needs to be assessed in terms of reversibility and irreplaceability as indicated below:

- **Reversibility** of the Impacts - the extent to which the impacts/risks are reversible assuming that the project has reached the end of its life cycle (decommissioning phase):
    - High reversibility of impacts (impact is highly reversible at end of project life i.e. this is the most favourable assessment for the environment);
    - Moderate reversibility of impacts;
    - Low reversibility of impacts; or
    - Impacts are non-reversible (impact is permanent, i.e. this is the least favourable assessment for the environment).

Determination of Impact Significance

The information presented above in terms of identifying and describing the aspects and impacts is summarised in below in and significance is assigned with supporting rational.

Table 3-1: Consolidated Table of Aspects and Impacts Scoring

Spatial Scale	Rating	Duration	Rating	Severity	Rating
Activity specific	1	One day to one month	1	Insignificant/non-harmful	1
Area specific	2	One month to one year	2	Small/potentially harmful	2
Whole site/plant/mine	3	One year to ten years	3	Significant/slightly harmful	3
Regional/neighbouring areas	4	Life of operation	4	Great/harmful	4
National	5	Post closure	5	Disastrous/extremely harmful	5

Frequency of Activity	Rating	Probability of Impact	Rating
Annually / Once-off	1	Almost never/almost impossible	1
6 monthly	2	Very seldom/highly unlikely	2
Monthly	3	Infrequent/unlikely/seldom	3
Weekly	4	Often/regularly/likely/possible	4
Daily / Regularly	5	Daily/highly likely/definitely	5

Significance Rating of Impacts	Timing
Very Low (1-25)	
Low (26-50)	Pre-construction
Low – Medium (51-75)	Construction
Medium – High (76-100)	Operation
High (101-125)	Decommissioning
Very High (126-150)	
Adjusted Significance Rating	

The environmental significance rating is an attempt to evaluate the importance of a particular impact, the consequence and likelihood of which is assessed by the relevant specialist. The description and assessment of the aspects and impacts is presented in a consolidated table with the significance of the impact assigned using the process and matrix detailed below.

The sum of the first three criteria (spatial scope, duration and severity) provides a collective score for the consequence of each impact. The sum of the last two criteria (frequency of activity and frequency of impact) determines the likelihood of the impact

occurring. The product of consequence and likelihood leads to the assessment of the significance of the impact (Significance = Consequence X Likelihood), shown in the significance matrix below in Table 3-2: Significance Assessment Matrix

Table 3-2: Significance Assessment Matrix

Likelihood (Frequency of Activity + Probability of Impact)	Consequence (Severity + Spatial Scope + Duration)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	6	8	10	12	14	16	08	20	22	24	26	28	30
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Table 3-3: Positive and Negative Impact Mitigation Ratings.

Colour Code	Significance Rating	Value	Negative Impact Management Recommendation	Positive Impact Management Recommendation
	Very High	126-150	Avoidance – consider alternatives	Optimal contribution from Project
	High	101-125	Avoidance as far as possible; implement strict mitigation measures to account for residual impacts	Positive contribution from Project with scope to improve
	Medium-High	76-100	Where avoidance is not possible, consider strict mitigation measures	Moderate contribution from Project with scope to improve
	Low-Medium	51-75	Mitigation measures to lower impacts and manage the project impacts appropriately	Improve on mitigation measures
	Low	26-50	Appropriate mitigation measures to manage the project impacts	Improve on mitigation measures; consider alternatives to improve on
	Very Low	1-25	Ensure impacts remain very low	Consider alternatives to improve on

3.2 IDENTIFICATION OF IMPACTS

Potential impacts resulting from the proposed Botterblom WEF were identified during the EIR phase using input from the following sectors:

- Existing information based on literature reviews and desktop assessments (EAP and specialist inputs);
- Site visit with the project team;
- Guidelines;
- Legislation; and
- Views of interested and affected parties (thus far).

The following potential impacts were identified:

- Socio-economic impacts;
- Sensitive Flora and Fauna;
- Terrestrial Biodiversity / Ecosystem services;
- Aquatic Impact;
- Agricultural;
- Heritage;
- Traffic;
- Dust;
- Noise;
- Transportation;
- Wake Impact Analysis;
- Visual; and
- Safety.

3.3 MITIGATION MEASURES

The Impact Mitigation Hierarchy (DEA 2013) will be followed to achieve no overall or limited negative impact on the receiving environment. The Impact Mitigation Hierarchy is a tool which is used reiteratively throughout the project lifecycle to limit negative impacts on the environment. There are four steps/tiers within the hierarchy, and include: Avoid/Prevent, Minimise, Rehabilitate and Offset (Figure 3-1).

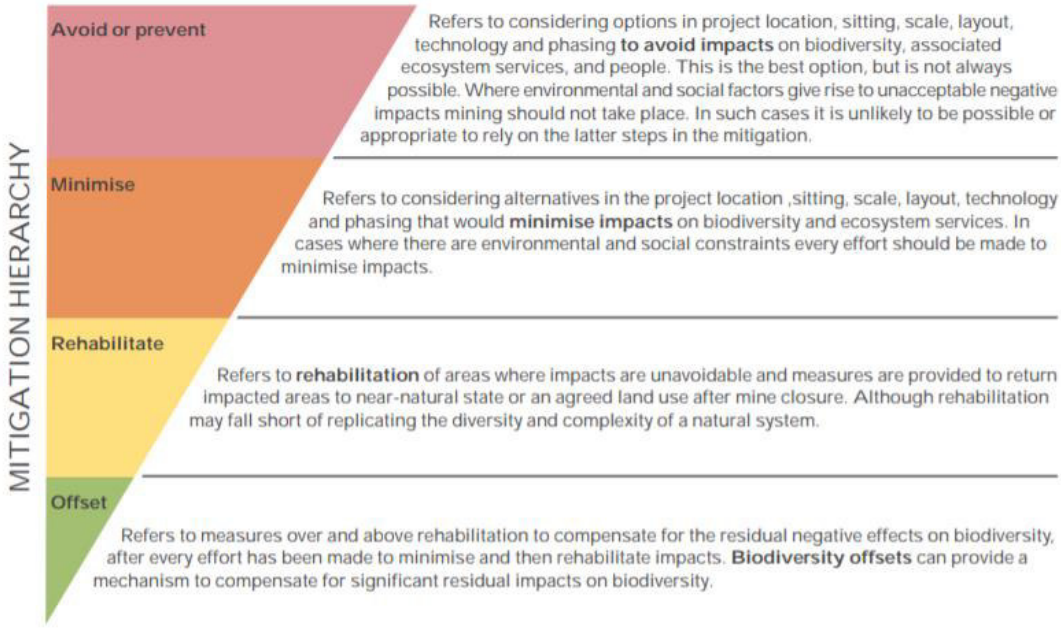

Figure 3-1: The Impact Mitigation Hierarchy (DEA et al., 2013).

Very High impacts should be avoided through alternative layout designs, technology alternatives etc. Where avoidance is not possible, the impacts that are generated by the development should be minimised if measures are implemented in order to reduce the impacts. The proposed mitigation measures should ensure that the development considers the environment and the predicted impacts in order to minimise impacts and achieve sustainable development. Where avoidance and/or minimisation are not possible, rehabilitation and possible offset will be considered. These last two options are rarely considered, and should only be done if the first two options could not be met.

3.4 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

Table 3-4: Potential Impacts prior to mitigation measures.

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
PLANNING & CONSTRUCTION										
Terrestrial Biodiversity										
Habitat Loss and Fragmentation.	Direct	Whole Site	• Life of operation (WoM) • One month to one year (WM)	• Partial (WoM) • Partial (WM)	Possible	Daily/highly likely/definitely	Partial	• Placement of turbines within the High Sensitivity areas and drainage lines should be avoided. • Ensure that lay-down and other temporary infrastructure is within low sensitivity areas, preferably previously transformed areas if possible. • Minimise the development footprint as far as possible. • Rehabilitate disturbed areas that are no longer required by the operational phase of the development. Inadequate rehabilitation could result in limited revegetation and/or an invasion of alien vegetation which will result in long term ecological degradation and damage. • A Rehabilitation Management Plan must be developed and implemented during the	Often/regularly/likely/possible	Low – Medium

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								construction phase as construction is complete at each site. • The number of roads should be reduced to the minimum possible and routes should also be adjusted to avoid areas of high sensitivity as far as possible. Where possible, existing roads must be used to avoid additional habitat loss and fragmentation. • Demarcate all areas to be cleared with construction tape or other appropriate and effective means. However, caution should be exercised to avoid using material that might entangle fauna. • An Environmental Control Officer (ECO) must be employed to monitor the clearing of vegetation for the construction of roads and hardstands.		
Loss of species of conservation concern.	Direct	Whole Site	Life of operation (WoM &WM)	No (WoM) Yes (WM)	Yes (WoM) No (WM)	Daily/highly likely/definitely	Yes	• A comprehensive Plant Search and Rescue must be undertaken by a suitably qualified botanical	Infrequent/unlikely/seldom	Low - Medium

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								specialist prior to vegetation clearance. • All relevant plant permits must be obtained from the provincial authority prior to the removal or relocation of SCC, including provincially protected species. • Plant SCC (excluding A. dichotomum which must be protected in situ) found within the proposed site must either be housed in an onsite nursery for use during rehabilitation or be relocated to suitable areas where vegetation clearance will not occur. • Demarcate sensitive species with the appropriate buffers which must be excluded from development activities. A 200m buffer is applied to *A. dichotomum*.		
Alien and invasive plant species	Direct	Whole Site	Life of operation (WoM &WM)	No (WoM) Yes (WM)	Possible (WoM) Unlikely (WM)	Often/regularly/likely/possible	Yes	• A site-specific Alien Invasive Species (AIS) Management Plan must be implemented during the construction phase and continued monitoring and eradication needs	Infrequent/unlikely/seldom	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								to take place throughout the life of the project. • Alien vegetation, within the development footprints, should be removed from the site and disposed of at a registered waste disposal site. • The development footprints and immediate surroundings should be monitored for the growth/regrowth of alien vegetation throughout the construction and operation phases of the project.		
Increased risk of erosion and flash floods.	Direct and Indirect	Whole Site	• One year to ten years (WoM) • One month to one year (WoM)	Partially (WoM &WM)	Possible (WoM) No (WM)	Often/regularly/likely/possible	Yes	• Soil erosion and Rehabilitation Plan to be part of the EMPr. • The clearance of vegetation, at any given time, must be kept to a minimum to reduce the possibility of soil erosion. • Rehabilitation of eroded areas on a regular basis during the construction period. • All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any	Infrequent/unlikely/seldom	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								energy in the water which may pose an erosion risk. • Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance.		
Disturbances or displacement impacts on fauna including traffic, noise and dust.	Direct	Whole Site	Life of operation (WoM) One year to ten years(WM)	Yes (WoM&WM)	Possible (WoM) No (WM)	Daily/highly likely/definitely	Yes	• Ground clearing and the digging of trenches should ideally take place at the end of the dry season, prior to the first rains in order to minimise the impacts of dust. • Newly cleared and exposed areas must be managed for dust and landscaped with indigenous vegetation to avoid soil erosion. Where necessary, temporary stabilisation measures must be used until vegetation establishes. • Speed restrictions (40 km per hour is recommended) should be in place to reduce the amount of dust caused by vehicle movement along the roads, and to reduce possible fauna fatalities with vehicle collisions.	Infrequent/unlikely/seldom	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								• Driving around in the area as well as noise levels at night should be limited, as should the use of harsh lights which could cause light pollution for nocturnal species. • Where appropriate, sound dampeners must be used. • Avoid the presence of people and vehicles in highly sensitive areas as far as possible. • Fences should be constructed in such a way so that burrowing animals can still gain access. • Strict measures should be put into place to prevent workers from poaching and hunting naturally occurring fauna.		
Avifauna										
Habitat destruction	Direct	Area specific	Life of operation (WoM) One year to ten years (WM)	Medium (WoM) Low (WM)	No	Daily/highly likely/definitely	Yes	Apply necessary buffers for roost sites and other sensitive bird habitat features, avoiding the construction of turbines and access roads in these areas. Roads must utilise or upgrade existing farm roads as far as possible.	Often/regularly/likely/possible	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
Destruction or disturbance of bird roosts	Direct	Area specific	One month to one year (WoM&WM)	No (WoM) Yes (WM)	Yes (WoM) No (WM)	Daily/highly likely/definitely	Yes	Apply necessary buffers for roost sites and other sensitive bird habitat features, avoiding the construction of turbines and access roads in these areas. Roads must utilise or upgrade existing farm roads as far as possible.	Infrequent/unlikely/seldom	Low
Bat										
Habitat destruction	Direct	Whole Site	One year to ten years (WoM&WM)	-	-	Definite	Yes	Apply the 200 m buffer to all potential bat roosts, avoiding the construction of turbines and access roads in these areas. Roads must follow existing farm roads as far as possible. The buffered sensitive areas must be excluded from all activities related to the WEF. Access roads may cross these however if required	Definite	Low
The destruction or disturbance of bat roosts	Direct	Area Specific	One year to ten years (WoM) One month to one year (WM)	-	-	Possible	Yes	All potential bat roosts must be avoided by applying a 200 m buffer	Almost impossible	Very Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
Aquatic										
Sedimentation of watercourse										
Alt 1	Direct	Regional	Medium term (WoM) Short Term (WM)	-	-	Medium	Yes	• It is essential that the road and other linear networks (cables) follow contour and lowest gradients as far as possible. Appropriate stormwater design for the road network is essential to prevent roads from serving as concentrated conduits for water run-off, significantly increasing erosion potential and sediment transport capacity. Water diversions along the road should be placed at regular intervals in order to divert water back into the natural veld on the downstream side of the road. This diverted water should be released in a diffuse manner on contour, e.g. appropriately designed swale which is appropriately vegetated to achieve high basal cover (taking cognisance of natural local herbaceous conditions).	Low	Low
Alt 2	Direct	Regional	Medium term (WoM) Short Term (WM)	-	-	Medium	Yes		Low	Low
Alt 3	Direct	Regional	Medium term (WoM) Short Term (WM)	-	-	High	Yes		Medium	Medium

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								• Water crossing must be exactly perpendicular to the natural flow of water as not to create water flow to concentrate more to one side. • It is essential to choose appropriate water crossing for the road network in order to reduce potential negative impacts. Crossing points should preferably utilise watercourse sections which already contain exposed bedrock and has a low gradient in that particular section of the watercourse. All crossing to be in the form of low water bridges in order for water to follow historic flow paths as much as possible. Concentration of water flow must be avoided. Where water is concentrated it needs to be diffusely released through appropriate diffuse release infrastructure placed on contour.		

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact	Can impact be prevented/ reversed or managed?	Will irreplaceable resources be lost?	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
			WoM- Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation					
								• It is recommended that all final positions of watercourse crossings be appropriately "fine tuned" through field verification in order to minimise potential impacts and reduce road construction cost. • Topsoil preparation and bush clearing must be done in a phased approach, only strip what is needed immediately prior to construction / field preparation. • The construction of surface stormwater drainage systems during the construction phase must be done in a manner that would protect the quality and quantity of the downstream system. Where applicable, the use of swales, which could then be grassed for the operational phase, is recommended as the swales would attenuate run-off water and facilitate the settling of sediment within the swale rather than within watercourses.		

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								For example, on the downslope edge of the infrastructure camp before vegetation clearing commences. • An effective 40m Buffer Zone which include all riparian habitat must be established prior to any construction activities taking place. No person or vehicle will be allowed within the Buffer Zone, except for officially marked crossings. Management should be vigilant in preventing personnel taking short-cuts across the Buffer Zones between construction sites. • All livestock should be removed from the site prior to the initiation of rehabilitation or construction activities. This would increase veld condition and thereby afford the study area higher basal coverages with associated higher sediment and erosion control properties. Further, no veld fires should be		

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								allowed for the next 5 years in order to aid veld restoration processes. • All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimized, and be surrounded by bunds. It should also only be stored for the minimum amount of time necessary. • Erosion control of all banks must take place so as to reduce erosion and sedimentation processes. • Topsoil, leaf and plant litter as well as subsoil must be stockpiled separately in low heaps. • Do not strip topsoil when it is wet. • In the absence of a recognizable topsoil layer, strip the upper most 500mm of soil. • Management has a responsibility to inform staff of the need to be vigilant against any practice that will have a		

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								harmful effect on riparian habitat and associated watercourses. • If possible, re-position topsoil stockpiles upslope of any infrastructure within the surface infrastructure footprint so as to prevent contaminated surface water coming into contact with topsoil. • Ensure that all topsoil is stored and protected in such a way and in such a place that it will not cause the damming up of water, erosion gullies, or wash away itself; • The ECO must be vigilant to detect any negative impacts on watercourses and consult with a wetland/riparian specialist if erosion or other negative impacts within watercourses or their buffers are noticed.		
Exposure to erosion										
Alt 1	Direct	Regional	Medium term (WoM)	-	-	Medium	Yes	• An ecologically-sound stormwater management plan must be implemented at the	Low	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
			Short Term (WM)					onset of the construction phase. This must include sustainable and sensitive stormwater design for the new road network and base infrastructure. Stormwater run-off must reach the A and B Section channels and or buffer zones in a diffuse manner; • The above guidelines can be achieved through diffuse release of stormwater flows utilising the natural topography and associated contours, vegetated channels, riparian buffers and veld restoration techniques, gabion baskets, eco-logs etc; • Erosion must not be allowed to develop on a large scale before effecting repairs; • A riparian monitoring program should be initiated prior to the start of the construction phase. • Make use of existing roads and tracks where feasible, rather than creating new routes through vegetated areas;		
Atl 2	Direct	Local	Medium term (WoM) Short Term (WM)	-	-	Medium	Yes		Low	Low
Alt 3	Direct	Regional	Medium term (WoM) Short Term (WM)	-	-	High	Yes		Medium	Medium

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								• Vegetation and soil must be retained in position for as long as possible, and removed immediately ahead of construction / earthworks in that area (DWAF, 2005); • Veld restoration must be actively pursued within the study area. As a start, it is recommended that all livestock must be removed from the property for at least a period of 5 years. Active reseeding must take place on the periphery of all disturbances .e.g roads and foundation platforms. • Runoff from roads must be managed to avoid erosion and pollution problems; • During the construction and operational phases, measures must be put in place to control the flow of surface water so that it does not impact on the vegetation, i.e., energy dissipaters and canal flow		

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								designs must be used to prevent scouring and erosion; • All areas susceptible to erosion must be protected and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and work areas; • Indigenous shrubbery and grass species must be retained wherever possible; • Areas exposed to erosion due to construction should be vegetated with species naturally occurring in the area; and • Surface water or storm water must not be allowed to concentrate, or flow down cut or fill slopes without erosion protection measures being in place.		
Potential increase in invasive vegetation										
Alt 1	Direct	Regional	Medium term (WoM)	-	-	Medium	Yes	• During construction, the construction area and immediate surroundings should	Low	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact	Can impact be prevented/ reversed or managed?	Will irreplaceable resources be lost?	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
			WoM- Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation					
			Short Term (WM)					be monitored regularly for emergent invasive vegetation; • Surrounding natural vegetation should not be disturbed to minimize chances of invasion by alien vegetation; • All alien seedlings and saplings must be removed as they become evident for the duration of construction and operational phase; • Manual / mechanical removal is preferred to chemical control; • All construction vehicles and equipment, as well as construction material should be free of plant material. Therefore, all equipment and vehicles should be thoroughly cleaned prior to access on to the construction site. This should be verified by the ECO; • An alien invasive eradication and monitoring plan must be compiled and implemented whereby all emergent invasive species are removed during		
Alt 2	Direct	Regional	Medium term (WoM) Short Term (WM)	-	-	Medium	Yes		Low	Low
Alt 3	Direct	Regional	Medium term (WoM) Short Term (WM)	-	-	High	Yes		Medium	Medium

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								construction. The monitoring plan must also ensure that the re-emergence of invasive species is monitored continuously during the operational and decommissioning phases and that monitoring and eradication continues post decommissioning.		
Pollution of water resources										
Alt 1	Direct	Regional	Medium term (WoM) Short Term (WM)	-	-	Medium	Yes	• Construction vehicles are to be maintained in good working order so as to reduce the probability of leakage of fuels and lubricants; • A walled concrete platform, dedicated store with adequate flooring or bermed area should be used to accommodate chemicals such as fuel, oil, paint, herbicide and insecticides, as appropriate, in well ventilated areas; • Storage of potentially hazardous materials should take place far away from	Low	Low
Alt 2	Direct	Regional	Long term (WoM) Short Term (WM)	-	-	Medium	Yes		Low	Low
Alt 3	Direct	Regional	Medium term (WoM)	-	-	High	Yes		Medium	Medium

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
			Short Term (WM)					preferential flow paths and or stormwater infrastructure. These materials include fuel, oil, cement, bitumen etc.; • Surface water draining off contaminated areas containing oil and petrol would need to be channelled towards a sump which will separate these chemicals and oils; • Concrete is to be mixed on mixing trays only, not on exposed soil; • Concrete and tar shall be mixed only in areas which have been specially demarcated for this purpose; • After all the concrete / tar mixing is complete all waste concrete / tar shall be removed from the batching area and disposed of at an approved dumpsite; • Stormwater shall not be allowed to flow through the batching area. Cement sediment shall be removed from time to time and disposed of in a manner as		

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								instructed by the Consulting Engineer; • All construction materials liable to spillage are to be stored in appropriate structures with impermeable flooring; • Portable septic toilets are to be provided and maintained for construction crews. Maintenance must include their removal without sewage spillage; • No uncontrolled discharges from the construction crew camps to any surface water resources shall be permitted. Any discharge points need to be approved by the relevant authority; • In the case of pollution of any surface or groundwater, the Regional Representative of the Department of Water Affairs must be informed immediately; • Store all litter carefully so it cannot be washed or blown into		

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								any of the water courses within the study area; • Provide bins for construction workers and staff at appropriate locations, particularly where food is consumed; • The construction site should be cleaned daily and litter removed; • Conduct ongoing staff awareness programs so as to reinforce the need to avoid littering; and • Backfill must be compacted to form a stabilised and durable blanket and the current load above the sewer lines must at no time be exceeded.		
Agricultural										
Loss of agricultural potential by occupation of land	Direct	Local	Long term (WoM)	-	-	High	Yes	Increased financial security for farming operations by the leasing of the property	Medium	Medium
Loss of agricultural potential by	Direct	Local	Medium term (WoM)	-	-	Medium	Yes	• Design an effective system of storm water runoff control, where it is required that is at any	Low	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
soil degradation			Short Term (WM)					points where runoff water might accumulate. The system must effectively collect and safely disseminate any runoff water from all accumulation points and it must prevent any potential down slope erosion. • Maintain where possible all vegetation cover and facilitate revegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion. • 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 respreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.		
Dust impact	Direct	Local	Medium term (WoM)	-	-	Medium	Yes	Implement dust control measure	Low	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
			Short Term (WM)							
Enhanced agricultural potential through increased financial security for farming operations	Positive Impact									
Visual										
Visual impact of construction on sensitive visual receptors in close proximity to the proposed WEF	Direct	Local	Short term (WoM&WM)	Reversible (WoM&WM)	No (WoM&WM)	Highly Probable	Yes	• Retain and maintain natural vegetation in all areas outside of the development footprint, but within the project site. • Ensure that vegetation is not unnecessarily removed during the construction period. • Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) where possible.	Improbable	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								• Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. • Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of regularly at licensed waste facilities. • Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent). • Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts. • Rehabilitate all disturbed areas immediately after the completion of construction works.		
Visual impact on observers	Direct	Local	Long Term	Reversible (WoM&WM)	No (WoM&WM)	Highly probable	No, only best	Retain/re-establish and maintain natural vegetation in all areas	Highly probable	High

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact	Can impact be prevented/ reversed or managed?	Will irreplaceable resources be lost?	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
			WoM- Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation					
(residents and visitors) in close proximity to the proposed wind turbine structures			(WoM&WM)				practice management measures can be implemented.	outside of the development footprint/servitude, but within the project site.		
Visual impact on observers travelling along roads in close proximity to the proposed wind turbine structures.	Direct	Local	Long Term (WoM&WM)	Reversible (WoM&WM)	No (WoM&WM)	Highly probable	No, only best practice management measures can be implemented.	Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site.	Highly probable	High
Visual impact on observers travelling along the roads and residents at homesteads within a 5 – 10km radius of the wind	Direct	Regional	Long Term (WoM&WM)	Reversible (WoM&WM)	No (WoM&WM)	Highly probable	No, only best practice management measures can be implemented.	Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site.	Highly probable	High

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
turbine structures										
Visual impact on observers travelling along the roads and residents at homesteads within a 10 – 20km radius of the wind turbine structures	Direct	Regional	Long Term (WoM&WM)	Reversible (WoM&WM)	No (WoM&WM)	Probable	No, only best practice management measures can be implemented.	Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site.	Probable	Medium
Visual impact of lighting at night on sensitive visual receptors.	Direct	Local / Regional	Long Term (WoM&WM)	Reversible (WoM&WM)	No	Highly probable	Yes	• Implement needs-based night lighting if considered acceptable by the CAA. • Limit aircraft warning lights to the turbines on the perimeter according to CAA requirements, thereby reducing the overall impact. • Shield the sources of light by physical barriers (walls, vegetation, or the structure itself).	Probable	Moderate

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								• Limit mounting heights of lighting fixtures, or alternatively use foot-lights or bollard level lights. • Make use of minimum lumen or wattage in fixtures. • Make use of down-lighters, or shielded fixtures. • Make use of Low Pressure Sodium lighting or other types of low impact lighting. Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.		
Visual impact of the ancillary infrastructure.	Direct	Local	Long Term (WoM&WM)	Reversible (WoM&WM)	No	Improbable	No, only best practise measures can be implemented	Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site.	Improbable	Low
The potential impact on the sense of place of the region.	Direct	Regional	Long Term (WoM&WM)	Reversible (WoM&WM)	No	Improbable	No, only best practise measures	Maintain the general appearance of the facility as a whole.	Improbable	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
							can be implemented			
Heritage										
Impact on Waypoint 20 and 22	Direct	Local	Permanent (WoM&WM)	Not reversible	Yes	Probable	N/A	Avoidance of known heritage sites, if this cannot be achieved mitigation will be required subject to Section 35 SAHRA permits	Improbable	Low
Impact on other recorded heritage resources	Direct	Local	Permanent (WoM&WM)	Not reversible	Yes	Probable	N/A	• Implementation of a chance find procedure for the project. • Avoidance of known heritage sites, if this cannot be achieved mitigation will be required subject to Section 35 SAHRA permits; • Final infrastructure must be subjected to a pre-construction survey	Improbable	Low
Social										
Employment, business opportunities and skills development impact rating	Direct and Cumulative	Whole site/plant/mine (WoM&WM)	One month to one year (WoM) Life of operation (WM)	-	-	Often/regularly/likely/possible	Yes	• Use local labour as far as possible • Local contractors and businesses • On the job skills development and training	Daily/highly likely/definitely	High Positive

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact	Can impact be prevented/ reversed or managed?	Will irreplaceable resources be lost?	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
			WoM-Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation					
Construction workers on site and in local area impact rating	Direct	Whole site/plant/mine (WoM& WM)	One month to one year (WoM) One day to one month (WM)	-	-	Often/regularly/likely/possible	Yes	• Use local labour and contractor as far as possible • Have code of conduct • Community liaison officer	Infrequent/unlikely/seldom	Low
Influx of job seekers to the area	Direct	Area specific (WoM& WM)	One month to one year (WoM&WM)	-	-	Often/regularly/likely/possible	Yes	• Do not employ at gate • Employ locally first • Secure construction site	Infrequent/unlikely/seldom	Low
Impacts on farms, farmers and their workers	Direct	Area specific (WoM& WM)	One month to one year (WoM&WM)	-	-	Infrequent/unlikely/seldom	Yes	• Employ community Liaison Officer • Employ locally • Secure site	Infrequent/unlikely/seldom	Low
Impact of construction vehicles	Direct	Area specific (WoM& WM)	One month to one year (WoM&WM)	-	-	Daily/highly likely/definitely	Yes	• Dust suppression • Road maintained • Roadworthy vehicles and licenced drivers	Often/regularly/likely/possible	Moderate
Impact on farming activities	Direct	Area specific (WoM& WM)	One month to one year	-	-	Often/regularly/likely/possible	Yes	• Access roads should be limited • Grazing areas should not be unnecessarily lost	Often/regularly/likely/possible	Moderate

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact	Can impact be prevented/ reversed or managed?	Will irreplaceable resources be lost?	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
			WoM- Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation					
			(WoM&WM)					• Ensuring that disturbed areas are rehabilitated		
Additional pressure on services	Direct and Cumulative	Area specific (WoM&WM)	One month to one year (WoM&WM)	-	-	Often/regularly/likely/possible	Yes	• Assist the municipality • HLM informed of the timing of the project • Identify projects in IDP	Infrequent/unlikely/seldom	Low
Loss of sense of place	Direct and Cumulative	Activity specific (WoM&WM)	Post closure (WoM&WM)	-	-	Daily/highly likely/definitely	No	• The area is changing the sense of place • No mitigation possible • Not many local permanent human receptors	Daily/highly likely/definitely	High
Noise, dust and visual impacts	Direct	Area specific (WoM&WM)	One month to one year	-	-	Often/regularly/likely/possible	Yes	• Dust mitigated from road • Few human receptors	Infrequent/unlikely/seldom	Low
Traffic										
Increased Traffic Volumes										
Alt 1	Direct	Local	Short Term (WoM&WM)	-	-	Highly Probable	Yes	• Abnormal and heavy load vehicles should not be allowed on the public road network during the typical weekday a.m. and p.m. peak hours. • Abnormal load vehicles should be escorted by traffic officials to	Probable	Low
Alt 2	Direct	Local	Short Term (WoM&WM)	-	-	Highly Probable	Yes		Probable	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
Alt 3	Direct	Local	Short Term (WoM&WM)	-	-	Highly Probable	Yes	control traffic and limit possible conflicts at intersections. • These measures will be included in the Transport Management Plan	Probable	Low
Heavy Loads during the construction phase										
Alt 1	Direct	Local	Short Term (WoM&WM)	-	-	Highly Probable	Yes	• Resurfacing of sections along Granaatboskolk / Zout Dwaggas, where required and regular road maintenance i.e. grading of the road once every two weeks during the construction phase. • The road can also be sprayed with water (grey water if available) once a day to limit dust pollution and gravel loss.	Probable	Low
Alt 2	Direct	Local	Short Term (WoM&WM)	-	-	Highly Probable	Yes		Probable	Low
Alt 3	Direct	Local	Short Term (WoM&WM)	-	-	Highly Probable	Yes		Probable	Low
General										
Stormwater Management	Indirect	Local	Construction	Yes – can be prevented/ managed	No	Medium	High	Vegetation maintenance: regular watering, weed control, replacement of dead plants, pest monitoring and control and dirt removal. Vegetation maintenance should occur bi-weekly. Maintenance of infrastructure such as concrete pipe and	Low	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact	Can impact be prevented/ reversed or managed?	Will irreplaceable resources be lost?	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
			WoM- Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation					
								channels as well as grids and kerb inlets should occur monthly.		
Hunting / Fishing by construction workers.	Direct	Local	Construction phase (short-term)	Yes – can be prevented	No	Medium - Low	High	Hunting / poaching and fishing are prohibited. During construction, guidelines set out by the ECO will be followed to ensure no potential impacts occur and workers will be instructed that hunting and fishing is a non-compliance of the authorized activity.	Low	Low
Degradation and contamination of the surrounding environment by construction activities, cement, hydrocarbons and other hazardous materials.	Direct	Local/ regional	Construction phase (short-term)	Yes – can be managed/ prevented	No	High	High	Site workers will be trained in avoiding impacts in areas of potential concern. Designated concrete mixing areas and storage areas for any hazardous materials must be assigned; cement mixing is not permitted in any area where runoff can contaminate the surrounding environment. This must be strictly controlled through the site specific EMPr.	Low	Low
Potential disturbance or	Direct	Local/ regional	Construction phase	Yes – can be	No	Low	Low	There is no evidence of any heritage resources. If any	Low	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact	Can impact be prevented/ reversed or managed?	Will irreplaceable resources be lost?	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
			WoM- Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation					
unearthing of graves or disturbance to other heritage resources during the construction phase.			(short-term)	managed/ prevented				resources are discovered during construction, the ECO must be notified immediately and construction around the resource must cease immediately. This must be strictly monitored by the ECO and controlled through the EMPr.		
Improper storage and disposal of solid waste.	Direct	Local/ regional	Construction phase (short-term)	Yes – can be managed/ prevented	No	High	High	Due to the nature of the activity, waste is anticipated to be minimal. All solid waste generated during the construction process must be placed in a designated waste collection area within the construction camp and must not be allowed to blow around the site, be accessible by animals, or be placed in piles adjacent to the skips / bins. All solid waste must then be disposed of at the nearest licensed landfill and safe disposal certificates must be obtained and kept on site at all times during construction. Separate skips/ bins for the different waste streams must be available on site. The waste containers must be	Low	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								appropriate to the waste type contained therein and where necessary should be lined and covered.		
Littering around the site.	Direct	Local	Construction & Operation phase (short-term)	Yes – can be prevented	No	Medium - Low	High	Littering is not permitted on the site and general housekeeping must be enforced. General waste bins must be readily available for litter disposal and general housekeeping.	Low	Low
Improper disposal of rubble i.e.: burying or neglecting building rubble resulting in direct mechanical damage to surrounding vegetation and untidiness of the site.	Direct	Local (within construction site)	Construction phase (short-term)	Yes impact can be managed	No	Medium	High	All excess material and rubble must be removed from the site so not to restrict the rehabilitation process. All excess material and rubble must go to an approved designated landfill and a safe disposal certificate must be obtained. Site workers will be trained in avoiding such impacts during induction training and regular toolbox talks.	Low	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact	Can impact be prevented/ reversed or managed?	Will irreplaceable resources be lost?	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
			WoM- Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation					
Lack of toilet facilities resulting in unsanitary conditions.	Direct	Local	Construction & Operation phase (short-term)	Yes – can be prevented	No	High	High	Adequate toilet facilities must be provided for all staff members as standard construction practice as well as during operational activities. Chemical toilets, if used, must be secured to the ground and kept away from any sensitive areas. It should be regularly cleaned by a reputable company and maintained in a clean state. During operation toilet facilities provided by the venue must be used by staff and guests. This must be monitored in an EMPr.	Low	Low
Improper disposal of toilet waste from chemical toilets resulting in contamination of the surrounding environment	Indirect	Local	Construction phase (short-term)	Yes – can be prevented	No	High	High	Chemical toilets must be placed onsite and not in close proximity to any sensitive areas. The chemical toilets must be provided by a registered company and all effluent must be regularly disposed of at a licenses facility. Safe disposal certificates must be obtained and kept on site.	Low	Low
Increase waste to landfill site.	Indirect	Local	Construction &	Yes – can be managed	No	High	Medium	Due to the nature of the activity during construction and operational phases, waste is	Medium	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact	Can impact be prevented/ reversed or managed?	Will irreplaceable resources be lost?	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
			WoM- Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation					
			Operation phase (short-term)					anticipated to be minimal. Where possible, waste streams will be separated and recycled to limit the amount of waste being added to the landfill site.		
Risk of spills from construction equipment (oils, fuels, cement etc.) contaminating soil and the watercourse.	Direct	Local (within construction site)	Construction phase (short-term)	Yes impact can be managed	No	Medium	High	Any hazardous or dangerous goods utilised during the construction phase must be stored on an impermeable surface that is bunded, fenced, locked and covered. A spill kit must be clearly marked and visible when utilizing hazardous or dangerous materials to ensure that all spills are immediately cleaned. Spill kits must be regularly checked and maintained.	Low	Low
Dust Generation and control	Direct	Local	Construction & Operation phase	Yes impact can be managed	No	Medium	High	• The Developer and construction contractors must take all reasonable measures to minimise the generation of dust as a result of construction activities to the satisfaction of the ECO and the relevant regulatory authorities;	Low	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								• Removal of vegetation must be avoided until such time as soil stripping is required, and similarly exposed surfaces must be re-vegetated or stabilised as soon as is practically possible; • Appropriate dust suppression measures must be used when dust generation is unavoidable, e.g. damping down of all exposed soil surfaces with a water bowser or hosepipe when necessary; • To reduce dust dampening with water, particularly during prolonged periods of dry weather appropriate chemical binders may be used. Such measures must also include the use of temporary stabilising measures (e.g. chemical soil binders, straw, brush packs, chipping etc.); • During high wind conditions, the Contractor during construction and the		

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								developer during operation, must evaluate the situation and make recommendations as to whether dust-damping measures are adequate, or whether working will cease altogether until the wind speed drops to an acceptable level; • Excavations and other clearing activities must only be done during agreed working times and permitting weather conditions to avoid sand and dust drifting into neighbouring areas; • The dust monitoring programme as per the National Dust Control Regulations, will be implemented and the necessary steps taken to ensure compliance with the relevant quality requirements; and • A complaints register will be implemented and any		

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								complaints related to dust will be investigated and appropriate measures taken to resolve the issue.		
Degradation of existing service infrastructure, e.g. roads, electricity.	Direct	Local	Construction phase (short-term).	Yes impact can be managed	No	High	High	Any damage to existing infrastructure will result in the reinstating of that infrastructure to an acceptable state. The cost of which will be that of the applicant. The site currently is not dependent on municipal services.	Low	Low
OPERATION										
Terrestrial Biodiversity										
Direct faunal impacts due to operation.	Direct	Area specific	Life of operation (WoM&WM)	The impact will persist for the lifespan of the facility (WoM&WM)	Possible (WoM) No (WM)	Often/regularly/likely/possible	Yes	• reduce the presence of human activity on the project area as far as possible by only focusing on the areas where operational tasks are required, • avoid the presence of people and vehicles in highly sensitive areas as far as possible, • no unauthorised persons should be allowed onto the site, • any potentially dangerous fauna such snakes or fauna threatened by the maintenance and	Very seldom/highly unlikely	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								operational activities should be removed to a safe location, • lower the levels of noise whenever possible and avoid the destruction or disturbance of identified important features, • The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden by anyone except by individuals with the appropriate permits, • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill, • fences should be constructed in such a way so that burrowing animals can still gain access, which will allow other animals to also utilise the holes dug under fences to increase connectivity in the area.		

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact	Can impact be prevented/ reversed or managed?	Will irreplaceable resources be lost?	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
			WoM- Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation					
Alien and invasive plant species	Direct	Whole Site	Life of operation (WoM&WM)	With appropriate mitigation the impact can be ameliorated (WoM&WM)	Possible (WoM) Unlikely (WM)	Often/regularly/likely/possible	Yes	• The site-specific AIS Management Plan must be implemented for the first year of the operational phase. Thereafter, alien vegetation must continue to be monitored and eradicated annually throughout the life of the project. • Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem woody species such as Prosopis are already present in the area and are likely to increase rapidly if not controlled. • Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.	Very seldom/highly unlikely	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								• Alien vegetation, within the development footprints, should be removed from the site and disposed of at a registered waste disposal site.		
Avifauna										
Bird mortalities	Direct	Whole site/plant/mine	Life of operation (WoM&WM)	No	Yes (WoM) Potentially (WM)	Daily/highly likely/definitely	Yes	Avoid placement of turbines near sensitive bird breeding and roosting habitats. The application of adaptive mitigation measures (e.g., shutdown on demand retrofitting), according to post-construction monitoring results (counted strikes of threatened species) must be informed by environmental correlates of avifaunal activity and/or strikes.	Infrequent/unlikely/seldom	Medium
Disruption of bird migratory pathways	Indirect	Whole site/plant/mine	Life of operation (WoM) One year to ten years (WM)	No (WoM) Yes (WM)	Yes (WoM) No (WM)	Daily/highly likely/definitely	Yes	Increase turbine cut in speed as this has been shown to reduce collisions. The risk is not considered to be high, and the annual collision risk is estimated at less than 5 birds per year. This is confirmed by the post-construction monitoring at Khobab WEF. The fatality rates post-construction will provide additional data and the	Very seldom/highly unlikely	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								risk model can be adjusted accordingly. Advanced Radar-based hutdown on demand must be applied where turbines transcend recommended buffers for nesting Martial Eagles.		
Bats										
Bat mortalities	Direct	Regional	Life of operation (WoM&WM)	-	-	Almost certain	Yes	• Cut-in speeds of turbines should be increased at strategic times based on bat mortalities observed during post-construction monitoring. An annual threshold for bat mortality in Nama Karoo is estimated at 0.0106 bats/hectare (MacEwan et al., 2020a) per annum. Therefore, the total annual bat mortality threshold for the Botterblom WEF is estimated at 61.4 bats. Corrected mortality estimates and appropriate adaptive mitigation thresholds and strategies will need to be determined during the post-construction monitoring • Increase turbine cut in speed as this has been shown to reduce collisions	Almost impossible	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
Artificial light	Direct	Whole Site	Life of operation (WoM&WM)	-	-	Infrequent		All artificial lights should be kept at a minimum with only civil aviation lights being used if possible. In cases where lighting is needed close to buildings the use of these lights must be limited and directed only where needed. Non-UV emitting lights must be used.	Almost impossible	Very Low
Disruption of bat migratory pathways	Direct and Indirect	Regional	Life of operation	-	-	Infrequent	Yes	Increasing the cut-in speed of turbines is especially relevant for periods of migration and/or increased feeding activity during frontal activity as seen in April and possible migration during November when higher than normal number of bats are expected in the area and curtailment of turbines may be required if mortalities during monitoring indicate immediate mitigation action. This will necessitate increased monitoring activities during these times with rapid dissemination of number of carcasses detected so that on-the-fly mitigation can occur	Almost impossible	Low
Aquatic										

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact	Can impact be prevented/ reversed or managed?	Will irreplaceable resources be lost?	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
			WoM- Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation					
Altered Hydrologic Regime										
Alt 1	Direct	Regional	Long Term (WoM) Short Term (WM)	-	-	High	Yes	• It is essential that the road and other linear networks (cables) follow contour and lowest gradients as far as possible. Appropriate stormwater design for the road network is essential to prevent roads from serving as concentrated conduits for water run-off, significantly increasing erosion potential and sediment transport capacity. Water diversions along the road (and other linear infrastructure) should be placed at regular intervals in order to divert water back into the natural veld on the downstream side of the road. This diverted water should be released in a diffuse manner on contour, e.g. appropriately designed swale which is appropriately vegetated with high basal cover). • It is essential to choose appropriate water crossing for the road network in order to	Low	Low
Alt 2	Direct	Regional	Long Term (WoM) Long Term (WM)	-	-	High	Yes		Low	Low
Alt 3	Direct	Regional	Long Term (WoM) Short Term (WM)	-	-	High	Yes		Medium	Medium

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								reduce potential negative impacts. Crossing points should preferably utilise watercourse sections which already contain exposed bedrock and has a low gradient in that particular section of the watercourse. All crossing to be in the form of low water bridges in order for water to follow historic flow paths as much as possible. Concentration of water flow must be avoided. Where water is concentrated it needs to be diffusely released through appropriate diffuse release infrastructure placed on contour. • The water crossing themselves should be designed and placed exactly on contour and be perpendicular to the flow of the watercourse) • It is recommended that all final positions of watercourse crossings be appropriately "fine tuned" through field verification		

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								in order to minimise potential impacts and reduce road construction cost.		
Agriculture										
Protection of soil resources	Direct	Local	Long Term (WoM) Short Term (WM)	-	-	Medium	Yes	• Maintain the storm water runoff control system. Monitor • erosion and remedy the storm water control system • in the event of any erosion • occurring. • Facilitate revegetation of • denuded areas throughout the site	Low	Low
Visual										
Visual impact on observers (residents and visitors) in close proximity to the proposed wind turbine structures	Direct	Local	Long Term (WoM&WM)	Reversible (WoM&WM)	No (WoM&WM)	Highly probable	No, only best practice management measures can be implemented.	• Maintain the general appearance of the facility as a whole.	Highly probable	High
Visual impact on observers travelling along roads in	Direct	Local	Long Term (WoM&WM)	Reversible (WoM&WM)	No (WoM&WM)	Highly probable	No, only best practice managemen	Maintain the general appearance of the facility as a whole.	Highly probable	High

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
close proximity to the proposed wind turbine structures.							t measures can be implemented.			
Visual impact on observers travelling along the roads and residents at homesteads within a 5 – 10km radius of the wind turbine structures	Direct	Regional	Long Term (WoM&WM)	Reversible (WoM&WM)	No (WoM&WM)	Highly probable	No, only best practice management measures can be implemented.	Maintain the general appearance of the facility as a whole.	Highly probable	High
Visual impact on observers travelling along the roads and residents at homesteads within a 10 – 20km radius of the wind	Direct	Regional	Long Term (WoM&WM)	Reversible (WoM&WM)	No (WoM&WM)	Probable	No, only best practice management measures can be implemented.	Maintain the general appearance of the facility as a whole.	Probable	Medium

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
turbine structures										
Visual impact of shadow flicker on sensitive visual receptors in close proximity to the proposed WEF.	Direct	Local	Long Term (WoM&WM)	Reversible (WoM&WM)	No	Improbable	N.A. due to the low probability of occurrence	N/A	Improbable	Low
Visual impact of lighting at night on sensitive visual receptors.	Direct	Local / Regional	Long Term (WoM&WM)	Reversible (WoM&WM)	No	Highly probable	Yes	• Implement needs-based night lighting if considered acceptable by the CAA. • Limit aircraft warning lights to the turbines on the perimeter according to CAA requirements, thereby reducing the overall impact. • Shield the sources of light by physical barriers (walls, vegetation, or the structure itself). • Limit mounting heights of lighting fixtures, or alternatively	Probable	Moderate

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								use foot-lights or bollard level lights. • Make use of minimum lumen or wattage in fixtures. • Make use of down-lighters, or shielded fixtures. • Make use of Low Pressure Sodium lighting or other types of low impact lighting. • Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.		
Visual impact of the ancillary infrastructure.	Direct	Local	Long Term (WoM&WM)	Reversible (WoM&WM)	No	Improbable	No, only best practise measures can be implemented	Maintain the general appearance of the infrastructure.	Improbable	Low
The potential impact on the sense of place of the region.	Direct	Regional	Long Term (WoM&WM)	Reversible (WoM&WM)	No	Improbable	No, only best practise measures can be	Maintain the general appearance of the facility as a whole.	Improbable	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
							implemented			
Visual impact of wind farms on the visual quality of the landscape.	Cumulative	Regional	Long Term (WoM&WM)	Reversible (WoM&WM)	No	Highly probable	No	N/A	Highly probable	High
Social										
Renewable energy infrastructure and clean renewable energy	Direct and Cumulative	Regional/neighbouring areas (WoM&WM)	Life of operation (WoM&WM)	-	-	Often/regularly/likely/possible	N/A	• Ensure project goes ahead • Ensure local content	Daily/highly likely/definitely	High Positive
Creation of employment and business opportunities	Direct and Cumulative	Whole site/plant/mine (WoM) Regional/neighbouring areas(WM)	One year to ten years (WoM) Life of operation (WM)	-	-	Infrequent/unlikely/seldom	N/A	• Local employment • On the job training and development • Local business development	Daily/highly likely/definitely	High Positive
Generation of income for landowner	Direct	Activity specific (WoM&WM)	Life of operation (WoM&WM)	-	-	Often/regularly/likely/possible	N/A	Agreements should be in place before WEF becomes operational	Daily/highly likely/definitely	High Positive

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact	Can impact be prevented/ reversed or managed?	Will irreplaceable resources be lost?	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
			WoM- Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation					
Social Economic Development and Enterprise Development	Direct and Cumulative	Whole site/plant/mine (WoM&WM)	Life of operation (WoM&WM)	-	-	Often/regularly/likely/possible	N/A	Align with the HLM IDP SED and ED spend will need to be determined and agreed Community trust with independent trustees should be established	Often/regularly/likely/possible	High Positive
Visual impacts and associated impact on sense of place	Direct	Area specific (WoM&WM)	Life of operation (WoM&WM)	-	-	Often/regularly/likely/possible	No	The visual impact cannot be effectively mitigated	Often/regularly/likely/possible	Moderate
Impact on property values	Indirect	Area specific (WoM&WM)	Life of operation (WoM&WM)	-	-	Almost never/almost impossible	N/A	Due to the limited prospect of this occurring no mitigation measures are suggested	Almost never/almost impossible	Low
Impact on tourism	Direct	Area specific (WoM) Whole site/plant/mine (WM)	Life of operation (WoM&WM)	-	-	Almost never/almost impossible	Yes	• The possible impact is low no mitigation is required • Marketing area as a tourist attraction	Often/regularly/likely/possible	Moderate
Noise	Direct	Activity specific (WoM&WM)	Life of operation (WoM&WM)	-	-	Almost never/almost impossible	N/A	There is no impact on human receptors no mitigation measures are required	Almost never/almost impossible	Low
Traffic										

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact	Can impact be prevented/ reversed or managed?	Will irreplaceable resources be lost?	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
			WoM- Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation					
Increased Traffic Volumes										
Alt 1	Direct	Local	Short Term (WoM&WM)	-	-	Highly Probable	Yes	Routine road maintenance by the relevant Roads Authority.	Probable	Low
Alt 2	Direct	Local	Short Term (WoM&WM)			Highly Probable	Yes		Probable	Low
Alt 3	Direct	Local	Short Term (WoM&WM)			Highly Probable	Yes		Probable	Low
Socio-Economic Wake Analysis										
Impact on CD by Loeriesfontein WEF (L1 and L2)										
Change in the contribution towards CD due to the wake losses caused by the Botterblom WEF	Direct	Regional	Life of operation (WoM&WM)	-	-	Probable	Yes	Sign a compensation agreement	Highly improbable	Low
Impact on CD by Khobab WEF (L1 and L2)										
Change in the contribution towards CD	Direct	Regional	Life of operation	-	-	Probable	Yes	Sign a compensation agreement	Highly improbable	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
due to the wake losses caused by the Botterblom WEF			(WoM&WM)							
Impact on CD by Kokerboom 1 WEF (L1 and L2)										
Change in the contribution towards CD due to the wake losses caused by the Botterblom WEF	Direct	Regional	Life of operation (WoM&WM)	-	-	Probable	Yes	Sign a compensation agreement	Highly improbable	Low
Impact on CD by Kokerboom 2 WEF (L1 and L2)										
Change in the contribution towards CD due to the wake losses caused by the Botterblom WEF	Direct	Regional	Life of operation (WoM&WM)	-	-	Probable	Yes	Sign a compensation agreement	Highly improbable	Low
Impact on CD by Kokerboom 3 WEF (L1 and L2)										
Change in the contribution towards CD	Direct	Regional	Life of operation	-	-	Probable	Yes	Sign a compensation agreement	Highly improbable	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
due to the wake losses caused by the Botterblom WEF			(WoM&WM)							
Impact on CD by Kokerboom 4 WEF (L1 and L2)										
Change in the contribution towards CD due to the wake losses caused by the Botterblom WEF	Direct	Regional	Life of operation (WoM&WM)	-	-	Probable	Yes	Sign a compensation agreement	Highly improbable	Low
Impact on CD by Botterblom WEF (L1 and L2)										
Change in the contribution towards CD due to the wake losses caused by the Botterblom WEF	Direct	Regional	Life of operation (WoM&WM)	-	-	Highly Probable	N/A	N/A	Highly Probable	High
Cumulative impact on CD (L1 and L2)										
Change in the contribution towards CD	Cumulative	Regional	Life of operation	-	-	Highly Probable	Yes	Sign compensation agreements with affected WEFs	Highly Probable	High

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
due to the wake losses caused by the Botterblom WEF and contributions made by the Botterblom WEF			(WoM&WM)							
DECOMMISSIONING										
Terrestrial Biodiversity										
The ecological impacts associated with the decommissioning phase will be similar to those listed in the construction phase and the associated mitigations measures must be updated and implemented to reduce potential adverse impacts.										
Agriculture										
Protection of soil resources	Direct	Local	Long Term (WoM) Short Term (WM)	-	-	Medium	Yes	• Implement an effective system of storm water runoff 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 runoff water from all accumulation points and it must prevent any potential down slope erosion. • Maintain where possible all vegetation cover and facilitate revegetation of denuded areas	Low	Low

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								throughout the site, to stabilize disturbed soil against erosion. • 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 respreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.		
Visual										
Visual impact on observers (residents and visitors) in close proximity to the proposed wind turbine structures	Direct	Local	Long Term (WoM&WM)	Reversible (WoM&WM)	No (WoM&WM)	Highly probable	No, only best practice management measures can be implemented.	• Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.	Highly probable	High
Visual impact on observers travelling	Direct	Local	Long Term	Reversible (WoM&WM)	No (WoM&WM)	Highly probable	No, only best practice	• Remove infrastructure not required for the post-decommissioning use.	Highly probable	High

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact	Can impact be prevented/ reversed or managed?	Will irreplaceable resources be lost?	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
			WoM- Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation	**WoM-**Without Mitigation **WM-** With Mitigation					
along roads in close proximity to the proposed wind turbine structures.			(WoM&WM)				management measures can be implemented.	• Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.		
Visual impact on observers travelling along the roads and residents at homesteads within a 5 – 10km radius of the wind turbine structures	Direct	Regional	Long Term (WoM&WM)	Reversible (WoM&WM)	No (WoM&WM)	Highly probable	No, only best practice management measures can be implemented.	• Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.	Highly probable	High
Visual impact on observers travelling along the roads and residents at homesteads within a 10 – 20km radius of	Direct	Regional	Long Term (WoM&WM)	Reversible (WoM&WM)	No (WoM&WM)	Probable	No, only best practice management measures can be implemented.	• Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.	Probable	Medium

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
the wind turbine structures										
Visual impact of the ancillary infrastructure.	Direct	Local	Long Term (WoM&WM)	Reversible (WoM&WM)	No	Improbable	No, only best practise measures can be implemented	• Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.	Improbable	Low
The potential impact on the sense of place of the region.	Direct	Regional	Long Term (WoM&WM)	Reversible (WoM&WM)	No	Improbable	No, only best practise measures can be implemented	• Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.	Improbable	Low
Social										
Deconstruction of the infrastructure and recycling	Direct	Whole site/plant/mine (WoM&WM)	One month to one year (WoM&WM)	-	-	Often/regularly/likely/possible	Yes	• Local contractors • Local employment • Rehabilitation	Daily/highly likely/definitely	Moderate
Loss of jobs and associated income	Direct	Area specific (WoM&WM)	Life of operation (WoM&WM)	-	-	Daily/highly likely/definitely	Yes	• Workers should be notified of their pending retrenchment • Workers should be assisted in calming form the UIF	Often/regularly/likely/possible	Moderate

Nature of impact (potential)	Direct or indirect or cumulative	Extent of impact	Duration of impact **WoM-** Without Mitigation **WM-** With Mitigation	Can impact be prevented/ reversed or managed? **WoM-**Without Mitigation **WM-** With Mitigation	Will irreplaceable resources be lost? **WoM-**Without Mitigation **WM-** With Mitigation	Probability before mitigation	Mitigatory potential	Mitigation measure	Probability after mitigation	Significance after mitigation
								• Social services are prepared for the potential additional dependents		
Traffic										
Heavy Loads during the decommissioning phase										
Alt 1	Direct	Local	Short Term (WoM&WM)	-	-	Highly Probable	Yes	• Resurfacing of sections along Granaatboskolk / Zout Dwaggas Road, where required and regular road maintenance i.e. grading of the road once every two weeks during the decommissioning phase. • The road can also be sprayed with water (grey water if available) once a day to limit • dust pollution and gravel loss.	Probable	Low
Alt 2	Direct	Local	Short Term (WoM&WM)	-	-	Highly Probable	Yes		Probable	Low
Alt 3	Direct	Local	Short Term (WoM&WM)	-	-	Highly Probable	Yes		Probable	Low

4 Procedures for environmental related emergencies and remediation

The purpose of this section is to anticipate a potential impact resulting in an environmental crisis which may occur due to unforeseen circumstances. Such events cannot be predicted and as such a procedure has been prepared. This procedure must be followed in the event of such an incident to prevent degradation to the surrounding environment and to contribute to the safety of the workers and I & APs.

4.1 POTENTIAL ENVIRONMENTAL INCIDENCES / EMERGENCIES

The National Environmental Management Act (NEMA) defines an 'incident' as an unexpected sudden occurrence, including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment, whether immediate or delayed. The following hazards have the potential to occur within the proposed site:

- Hazardous chemical spillage
- Leakage of fuel or oil from equipment
- Potential contamination of water resources (ground and surface).
- Damage to surrounding infrastructure
- Erosion of areas stripped of groundcover

4.2 RESPONSE TO ENVIRONMENTAL EMERGENCIES

The emergency response plan (Appendix 4) must be used to update the onsite emergency response plans. A record of all incidents must be recorded as defined in NEMA and NWA (Appendix 5). Incidents should be reported and recorded the relevant authority as soon as reasonably practicable after knowledge of the incident.

An emergency incident report (Appendix 6) must be completed in terms of section 30(5) of the National Environmental Management Act (Act No. 107 of 1998).

"The responsible person or, where the incident occurred in the course of that person´s employment, his or her employer, must, within 14 days of the incident, report to the Director General, provincial head of department and municipality such information as is available to enable an initial evaluation of the incident, including:

(a) the nature of the incident;

(b) the substances involved and an estimation of the quantity released and their possible acute effect on persons and the environment and data needed to assess these effects;

(c) initial measures taken to minimise impacts;

(d) causes of the incident, whether direct or indirect, including equipment, technology, system, or management failure; and

(e) measures taken and to be taken to avoid a recurrence of such incident."

4.3 ENVIRONMENTAL AWARENESS PLAN

In accordance with NEMA EIA, 2017 regulations, an environmental awareness plan is required. As part of the environmental awareness plan 'Toolbox Talks' posters have been developed and can be used for training purposes.

- **Objectives of the plan**

The objective of the environmental awareness plan is to inform employees and contractors of any environmental risks which may result from their work and the manner in which the identified possible risks must be dealt with in order to prevent degradation of the environment.

- **Content of the plan**

The environmental awareness plan should include:

- The definition of environment (people + air + soil + water +business);
- Reasons for conserving and protecting the environment;
- How the following activities can impact the environment: - Not using assigned ablutions, hazardous materials, uncleaned spills, mixing of cement or paint on soil or grass surfaces, waste management i.e. use of waste receptacles and waste separation for recycling, vehicle washing polluting soil & ground water; litter;
- What to do to prevent the above impacting the environment i.e. assign impermeable mixing areas, no vehicle washing on site, use of waste receptacles and separation of waste to allow for recycling, how to respond in an emergency and deal with a spill; and
- Consideration of neighbours.

The environmental awareness plan that should be presented to employees is attached in Appendix 7. A training record of all staff that has undergone environmental training must be kept on record (Appendix 8).

APPENDICES

APPENDIX 1: LETTER OF ACCEPTANCE OF EMPR

RE: FE Botterblom (Pty) Ltd

To whom it may concern

This is to state that the undersigned have received a copy of the Environmental Management Programme (EMPr) developed for this site dated October 2021. The undersigned do hereby agree to abide by the strictures of the Environmental Management Programme (EMPr). Any contravention of the EMPr will be recorded and corrective action will be carried out.

Any changes to the EMPr must be approved by the *Environmental Control Officer (ECO)*, the relevant Environmental Assessment Practitioner (EAP) and the relevant authority. Such changes are to be made in writing and a record must be maintained.

As Agreed on this day _____ of _____(Month) _____(Year)

Environmental Control Officer (ECO)

Name _____

Signed _____

Contractor
Name _____

Company _____

Signed _____

Engineer
Name _____

Company _____

Signed _____

APPENDIX 2: COMPLAINTS REGISTER

This a register for recording all complaints received from neighbours i.e. Complaints about noise, odours, dust etc.

Date of complaint	Complainant's name	Contact Details (phone)	Nature of complaint	Corrective action taken	Date action completed

APPENDIX 3: NON-CONFORMANCE RECORD AND AUDIT TEMPLATE

This is record of non-compliances with the EMPr i.e., any action taken that is in violation of the EMPr must be recorded e.g. mixing concrete directly on soil, site staff using neighbouring properties as toilet facilities, dumping of material over fence etc.

Date of Non-conformance	Details of non-conformance	Party/ies responsible	Corrective action taken	Date action completed

APPENDIX 4: BASIC EMERGENCY RESPONSE PLAN

AIM

1) The effective response to emergency incidents.
2) The control of emergency incidents.
3) Recording incidents and ensuring that where possible, all measures are taken to prevent them from re-occurring

DEFINITION OF AN "INCIDENT"

As defined by NEMA, section 30 "Control of emergency incidents"

(1) In this section—

(a) "incident" means an unexpected sudden occurrence, including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment, whether immediate or delayed;

(b) "responsible person" includes any person who—

(i) is responsible for the incident;

(ii) owns any hazardous substance involved in the incident; or

(iii) was in control of any hazardous substance involved in the incident at the time of the incident;

(c) "relevant authority" means—

(i) a municipality with jurisdiction over the area in which an incident occurs;

(ii) a provincial head of department or any other provincial official designated for that purpose by the MEC in a province in which an incident occurs;

(iii) the Director General;

(iv) any other Director General of a national department.

As defined by the National Water Act section 20 "Control of emergency incidents"

(1) In this section "incident" includes any incident or accident in which a substance -

(a) pollutes or has the potential to pollute a water resource; or

(b) has, or is likely to have, a detrimental effect on a water resource.

Definition of an Incident on Site

Spills, contamination of soil and or stormwater, fires, explosions.

CONTENTS OF REPORT TO AUTHORITIES

As taken from NEMA, Section 30 :Control of Emergency Incidents"

(3) The responsible person or, where the incident occurred in the course of that person´s employment, his or her employer must forthwith after knowledge of the incident, report through the most effective means reasonably available—

(a) the nature of the incident;

(b) any risks posed by the incident to public health, safety and property;

(c) the toxicity of substances or by products released by the incident; and

(d) any steps that should be taken in order to avoid or minimise the effects of the incident on public health and the environment to—

(i) the Director General;

(ii) the South African Police Services and the relevant fire prevention service;

(iii) the relevant provincial head of department or municipality; and

(iv) all persons whose health may be affected by the incident.

(4) The responsible person or, where the incident occurred in the course of that person´s employment, his or her employer, must, as soon as reasonably practicable after knowledge of the incident—

(a) take all reasonable measures to contain and minimise the effects of the incident, including its effects on the environment and any risks posed by the incident to the health, safety and property of persons;

(b) undertake clean-up procedures;

(c) remedy the effects of the incident;

(d) assess the immediate and long term effects of the incident on the environment and public health.

(5) The responsible person or, where the incident occurred in the course of that person´s employment, his or her employer, must, within 14 days of the incident, report to the Director General, provincial head of department and municipality such information as is available to enable an initial evaluation of the incident, including—

(a) the nature of the incident;

(b) the substances involved and an estimation of the quantity released and their possible acute effect on persons and the environment and data needed to assess these effects;

(c) initial measures taken to minimise impacts;

(d) causes of the incident, whether direct or indirect, including equipment, technology, system, or management failure; and

(e) measures taken and to be taken to avoid a recurrence of such incident.

(6) A relevant authority may direct the responsible person to undertake specific measures within a specific time to fulfil his or her obligations under subsections (4) and (5): Provided that the relevant authority must, when considering any such measure or time period, have regard to the following:

(a) the principles set out in section 2;

(b) the severity of any impact on the environment as a result of the incident and the costs of the measures being considered;

(c) any measures already taken or proposed by the person on whom measures are to be imposed, if applicable;

(d) the desirability of the State fulfilling its role as custodian holding the environment in public trust for the people;

(e) any other relevant factors.

(7) A verbal directive must be confirmed in writing at the earliest opportunity, which must be within seven days.

(8) Should—

(a) the responsible person fail to comply, or inadequately comply with a directive under subsection (6);

(b) there be uncertainty as to who the responsible person is; or

(c) there be an immediate risk of serious danger to the public or potentially serious detriment to the environment, a relevant authority may take the measures it considers necessary to—

(i) contain and minimise the effects of the incident;

(ii) undertake clean-up procedures; and

(iii) remedy the effects of the incident.

As taken from the National Water Act section 20 “Control of emergency incidents”

(2) In this section, ``responsible person'' includes any person who -

(a) is responsible for the incident;

(b) owns the substance involved in the incident; or

(c) was in control of the substance involved in the incident at the time of the incident.

(3) The responsible person, any other person involved in the incident or any other person with knowledge of the incident must, as soon as reasonably practicable after obtaining knowledge of the incident, report to -

(a) the Department;

(b) the South African Police Service or the relevant fire department; or

(c) the relevant catchment management agency.

(4) A responsible person must -

(a) take all reasonable measures to contain and minimise the effects of the incident;

(b) undertake clean-up procedures;

(c) remedy the effects of the incident; and

(d) take such measures as the catchment management agency may either verbally or in writing direct within the time specified by such institution.

The following emergency procedures are guidelines only and should be used in conjunction with the emergency response plan provide by the contractor.

ON SITE EMERGENCY PROCEDURES

SPILL RESPONSE

RESPONSIBLE PERSON/S

- The spill is reported to the Foreman who must report to his superior who must report to the ECO.
- All employees should be made aware of the procedure in case of a spill.
- The ECO must report to relevant authorities if contamination occurs and if spill falls within the definition of a spill

PROCEDURE

- Identify nature and size of spill e.g. oil 20L. Consult MSDS for safety precautions
- Protect exposed stormwater drains, prevent entry of substance to stormwater drains and drainage line.
- For a small spill (less than a litre, locate spill kit, contain spill according to the training from the spill kit suppliers
- For large spill (unable to deal with on-site), contact external spill control contractors
- Determine appropriate method for disposal of material based on information provided in MSDS
- Determine if any contamination has occurred i.e. entry to stormwater, soil contamination
- If contamination has occurred, consult with authorities on need for on-going monitoring and or rehabilitation requirements. Determine medium and long term effects. Stormwater incidents should be reported to Waste water
- If no contamination has occurred, determine if spill falls under definition of an "incident" and if so, report to relevant authorities.
- Record in Incidents register
    - Nature of incident
    - Cause of incident
    - Contamination if any
    - Measures taken to control spill and handle contamination
    - If spill falls under definition of an incident
    - Mitigation measures taken to prevent re-occurrence
- Record in non-compliance register and incident (if defined as incident)
- The ECO must review all spill reports
- Adjustments will be made, if necessary, to the operational and emergency procedures to prevent future occurrences

FIRE

RESPONSIBLE PERSON/S

- The spill is reported to the Foreman who must report to his superior who must report to the ECO.
- All employees should be made aware of the procedure in case of a spill.

- The ECO must report to relevant authorities if contamination occurs and if spill falls within the definition of a spill

PROCEDURE

- Identify source and nature of fire
- In case of small fire extinguish with material appropriate to the nature of the fire. Consult MSDS.
- Immediately contact the ECO. In case of a large fire contact Fire Department
- Seal off exposed stormwater drains to ensure spill does not cause any external contamination
- Determine whether any contamination has occurred
- If contamination has occurred, consult with authorities to determine appropriate rehabilitation and monitoring
- Record in incident register:
    - Nature of incident
    - Cause of incident
    - Clean up measures
    - Mitigation measures taken
- Record in non-compliance register and record as incident if applicable.
- The ECO must review all fire reports
- Adjustments will be made, if necessary, to the operational and emergency procedures.

APPENDIX 5: INCIDENT RECORD

This is record of incidents as defined in NEMA and the NWA. Incidents should be recorded and reported to the applicable authorities.

Date of incident	Details of incident	Party / ies responsible	Corrective action taken	Date action completed

APPENDIX 6: EXAMPLE OF AN EMERGENCY INCIDENT REPORT

EXAMPLE OF AN EMERGENCY INCIDENT REPORT FORM (SOURCE: DEA WEBSITE)

environmental affairs Department: Environmental Affairs REPUBLIC OF SOUTH AFRICA	**Document Type:**	Emergency Incident Report	
	Title for the Incident:		
	Date of the incident:		
Reference:	[A reference that may be used in future correspondence]	**Initial Submission Date:**	[Date of initial submission of the report to the Department: Environmental Affair, Tourism]
Revision No.:	example	**Compiled by:**	[Full name and contact details of the person submitting the report]

This form provides a template for the emergency incident report required in terms of section 30(5) of the National Environmental Management Act (Act No. 107 of 1998) (hereinafter "NEMA") in which the responsible person or, where the incident occurred in the course of that person´s employment, his or her employer, must, within 14 days of the incident, report to the Director General, provincial head of department and municipality such information as is available to enable an initial evaluation of the incident, including: (a) the nature of the incident; (b) the substances involved and an estimation of the quantity released and their possible acute effect on persons and the environment and data needed to assess these effects; (c) initial measures taken to minimise impacts; (d) causes of the incident, whether direct or indirect, including equipment, technology, system, or management failure; and (e) measures taken and to be taken to avoid a recurrence of such incident.
In terms of section 30(1)(a) of NEMA, an "incident" means an unexpected sudden occurrence, including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment, whether immediate or delayed.
In line with section 24 of the Constitution of the Republic of South Africa (Act No. 108 of 1996), "serious" is taken to be a measure of the impact of an incident where such an incident has had, could have had, is having, or will have a negative impact on human health or well-being.

RESPONSIBLE PERSON			
In terms of section 30(1)(b) of NEMA, the "responsible person" includes any person who: (i) is responsible for the incident; (ii) owns any hazardous substance involved in the incident; or (iii) was in control of any hazardous substance involved in the incident at the time of the incident			
Name:	[Full name of person, company, etc.]	**Designation:**	[designation of responsible person (n/a for companies, etc.)]
Postal Address:	[Full postal address including postal code]	**Physical Address:**	[Full physical address]

RESPONSIBLE PERSON			
In terms of section 30(1)(b) of NEMA, the "responsible person" includes any person who: (i) is responsible for the incident; (ii) owns any hazardous substance involved in the incident; or (iii) was in control of any hazardous substance involved in the incident at the time of the incident			
Telephone (B/H)	[Business hours contact telephone number and area code]	**Telephone (A/H)**	[After hours contact telephone number and area code]
Fax:		**Email:**	
Nature of Business:	[Brief summary of the nature of the business]		

Emergency Incident Summary Information							
Mark the appropriate boxes							
2.1 Fire		2.2 Spill		2.3 Explosion		2.4 Gaseous Emission	
2.5 Injuries		2.6 Reportable injuries:		2.7 Hospitalisation		2.8 Fatalities	
2.9 Open water impacts		2.10 Ground water impacts		2.11 Atmospheric impacts		2.12 Soil impacts	
2.13 Own emergency response involved		2.14 Fire prevention services involved		2.15 Government hazardous materials emergency response involved		2.16 More than 1 governmental emergency response service involved	
2.17 Emission of non-toxic substances at low concentrations		2.18 Emission of non-toxic substances at high concentrations		2.19 Emission of toxic substances at low concentrations		2.20 Emission of toxic substances at high concentrations	
2.21 No evacuation required		2.22 Immediate area evacuated		2.23 Immediate surrounds evacuated		2.24 Evacuation of the general public	
2.25 Others							

Initial Emergency Incident Report				
In terms of section 30(3) of NEMA, the responsible person or, where the incident occurred in the course of that person´s employment, his or her employer must forthwith after knowledge of the incident, report through the most effective means reasonably available: (a) the nature of the incident; (b) any risks posed by the incident to public health, safety and property; (c) the toxicity of substances or by products released by the incident; and (d) any steps that must be taken in order to avoid or minimise the effects of the incident on public health and the environment to: (i) the Director General; (ii) the South African Police Services and the relevant fire prevention service; (iii) the relevant provincial head of department or municipality; and (iv) all persons whose health may be affected by the incident.				
Description	Date:	Time:	Medium:	Contact Details:
Relevant fire prevention services: (in case of fire)	[submission date]	[submission time]	[Fax, phone, SMS, letter, etc.)	[who was the report made to?]
Local:				
Provincial: (Those deal with Environmental issues)				
Director General: (DEA)				
Any other Director General of National Department eg DWA				

Incident Details			
In terms of NEMA section 30(5)(a) and (d), the responsible person must report on the nature of the incident as well as the causes of the incident, whether direct or indirect, including equipment, technology, system, or management failure			
4.1 Location of the incident	[Provide physical address of the location where the incident happened including the GPS co-ordinates]		
Incident start date and time:	[The exact time that the unexpected event started]	Incident duration:	[the duration of the unexpected event]
Duration of exposure:	[The duration of conditions that had a direct impact anyone's health or well-being]		

Incident Details			
In terms of NEMA section 30(5)(a) and (d), the responsible person must report on the nature of the incident as well as the causes of the incident, whether direct or indirect, including equipment, technology, system, or management failure			
Incident description			
Background of the incident: Operation: Incident type: Root Cause of the incident: Contributing factors to the incident: Conclusion:			
Wind speed and direction	[The wind speed and direction at the point of the incident at the time of the incident]	Ambient air temperature	[ambient air temperature at the time of the incident]
Weather conditions	[Sunny, light rain, mist, heavy rain, etc.]	Other relevant meteorological conditions	[Temperature inversion, floods, etc]

POLLUTANTS RELEASED DURING INCIDENT					
In terms of NEMA section 30(5)(b), the responsible person must report on the substances involved and an estimation of the quantity.					
List all the pollutants directly released during the incident (i.e. exclude those pollutants that resulted from mitigation measures, e.g. flaring, treatment, dilution etc.)					
5.1 Substance or mixture of substances	5.2 Reference Number	5.3 Phase	5.4 Total Quantity emitted	5.5 Unit	5.6 Nature of emission
[The name recognised by any national or internationally	[Reference to any national or internationally	[solid, semi-solid, liquid or gas]	[the total measured or estimated quantity released	[the unit of measure in	[emitted from truck,

POLLUTANTS RELEASED DURING INCIDENT					
In terms of NEMA section 30(5)(b), the responsible person must report on the substances involved and an estimation of the quantity.					
List all the pollutants directly released during the incident (i.e. exclude those pollutants that resulted from mitigation measures, e.g. flaring, treatment, dilution etc.)					
5.1 Substance or mixture of substances	5.2 Reference Number	5.3 Phase	5.4 Total Quantity emitted	5.5 Unit	5.6 Nature of emission
recognised chemical referencing system]	recognised chemical referencing system]		into the environment]	respect to the quantity]	underground pipe, stack, etc.]

SECONDARY POLLUTANTS RESULTING FROM INCIDENT					
In terms of NEMA section 30(5)(b), the responsible person must report on the substances involved and an estimation of the quantity released.					
List all the pollutants that resulted from mitigation measures, e.g. flaring, treatment, dilution etc.					
6.1 Substance or mixture of substances	6.2 Reference Number	5.3 Phase	5.4 Total Quantity emitted	5.5 Unit	5.6 Nature of emission
[The name recognised by any national or internationally recognised chemical referencing system]	[Reference to any national or internationally recognised chemical referencing system]	[solid, semi-solid, liquid or gas]	[the total measured or estimated quantity released into the environment]	[the unit of measure in respect to the quantity]	[emitted from truck, underground pipe, stack, etc.]

POLLUTANT CONCENTRATIONS					
In terms of NEMA section 30(5)(b), the responsible person must report on the substances involved and an estimation of the quantity released.					
List all the pollutants detailed above.					
7.1. Substance or mixture of substances	7.2. Reference Number	7.3. Estimated pollutant concentration			
		7.3.1. 10m	7.3.2. 100m	7.3.3. 500m	7.3.4. >2000m
[The name recognised by any national or internationally recognised chemical referencing system]	[Reference to any national or internationally recognised chemical referencing system]	[estimate the concentration of the pollutant in water, soil and/or air within a 10m radius of the epicentre of the incident] [provide the units used in a case of estimating concentrations eg ppm]	[estimate the concentration of the pollutant in water, soil and/or air within a 100m radius of the epicentre of the incident] [provide the units used in a case of estimating concentrations eg ppm]	[estimate the concentration of the pollutant in water, soil and/or air within a 500m radius of the epicentre of the incident] [provide the units used in a case of estimating concentrations eg ppm]	[estimate the concentration of the pollutant in water, soil and/or air within a >2000m radius of the epicentre of the incident] [provide the units used in a case of estimating concentrations eg ppm]

INCIDENT IMPACT	
In terms of NEMA section 30(5)(b), the responsible person must report on possible acute effect on persons and the environment and data needed to assess these effects;	
8.1 Minor injuries	[Describe the number and types of any minor injuries that resulted from the incident or efforts to manage the incident or the impacts thereof]
8.2 Reportable injuries	[Describe the number and types of any injuries requiring statutory reporting that resulted from the incident or efforts to manage the incident or the impacts thereof]
8.3 Hospitalisation	[Describe the number and types of any injuries that required professional medical care that resulted from the incident or efforts to manage the incident or the impacts thereof]
8.4 Fatalities	[Describe the number and cause of any fatalities that resulted from the incident or efforts to manage the incident or the impacts thereof]
8.5 Biological impacts	[Describe any impacts on biological life, other than human life, e.g. fish kills, plant mortality, etc.]

8.6 Impact area	[Describe the area possibly affected by the incident or the impacts thereof including: (i) size of the area; (ii) socio-economic context; (iii) population density; (iv) sensitive environments (if any), etc.]
8.7 Data	Attach relevant impact reports, medical reports, death certificates, post mortem reports, environmental monitoring data, etc. as Annexes C1, C2,… to this report

EXISTING PREVENTION PROCEDURES AND/OR SYSTEMS	
9.1 Foresight	[Briefly describe whether the incident could have, or had, been foreseen, e.g. was it included in any environmental impact assessment, risk assessment, health and safety plan, etc.]
9.2 Procedures and/or systems	Attach any relevant safety, health and environmental plans (including any statutory planning requirements) that detail what actions must be taken in the event of the incident that is the subject of this report
9.3 Procedure and/or systems failures	[Describe any failures or shortfalls in procedures and/or systems that may have contributed to the incident]
9.4 Technical measures	[Describe any technical measures, equipment, 'fail-safe' devices, etc. that are in place to prevent the occurance of the incident]
9.5 Technical failure	[Describe any failures of technical measures, equipment, 'fail-safe' devices, etc. that are in place to prevent the occurance of the incident]

INITIAL INCIDENT MANAGEMENT	
In terms of NEMA section 30(5)(c), the responsible person must report on initial measures taken to minimise impacts.	
10.1 Evacuation	[Describe any evacuation activities including information on the number of people evacuated and whether these people were staff or otherwise]
10.2 Technical measures	[Describe all technical measures taken to address the incident]
10.3 Mitigation measures	[Describe all measures taken to minimise the impact]
10.4 Emergency Services	[Describe any governmental emergency services involvement]

CLEANUP AND/OR DECONTAMINATION	
In terms of NEMA section 30(5)(c), the responsible person must report on initial measures taken to minimise impacts.	
11.1 Cleanup and/or decontamination	[Provide a detailed description of all cleanup and/or decontamination activities and the environmental quality and impacts resulting from these activities as well as contact details for any contracted service providers in an annex.]

11.2 Permissions and Instructions			
Provide details of any permissions and/or instructions received from any organ of state during initial incident management, cleanup and/or decontamination			
11.3 Type	11.4 Statute	11.5 Issued By	11.6 Name and contact details
[Describe the nature or type of permission or instruction]	[Provide a reference to the legal mandate for the permission or instruction]	[Provide contact details for the permitting or instructing authority]	[provide a summary of the activities carried out in terms of the permission or instruction]

MITIGATION MEASURES			
In terms of NEMA section 30(5)(e), the responsible person must report on measures taken and to be taken to avoid a recurrence of such incident.			
12.1 Measure	12.2 Objective	12.3 Cost	12.4 Timing
[Briefly describe each of the measures taken, and to be taken, to avoid a recurrence of such incident]	[Briefly describe the objective of the measure, i.e. the desired outcome of the measure]	[Estimate the cost of the measure in terms of capital costs and/or recurrent costs]	[Provide information on the timing for the full implementation of the measure]

AUTHORISATIONS			
Provide detail on all authorisations (including permits, licenses, certificates, etc.) in respect of the activity to which the incident relates.			
13.1 Type	13.2 Statute	13.3 Issued By	13.4 Issue & Expiry Date
[Describe the nature or type of authorisation, e.g. Registration Certificate]	[Provide the reference for the authorisation, e.g. section X of the National Environmental Management Act (Act No. 107 of 1989)]	[Provide contact details for the issuing authority]	[provide the date of issue and expiry]

History			
Provide details on any and every similar incident involving the responsible person in the last 24 months. Similar incidents include those that: (i) involved similar circumstances; (ii) involved similar emissions; (iii) involved similar personal; and/or (iv) involved similar impacts.			
14.1 Incident title	14.2 Report reference	14.3 Date of incident	14.4 Summary of event
[Provide the title used in the relevant emergency incident report]	[Provide the reference in respect of the relevant emergency incident report]	[Date of incident]	[Provide a summary of the event]

Signed by, or as a mandated signatory for, the responsible person:		Date:	

APPENDIX 1 List of affected people as results of the incident				
NAME	ADDRESS	PHONE	FAULT	REMARKS

APPENDIX 2

Disclaimer: Any other information not covered in the reporting template must be included.

CAUTION: In terms of section 30 (11) of NEMA as amended, it is an offence not to report an incident and liable on conviction to a fine not exceeding R 1 million or imprisonment for a period not exceeding 1 year, or to both such a fine and such imprisonment.

APPENDIX 7: ENVIRONMENTAL AWARENESS PLAN

SITE ENVIRONMENTAL RULES

TOOLBOX TALK 1:
Definitions, EMPr, and Site Environmental Rules.
ISSUE:
Do's and Don'ts of the Construction Site.

PRESENTER:
What is the Environment?
Environment (NEMA, 1998) - means the surroundings within which humans exist and that are made up of:

- the land, water and atmosphere of the earth;
- microorganisms, plant and animal life;
- any part or combination of (i) and (ii) and the interrelationships among and between them; and
- the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing;

What is the Pollution?
Pollution (NEMA, 1998) - means any change in the environment caused by -

- substances;
- radioactive or other waves; or
- noise, odours, dust or heat, emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or wellbeing or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future;

What is an EMPr?
Environmental Management Programme – refers to a document that is used to investigate, assess and evaluate the impacts that a development is likely to have on the environment during the construction, operation and decommission phases.

Why should we protect the Environment?

- It is our right to live in a clean and healthy environment.
- To ensure that future generations live in a clean environment.
- To prevent the loss of species diversity.
- To prevent loss of ecological goods and services

Environmental Site Rules:

- *No urinating or defecating on site. Toilet facilities provided at the construction site must be used at all times*
- *Do not waste water*
- *No littering*
- *No washing of cars or other vehicles on site*
- *Do not use spill kits for disposal of waste*
- *Do not dispose of any waste / wastewater in watercourses.*

DISPENSING, STORAGE AND DISPOSAL OF HYDROCARBONS/MINERAL

TOOLBOX TALK 2:
Definitions, EMPr, and Site Environmental Rules.

ISSUE:
Do's and Don'ts of the Construction Site.

What is a Hydrocarbon (mineral oil)?
Diesel/hydraulic oil etc. are hydrocarbons and therefore classified as hazardous substances. A hazardous substance is any material that poses an unreasonable risk to people, property and the environment. The environment is our surroundings, soil, air and water.

What is the risk?

- Regular dispensing and offloading of diesel increases the risk of a spillage occurring.
- Changing hydraulic lines/ greasing parts / basic maintenance of vehicles
- Leaks from vehicles and equipment

Hydrocarbons are toxic if swallowed by humans or animals. The presence of hydrocarbons in water can also prevent aquatic organisms from breathing and may result in aquatic kills depending on the extent of the spill. Hydrocarbons should therefore be prevented from contaminating ground or surface water.

Note:
Only 1 litre of oil can contaminate a soccer field size of water. It is therefore essential to prevent spillages as far as possible and to ensure that if they do occur that they are properly cleaned up and that the resulting material is disposed of correctly.

What is a spillage?
All situations involving the spilling of a hydrocarbon on to the floor or ground or water.

How do we manage this?

1. **Correct Storage:**
   a. Refer to issues around the bunded area.
   b. Should be contained in waterproof and leak proof containers. Any containers or points that are leaking to be addressed immediately.
   c. Should be stored in a dedicated area on site.
2. **Correct Dispensing:**
   a. Should check lines for leaks before starting with dispensing.
   b. Place drip tray so as to catch any drips. How would you and into what would you empty the drip tray?
   c. Ensure all residual diesel/oil is drained from pipe before disconnecting.
3. Maintenance of vehicles and equipment
   a. Check equipment and vehicles for leaks daily. Report leaks to supervisor immediately. Contain slow drips using a drip tray.
   b. Do not use excessive grease when greasing vehicle or equipment parts.
4. **Correct Spillage Handling and Disposal:**
   a. Clean all spillages immediately. This means treat and remove spillage.
   b. Dispose in hazardous waste drum or skip.
   c. Report spillage to supervisor.

DATE:	**TIME:**	**LOCATION:**
TOPIC:	Dispensing, storage and disposal of hydrocarbons/ mineral oils	
ISSUE:	Spillage	

USE AND MAINTENANCE OF DRIP TRAYS

TOOLBOX TALK 3:
Definitions, EMPr, and Site Environmental Rules.
ISSUE:
Do's and Don'ts of the Construction Site.

What is a Drip Tray?
A drip tray is a plastic or metal container that can be used to contain a liquid. A container is suitable to be used as a drip tray, if

- It is heavy enough not to be blown away;
- Has no holes in the base or side from which a liquid could leak; and
- The sides are high enough that the liquid will not overflow.

The drip tray must be sized according to the amount of liquid that needs to be captured and contained.

What is the risk?
There is a risk of spillage of hydrocarbons or other chemicals under the following circumstance:

- Various equipment and vehicles may develop slow hydrocarbon leaks (oils);
- During maintenance of vehicles and equipment, there is a risk that hydrocarbons, grease, diesel/petrol may be spilt;
- Refueling of equipment and vehicles;
- During decanting of chemicals such as paint and curing compound etc, some of the chemicals may be spilt on the ground; and/or
- While applying paint or grease you need something to put the tin, paint brush or roller into.
- Temporary storage of chemicals at point of use

Under all these circumstances the correct use of a drip tray could prevent a spillage on to the ground or into water.

What is correct use of a drip tray?
Note that the use of a drip tray should be an additional precaution to other controls. For example:

- Decanting of chemicals should be done within a bunded area as far as possible. A funnel should be used when discharging liquids into a container with a small opening. Spillage of chemicals should always be avoided. A drip tray should be used only as a precaution in case there is a spill.
- Vehicles and equipment should be checked daily and maintained correctly to prevent leaks. Drip trays should be placed underneath equipment and vehicles when stationary as a precaution in case there is a leak.
- Temporary storage of chemicals at point of use. Chemicals should always be returned to chemical store at the end of the shift.
- When refueling vehicles or equipment a drip tray should be used to capture any excess or spillages from the nozzle of the hose. There should be no overfilling of vehicles and equipment.
- Drip trays may be used for the placing of paint brushes and rollers while applying curing compound.

Correct maintenance?
Drip trays should be maintained empty. Drip trays are to be checked daily, cleaned and emptied into the hazardous waste skip. Drip trays that are not being used should be stored under cover to prevent

them filling with rain water.	
TOPIC:	Use and maintenance of Drip trays
ISSUE:	Drips trays not being used when they should be
	Incorrect maintenance of drip trays resulting in spillages

USE, HANDLING AND STORAGE OF HAZARDOUS CHEMICALS

TOOLBOX TALK 4:
Definitions, EMPr, and Site Environmental Rules.
ISSUE:
Do's and Don'ts of the Construction Site.

What is a Hazardous Chemical?
These are substances that may be dangerous to humans and or the environment if not handled, stored and disposed of correctly. The definition of a hazardous chemical is based on the amount, concentration or inherent properties of the waste.
e.g. Consumption of Alcohol,

Amount – the effect of 1 glass versus 5 litres. It is the same with a chemical. One drop may not be harmful but continuous dripping over a period of a week could be very harmful
Concentration – Beer as opposed to wine, there is alcohol in both but there is more alcohol in the wine than in the beer. It is the same with some chemicals
Inherent properties – Methylated spirits versus Beer, one bottle of methylated spirits could kill you but one beer won't because of the type of alcohol in the beer versus that in methylated spirits. It is the same with some chemicals

What is the risk?
There is a risk of spillage of chemicals under the following circumstance:

- During decanting of chemicals such as paint and curing compound etc, some of the chemicals may be spilt on the ground; and/or
- While applying paint or grease you need something to put the tin, paint brush or roller into.
- Temporary storage of chemicals at point of use

What are the correct use, handling and storage of hazardous chemicals?

- Hazardous chemicals should be stored in a roofed, bunded area that is kept locked. Entry of rain water into the bunded area must be prevented.
- All chemicals or chemical contaminated items should be stored within the bunded area. NOT on the wall of the bunded area or outside the bunded area on a concrete slab.
- Empty chemical containers and drums should be stored in the bunded area until removed or smaller containers thrown in the hazardous waste skip e.g. paint tins, paint brushes or rollers.
- Decanting of chemicals should be done within a bunded area as far as possible. A funnel should be used when discharging liquids into a container with a small opening. Spillage of chemicals should always be avoided.
- All chemical containers should be labelled. No food related containers are to be used for the storage of chemicals e.g. cool drink bottles.
- Temporary storage of chemicals at point of use. Chemicals should always be returned to chemical store at the end of the shift.

- Drip trays may be used for the placing of paint brushes and rollers while applying curing compound or shutter oil.
- All these chemicals must have an MSDS (material safety data sheet). This information is required to ensure that all chemicals are stored, handled and disposed of in the best possible way to ensure the safety of staff and the environment.

Correct maintenance of bunded area
Any cracks in the walls or floors and holes in the roof are to be repaired as soon as possible. Bunded area is to be kept free of spillages. Any spillages are to be cleaned up and disposed of as hazardous waste.

TOPIC:	Use, handling and storage of hazardous chemicals
ISSUE:	Incorrect storage of chemicals
	Spillage of chemicals

WASTE SEGREGATION AND SEPARATION

TOOLBOX TALK 5:
Definitions, EMPr, and Site Environmental Rules.
ISSUE:
Do's and Don'ts of the Construction Site.

What is waste separation?
This is the separation of hazardous and general waste

Some examples of hazardous wastes generated on site:
Used oils (hydrocarbons), contaminated spill absorbent or sand, paints, batteries (acid), fluorescent tubes (mercury), concrete.

Some examples of general waste generated on site:
Cool drink bottles, chip packets, plastic, leftover food, paper etc.

Correct handling, storage and disposal
- General waste must be disposed of in the green wheelie bins or marked skips provided
- Hazardous waste to be thrown in marked skips provided or 210L marked drums provided in certain areas
- The two must not be mixed!
- If hazardous waste is found in general waste, all must be disposed of as hazardous waste.

Why?
- The two waste types are disposed of at different waste dumps. The general waste dump is built only to deal with general waste. Hazardous waste accidentally disposed of here, could pollute the water and harm the people in the area.
- Disposal of general waste at a hazardous waste site results in an unnecessary cost to the company, as it is a lot more expensive to dispose of hazardous waste than general waste.

What is an incident?
- Mixed waste in any of the skips or bins.

TOPIC:	Waste segregation
ISSUE:	Mixing of wastes
	Incorrect disposal of mixed wastes

WASTING DRINKING WATER

TOOLBOX TALK 6:
Definitions, EMPr, and Site Environmental Rules.
ISSUE:
Do's and Don'ts of the Construction Site.

What are examples of wasting of drinking water?
- Not turning a tap off properly after use.
- Poor maintenance of water fittings resulting in continuous leaking or dripping.
- Overfilling and / or overflowing of water containers.

Why should we not waste drinking water?
- Good, clean water is scarce in South Africa and expensive to produce and must therefore be used sparingly. Remember anything we put into the water (river, lake or dam) has to be removed before we can drink the water. The more we pollute the water the more expensive it becomes to clean it.

Ways to save water:
- Don't drink directly from the tape, rather fill a glass with water, switch the tape off and drink from the glass.
- Report any maintenance issues with water fittings or lines, as soon as possible.

What is an incident?
- Dripping or leaking tapes or water connections.
- Overflowing of containers that contain water.

TOPIC:	Wasting drinking water
ISSUE:	Scarcity of drinking water
	Expense to produce drinking water

	Site Inception	Construction	Post construction	Operation	Key Issues
General Administration	**Site Inception** • An emergency response plan must be available on site as must a copy of the EMPr and the EA. • An incident register must be maintained and kept on site. • A record of training must be maintained and kept on site. • Records proving source of materials must be kept on site. • A record of audits conducted on operations, as well as findings must be kept by the Site Engineer, and findings from audits are to be communicated to the Foreman on site. Proof of communication of findings are to be kept on site. • The site must be sufficiently lit, enabling security and policing should work be required at night. • The following details are to be available at each site: ▪ Emergency contact numbers: Name, contact details ▪ Environmental Control Officer: Name, contact details ▪ A list of the sensitive areas identified for that site ▪ Proof of communication of these details to the staff at that particular site. • A hazardous chemical/waste storage area must be provided for, if required. This could be in the form of a leak proof container or suitably sized drip tray. An inventory of goods stored must be maintained and updated weekly. • General waste bins with lids must be provided on site. Accumulated waste must be removed from site regularly and disposed of at a suitably licensed landfill site. • Adequate spill kits and containers for spilled and contaminated material must be provided on site. • Designated areas for stockpiling of raw materials must be identified on site. No stockpiling is to occur on or near slopes or watercourses. All stockpiling areas must be approved by the Site Engineer. • Haulage roads must be identified and demarcated at site set up. Turning areas must be identified and clearly demarcated. Roads may not be located in the designated sensitive areas. • Temporary stormwater protection measures must be established before construction activities commence. All staff are to be trained on their environmental responsibilities before commencing work. All new staff are to be trained before they start work on site. All construction staff will have basic environmental awareness training, which can be conducted at the same time as the required health, & safety training. Training should include (1) the definition of environment (people + air + soil + water +business); (2) reasons for conserving and protecting the environment; (3) how the following activities can impact the environment: - Not using assigned ablutions, hazardous materials, uncleaned spills, mixing of cement or paint on soil or grass surfaces, waste management i.e. use of waste receptacles and waste separation for recycling, vehicle washing polluting soil & ground water; litter; (4) What to do to prevent the above impacting the environment i.e. assign impermeable mixing areas, no vehicle washing on site, use of waste				

	Site Inception	Construction	Post construction	Operation	Key Issues
Site Camp Establishment	• The construction camp must be located within the construction site and securely fenced	• A designated waste area must be utilised at all times. Bins must be provided and emptied at no less than monthly intervals.	• All building materials and waste must be removed from the site at the end of construction.	• Not Applicable	• Site camp must be established in accordance with all the requirements of the EMPr.

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
	• The construction camp may not be situated on slopes greater than 1:3. • The size of the construction camp must be minimized and must not encroach on any privately owned land without permission. • Cut and fill must be avoided where possible during the set-up of the construction camp. • The contractor must attend to drainage of the construction camp to avoid standing water or sheet erosion. • No contaminated runoff or grey water is allowed to be discharged from the construction camp. • Suitable and sufficient waste bins must be provided within the construction camp. • A materials storage area must be identified and designated within the construction camp. • An area for fuel and hazardous chemical storage must be identified if required. This area should be bunded	• Chemical toilets, if used, must be located on site and maintained regularly (weekly or bi-weekly). • Storm water control must be maintained. • Drip trays are to be cleaned out daily and material collected disposed of as hazardous waste.	• Clearance from the ECO must be obtained to ensure the all of the requirements of the EMPr have been complied with. • Ensure bins and / or skips have been removed from the construction site. • Waybills must be produced showing the removal of waste / spoil / rubble to a registered waste site. • Used oil must be collected by a registered used oil contractor and documentation to this effect has been provided.		

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
	with an impermeable liner or a suitably sized container should be provided as storage space. There should be no bulk fuel storage tanks on site. • Fuel bowsers must be in good condition and be provided with a drip tray for use when dispensing/ refuelling equipment and must be placed under the pump and dispensing unit of the bowser during overnight storage. If possible an undercover area should be provided for overnight storage of the bowser/s. • Decanting of any chemical should be done within the confines of a suitably sized drip tray. • Decanting from large containers (e.g. 210 L drums) should be done using a hand pump, where possible. • Storage areas/containers containing hazardous substances / materials must be clearly signed				

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
	and fire extinguishers must be located in close proximity. • Suitable spill kits for all stationary machinery must be available at the Site Camp, and within the site. • Only emergency (breakdown where equipment is no longer mobile) and minor maintenance (e.g. greasing) may be done on site. Any other planned or required maintenance must be done offsite at a suitable location.				
VEGETATION CLEARING & ENVIRONMENTALLY SENSITIVE AREAS	• The Contractor is responsible for informing all employees about the need to prevent any harmful effects on indigenous vegetation on or around the construction site as a result of their activities. • Workers should be informed of the areas of important indigenous vegetation and the importance of protecting these. • Pesticides and herbicides may not be	• Care must be taken to avoid the introduction of alien plant species to the site. • Alien vegetation re-growth must be controlled throughout the entire site during the construction period. • All areas that have been stripped of vegetation, including the roadsides, should be dampened periodically to avoid excessive dust. • No dumping of the removed vegetation is permitted in the surrounding properties. • In the event of a spill, the Contractor must take prompt	• Rehabilitation of areas disturbed by construction activities or earthworks must commence immediately after the completion of construction activities. • The site must be rehabilitated with species indigenous to the site. • Ensure that no sensitive habitats have been permanently damaged during the construction phase. • Where sensitive environmental areas have	• The watercourse must not be used as a waste dumping site or wash area.	• Only vegetation directly within the project footprint may be removed. • No other vegetation surrounding the site may be impacted on.

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
	used on the construction site. Removal of any alien vegetation should be done by hand where possible. • Only vegetation directly impacted by the road upgrade may be removed. • All sensitive areas must be protected from erosion and direct or indirect spills of pollutants, e.g. sediment, refuse, sewage, cement, oils, fuels, chemicals, wastewater etc.	action to clear polluted areas and prevent spreading of the pollutants. The Contractor must be liable to arrange for professional service providers to clear affected areas, if required. • The Contractor must submit a method statement to the RE for approval, detailing the location of the temporary bypasses, spill prevention measures, erosion and sedimentation control measures, surface water flow diversion, reinstatement, etc.	been damaged these must be reported to the ECO and procedures for rehabilitation of these habitats must be undertaken.		
STORMWATER	• There should be limited storage of sand and cement on the site as this could contaminate stormwater during construction. • All potential stormwater contaminants must be bunded in the site camp to prevent run-off into the surrounding environment. • A drainage system must be established for the construction camp. The drainage system must be regularly checked to ensure an unobstructed water flow. Establish cut	• Any runoff from the construction site must not be allowed to cause excessive erosion or sediment input into the surrounding environment. • Flow of stormwater must not be impeded during construction. • Contamination of stormwater must be avoided at all times. • A drainage system must be established for the construction camp. The drainage system must be regularly checked to ensure an unobstructed water flow. • The use of high velocity stormwater pipelines should	• The stormwater infrastructure must be maintained to ensure accumulation debris does not impede water flow.	• Stormwater control measures will need to be implemented to ensure water runoff does not cause erosion to the surrounding environment.	• Stormwater must be controlled before it is released into the surrounding areas.

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
	off drains and berms to reduce stormwater flow through the construction site. • As there are no formal stormwater drainage facilities on site, the contractor must prepare a Stormwater Control Plan to ensure that all construction methods adopted on site do not cause, or precipitate, soil erosion. The designated responsible person on site, as indicated in the stormwater control plan (usually the contractor) must ensure that no construction work takes place before the stormwater control measures are in place.	be avoided in favour of open, high friction, semi-permeable channels wherever feasible. • During construction unchannelled flow must be controlled to avoid soil erosion. Where large areas of soil are left exposed, rows of straw / hay or bundles of cut vegetation should be dug into the soil in contours to slow surface wash and capture eroded soil. The spacing between rows will be dependent on the slope. • Any incidents involving stormwater contamination must be reported to the ECO for the purposes of maintaining the site's incident records. • The stormwater control plan must be adhered to at all times.			
CONSTRUCTION MATERIAL (SOURCING AND STOCKPILING)	• Contractors must prepare a source statement indicating the sources of all materials (including topsoil, sands, indigenous gravels, crushed stone etc.). • Where possible, a signed document from the supplier of natural materials must be obtained confirming that	•Ensure that all materials are sourced from those sites set out in the source statement and that any changes to sources of materials are updated and approved by the ECO. •Make certain transportation of materials is such that no spillage occurs on route to the site.	• Ensure that areas where materials are sourced are rehabilitated to ensure no erosion or degradation of the surrounding area occurs. • All residual stockpiles must be removed to spoil or spread on site as directed by the ECO.	• Not Applicable.	• Review of source materials lists. • Approve any changes in material sources with ECO first. • Stockpiles must be located at least 50 m away from the edge of any watercourse and outside the 1:100 year flood line. The furthest

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
	they have been obtained in a sustainable manner and in compliance with relevant legislation. • Any mined material must be from a licensed and permitted site. Suppliers must be able to provide permits for the quarry where material has been mined from. • Stockpiles must be positioned and sloped to create the least visual impact.	•The designated storage area must be secured to keep people and animals out. This area should be located in or near the construction camp enclosure. •General building/other materials include non-hazardous materials and chemicals. These must be kept in a designated area. •Materials must be stacked in a way that they cannot fall and cause injury or damage to property or the surrounding environment. Stockpiles must not exceed 2m in height and must be covered if exposed to heavy wind or rain. Alternatively, low walls or berms must be constructed around the stockpiles	• All leftover building materials must be removed from the site. • No foreign material generated / deposited during construction must remain on site. Areas affected by stockpiling must be reinstated to the satisfaction of the RE and ECO.		threshold must be adhered to.
WATER USE AND CEMENT BATCHING	• Water used on site must be from an approved source. Should the water be extracted from a natural source (river), a water use permit must be acquired from DWS. • Topsoil must be stored on a level area to prevent erosion. • If large quantities of concrete is required then it should be trucked in	• Water use on the site must be recorded and monitored. • Stone chip / gravel excess must not be left on site. This must be swept / raked into piles and removed to an area approved by the ECO. • Concrete mixing directly on the ground must not be allowed and must take place on impermeable surfaces to the satisfaction of the ECO. • Designated concrete mixing areas and storage areas for	• All excess concrete must be removed from site on completion of works and disposed of. Washing of the excess material into the ground or watercourses is not allowed. • All excess aggregate must also be removed from site.	• Not Applicable.	• Water may only be used from an approved natural source or from a municipal source. • Concrete mixing directly on the ground is prohibited.

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
	and discharge directly to areas where it may be needed. • No topsoil may be removed from site.	any hazardous materials will be assigned; cement mixing will not be permitted to where runoff can enter any watercourse. • During construction, waste reduction must be targeted and recycled building materials should be used where possible. • Cement mixing must take place on a hard surface or on cement mixing trays. • The concrete batching activities must be located in the site camp only.			
CONTAMINATION & WASTE WATER MANAGEMENT	• A method statement must be completed by the Contractor and submitted to the ECO showing procedures for dealing with possible emergencies that can occur, such as fire, accidental leaks and spillages. • The Contractor must be in possession of an emergency spill kit that is complete and available at all times on site. The internal EO must be aware of the location of the emergency spill kit and have access to it.	• Should any spills of hazardous materials occur on the site or in the storage area, the relevant clean-up specialists must be contacted immediately. Materials that absorb fuel & oil, such as Drizit or earth should be placed over the spill. This contaminated material must be uplifted, placed within impermeable container and disposed of at a recognized disposal site. • Environment surrounding the watercourse crossings must be protected from any contamination. • An incident record must be completed for all spills.	• No evidence of spills must be evident after construction. • Any damage to sensitive areas, due to spillages occurring during the construction period, must be remediated. • Ensure clean up and rehabilitation of areas where any waste water spillage has occurred.	• No contaminated waste water is allowed to enter any watercourse.	• Correct procedures followed and records to be compiled. • Protection of the indigenous vegetation from contamination. • Waste water must either be collected for removal or no washing should occur on site.

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
	• The ECO must be aware of the spillage procedure with regard to spillages of hazardous or potentially hazardous substances. • Adequate wastewater collection facilities must be provided • The Contractor must submit a method statement to the ECO detailing how wastewater would be collected from all wastewater generating areas, as well as storage and disposal methods. • No contaminated runoff or grey water may be discharged from the site camp. • Portable toilets must be situated outside of all sensitive areas. • A maintenance plan for the servicing of these toilets must be drawn up and strictly adhered to, to prevent malfunctioning and neglect resulting in environmental contamination.	• In the event of a spillage that cannot be contained and which poses a serious threat to the local environment, the following Departments must be informed of the incident in accordance with Section 30 of the National Environmental Management Act, Act 107 of 1998, within forty-eight (48) hours: • The Local Authority; • Department of Water and Sanitation; • The Gauteng Department of Agriculture and Rural Development. • The Local Fire Department when relevant; and • Any other affected departments. • The chemical toilets servicing the camp must be maintained in a good state, and any spills or overflows must be attended to immediately by a sanitation expert. • No waste water must be allowed to runoff into the watercourses or into the indigenous vegetation areas. • No vehicle equipment washing should be conducted on site.			

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
		• Toilet waste to be removed by an approved contractor and safe disposal certificates must be available on request. • Drip trays must be made available for all construction vehicles and hazardous chemical/substances bought on to the construction site. • Drip trays must be cleaned out daily and material collected disposed of as hazardous waste. • An incident record must be completed for all spills that do occur. Minor incidents will include small spills of less than 5l that do not enter the stormwater drains, housekeeping issues and general small non compliances with the requirements of the EMPr. The list of incidents to be included in the reporting to the authorities. Major incidents are those that as per section 2.6 of this EMPr must be reported to the authorities, which include all incidents involving contamination of the stormwater or other reportable incidents as defined in 2.6. **Minor incidents:** small spills less than 5l that do not enter			

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
		stormwater, minor non-compliance with EMPr that does not cause major environmental impact i.e. Housekeeping issues etc. Action: Supervisor and staff on site to record and address and notify ECO. ECO to advise on remediation measures and to follow up on actions taken to address incident. Records: On site incident register. **Major incidents:** Large spills or any spills that enter stormwater, contamination of soil fires, explosions. Please see definition of a reportable incident provided below. Action: Report immediately to ECO, action to be taken to prevent further damage and incident to be reported to authorities. ECO to advise on remediation measures and to follow up on actions taken to address incident. Records: On site incident register and report to authorities as listed above.			
WASTE MANAGEMENT	• Waste must be disposed at the appropriate landfill site by an approved contractor.	• The construction rubble must be disposed in designated spoil dumps, demarcated by the Engineer. • Refuse must be separated at source and disposed of in	• No litter must be left on site • All bins and other waste storage are removed from site.	• Maintenance personnel must undergo an induction programme to ensure compliance with operational phase requirements of the EMPr.	• Recycling to be conducted onsite. • Bins must be located at adequate intervals in the construction area.

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
	• Safe disposal certificates will be obtained and kept on site. • The excavation of rubbish pits on site is not allowed. • Burning of rubbish on site is not allowed. • Recycling bins must be placed within the construction site to ensure all materials are properly sorted for recycling.	the appropriate bins, which must be emptied regularly. • Littering is prohibited and the site must be cleaned daily. • All solid waste generated during the construction process (including packets, plastic, rubble, cut plant material, waste metals etc.) must be placed in the waste collection area in the construction camp and must not be allowed to blow around the site, be accessible by animals, or be placed in piles adjacent the skips / bins. • Hazardous waste such as oils, contaminated rags etc must be disposed of at a hazardous class landfill. • A separate drum must be available for storage of contaminated soil. • Recycling must be undertaken to limit waste added to the landfill site.	• A final check must be done to ensure that no waste is left on site. • Burying of rubble on site is prohibited. • Surfaces are to be checked for waste products from activities such as concreting and cleared in a manner approved by the ECO. • The Contractor is to check that the stormwater channels and the drainage pipes are free from building rubble, spoil materials and waste materials.	• Littering on site is prohibited and the site must be cleaned daily.	
HAZARDOUS STORAGE AND DISPOSAL	• Material Safety Data Sheets (MSDSs) must be readily available on site for all chemicals and hazardous substances to be used on site. Where possible and available, MSDSs should additionally include information on	• Hazardous materials to be stored separately. • All hazardous chemicals to be returned to the storage area at the site camp each night. • Fuel storage areas must be bunded with a catch pit of at least 110% the storage	• Hazardous materials that require disposal (cement, paints, solvents, old fuel / oil etc.) must be disposed of to a registered hazardous landfill site. These materials may be removed by an appropriate hazardous	• Not Applicable.	• Hazardous materials must always be stored on a hard-surfaced (impermeable), bunded, secure and undercover area.

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
	ecological impacts and measures to minimize negative environmental impacts during accidental releases or escapes. • Ensure all staff are trained on proper hazardous waste disposal. • Hazardous storage areas to be hard surfaced and bunded with an impermeable liner to protect groundwater quality and undercover. The Contractor must submit a method statement to this effect to the Engineer for approval. • Hazardous storage areas must not be located near any indigenous vegetation areas. • Storage areas containing hazardous substances/materials must be clearly signed. • The hazardous materials storage area must be fully secured to prevent people and animals from accessing it.	capacity of the fuel storage container. This bund must have a controlled stormwater outlet with a filter. • A full inventory of hazardous substances and MSDS for each substance stored on site must be maintained, with each substance being stored and managed in accordance with the MSDS. • Concrete waste must be disposed of at an appropriate waste site. • Do not mix hazardous materials and other demolition materials. • A separate drum should be available for storage of contaminated soil. • Staff dealing with these materials/substances must be aware of their potential impacts and follow the appropriate safety measures. • Transport of hazardous materials around the site should be limited, and materials must be transported in sealed bags/containers. • Mixing/decanting of all chemicals and hazardous substances must take place either on a tray or on an impermeable surface. Waste from these should then be	waste contractor. Proof of appropriate disposal must be available to the ECO for scrutiny and kept on record.		

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
	• Hazardous material storage areas must not be within 50 m of any watercourse or within the 1:100 year flood line. The furthest threshold must be adhered to.	disposed of to a suitable waste site. • Decanting of any chemical should be done within the confines of a suitably sized drip tray. • Decanting from large containers (e.g. 210 L drums) must be done using a hand pump. • Firefighting equipment to be kept near material storage area. • Drip trays are to be cleaned out daily and material collected and disposed of as hazardous waste.			
EROSION CONTROL & AIR QUALITY MANAGEMENT	• The Contractor must, as an initial and on-going exercise, implement erosion and sedimentation control measures to the satisfaction of the ECO. • The contractor must ensure that the necessary equipment is in place to control dust generated during construction.	• Stabilisation of cleared areas to prevent and control erosion and/or sedimentation must be actively managed. • During construction, the Contractor must protect all areas susceptible to erosion by installing necessary temporary drainage systems as soon as possible and by taking any other measures necessary to prevent stormwater from concentrating in streams and scouring slopes, banks, etc. • Damage to stabilised areas must be repaired and maintained to the satisfaction of the ECO.	• In areas where construction activities have been completed and where no further disturbance would take place, rehabilitation and re-vegetation should commence as soon as possible. • Re-vegetation of cleared land must utilize only 100% locally indigenous plant material to ensure no erosion occurs once the site is vacated. • Any eroded soil on paths / roadways / other areas must be collected	• Areas that have been rehabilitated must be maintained and monitored to ensure infestation by alien vegetation does not occur. • Indigenous vegetation utilised in the rehabilitation process must not be used for medicinal purposes.	• Cleared areas must have erosion control measures implemented. • Any eroded sections must be stabilised. • Controls must be implemented to avoid dust generated during construction.

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
		• Bank stabilization must occur in order to prevent collapse of these steep embankments • Vehicles travelling along disturbed areas must adhere to speed limits to avoid creating excessive dust. • Dust suppression techniques must be adopted to control dust generated during construction (e.g. keep dusty areas watered, compact stockpiled soil, construct physical barriers, and control traffic on site). • A complaints register must be maintained on site at all times and be made accessible to the surrounding community (or any affected person(s)) to record complaints regarding odours, emissions and/or excessive levels of dust. • Vehicles and machinery are to be kept in good working order and to meet manufacturer's specifications for safety, fuel consumption etc. • No fires are allowed on site.	and replaced in the area from which it was eroded.		
TRAINING AND CONDUCT	• The ECO must ensure that the Engineer and site agents have sufficient understanding	• Regular toolbox sessions must be held to ensure that staff are reminded about	• Any damage caused by misconduct must be remedied and rehabilitated.	• All maintenance personnel must be made aware of the operational requirements of this EMPr. It	• Workers must be briefed on the requirements of the EMPr.

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
	of environmental issues to pass this information on to the construction staff. • The site manager must ensure that all direct and sub-contracted site personnel have a basic level of environmental awareness training and this has been offered to them in English and Afrikaans/Sesotho. • The Engineer / Environmental Control Officer must be on hand to explain more difficult / technical environmental issues and to answer questions at project commencement. • The need for a "clean site" policy must be explained to construction workers. • The Environmental Control Officer (ECO) must ensure that all site staff are informed of the details of the EMPr document as well as the conditions of the Environmental Authorisation issued by DEA.	environmental and safety issues and procedures. • No fires may be made on the property. • Workers that are under the influence of alcohol or drugs may not operate chainsaws, vehicles or other machinery. • The harvesting of firewood, medicinal plants, tree bark, flowers or other natural materials is forbidden on the site and adjacent properties. • No hunting, killing or harassing of any animals may occur. • No workers may sleep on the property unless proper accommodations for this have been established. • Prior to the commencement of construction, all workers need to know what possible archaeological or historical objects of value may look like, and to notify the site manager if one is found.		is recommended that maintenance personnel undergo an induction programme regarding the requirements of the EMPr.	• Regular toolbox sessions are to be held in order to remind staff about environmental and safety issues.

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
	• Workers must be shown any indigenous vegetation areas and must be informed of the importance of ensuring this area is not impacted on. • Workers must be briefed by the person in charge of managing construction / management activities on the do's and don'ts on the site, when workers arrive at site. This must be repeated in weekly toolbox talks. • No alcohol, drugs, snares, slingshots or animals may be brought onto the property. • Adequate toilets must be available on site for use by construction staff at all times. • The digging of pit latrines is not allowed under any circumstances. • None of the open areas or the surrounding environment may be used as a toilet facility.				
EQUIPMENT MAINTENANCE AND VEHICLE WASHBAY	• Machinery and vehicles must be well maintained but no	• All vehicles and equipment must be kept in good working	• Used oil, lubricants, cleaning materials, etc. to be disposed of at a DWS	• No washing of vehicles is permitted in the vicinity of any watercourse.	• All machinery maintenance, must take place off site.

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
	maintenance work will be carried out on site. • Excessively noisy machinery must be removed from site. • All machinery servicing areas must be bunded.	order to maximize efficiency and minimize pollution. • All maintenance, including washing and repairs of plant on site must take place off site. • Washing of equipment must be conducted offsite where grey water can be collected or disposed, unless adequate collection facilities are available onsite. • The Contractor must ensure that no contamination of soil or vegetation occurs. • Drip trays must be used to collect used oil, lubricants, etc. during minor maintenance. • Drip trays must be provided for all stationary plant.	approved hazardous waste site, safe disposal certificates to be obtained.		• Drip trays must be provided for all stationary plant. • Washing of machines and equipment must be conducted offsite.
OCCUPATIONAL HEALTH & SAFETY AND EMERGENCY RESPONSE	• All construction staff must be provided with relevant Personal Protective Equipment (PPE). • All construction staff must be made aware of emergency phone numbers to use in the case of an emergency. • All staff must be trained on how to react in the case of an emergency. • An emergency response team must be	• The necessary PPE must be worn. • Firefighting equipment to be installed and fire teams must be trained accordingly. • Material stockpiles must be stable and well secured to avoid collapse and possible injury to workers. • Staff handling hazardous substances/materials must be aware of their potential impacts and follow appropriate safety measures.	• Staff handling hazardous substances/materials must be aware of their potential impacts and follow appropriate safety measures.	• Not Applicable	• Emergency phone numbers and responsible persons must be indicated. • The necessary PPE must be worn.

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
	set up to manage emergencies.	• Keep clearly marked absorbent material on site to contain spills if they occur. • If a spill occurs, stop the source, contain it, clean up in accordance with MSDSs and notify relevant authorities.			
TRAFFIC, ACCESS, ROADS AND EQUIPMENT	• All access points must be agreed by the engineer and ECO prior to commencement of construction. • No ad hoc haulage roads or turning areas may be created. • Clear signage relating to traffic and speed limits must be erected prior to construction.	• Stop/Go control must be implemented. Construction sections should be limited to 4km, with a minimum of 4km between two consecutive work areas. In the event that a major intersection is located between two Stop/Go control points within a section under construction, an additional Stop/Go control point will be required at such an intersection. • Legal speed limits must be maintained at all times. • Noise suppressors must be used on machinery on site. Workers will be trained regarding noise on site and construction hours will be kept to working hours (07h00 to 17h00).	• All temporary signage must be removed on completion of construction. • All existing access roads to and from the construction site must be cleared.	• Not Applicable.	• Pointsmen / flagsmen and stop/go control must be used to control traffic during construction.
DECOMMISSIONING	A detailed decommissioning plan must be submitted to GDARD / DEA for approval at least 30 days prior to the decommissioning of the Electrical Line. The plan must address the following: ▪ Air quality ▪ Soil erosion ▪ Waste management ▪ Waste water management ▪ Stormwater management				

	SITE INCEPTION	CONSTRUCTION	POST CONSTRUCTION	OPERATION	KEY ISSUES
	▪ Worker conduct ▪ Dust ▪ Landscaping, re-vegetation, stabilisation and rehabilitation ▪ Land contamination ▪ Complaints register Prior to decommissioning the surrounding community must be notified. Decommissioning must take place only during working hours. All solid waste and rubble must be disposed of at an approved landfill site. No waste is allowed to contaminate any watercourse. Any wash water must be treated as contaminated and is not permitted to enter stormwater drains and run-off into the any watercourses. Rehabilitation measures must be put into place. All structures, foundations, concrete and tarred areas are demolished. Rubble must be removed by an approved contractor and taken to a licensed landfill site. Waste recycling must be encouraged. A long-term monitoring system must be in place to ensure total rehabilitation of the site following decommissioning.				

APPENDIX 8: TRAINING RECORD

This is record of training carried out on site.

Training Topic:_____

Training Topic Details

Training Attendance	
Name	**Signature**

Training Provider: _____ _____

Name Signature

_____

Date

APPENDIX 9: EAP CURRICULUM VITAE