
BATTERY ENERGY STORAGE SYSTEM (BESS) AND ASSOCIATED INFRASTRUCTURE AT GREAT KAROO WIND ENERGY FACILITY, NORTHERN CAPE PROVINCE

ENVIRONMENTAL MANAGEMENT PROGRAMME

January 2021

Prepared for


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PROJECT DETAILS

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Title	:	Environmental Management Programme: Battery Energy Storage System (BESS) and associated infrastructure for the Great Karoo Wind Energy Facility (WEF), Northern Cape
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DEFINITIONS AND TERMINOLOGY

The following definitions and terminology may be applicable to this project and may occur in the report below:

Alien species: A species that is not indigenous to the area or out of its natural distribution range.

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Ambient sound level: The reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation.

Assessment: The process of collecting, organising, analysing, interpreting and communicating information which is relevant.

Biological diversity: The variables among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes they belong to.

Commence: The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

Construction: Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity as per the EIA Regulations. Construction begins with any activity which requires Environmental Authorisation.

Cumulative impacts: The impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Decommissioning: To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation, or maintenance of an activity and are generally obvious and quantifiable.

Disturbing noise: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Ecosystem: A dynamic system of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that is made up of:

- i. The land, water and atmosphere of the earth;
- ii. Micro-organisms, plant and animal life;
- iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
- iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental Authorisation (EA): means the authorisation issued by a competent authority (Department of Environmental Affairs) of a listed activity or specified activity in terms of the National Environmental Management Act (No 107 of 1998) and the EIA Regulations promulgated under the Act.

Environmental assessment practitioner (EAP): An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

Environmental Control Officer (ECO): An individual appointed by the Owner prior to the commencement of any authorised activities, responsible for monitoring, reviewing and verifying compliance by the EPC Contractor with the environmental specifications of the EMPr and the conditions of the Environmental Authorisation

Environmental impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment, as defined in the NEMA EIA Regulations, is a systematic process of identifying, assessing and reporting environmental impacts associated with an activity.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental Management Programme (EMPr): A plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a project or facility and its ongoing maintenance after implementation.

Environmental Officer (EO): The Environmental Officer (EO), employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. The EO must act as liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor.

Habitat: The place in which a species or ecological community occurs naturally.

Hazardous waste: Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800.

Incident: An unplanned occurrence that has caused, or has the potential to cause, environmental damage.

Indirect impacts: Indirect or induced changes that may occur because of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place because of the activity.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

Method Statement: a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications.

Pre-construction: The period prior to the commencement of construction, which may include activities which do not require Environmental Authorisation (e.g. geotechnical surveys).

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances).

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare."

Red Data Species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Significant impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

Vulnerable species: A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future.

Waste: Any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to the Waste Amendment Act (as amended on June 2014); or any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the Gazette.

ABBREVIATIONS

The following abbreviations may be applicable to this project and may occur in the report below:

BA	Basic Assessment
BAR	Basic Assessment Report
dB	Decibels
DEFF	Department of Environment, Forestry and Fisheries (recently renamed from Department of Environmental Affairs)
DAEARDLR	Department of Agriculture, Environmental Affairs, Rural Development and Land Reform
DMRE	Department of Mineral Resources and Energy
EAP	Environmental Assessment Practitioner
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
GPS	Global Positioning System
GWh	Giga Watt hour
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
kV	Kilo Volt
MW	Mega Watt
NEMA	National Environmental Management Act
NEMAA	National Environmental Management Amendment Act
NEMBA	National Environmental Management: Biodiversity Act
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act
NWA	National Water Act
SAHRA	South African National Heritage Resources Agency
SWMP	Stormwater Management Plan

TABLE OF CONTENTS

	PAGE
PROJECT DETAILS	i
DEFINITIONS AND TERMINOLOGY	ii
TABLE OF CONTENTS	vii
APPENDICES	ix
CHAPTER 1: INTRODUCTION	1
CHAPTER 2: PROJECT DETAILS	3
2.1 Study Area	3
2.2 Project Description	3
2.3. Project Development Phases associated with the BESS and Associated Infrastructure for the Great Karoo Wind Energy Facility	4
2.4 Findings of the Basic Assessment	9
2.5. Environmental Sensitivity Mapping	10
CHAPTER 3: PURPOSE AND OBJECTIVES OF THE EMPr	12
CHAPTER 4: STRUCTURE OF THIS EMPr	14
4.1 Contents of this Environmental Management Programme (EMPr)	15
4.2 Project Team	16
4.2.1 Details and Expertise of the Environmental Assessment Practitioner (EAP)	17
4.2.2 Details of the Specialist Consultants	18
CHAPTER 5: PLANNING AND DESIGN MANAGEMENT PROGRAMME	19
5.1 Outcomes	19
OUTCOME 1: Ensure the facility design responds to identified environmental constraints and opportunities	19
OUTCOME 2: Ensure that relevant permits and plans are in place to manage impacts on the environment	21
OUTCOME 3: Ensure effective communication mechanisms	22
CHAPTER 6: MANAGEMENT PROGRAMME: CONSTRUCTION	24
6.1 Institutional Arrangements: Roles and Responsibilities for the Construction Phase	24
OUTCOME 4: Establish clear reporting, communication, and responsibilities in relation to the overall implementation of the EMPr	24
6.2 Outcomes	28
OUTCOME 5: Minimise impacts related to inappropriate site establishment	29
OUTCOME 6: Appropriate management of the construction site and construction workers	30
OUTCOME 7: Limit disturbance of vegetation and loss of protected flora during construction	33
OUTCOME 8: Protection and management of soil and agricultural resources on site	34
OUTCOME 9: Limit direct and indirect faunal (including avifauna) impacts during construction	37
OUTCOME 10: Protection of Heritage Resources	39
OUTCOME 11: Appropriate handling and management of waste	41
OUTCOME 12: Appropriate handling and storage of chemicals, hazardous substances	44
6.3 Detailing Method Statements	47
OUTCOME 13: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk	47
6.4 Awareness and Competence: Construction Phase	49
OUTCOME 14: To ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm	49
6.4.1 Environmental Awareness and Induction Training	50

6.4.2 Toolbox Talks	50
6.5 Monitoring Programme: Construction Phase	51
OUTCOME 15: To monitor the performance of the control strategies employed against environmental objectives and standards	51
6.5.1. Non-Conformance Reports	52
6.5.2. Monitoring Reports	52
6.5.3. Audit Reports	52
6.5.4. Final Audit Report	52
CHAPTER 7: MANAGEMENT PROGRAMME: REHABILITATION	53
7.1. Objectives	53
OUTCOME 16: Ensure appropriate rehabilitation of disturbed areas such that residual environmental risks are remediated or curtailed.....	53
CHAPTER 8: OPERATION MANAGEMENT PROGRAMME	56
8.1. Outcomes	56
OUTCOME 17: Establish clear reporting, communication, and responsibilities in relation to overall implementation of the EMPr during operation.....	56
OUTCOME 18: Limit the ecological footprint of the Great Karoo BESS.....	57
OUTCOME 19: Ensure appropriate operation and maintenance of the battery energy storage system	58
OUTCOME 20: Ensure the implementation of an appropriate fire management plan and general management measures during the operation phase	60
OUTCOME 21: Appropriate handling and management of waste	61
OUTCOME 22: Appropriate handling and management of hazardous substances and dangerous goods	63
CHAPTER 9: MANAGEMENT PROGRAMME: DECOMMISSIONING	65
9.1. Outcomes	65
9.2. Approach to the Decommissioning Phase	66
9.2.1. Identification of structures for post-closure use	67
9.2.2. Removal of infrastructure	67
9.2.3. Soil rehabilitation	67
9.2.4. Establishment of vegetation	67
9.2.5. Maintenance	67
9.2.6. Monitoring	67

APPENDICES

Appendix H.1:	Grievance Mechanism for Public Complaints and Issues
Appendix H.2:	Stormwater Management Plan
Appendix H.3:	Waste Management Plan
Appendix H.4:	Emergency Preparedness, Response and Fire Management Plan
Appendix H.5:	Chance Find Procedure
Appendix H.6:	Alien and invasive plant management plan
Appendix H.7:	Revegetation and Rehabilitation Plan
Appendix H.8:	Erosion Management Plan
Appendix H.9:	Key Legislation
Appendix H.10:	A3 Maps
Appendix H.11:	CVs
Appendix H.12:	Plant rescue and protection plan

CHAPTER 1: INTRODUCTION

This Environmental Management Programme (EMPr) has been compiled for Great Karoo Wind Farm (Pty) Ltd (the developer/proponent) for the development of the Great Karoo Battery Energy Storage System (BESS) (DEFF Ref: 14/12/16/3/3/1/2237) related to the authorised Great Karoo Wind Energy Facility (WEF) (DEFF reference: 12/12/20/2370/3), located within the Karoo Hoogland Municipality of the Namakwa District Municipality near Sutherland, Northern Cape Province. The general purpose and utilisation of a Battery Energy Storage System (BESS) is to save and store excess electrical output as it is generated, allowing for a timed release when the capacity is required. BESS systems therefore provide flexibility in the efficient operation of the electric grid through decoupling of the energy supply and demand. The BESS is envisaged to become an integral component of the authorised WEF, allowing for the storage of energy and extension of the generation period of the WEF.

The project will include the development of the BESS of up to 4ha in extent to be located near to (within 500m of) the Wind Energy Facility substation. Associated infrastructure includes MV cabling (33kV or less to be constructed underground or overhead) connecting the BESS to the substation, laydown area and an access road. The access road will be up to 6m in width to allow large trucks to access the BESS and will also have 1m drainage on each side (i.e. 8m total width). The length of the road will depend on where the BESS is micro-sited within the 500m assessment zone around the substation but will not exceed 500m.

The infrastructure considered within this Environmental Management Programme includes:

- » A Battery Energy Storage System (BESS) inside containers (or similar housing structures) with a footprint of up to 4ha in extent. Both Lithium-ion and Redox-flow technology are being considered for the project, depending on which is most feasible at the time of implementation.
- » An 8m wide access road to the BESS (6m in width with 1m drainage on each side of the road) branching off of the WEF roads, and internal roads within the BESS footprint.
- » MV Cabling (underground or overhead) between the BESS and the WEF substation.
- » Fencing around the BESS for increased security measures.
- » Firebreak around the perimeter of the BESS (within the 4ha footprint), if required.
- » Temporary laydown area within the 4ha footprint of the BESS.

The BESS facility will be located within Farm Kentucky 206. The affected property has been identified by the applicant as the preferred project site suitable for the development of a BESS, based on the requirement for the BESS to be located in close proximity to the WEF substation.

The development of the BESS will support the proposed Great Karoo Wind Energy Facility, which is planned to be developed in accordance with the identified objectives of the national, provincial and local government to develop renewable energy facilities for power generation purposes. The project development site is located within the Komsberg Renewable Energy Development Zone (REDZ) and within the Central Corridor of the Strategic Transmission Corridors.

The nature and extent of the proposed BESS and associated infrastructure, as well as the potential environmental impacts associated with the construction, operation and decommissioning phases of the proposed infrastructure were assessed in the associated Basic Assessment Report (Savannah Environmental, 2020). Site specific environmental issues and constraints within the BESS 500m assessment zone were

considered by independent specialist studies in order to determine the environmental suitability of the assessment zone for the proposed BESS project, delineate areas of sensitivity within the assessment zone, and ultimately inform the placement of the BESS infrastructure.

CHAPTER 2: PROJECT DETAILS

The Battery Energy Storage System (BESS) is proposed to be located on Farm Kentucky, No. 206 (refer to **Table 2.1**) near to the authorised Great Karoo WEF substation and will be up to 4ha in total extent. The general purpose and utilisation of a BESS is to save and store excess electrical output as it is generated, allowing for a timed release of the electricity to the grid when the capacity is required. BESS systems therefore provide flexibility in the efficient operation of the electric grid through decoupling of the energy supply and demand.

Both Lithium-Ion ion and Redox-flow technology are being considered for the project, depending on which is most feasible at the time of implementation. The battery units will be enclosed within containers or similar housing structures. Associated infrastructure includes above- or below-ground MV cabling (33kV or less) to connect the BESS to the substation, laydown area and an access road (8m in total width, with a 6m wide road surface and 1m drainage either side). An area of ~500m around the boundary of the facility substation was assessed in the Basic Assessment process, to allow for the optimization of the placement of the BESS. The BESS is planned to become an integral component of the authorised WEF, allowing for the storage of additional energy and extension of the generation period of the WEF.

2.1 Study Area

Table 2.1 provides information regarding the proposed study area and development area identified for the Great Karoo BESS and also includes information regarding the properties that may be impacted by the development.

Table 2.1: A description of the study area identified for Great Karoo BESS and associated infrastructure

Province	Northern Cape Province
District Municipality	Namakwa District Municipality (DC6)
Local Municipality	Karoo Hoogland Municipality
Ward number(s)	3
Nearest town(s)	Sutherland (+/- 46km) and Laingsburg (+/- 44km)
Affected Properties: Farm name(s), number(s) and portion numbers	BESS and Associated Infrastructure: » Farm Kentucky, No. 206; near Sutherland, Northern Cape
SG 21 Digit Code (s): Affected Properties	BESS and Associated Infrastructure: » Farm Kentucky 206, Sutherland, Northern Cape: C0720000000020600000

A locality map illustrating the location of the study area and the development area is provided in **Figure 2.1**, with a layout map of the BESS footprint illustrated in **Figure 2.2**.

2.2 Project Description

The infrastructure considered within this EMP includes:

- » A Battery Energy Storage System (BESS) inside containers (or similar housing structures) with a footprint of up to 4ha in extent. Both Lithium-Ion and Redox-flow technology are being considered for the project, depending on which is most feasible at the time of implementation.
- » An access road to the BESS (8m in width with 1m drainage on each side of the road branching off of the authorised WEF roads), and internal roads within the BESS footprint.
- » MV Cabling (underground or overhead) between the BESS and the substation.
- » Fencing around the BESS for increased security measures.
- » Possible firebreak around the perimeter of the BESS (within the 4ha footprint), if required.
- » Temporary laydown area within the 4ha footprint of the BESS.

A summary of the details and dimensions of the planned BESS and associated infrastructure associated with the project is provided in **Table 2.2**.

Table 2.2: Details of the proposed BESS and associated infrastructure for the Great Karoo Wind Energy Facility.¹

Infrastructure	Footprint, dimensions and details
BESS Technology	Lithium-Ion or Redox-flow technology
BESS footprint	Up to 4ha in total extent, including foundation, containerised battery system, internal roads, fencing and firebreak.
Capacity	Capacity of up to 1 200MWh Storage capacity of up to 6-8 hours
Access road to the BESS	This will branch off the WEF roads to the BESS and will be 8m in width (6m road surface with 1m drainage either side) and a maximum of 500m in length
Medium Voltage cabling	33kV or less (underground or overhead) between the BESS and WEF substation.
Depth of excavation for the battery foundation and cabling	Maximum of 2m
Height of Development	Maximum of 4m
Fencing	Fencing around the entire footprint of the BESS will be installed for access restriction measures.
Laydown Area	Up to 1ha located within the BESS footprint

2.3. Project Development Phases associated with the BESS and Associated Infrastructure for the Great Karoo Wind Energy Facility

Table 2.2 provides the details regarding the requirements and the activities to be undertaken during the BESS and associated infrastructure development phases (i.e. construction phase, operation phase and decommissioning phase).

Table 2.2: Details of the BESS and associated Infrastructure development phases (i.e. construction, operation and decommissioning)

Construction Phase	
Requirements	» Duration of the construction phase is expected to be up to 12 months.

¹ The confirmed details and dimensions of the BESS infrastructure was assessed as part of the independent specialist studies.

	<ul style="list-style-type: none"> » Create direct construction employment opportunities. Up to 15-20 employment opportunities will be created during the construction phase. » No on-site labour camps. Employees to be accommodated in the nearby towns such as Sutherland (+/- 46km) and Laingsburg (+/- 44km) and transported to and from site daily. » Overnight on-site worker presence would be limited to security staff. » Construction waste will be temporarily stored on site and waste removal and sanitation will be undertaken by a sub-contractor or appointed contractor on a regular basis. » Electricity required for construction activities will be generated by a generator or will be sourced from available Eskom distribution networks in the area. » Negligible water will be required for the construction phase and potable needs. If required, water will be sourced from the local municipality, existing borehole/s on or near the project site (subject to agreement with landowners and authorisation from DHSWS), or water will be extracted from any bulk water supply pipelines near the 500m assessment zone surrounding the Great Karoo Substation.
Construction sequence	<p>BESS are constructed in the following simplified sequence:</p> <ul style="list-style-type: none"> » Step 1: Vegetation clearance and construction of access roads/tracks (as may be needed for permitting and/or search-and-rescue purposes); » Step 2: Construction of the BESS foundations; » Step 3: Vegetation clearance and construction of access roads/tracks (where required); » Step 4: Assembly and construction of the BESS infrastructure on site; <ul style="list-style-type: none"> o For Lithium-ion batteries, the battery cell packs (containing an electrolyte solution) will be brought to site as sealed units which will be installed and connected on site. o For Redox-flow batteries, the battery system will be installed on site and then the electrolyte solution will be pumped into the system from mobile storage drums/totes which are temporarily brought to site to deliver the electrolyte solution. No storage facility for the storage of electrolyte solution/s outside of the battery unit will be developed on site » Step 5: Assembly and construction of MV cabling connecting the BESS to the nearby substation (overhead or underground). Erection of fencing around the BESS. » Step 6: Rehabilitation of disturbed areas; » Step 7: Continued maintenance. <p>It is anticipated that the construction of the BESS and associated infrastructure will take up to 12 months to complete.</p>
Activities to be undertaken	
Conduct surveys prior to construction	<ul style="list-style-type: none"> » Including, but not limited to: a geotechnical survey and environmental walkthroughs (if required for permitting or search-and-rescue purposes).
Undertake site preparation	<ul style="list-style-type: none"> » Including the clearance of vegetation at the BESS foundation, establishment of the laydown areas, the establishment of access roads/tracks and excavations for foundations. » Stripping of topsoil to be stockpiled, backfilled, removed from site and/or spread on site. » To be undertaken in a systematic manner to reduce the risk of exposed ground being subjected to erosion. » Include search and rescue for identified species of concern within the disturbance footprint before construction.
Establishment of laydown areas and batching plant on site	<ul style="list-style-type: none"> » A laydown area for the storage of BESS infrastructure components within the ~4ha BESS footprint, » If necessary, a temporary concrete batching plant of 50m x 50m in extent to facilitate the concrete requirements for BESS infrastructure foundations. Other options include the use of existing batch plants for the WEF or mobile batching plants that allow for in situ batching of concrete.

Facility installation	<ul style="list-style-type: none"> » Installation of BESS infrastructure within the BESS footprint. » Installation of MV cabling to connect the BESS to the nearby substation.
Undertake site rehabilitation	<ul style="list-style-type: none"> » Commence with rehabilitation efforts once construction is completed in an area, and all construction equipment is removed. » On commissioning, access points to the site that will not be required for the operation phase will be closed and prepared for rehabilitation.

Operation Phase

Requirements	<ul style="list-style-type: none"> » Duration will be at least 20 years, or longer as needed for the operation of the Great Karoo Wind Energy Facility. » Requirements for security and maintenance of the BESS infrastructure. » Employment opportunities relating mainly to operation activities and maintenance. Very limited employment opportunities will be available.
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Activities to be undertaken

Operation and Maintenance	<ul style="list-style-type: none"> » Ad hoc infrastructure maintenance activities. » Disposal of limited waste products in accordance with relevant waste management legislation. » On-going rehabilitation of those areas which were disturbed during the construction phase. » During this operation phase vegetation surrounding the BESS boundary will require management only if it impacts on the safety and operational objectives of the project.
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Decommissioning Phase

Requirements	<ul style="list-style-type: none"> » Decommissioning of the BESS infrastructure for the Great Karoo Wind Energy Facility will occur at the end of its economic life. » Removal, recycling, resale or disposal of materials or components in accordance with the relevant local and/or international standards and legislation relevant at the time. » Expected lifespan of approximately 20 years (with maintenance) before decommissioning may be required. This is dependent on the lifespan of the larger Great Karoo Wind Energy Facility. » Decommissioning activities to comply with the standards and legislation relevant at the time.
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Activities to be undertaken

Site preparation	<ul style="list-style-type: none"> » Confirming the integrity of access to the BESS infrastructure to accommodate the required equipment. » Mobilisation of decommissioning equipment.
Disassemble components and rehabilitation	<ul style="list-style-type: none"> » The BESS infrastructure components will be disassembled, removed, reused or recycled (where possible). » Where components cannot be reused or recycled it will be disposed of in accordance with the relevant standards and regulatory requirements at the time of decommissioning. » Disturbed areas, where infrastructure has been removed, will be rehabilitated, if required and depending on the future land-use of the affected areas and the relevant legislation applicable at the time of decommissioning.

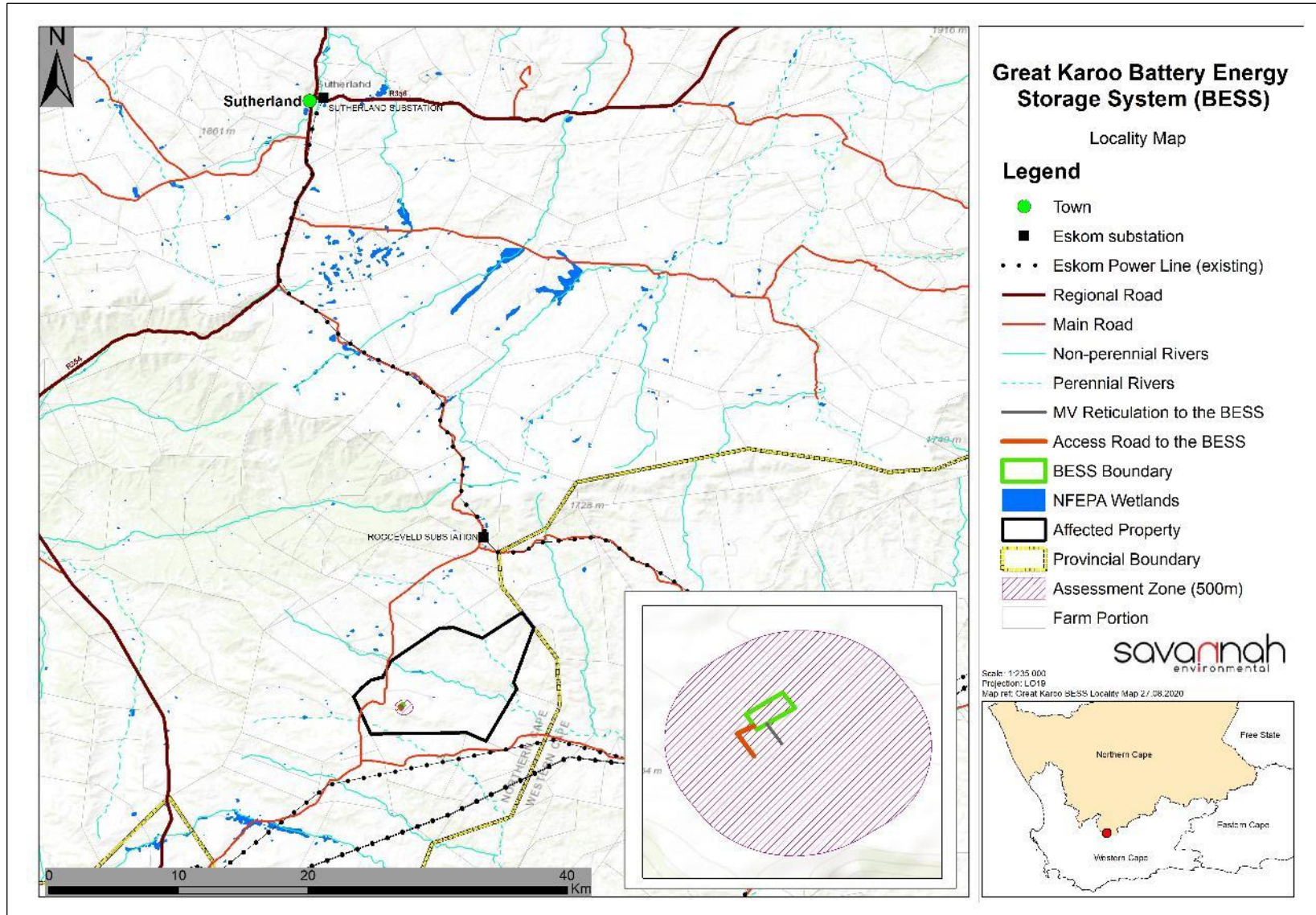


Figure 2.1: Locality map showing the BESS and associated infrastructure for the authorised Great Karoo Energy Facility (refer to **Appendix H.10** for A3 map).

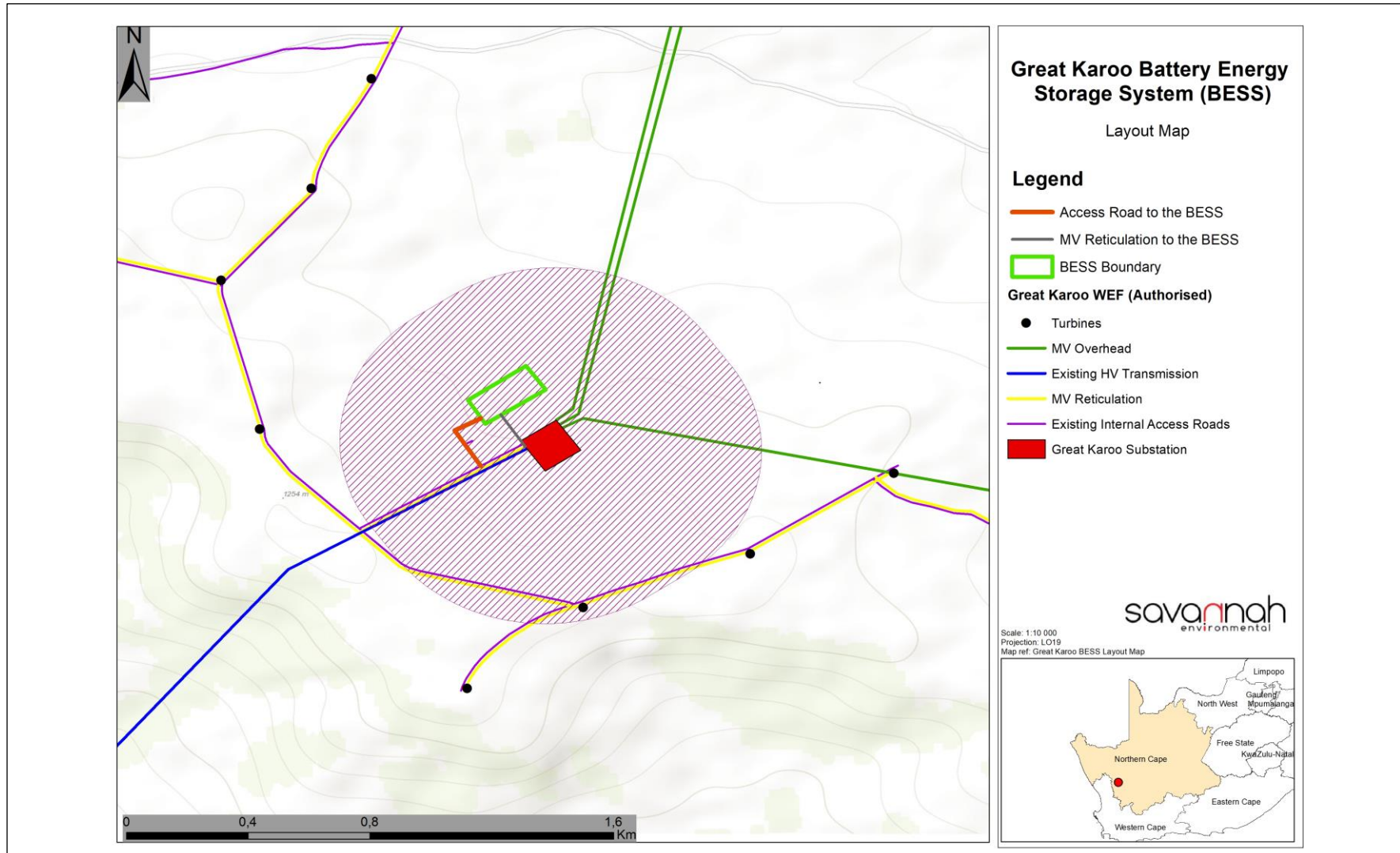


Figure 2.2: Layout map for Great Karoo BESS and associated Infrastructure for the Great Karoo Wind Energy Facility.

2.4 Findings of the Basic Assessment

No environmental fatal flaws were identified from the specialist studies conducted for the BESS for the Great Karoo Wind Energy Facility. All impacts associated with the project establishment within the BESS 500m assessment zone can be mitigated to acceptable levels or enhanced through the implementation of the recommended mitigation or enhancement measures.

The potential environmental impacts associated with the BESS and associated infrastructure for the Great Karoo Wind Energy Facility identified and assessed through the BA process include:

Ecological Impacts (fauna, flora, avifauna & aquatic) - There are no impacts associated with the establishment of Great Karoo BESS that cannot be mitigated to a low significance. Although cumulative impacts in the area are a concern due to the high density of wind energy developments in the area, the contribution of the Great Karoo BESS would be low and is not considered to be of significance. As such, there are no fatal flaws or high post-mitigation impacts that should prevent the development from proceeding with the BESS at the current location, or any other low and/or medium sensitivity area within the 500m assessment zone. Where drainage lines are crossed for MV cabling, these should preferably be above-ground and resulting potential avifaunal impacts are considered acceptable given the short length of the proposed cabling. Based on the location of the BESS as provided for this assessment and the sensitivity determined on site, the Great Karoo BESS can be supported from a terrestrial, aquatic and avifaunal ecology point of view.

Impacts on Heritage Resources – Impacts on archaeology, palaeontology and cultural landscape have been identified. No fatal flaws have been identified from a heritage perspective. The significance of the impacts will be low, with the implementation of the recommended mitigation measures. No heritage impacts of high significance are expected, and the development of the BESS and associated infrastructure is acceptable, subject to the implementation of the recommendations made by the specialist.

Impacts on Noise Resources – Noise impacts on the climate control system of the BESS have been assessed. No fatal flaws have been identified from a noise perspective. No noise impacts other than that of low significance are expected as the noise from the climate control system of the BESS is significantly less than the noise that will be generated by the wind turbines of the proposed Great Karoo WEF and these noises will not cumulatively add to the noise of the WEF.

Impacts on Agricultural Potential – Following the data analysis and impact assessment above, the proposed Great Karoo BESS is considered an acceptable development within the area of the 500m project assessment zone that was assessed for the purpose of compiling the Agricultural Compliance Report.

The project assessment zone consists largely of shallow rocky soil where soil depths and low land capability classes. The land capability classes range between Low-Very-Low (Class 04) and Low-Moderate (Class 06). The long-term grazing capacity of 36 ha/LSU indicates that large portions of land are required for long-term sustainable livestock farming. The vegetation and climatic conditions of the project assessment zone makes this area more suitable for small stock farming (sheep and goats) than cattle farming.

It is anticipated that the construction phase will have impacts that range from medium to low and that through the consistent implementation of the recommendation mitigation measures, these impacts can all be reduced to low. Impacts during the operational phase are associated with maintenance of the infrastructure as well as possible repairs that may be required in the case of equipment failure.

The soil specialist concluded that the application be considered favourably, permitting that the mitigation measures are followed to prevent soil erosion and soil pollution and to minimise impacts on the veld quality of the farm portions that will be affected. The project infrastructure should also remain within the 500m project assessment zone but placement thereof anywhere in the assessment zone has been assessed in this report and does not alter any impacts, mitigations or ratings provided, and regardless of precise location within the 500m project assessment zone, is thus regarded as acceptable from an agricultural impact perspective.

2.5. Environmental Sensitivity Mapping

As part of the specialist investigations undertaken within the development area of Great Karoo BESS, specific environmental features were identified which will be impacted by the placement of the development footprint (i.e. infrastructure) associated with the facility. The current condition of the features identified (i.e. intact or disturbed) will inform the sensitivity of the environmental features and its capacity for disturbance and change associated with the proposed development.

The environmental features identified within the assessment area are illustrated in **Figure 2.3**. The features identified specifically relate to ecological (fauna, flora, avifauna and aquatic) habitats, soil and heritage resources. The following points provide a description of the features present within the development area:

- » The soil specialist determined the site to have a Low Sensitivity. The soil forms observed within the project assessment zone confirmed the details of the land type analysis that indicates very low suitability of these areas for arable crop production. The dominant soil forms identified in Great Karoo BESS project assessment zone are solid rock, Mispah and shallow Bethesda profiles. Further to the low soil suitability, the arid climate (accompanied by long drought spells) from time to time, makes these areas not suitable for rainfed agriculture.
- » In addition, the ecological specialist found that the majority of the 500m assessment region is typical, open plains Central Mountain Shale Renosterveld, considered to be low ecological sensitivity. There are however some drainage features within the BESS 500m assessment region that are considered to be high ecological sensitivity and unsuitable for development. There are also some low hills in the south and west which are considered high sensitivity on account of the vulnerability of these habitats to disturbance. A sensitive drainage line is also present within the assessment area. However, under the layout provided for the assessment, the BESS would be restricted to the lower sensitivity typical low renosterveld of the area. In instance where the BESS MV cabling cross this drainage line and cannot be avoided, overhead lines should be employed to reduce impact. However, considering the short length of the cabling planned, the use of overhead MV cabling across the drainage line will be acceptable. Access roads related to the BESS should not however be located within high or very high areas. Given the avoidance of the sensitive features present and the short length of MV cabling across the drainage line, the BESS would generate a low overall impact on flora, fauna and avifauna and there are no fatal flaws or high impacts associated with the project.
- » Furthermore, the heritage specialist found that none of the archaeological or built environment heritage resources identified by Booth (2012) related to the WEF footprint are located near to the proposed BESS development and as such, it is very unlikely that the proposed BESS will negatively impact on significant archaeological or built environment heritage resources. In addition, a high palaeontological sensitivity was determined for the 500m assessment area of the BESS, with recommendations made for mitigation within the Great Karoo BESS BAR and this report.

These findings were incorporated into the sensitivity mapping below.

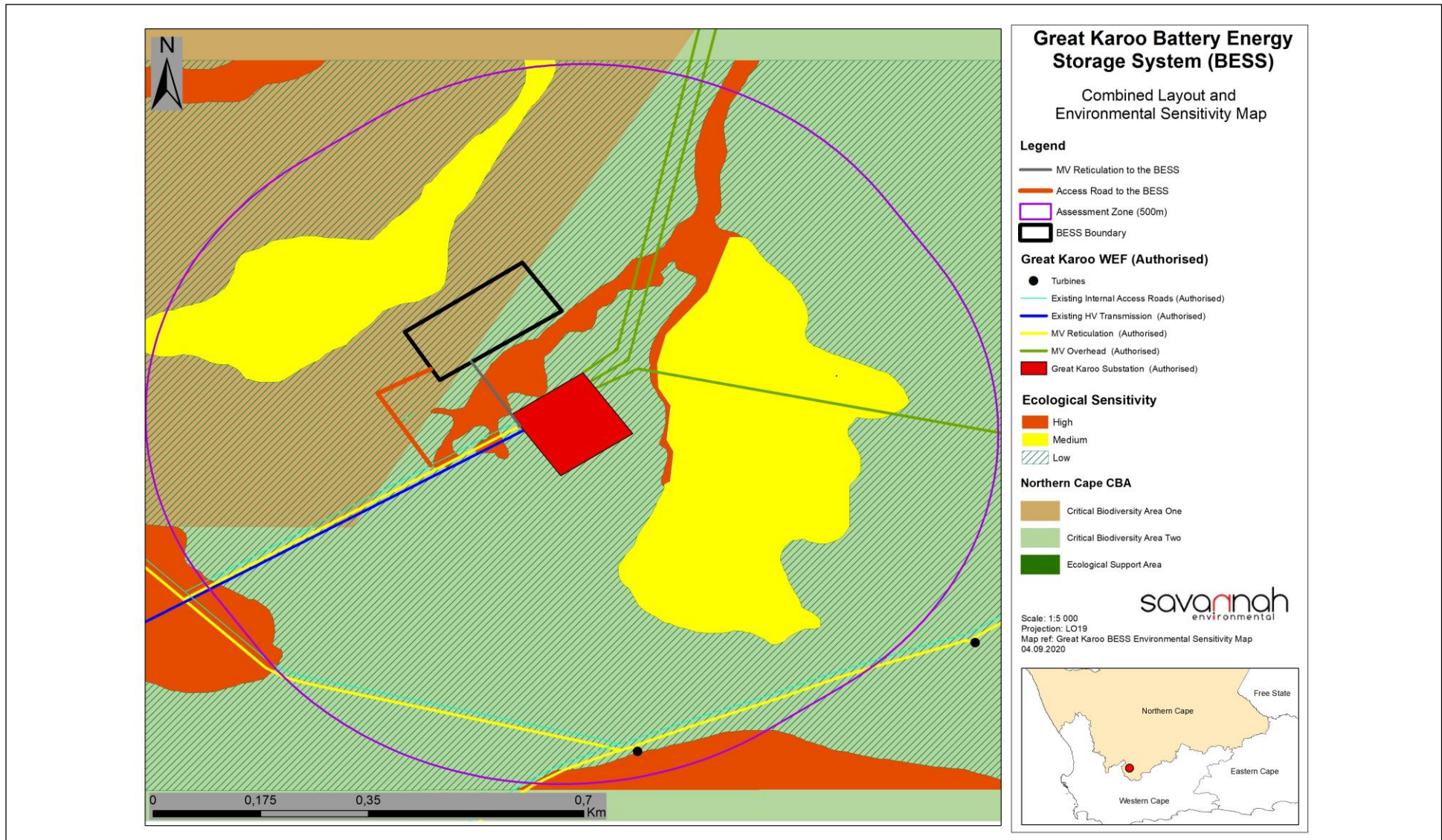


Figure 2.3: Combined layout and sensitivity map of the BESS within the 500m assessment zone.

CHAPTER 3: PURPOSE AND OBJECTIVES OF THE EMPR

An Environmental Management Programme (EMPr) is defined as “an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented or mitigated, and that the positive benefits of the projects are enhanced”. The objective of this EMPr is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMPr is to help ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project.

The EMPr provides specific environmental guidance for the construction and operation phases of a project, and is intended to manage and mitigate construction and operation activities so that unnecessary or preventable environmental impacts do not result. These impacts range from those incurred during start up (site clearing and site establishment) through to those incurred during the construction activities themselves (erosion, noise, dust) to those incurred during site rehabilitation (soil stabilisation, re-vegetation) and operation. The EMPr also defines monitoring requirements in order to ensure that the specified objectives are met.

This EMPr is applicable to all employees and contractors working on the pre-construction, construction, and operation and maintenance phases of Great Karoo BESS. The document must be adhered to and updated as relevant throughout the project life cycle.

This EMPr has been compiled in accordance with Appendix 4 of the EIA Regulations, 2014 (as amended) (refer to **Table 4.1**). This is a dynamic document and will be further developed in terms of specific requirements listed in any authorisations issued for the Great Karoo BESS and/or as the project develops. This will ensure that the construction and operation activities are planned and implemented taking sensitive environmental features into account. The EMPr has been developed as a set of environmental specifications (i.e. principles of environmental management), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools).

The EMPr has the following objectives:

- » Outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction, rehabilitation and operation phases of the project in order to minimise the extent of environmental impacts, and to manage environmental impacts associated with the Great Karoo BESS development.
- » Ensure that the construction and operation phases do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
- » Identify entities who will be responsible for the implementation of the measures and outline functions and responsibilities.
- » Propose mechanisms and frequency for monitoring compliance, and prevent long-term or permanent environmental degradation.
- » Facilitate appropriate and proactive responses to unforeseen events or changes in the project implementation that were not considered in the BA process.

The mitigation measures identified within the BA process are systematically addressed in the EMPr, ensuring the minimisation of adverse environmental impacts to an acceptable level.

The developer must ensure that the implementation of the project complies with the requirements of all environmental authorisations, permits, and obligations emanating from relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMPr, and through its integration into the relevant contract documentation provided to parties responsible for construction and/or operation activities on the site. Since this EMPr is part of the BA process for the Great Karoo BESS, it is important that this document be read in conjunction with the BA Report compiled for this project.

This will contextualise the EMPr and enable a thorough understanding of its role and purpose in the integrated environmental management process. Should there be a conflict of interpretation between this EMPr and the Environmental Authorisation (EA), the stipulations in the EA shall prevail over that of the EMPr, unless otherwise agreed by the authorities in writing. Similarly, any provisions in legislation overrule any provisions or interpretations within this EMPr.

This EMPr shall be binding on all the parties involved in the planning, construction and operation phases of the project, and shall be enforceable at all levels of contract and operational management within the project. The document must be adhered to and updated as relevant throughout the project life cycle. Any updates must be undertaken in accordance with the requirements of the relevant legislation.

CHAPTER 4: STRUCTURE OF THIS EMPR

The preceding chapters provide background to the EMPr and the proposed project, while the chapters that follow consider the following:

- » Planning and design activities;
- » Construction activities;
- » Operation activities; and
- » Decommissioning activities.

These chapters set out the procedures necessary for the project owner to minimise environmental impacts and achieve environmental compliance. For each of the phases of implementation for the project, an overarching environmental **goal** is stated. In order to meet this goal, a number of **outcome** are listed. The management programme has been structured in table format in order to show the links between the goals for each phase and their associated outcome, activities/risk sources, mitigation actions, monitoring requirements and performance indicators. A specific EMPr table has been established for each environmental outcome. The information provided within the EMPr table for each outcome is illustrated below:

OUTCOME: Description of the outcome that is necessary to meet the overall goal, which takes into account the findings of the BA specialist studies

Project Component/s	List of project components affecting the objective, i.e.: <ul style="list-style-type: none"> » BESS Infrastructure; » Access roads; and » Associated infrastructure.
Potential Impact	Brief description of potential environmental impact if objective is not met.
Activity/Risk Source	Description of activities which could affect achieving the objective.
Mitigation: Target/Objective	Description of the target and/or desired outcomes of mitigation.

Mitigation: Action/Control	Responsibility	Timeframe
List specific action(s) required to meet the mitigation target/objective described above.	Who is responsible for the measures	Time periods for implementation of measures

Performance Indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the management programme.
Monitoring	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the outcomes are being achieved, taking into consideration responsibility, frequency, methods, and reporting.

The outcomes and EMPr tables are required to be reviewed and possibly modified whenever changes, such as the following, occur:

- » Planned activities change (i.e. in terms of the components and/or layout of the facility);
- » Modification to or addition to environmental outcomes and targets;
- » Additional or unforeseen environmental impacts are identified and additional measures are required to be included in the EMPr to prevent deterioration or further deterioration of the environment.
- » Relevant legal or other requirements are changed or introduced; and
- » Significant progress has been made on achieving an outcome or target such that it should be re-examined to determine if it is still relevant, should be modified, etc.

4.1 Contents of this Environmental Management Programme (EMPr)

This EMPr has been prepared as part of the BA process conducted in support of the application for EA for the Great Karoo BESS. This EMPr has been prepared in accordance with the requirements of Appendix 4 of the EIA Regulations, 2014 (GNR 326). It provides recommended management and mitigation measures with which to minimise impacts and enhance benefits associated with the project.

An overview of the contents of this EMPr, as prescribed by Appendix 4 of the 2014 EIA Regulations (GNR 326), and where the corresponding information can be found within this EMPr is provided in **Table 4.1**.

Table 4.1: Summary of where the requirements of Appendix 4 of the 2014 NEMA EIA Regulations (GNR 326) are provided in this EMPr.

Requirement	Location in this EMPr
(1) An EMPr must comply with section 24N of the Act and include –	
(a) Details of –	Chapter 4 Appendix H.11
(i) The EAP who prepared the EMPr.	
(ii) The expertise of that EAP to prepare an EMPr, including a curriculum vitae.	
(b) A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description.	Chapter 2
(c) A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers.	Chapter 2 Appendix H.10
(d) A description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including –	
(i) Planning and design.	Chapter 5
(ii) Pre-construction activities.	Chapter 5
(iii) Construction activities.	Chapter 6
(iv) Rehabilitation of the environment after construction and where applicable post closure.	Chapter 7
(v) Where relevant, operation activities.	Chapter 8
(f) A description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to –	Chapters 5 - 8

Requirement	Location in this EMPr
(i) Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation. (ii) Comply with any prescribed environmental management standards or practices. (iii) Comply with any applicable provisions of the Act regarding closure, where applicable. (iv) Comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable.	
(g) The method of monitoring the implementation of the impact management actions contemplated in paragraph (f).	Chapters 5 - 8
(h) The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f).	Chapters 5 - 8
(i) An indication of the persons who will be responsible for the implementation of the impact management actions.	Chapters 5 - 8
(j) The time periods within which the impact management actions contemplated in paragraph (f) must be implemented.	Chapters 5 - 8
(k) The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f).	Chapters 5 - 8
(l) A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations.	Chapter 6
(m) An environmental awareness plan describing the manner in which – (i) The applicant intends to inform his or her employees of any environmental risk which may result from their work. (ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment.	Chapter 6
(n) Any specific information that may be required by the competent authority.	Table 4.2
(2) Where a government notice gazetted by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.	N/A

The following project specific management plans have been developed as part of this EMPr:

- » Appendix H.1: Grievance Mechanism for Public Complaints and Issues
- » Appendix H.2: Stormwater Management Plan
- » Appendix H.3: Waste Management Plan
- » Appendix H.4: Emergency Preparedness, Response and Fire Management Plan
- » Appendix H.5: Chance Find Procedure
- » Appendix H.6: Alien and invasive plant management plan
- » Appendix H.7: Revegetation and Rehabilitation Plan
- » Appendix H.8: Erosion Management Plan
- » Appendix H.9: Key Legislation
- » Appendix H.10: A3 Maps
- » Appendix H.11: CVs
- » Appendix H.12: Plant rescue and protection plan

4.2 Project Team

In accordance with Regulation 12 of the EIA Regulations, 2014 (GNR 326), as amended, the developer appointed Savannah Environmental (Pty) Ltd as the independent environmental consultant responsible for

managing the application for EA and the supporting BA process. The application for EA and the BA process, is being managed in accordance with the requirements of NEMA, the 2014 EIA Regulations (GNR 326), as amended, and all other relevant applicable legislation.

4.2.1 Details and Expertise of the Environmental Assessment Practitioner (EAP)

Savannah Environmental is a leading provider of integrated environmental and social consulting, advisory and management services with considerable experience in the fields of environmental assessment and management. The company is wholly woman-owned (51% black woman-owned), and is rated as a Level 2 Broad-based Black Economic Empowerment (B-BBEE) Contributor. Savannah Environmental's team have been actively involved in undertaking environmental studies over the past 13 years, for a wide variety of projects throughout South Africa, including those associated with electricity generation and infrastructure development.

This BA process is being managed by Jo-Anne Thomas (as EAP). She is supported by Gideon Raath.

- » **Gideon Raath**, the author for this report, holds an MSc (Geography and Environmental Management; SU), a BSc Honours (Ecology and Environmental Studies - Cum laude; Wits) and a BSc (Geography and Environmental Management; UJ). He is a registered professional with the South African Council for Natural Scientific Professions (SACNASP). Gideon's experience includes EIA permitting for ~72 different projects, ranging from infrastructure, mining, energy, housing, renewable energy and the conservation industries. These include Environmental Authorisations (BAR, S&EIR), Water Use Licencing, Waste Licencing, Environmental Compliance Officer compliance auditing, GIS studies and MPRDA permitting. He therefore has wide ranging experience in NEMA, NHRA, NEM:WA, NEM:BA, MPRDA and NWA regulations, having applied them for numerous private and public sector clients across various industries, for small, medium and large projects. Gideon is also an experienced Ecological & Wetland Specialist having conducted ~21 specialist studies, accredited with SACNASP as a professional natural scientist (Pr.Sci.Nat) since 2017. Gideon also has experience beyond the permitting sphere through numerous screening assessments for potential developers, including fatal flaw screenings, regulatory and permitting approval screening as well as ecological and hydrological sensitivity screening. Gideon has also served in an advisory role for various infrastructure and mining projects, assisting with environmental due diligence, bankable feasibility study input and assistance towards financial close.
- » **Jo-Anne Thomas** is the registered EAP for the BA process for this project. Jo-Anne holds a Master of Science Degree in Botany (M.Sc. Botany) from the University of the Witwatersrand, and is a registered Environmental Assessment Practitioner (2019/726) with the Environmental Assessment Practitioners Association of South Africa (EAPASA), as well as a Professional Natural Scientist (400024/2000) with the South African Council for Natural Scientific Professions (SACNASP). She has over 20 years of experience in the field of environmental assessment and management, and the management of large environmental assessment and management projects. During this time she has managed and coordinated a multitude of large-scale infrastructure EIAs, and is also well versed in the management and leadership of teams of specialist consultants, and dynamic stakeholders. Jo-Anne has been responsible for providing technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, EIA studies, environmental permitting, public participation, EMPs and EMPs, environmental policy, strategy and guideline formulation, and integrated environmental management (IEM). Her responsibilities for environmental studies include project management, review and integration of specialist studies, identification and assessment of potential negative environmental impacts and benefits, and the

identification of mitigation measures, and compilation of reports in accordance with applicable environmental legislation.

Savannah Environmental's team have been actively involved in undertaking environmental studies over the past 14 years, for a wide variety of projects throughout South Africa, including those associated with electricity generation and infrastructure development, and therefore have extensive knowledge and experience in EIAs and environmental management, having managed and drafted EMPs for numerous other power generation projects throughout South Africa. Curricula Vitae (CVs) detailing the Savannah Environmental team's expertise and relevant experience are provided in **Appendix H.11** of the EMP.

4.2.2 Details of the Specialist Consultants

A number of independent specialist consultants have been appointed as part of the BA project team in order to adequately identify and assess potential impacts associated with the project (refer to **Table 4.2**). The specialist consultants have provided input into the BA Report as well as this EMP.

Table 4.2: Specialist Consultants which provided input into the EMP

Company	Specialist Area of Expertise	Specialist Name
3Foxes Biodiversity Consulting (Pty) Ltd	Ecology (fauna, flora, avifauna, aquatic)	Simon Todd
TerraAfrica	Soils and Agricultural Potential	Mariné Pienaar
CTS Heritage (Pty) Ltd	Heritage (including archaeology and palaeontology)	Jenna Lavin
EARES Enviro Acoustic Research	Noise (Compliance Statement)	Morné de Jager

CHAPTER 5: PLANNING AND DESIGN MANAGEMENT PROGRAMME

Overall Goal: undertake the pre-construction activities (planning and design phase) in a way that:

- » Ensures that the design and layout of the BESS and associated infrastructure responds to the identified environmental constraints and opportunities.
- » Ensures that pre-construction activities are undertaken in accordance with all relevant legislative requirements.
- » Ensures that adequate regard has been taken of any landowner and community concerns and that these are appropriately addressed through design and planning (where appropriate).
- » Ensures that the best environmental options are selected for the linear components, including the access roads and cabling.
- » Enables the construction activities to be undertaken without significant disruption to other land uses and activities in the area.

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

5.1 Outcomes

OUTCOME 1: Ensure the facility design responds to identified environmental constraints and opportunities

Although areas of high environmental sensitivity have been identified within the 500m assessment area for the Great Karoo BESS, the design of the development footprint minimises impact to high sensitivity areas. All impacts associated with the facility can be mitigated to acceptable levels or enhanced through the implementation of the recommended management, mitigation or enhancement measures. Through the assessment of the development Great Karoo BESS within the study area it was concluded that the development of the BESS facility is environmentally acceptable (subject to the implementation of the recommended mitigation measures).

Project Component/s	<ul style="list-style-type: none"> » Area infrastructure (i.e. BESS footprint, temporary lay-down area and battery units). » Linear infrastructure (i.e. cabling connecting the substation, access road, fencing).
Potential Impact	<ul style="list-style-type: none"> » Impact on identified sensitive areas. » Design fails to respond optimally to the environmental considerations.
Activities/Risk Sources	<ul style="list-style-type: none"> » Positioning of all project components and BESS footprint. » Pre-construction activities, e.g. geotechnical investigations, site surveys and environmental walk-through surveys (where required for permitting and/or search-and-rescue purposes). » Positioning of temporary sites.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » The design of the facility responds to the identified environmental constraints and opportunities. » Optimal planning of infrastructure to minimise visual impact. » Site sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	Responsibility	Timeframe
Plan and conduct pre-construction activities in an environmentally acceptable manner.	Developer Contractor	Pre-construction
Identified areas of high sensitivity must be avoided during the design and layout of the BESS,	Developer Contractor	Design
If the connection to the substation is an overhead line then the design of the proposed power line must be of a type or similar structure as endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy, taking into account the mitigation guidelines recommended by Birdlife South Africa (Jenkins et al., 2017).	Developer Contractor	Design
The EMPr and the EA should form part of the contract with the Contractors appointed to construct the facility and associated infrastructure, and must be used to ensure compliance with environmental specifications and management measures.	Developer Contractor	Tender Design and Design Review Stage
Plan the placement of the temporary laydown areas in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible and to avoid habitat loss and disturbance to adjoining areas and ensure the laydown areas are located in areas of medium to low sensitivity and are properly fenced off.	Developer Contractor	Project planning
Plan development levels to minimise earthworks to ensure that levels are not elevated unnecessarily.	Developer Contractor	Project planning
The fence to be used to fence off the facility must be designed to be animal and bird friendly in order to prevent entrapment and electrocutions of ground-dwelling animal and bird species. No electrified strands should be placed within 30cm of the ground or alternatively, the electrified strands should be placed on the inside of the fence and not on the outside.	Developer Contractor	Project planning
Pre-construction ecology walk-through of the layout in order to locate species of conservation concern that can be translocated as well as comply with the Northern Cape Nature Conservation Act and DAEARDLR /DEFF permit conditions.	Botanical or ecological specialist	Prior to construction commencing
Search and rescue for identified species of concern before construction.	Botanical or ecological specialist	Prior to construction commencing
An archaeological walk-down of the proposed BESS area is required prior to construction. This must be conducted by a qualified archaeologist to ensure that no heritage resources are to be impacted by the development. If heritage resources are identified at or near any proposed infrastructure, an assessment of the significance of the heritage resources and the impact to the identified heritage resource must be completed. A report detailing the results of the survey must be submitted to SAHRA before construction commences.	Archaeologist	Prior to construction commencing
Where appropriate and suitable, consider an aqueous electrolyte for the BESS which significantly reduces the hazards associated with organics and acids.	Developer Contractor	Project planning
Ensure clear rules and regulations for access to the proposed site are developed.	Developer Contractor	Pre-Construction
Appropriate drainage channels must be designed and implemented, including the application of diffuse flow measures	Developer Contractor	Project planning

Mitigation: Action/Control	Responsibility	Timeframe
where discharge of rainwater on roads will be channelled directly into the natural environment,		
Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.	Developer / Contractor Design engineer	Planning and design
Reduce the construction period as far as possible through careful planning and productive implementation of resources.	Developer Contractor	Pre-construction
Compile appropriate action plans to have in place on site, and develop training for contractors and employees in the event of spills, leaks and other potential impacts to any nearby aquatic systems.	Developer Contractor	Pre-construction

Performance Indicator	<ul style="list-style-type: none"> » The design meets the objectives and does not degrade the environment. » Demarcated sensitive areas are avoided based on the approved layout. » Design and layouts respond to the mitigation measures and recommendations in the BA Report.
Monitoring	<ul style="list-style-type: none"> » Review of the design by the Project Manager and the Environmental Control Officer (ECO) prior to the commencement of construction. » Monitor ongoing compliance with the method statements.

OUTCOME 2: Ensure that relevant permits and plans are in place to manage impacts on the environment

Project Component/s	<ul style="list-style-type: none"> » Area infrastructure (i.e. BESS footprint, temporary laydown area and battery units). » Linear infrastructure (i.e. cabling connecting the substation, access road, fencing).
Potential Impact	<ul style="list-style-type: none"> » Impact on identified sensitive areas and protected species. » Design fails to respond optimally to the environmental considerations.
Activities/Risk Sources	<ul style="list-style-type: none"> » Positioning of all project components. » Pre-construction activities, e.g. geotechnical investigations, temporary lay-down area, internal access roads and environmental walk-through surveys (where required for permitting and/or search-and-rescue purposes). » Positioning of temporary sites.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure that the design of the facility responds to the identified environmental constraints and opportunities. » To ensure that pre-construction activities are undertaken in an environmentally friendly manner. »

Mitigation: Action/Control	Responsibility	Timeframe
Obtain any additional environmental permits required from the Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARD&LR) prior to the commencement of on-site construction activities. Copies of permits/licenses must be submitted to the DEFF.	Developer	Pre-construction
Should a water use under the National Water Act be triggered by the development proposal, Water Use Authorisation must be	Developer	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
obtained from the Department of Water and Sanitation prior to commencing with construction activities		
Should abnormal loads have to be transported by road to the site, a permit must be obtained from the relevant Provincial Government. Alert traffic authorities well in advance of any heavy loads that must be transported on local roads and elicit their assistance in controlling traffic associated with the transportation of these loads.	Developer Contractor transporting material to site.	Planning and design
Relevant permits must be obtained for impacts on protected plant species. A pre-construction walk-through should be conducted of the layout in order to locate species of conservation concern that can be translocated as well as comply with the Northern Cape Nature Conservation Act and DAEARD&LR /DAFF permit conditions.	Developer/ Contractor Specialist	Pre-construction
Affected individuals of selected protected species which cannot be avoided should be translocated to a safe area on the site prior to construction. This does not include woody species which cannot be translocated and where these are protected by DAFF and a permit for their destruction would be required.	Developer/ Contractor Specialist	Pre-construction
Vegetation clearing to commence only after the walk through has been conducted, necessary permits obtained and following search and rescue activities completion.	Developer Contractor	Pre-construction
Pre-construction environmental induction must be provided to all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas etc.	Developer/ Contractor Specialist	Pre-construction
A Chance & Fossil Find Protocol (Appendix H.5) must be implemented in the event that archaeological or palaeontological resources are found.	Developer Contractor	Pre-construction
The mitigation measures of the Stormwater Management Plan (SWMP) (Appendix H.2) must be implemented and should provide for a drainage system sufficiently designed to prevent water run-off causing soil erosion.	Developer/ Contractor Design engineer	Pre-construction
An alien and invasive plants and weeds eradication/control plan must be developed and implemented (Appendix H.6)	Developer/ Contractor Specialist	Pre-construction

Performance Indicator	<ul style="list-style-type: none"> » Permits are obtained and relevant conditions complied with. » Permit obtained to destroy or translocate affected individuals of protected species. » Relevant management plans and Method Statements prepared and implemented.
Monitoring	<ul style="list-style-type: none"> » Review of the design by the Project Manager and the ECO prior to the commencement of construction. » Monitor ongoing compliance with the EMPr and method statements.

OUTCOME 3: Ensure effective communication mechanisms

On-going communication with affected and surrounding landowners, and surrounding communities is important to maintain during the construction and operation phases of the development. Any issues and concerns raised should be addressed as far as possible in as short a timeframe as possible.

Project component/s	<ul style="list-style-type: none"> » Area infrastructure (i.e. BESS footprint, temporary laydown area and battery units,). » Linear infrastructure (i.e. cabling connecting the substation, access road, fencing).
Potential Impact	» Impacts on affected and surrounding landowners, communities and land uses
Activity/risk source	<ul style="list-style-type: none"> » Activities associated with construction » Activities associated with operation
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Effective communication with affected and surrounding landowners, and communities. » Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible.

Mitigation: Action/control	Responsibility	Timeframe
A grievance mechanism must be compiled and implemented (Appendix H.1) for the public to be implemented during both the construction and operation phases of the facility. This procedure should include details of the contact person who will be receiving issues raised by interested and affected parties, and the process that will be followed to address issues.	Developer Contractor O&M Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)
Develop and implement a grievance mechanism for the construction, operation and closure phases of the project for all employees, contractors, subcontractors and site personnel. This procedure should be in line with the South African Labour Law.	Developer Contractor O&M Contractor	Pre-construction (construction procedure) Pre-operation (operation procedure)
Organise local community meetings to advise the local labour of the project that is planned to be established and the jobs that can potentially be applied for. These meetings may be combined with any local community interactions determined necessary by the Great Karoo Wind Farm EMPr.	Developer/ Contractor	Pre-construction
Before construction commences, representatives from the local municipality, community leaders, community-based organisations and the surrounding property owners (of the larger area), must be informed of the details of the contractors, size of the workforce and construction schedules.	Developer Contractor	Pre-construction and construction

Performance Indicator	» Effective communication procedures in place.
Monitoring	<ul style="list-style-type: none"> » A grievance mechanism (Appendix H.1) and register must be maintained by the Contractor to record all complaints and queries relating to the project and the action taken to resolve the issue. » All correspondence should be recorded in writing. » Developer and contractor must keep a record of local recruitments and information on local labour; to be shared with the EO and ECO for reporting purposes during construction.

CHAPTER 6: MANAGEMENT PROGRAMME: CONSTRUCTION

Overall Goal: Undertake the construction phase in a way that:

- » Ensures that construction activities are appropriately managed in respect of environmental aspects and impacts.
- » Enables construction activities to be undertaken without significant disruption to other land uses and activities in the area, in particular concerning farming practices, road use, and effects on local residents.
- » Minimises the impact on the indigenous natural vegetation, and habitats of ecological value.
- » Minimises impacts on fauna in the study area.
- » Minimises the impact on heritage sites should they be uncovered.

6.1 Institutional Arrangements: Roles and Responsibilities for the Construction Phase

As the developer, Great Karoo Wind Farm (Pty) Ltd must ensure that the project complies with the requirements of all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development of the EMPr, and the implementation of the EMPr through its integration into the contract documentation. The Developer will retain various key roles and responsibilities during the construction phase.

OUTCOME 4: Establish clear reporting, communication, and responsibilities in relation to the overall implementation of the EMPr

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Technical Director/Manager, Site Manager, Internal Environmental Officer (EO), Safety and Health Representative, Independent Environmental Control Officer (ECO) and Contractor for the construction phase of this project are as detailed below. Formal responsibilities are necessary to ensure that key procedures are executed. **Figure 6.1** provides an organogram indicating the organisational structure for the implementation of the EMPr. **It should be noted that these resources can be the same as those utilised for the wind farm construction, where relevant.**

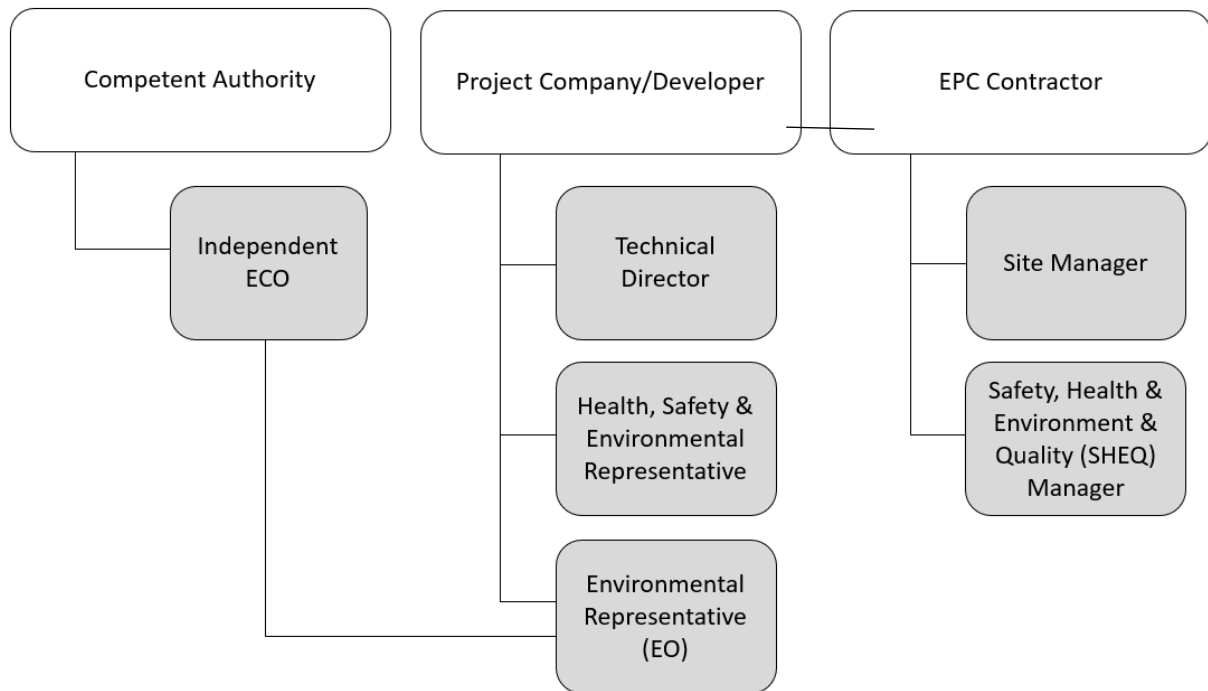


Figure 6.1. Organisational structure for the implementation of the EMPr

Please note: for the purposes of this EMPr the roles of “Project Company” is used interchangeably with that of the “Developer”.

Please further note: The contractor (EPC) may also have an Environmental Representative (EO) role, which would work in conjunction with the developer EO depicted in Figure 6.1 above.

Construction Manager will:

- » Ensure all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these.
- » Ensure that the Developer and its Contractor(s) are made aware of all stipulations within the EMPr and the Environmental Authorisation.
- » Ensure that the EMPr is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes through input from the independent ECO.
- » Be fully conversant with the BA Report for the project, the EMPr, the conditions of the Environmental Authorisation, and all other relevant environmental legislation.
- » Be fully knowledgeable with the contents of all relevant authorisations, licences and permits.

Site Manager (The Contractor's On-site Representative) will:

- » Be fully knowledgeable with the contents of the BA Report.
- » Be fully knowledgeable with the contents and conditions of the Environmental Authorisation.
- » Be fully knowledgeable with the contents and requirements of the EMPr.

- » Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.
- » Have overall responsibility of the EMPr and its implementation.
- » Conduct internal audits to ensure compliance to the EMPr.
- » Ensure there is communication with the Technical Director, the ECO, the Internal EO and relevant discipline engineers on matters concerning the environment.
- » Be fully knowledgeable with the contents of all relevant authorisations, licences and permits.
- » Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site.
- » Confine activities to the approved project site and relevant demarcated construction sites.

An **Independent ECO** must be appointed by the project Developer prior to the commencement of any authorised activities and will be responsible for monitoring, reviewing and verifying compliance by the Contractor with the environmental specifications of the EMPr and the conditions of the Environmental Authorisation. Accordingly, the ECO will:

- » Be fully knowledgeable of the contents of the BA Report.
- » Be fully knowledgeable of the contents of the conditions of the EA (once issued).
- » Be fully knowledgeable of the contents of the EMPr.
- » Be fully knowledgeable of the contents of all relevant environmental legislation, and ensure compliance therewith.
- » Be fully knowledgeable with the contents of all relevant authorisations, licences and permits issued for the project.
- » Ensure that the contents of the EMPr are communicated to the Contractors' site staff and that the Site Manager and Contractors are constantly made aware of the contents through ongoing discussion.
- » Ensure that compliance with the EMPr is monitored through regular and comprehensive inspection of the site and surrounding areas.
- » Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
- » Ensure that activities on site comply with all relevant environmental legislation.
- » Ensure that removal is reported to the Site Manager of any person(s) and/or equipment responsible for any contravention of the specifications of the EMPr where required.
- » Ensure that any non-compliance or remedial measures that need to be applied are reported.
- » Keep records of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
- » Independently report to the Department of Environment, Forestry and Fisheries (DEFF) in terms of compliance with the specifications of the EMPr and conditions of the EA (once issued).
- » Keep records of all reports submitted to DEFF.

As a general mitigation strategy, the ECO should undertake regular inspections of the site preparation and initial clearing activities to ensure the correct demarcation of no-go areas, to facilitate environmental induction with construction staff and to supervise any flora relocation and faunal rescue activities that may need to take place during the site clearing (i.e. during site establishment, and earthworks). Thereafter, further frequent site compliance inspections should be conducted, which must be increased in frequency if required. The period and frequency of monitoring will be stipulated by the EA (once issued). Where this is not clearly dictated, the Developer will determine and stipulate the period and frequency of monitoring required in

consultation with the Competent Authority (however, this is typically required on a monthly basis for the duration of construction unless otherwise established).

The ECO will be supplemented with the **Project Company's Environmental Officer (EO) the EPC Contractor's EO** who will be located on site on a daily (or near daily) basis and will guide the EPC Contractors/Project Company to ensure compliance with the environmental considerations. Therefore, in the absence of the ECO there will be a designated Project Company's EO present to deal with any environmental issues that may arise. Compilation of Weekly and Monthly (if and where required) Monitoring Reports by the EO are to be compiled and submitted to the ECO and Site Manager.

The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site is handed over for operation.

EPC Contractor's Safety, Health and Environment Representative / Environmental Officer: The Contractor's Safety, Health and Environment (SHE) Representative / Environmental Officer, employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. In addition, the SHE / EO must act as liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor. In some instances, a separate EO may be appointed to accept total responsibility for this function.

The EPC Contractor's Safety, Health and Environment Representative / EO should:

- » Be well versed in environmental compliance matters.
- » Understand the relevant environmental legislation and processes, and the implementation thereof.
- » Understand the hierarchy of Environmental Compliance Reporting, and the implications of Non-Compliance.
- » Know the background of the project and understand the implementation programme in line with the EMPr.
- » Be able to resolve conflicts and make recommendations on site in terms of the requirements of this specification.
- » Keep accurate and detailed records of all EMPr-related activities on site. The EPC Contractor's EO shall keep a daily diary for monitoring the site specific activities as per the project schedule.
- » Supervise any flora relocation and faunal rescue activities that may need to take place during the site clearing (i.e. during site establishment, and excavation of foundations) in consultation with the Project Company's Environmental Officer EO and therefore needs the relevant training/ experience. The EPC Contractor's EO will have the overall responsibility for day-to day environmental management and implementation of mitigations.
- » The EPC Contractor's EO is responsible for reporting to the ECO on the day-to-day on-site implementation of this EMPr and other Project Permits/Authorisations.
- » Ensure or otherwise train and induct all contractor's employees prior to commencement of any works.
- » Ensure that there is daily communication with the Site Manager regarding the monitoring of the site.
- » In addition, the EPC Contractor's EO must act as project liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager, ECO Project Company EO and relevant Contractor(s).

Contractors and Service Providers: It is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The Contractors must appoint an Internal EO who will be responsible for informing contractor employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The Internal EO and Contractor's obligations in this regard include the following:

- » Must be fully knowledgeable on all environmental features of the construction site and the surrounding environment.
- » Be fully knowledgeable with the contents and the conditions of the Environmental Authorisation.
- » Be fully knowledgeable with the contents with the EMPr.
- » Be fully knowledgeable of all the authorisations, licences and permits issued for the site.
- » Ensure a copy of the Environmental Authorisation and EMPr is easily accessible to all on-site staff members.
- » Ensure contractor employees are familiar with the requirements of this EMPr and the environmental specifications as they apply to the construction of the BESS facility and associated infrastructure.
- » Ensure that prior to commencing any site works, all contractor employees and sub-contractors must have attended environmental awareness training included in the induction training which must provide staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- » Ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager, ECO, Project Company EO and EPC Contractor's EO.
- » Manage the day-to-day on-site implementation of this EMPr, and the compilation of regular (usually weekly) Monitoring Reports.
- » Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken, including those of the Independent ECO.
- » Inform staff of the environmental issues as deemed necessary by the Independent ECO.

All Contractors (including sub-contractors and staff) and service providers are ultimately responsible for:

- » Ensuring adherence to the environmental management specifications.
- » Ensuring that Method Statements are submitted to the Site Manager (ECO and Project Company's EO) for approval before any work is undertaken.
- » Ensuring that any instructions issued by the Site Manager on the advice of the ECO are adhered to.
- » Ensuring that a report is tabled at each site meeting, which will document all incidents that have occurred during the period before the site meeting.
- » Ensuring that a register is kept in the site office, which lists all transgressions issued by the ECO or Project Company's EO.
- » Ensuring that a register of all public complaints is maintained.
- » Ensuring that all employees, including those of sub-contractors, receive training before the commencement of construction in order for the sub-contractors to constructively contribute towards the successful implementation of the EMPr (i.e. ensure their staff are appropriately trained on the environmental obligations).

6.2 Outcomes

In order to meet the overall goal for construction, the following outcomes, actions, and monitoring requirements have been identified.

OUTCOME 5: Minimise impacts related to inappropriate site establishment

Project Component/s	<ul style="list-style-type: none"> » Area infrastructure (i.e. BESS footprint, temporary lay-down area and battery units)). » Linear infrastructure (i.e. cabling / overhead powerlines connecting the substation, access road, fencing).
Potential Impact	<ul style="list-style-type: none"> » Hazards to landowners and the public. » Damage to indigenous natural vegetation. » Loss of threatened plant species. » Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing and resulting erosion.
Activities/Risk Sources	<ul style="list-style-type: none"> » Any unintended or intended open excavations (foundations and/or trenches). » Movement of construction vehicles in the area and on site. » Transport to and from the temporary construction area/s.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To secure the site against unauthorised entry. » To protect members of the public/landowners/residents. » No loss of or damage to sensitive vegetation in areas outside the immediate development footprint. » Minimal visual intrusion by construction activities and intact vegetation cover outside of the immediate construction work areas.

Mitigation: Action/Control	Responsibility	Timeframe
Secure site, working areas and excavations in an appropriate manner.	Contractor	Site establishment, and duration of construction
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	Contractor	Construction
Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust generation presents a significant impact).	Contractor	Construction
Restrict construction activities to daylight hours as far as possible in order to negate or reduce the visual impacts associated with lighting.	Contractor	Construction
Access to the construction site must be controlled to avoid unauthorised entry	Contractor	Construction
All unattended open excavations must be adequately demarcated and/or fenced.	Contractor	Construction
Establish appropriately bunded areas for storage of hazardous materials (e.g. fuel to be required during construction).	Contractor	Site establishment, and duration of construction
Visual impacts must be reduced during construction through minimising areas of surface disturbance, controlling erosion, using dust suppression techniques, and restoring exposed soil as closely as possible to their original contour and vegetation as and where required.	Contractor	Site establishment, and duration of construction
Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers so that the surrounding environment is not polluted (the provision of ablution facilities must comply with the	Contractor	Site establishment, and duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
2014 Construction Regulations (Section 30(1) (b)) or the relevant legislation applicable at the time).		
Temporary ablution / sanitation facilities must not be located within 100m from any drainage line.	Contractor	Site establishment, and duration of construction
Supply adequate weather and vermin proof waste collection bins and skips (covered at minimum with secured netting or shade cloth) at the site where construction is being undertaken. Separate bins should be provided for general and hazardous waste. Provision should be made for separation of waste for recycling.	Contractor	Site establishment, and duration of construction

Performance Indicator	<ul style="list-style-type: none"> » Site is secure and there is no unauthorised entry. » No members of the public/ landowners injured. » Appropriate and adequate waste management and sanitation facilities are provided at construction site.
Monitoring	<ul style="list-style-type: none"> » An incident reporting system is used to record non-conformances to the EMPr. » EO to monitor all construction areas on a continuous basis until all construction is completed. Non-conformances must be immediately reported to the Site Manager.

OUTCOME 6: Appropriate management of the construction site and construction workers

Project Component/s	<ul style="list-style-type: none"> » Area infrastructure (i.e. BESS footprint, temporary lay-down area and battery units, electrical transformers/switchgear and ancillary buildings). » Linear infrastructure (i.e. cabling / overhead powerlines connecting the substation, access road fencing).
Potential Impact	<ul style="list-style-type: none"> » Damage to indigenous natural vegetation and sensitive areas. » Damage to and/or loss of topsoil (i.e. pollution, compaction etc.). » Impacts on the surrounding environment due to inadequate sanitation and waste removal facilities. » Pollution/contamination of the environment.
Activities/Risk Sources	<ul style="list-style-type: none"> » Vegetation clearing and levelling of equipment storage area/s. » Access to and from the equipment storage area/s. » Stringing of conductors across drainage lines (if required) » Ablution facilities. » Contractors not aware of the requirements of the EMPr, leading to unnecessary impacts on the surrounding environment.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Limit equipment storage within demarcated designated areas. » Ensure adequate sanitation facilities and waste management practices are implemented. » Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment.

Mitigation: Action/Control	Responsibility	Timeframe
Access to the construction site must be controlled to avoid unauthorised entry.	Contractor	Construction
In order to minimise impacts on the surrounding environment, contractors must be required to adopt a certain Code of Conduct and commit to restricting construction activities to areas within the development footprint. Contractors and their sub-contractors must be familiar with the conditions of the EA, the BA Report, and this EMPr, as well as the requirements of all relevant environmental legislation.	Contractor	Construction
Introduce an incident reporting system to be tabled at weekly/monthly project meetings.	Contractor and sub-contractor/s	Pre-construction
Infrastructure such as the perimeter fences (including gates) and the main access and internal roads must be maintained or repaired if disturbed or damaged due to construction activities.	Contractor	Construction
All vehicles must be road worthy and drivers must be licensed, obey traffic rules, follow speed limits and be made aware of potential road safety issues.	Contractor and sub-contractor/s	Construction
Implement penalties for drivers of heavy and light vehicles for reckless driving or speeding as a way to enforce compliance to traffic rules.	Contractor	Construction
No laydown areas, operation and maintenance buildings are allowed in the drainage lines.	Contractor	Construction
No vegetation within the drainage lines is to be removed unnecessarily.	Contractor	Construction
All vehicles and machinery must be checked for leaks before being allowed to operate on the project site. Should leaks be detected, the relevant vehicles and machinery must be repaired before being allowed to operate on the project site.	Contractor	Construction
No storage of fuels, oils or any other hazardous substance are allowed directly in the drainage lines	Contractor	Construction
General storage of fuels, oils and any other hazardous substances must be contained in bunded areas.	Contractor	Construction
Vehicle movement through any drainage lines is to be limited as far as possible.	Contractor	Construction
Heavy and light vehicles must be inspected regularly to ensure their road safety worthiness. Records pertaining to this must be maintained and made available for inspection as necessary.	Contractor	Construction
Ensure all construction equipment and vehicles are properly maintained at all times.	Contractor	Construction
Restrict the operation of power tools and plant that generate noise to daylight hours as per the Environment Conservation Act (Act No. 73 of 1989) during the construction phase, and/or as any deviation that is approved by the relevant authorities.	Contractor	Construction
Ensure that construction workers are clearly identifiable. All workers should carry identification cards and wear identifiable clothing.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Ensure that operators and drivers are properly trained and make them aware, through regular toolbox talks, of any risk they may pose to the community and/or environment.	Contractor	Construction
Contact details of emergency services should be prominently displayed on site.	Contractor	Construction
Open fires on the site for heating, smoking or cooking are not allowed, except in designated areas.	Contractor	Construction
Contractor must provide adequate firefighting equipment on site and provide firefighting training to selected construction staff.	Contractor	Construction
Personnel trained in first aid should be on site to deal with smaller incidents that require medical attention.	Contractor	Construction
Ensure waste storage facilities are maintained and emptied on a regular basis.	Contractor	Site establishment, and duration of construction
Ensure compliance with all national, regional and local legislation with regard to the storage, handling and disposal of waste, hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.	Contractor	Construction
Ensure temporary ablution facilities are appropriately maintained. Temporary ablutions must be cleaned regularly and associated waste disposed of at a registered/permited waste disposal site. Temporary ablutions must be removed from site when construction is completed.	Contractor and sub-contractor/s	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area. Particular attention needs to be paid to food waste.	Contractor and sub-contractor/s	Duration of contract
Keep a record of all hazardous substances stored on site. Clearly label all the containers storing hazardous waste.	Contractor	Duration of contract
No disturbance of flora or fauna must be undertaken outside of the demarcated construction area/s.	Contractor and sub-contractor/s	Duration of contract
Workers must be aware of the importance of drainage lines and drainage systems (especially those surrounding the development footprint) and the significance of not undertaking activities that could result in pollution of the features.	Contractor and EO	Pre-construction Construction
Ensure all requirements of the OHS Act and any other relevant health and safety protocols are appropriately implemented.	Contractor	Construction
Keep record of all accidents or transgressions of safety in accordance with OHS Act and implement corrective action.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » Ablution and waste removal facilities are in a good working order and do not pollute the environment due to mismanagement. » Excess vegetation clearing and levelling is not undertaken. » No complaints regarding contractor behaviour or habits are received. » Appropriate training of all staff is undertaken prior to them commencing work on the construction site. » Code of Conduct drafted before commencement of the construction phase. » Compliance with OHS Act. » Vehicles are roadworthy, inspected regularly and speed limits are adhered to. » Roadworthy certificates are in place for all vehicles.
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	» Roads and the perimeter fence are maintained or improved if disturbed.
Monitoring	<ul style="list-style-type: none"> » Regular audits of the construction on site by the EO. » Proof of disposal of sewage at an appropriate licensed wastewater treatment works. » Proof of disposal of waste at an appropriate licensed waste disposal facility. » An incident reporting system should be used to record non-conformances to the EMPr. » Observation and supervision of Contractor practices throughout the construction phase by the EO. » Complaints are investigated and, if appropriate, acted upon. » Comprehensive record of accidents and incidence and related investigations, findings and corrective action in accordance with the OHS Act.

OUTCOME 7: Limit disturbance of vegetation and loss of protected flora during construction

Potential Impact	» Loss of plant cover leading to erosion as well as loss of faunal habitat and loss of specimens of protected plants.
Activity/Risk Source	<p>Vegetation clearing for the following</p> <ul style="list-style-type: none"> » Clearing for infrastructure establishment. » Access roads. » Laydown areas. » Construction Camps. » Installation of cabling » Installation of overhead power line
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Low footprint and low impact on terrestrial environment. » Low impact on protected plant species.

Mitigation: Action/Control	Responsibility	Timeframe
Vegetation clearing to commence only after walk-through has been conducted and necessary permits obtained.	Contractor	Construction
Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas etc.	Contractor, EO	Construction
Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near the drainage lines and wetlands.	Contractor, EO	Construction
Vegetation clearing should be kept to a minimum and restricted to the development footprint as closely as possible.	Contractor	Construction
All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area.	Contractor	Construction
Temporary laydown areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity preferably, or if unavoidable within medium sensitivity areas. These areas should be rehabilitated after use if	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
not to be permanently developed for the BESS or associated infrastructure.		
There should be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous perennial shrubs, grasses and trees from the local area, for at least 3 years after decommissioning.	Contractor	Decommissioning
Erosion control measures should be implemented in areas where slopes have been disturbed.	Contractor/EO	Construction & Operation
Revegetation of cleared areas or monitoring to ensure that recovery is taking place.	Contractor/EO	Construction & Operation
Alien plant clearing where necessary.	Contractor	Construction & Operation

Performance Indicator	<ul style="list-style-type: none"> » Vegetation loss restricted to infrastructure footprint. » Low impact on protected plant species. » Permit obtained to destroy or translocate affected individuals of protected species.
Monitoring	<ul style="list-style-type: none"> » EO to monitor construction to ensure that: » Vegetation is cleared only within essential areas. » Erosion risk is maintained to an acceptable level through flow regulation structures where appropriate and the maintenance of plant cover wherever possible.

OUTCOME 8: Protection and management of soil and agricultural resources on site

Project Component/s	<ul style="list-style-type: none"> » Area infrastructure (i.e. BESS footprint, temporary lay-down area and battery units)). » Linear infrastructure (i.e. cabling / overhead powerlines connecting the substation, access road, fencing). » Alteration of natural areas into impervious surfaces impacting on the local hydrological regime of the area.
Potential Impact	<ul style="list-style-type: none"> » Impacts on soil (soil pollution) » Loss of topsoil or livestock grazing » Soil Erosion.
Activity/Risk Source	<ul style="list-style-type: none"> » Site preparation and earthworks. » Excavation. » Construction of infrastructure. » Site preparation (e.g. compaction). » Stockpiling of topsoil, subsoil and spoil material.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To minimise the development footprint as far as possible. » To minimise impacts on surrounding sensitive areas. » To minimise impacts on soils. » Minimise spoil material. » Minimise erosion potential. » Minimise the grazing lost by construction activities » Reduce the potential increase in surface flow velocities and the impact on localised drainage systems.

Mitigation: Action/Control	Responsibility	Timeframe
Topsoil must be removed and stored at a maximum height of 2m and stored separately from subsoil and must be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation on cleared areas (maximum length of time before re-use: 18 months).	Contractor	Construction
Soil stockpiles must be located away from any drainage lines or preferential water flow path in the landscape, to minimise soil erosion from these	Contractor	Construction
Soil stockpiles must be dampened with water or a dust suppressant or an equivalent to prevent erosion by wind, or protected from wind erosion by alternate effective means.	Contractor	Duration of construction
Stockpiles are not to be used as stormwater control features.	Contractor	Construction
All graded or disturbed areas which will not be covered by permanent infrastructure such as paving, buildings or roads must be stabilised using appropriate erosion control measures.	Contractor	Construction
A method statement must be developed and submitted to the engineer to deal with erosion issues prior to bulk earthworks operations commencing.	Contractor	Before and during construction
Signs of erosion within the development footprint must be documented through photographic evidence encompassed with the inclusion of the GPS coordinates of the identified problem areas.	EO	Duration of project
Where erosion takes place, the EO must inspect the degree of erosion and propose suitable mitigation measures to prevent further erosion.	Contractor EO	Construction
Any erosion problems observed within the development area as a result of the construction activities must be rectified immediately and monitored thereafter to ensure that they do not re-occur.	Contractor	Construction
Any signs of soil erosion on site should be documented (including photographic evidence and coordinates of the problem areas) and submitted to the management team for further action.	Contractor	Construction
During construction the contractor shall protect areas susceptible to erosion by installing appropriate temporary and permanent drainage works (where required) as soon as possible and by taking other measures necessary to prevent the surface water from being concentrated in streams and from scouring the slopes, banks or other areas.	Contractor	construction
Erosion control measures to be regularly maintained.	Contractor	Construction
Only the designated access routes are to be used to reduce any unnecessary compaction.	Contractor	Construction
Topsoil to be stripped when the soil is dry in order to reduce compaction. The topsoil should be stripped by means of an excavator bucket, and loaded onto dump trucks.	Contractor	Construction
The handling of the stripped topsoil must be minimized to ensure the soil's structure does not deteriorate significantly	Contractor	Construction
Vegetation clearance must be restricted to areas where infrastructure is constructed	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Removal of obstacles to allow for access of construction vehicles must be kept to only where essential.	Contractor	Construction
Prior arrangements must be made with the landowners to ensure that livestock and game animals are moved to areas where they cannot be injured by vehicles traversing the area.	Contractor	Duration of project
No farm gates must be opened without the landowners' permission.	Contractor	Duration of project
No open fires made by the construction teams are allowable during the construction phase.	Contractor	Construction
Land clearance must only be undertaken immediately prior to construction activities and only within the development footprint;	Contractor	Construction
Unnecessary land clearance must be avoided;	Contractor	Duration of project
Where possible, conduct the construction activities outside of the rainy season.	Contractor	Construction
Maintenance must be undertaken regularly on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills;	Contractor	Construction
Any waste generated during construction, must be stored into designated containers and removed from the site by the construction teams.	Contractor	Construction
Ensure battery transport and installation by accredited staff / contractors.	Contractor	Construction
Compile (and adhere to) a procedure for the safe handling of battery cells during transport and installation.	Contractor	Construction
Foundations and trenches must be backfilled with originally excavated materials as much as possible. Excess excavation materials must be disposed of only in approved areas, or, if suitable, stockpiled for use in reclamation activities.	Contractor	Site establishment, and duration of construction and rehabilitation
The mitigation measures included in the Stormwater Management Plan (Appendix H.2 of the EMPr) must be implemented.	Contractor Developer	Duration of project
Stormwater management around the construction footprint areas must be undertaken to ensure that sediment-laden run-off does not enter drainage lines.	Contractor	Construction
Any stormwater within the site must be handled in a suitable manner. Contaminated water must not be discharged into the surrounding environment.	Contractor and Engineers	Construction
All roads and other hardened surfaces must have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.	Contractor	Construction
The access roads should be permeable to allow for drainage from the road surface. In this regard, suitable stormwater management should be implemented to allow for water to drain from the roads without causing erosion.	Contractor	Construction
Appropriate drainage channels must be designed and implemented, including the application of diffuse flow measures where discharge of rainwater on roads will be channelled directly into the natural environment,	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
New access roads within the site are to be constructed according to design and contract specifications.	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » Topsoil appropriately stored, managed and rehabilitated. » Limited soil erosion around the development area. » No activity is undertaken in restricted areas. » Minimal level of soil degradation. » Minimal level of grazing lost due to construction. » No impacts due to runoff. » Appropriate stormwater management practices implemented.
Monitoring	<ul style="list-style-type: none"> » Project Company EO and EPC Contractor's EO to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near drainage lines. » Supervision of all clearing and earthworks. » Ongoing monitoring of erosion management measures within the development area. » An incident reporting system will be used to record non-conformances to the EMPr.

OUTCOME 9: Limit direct and indirect faunal (including avifauna) impacts during construction

Project Component/s	Construction activities especially the following: <ul style="list-style-type: none"> » Vegetation clearing. » Human presence. » Operation of heavy machinery.
Potential Impact	Disturbance of faunal communities due to construction as well as poaching and hunting risk from construction staff.
Activities/Risk Sources	<ul style="list-style-type: none"> » Habitat transformation during construction. » Presence of construction crews. » Operation of heavy vehicles.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Low faunal impact during construction.

Mitigation: Action/Control	Responsibility	Timeframe
EO to monitor and enforce a ban on hunting, collecting etc. of all plants and animals or their products.	Contractor/EO	Construction
All personnel should undergo environmental induction with regards to fauna and, in particular, awareness about not harming or collecting species such as snakes, tortoises and owls, which are often persecuted out of superstition.	Contractor	Construction
Any fauna threatened by the construction activities should be removed to safety by an appropriately qualified environmental officer, or allowed to passively vacate the area.	EO	Construction
All vehicles should adhere to a low speed limit on site (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Where necessary, deterrent devices such as bird guards should be mounted on relevant parts of the pylons to further reduce the possibility of electrocutions.	Contractor	Construction
The power line should be marked with bird diverters in order to make the lines as visible as possible to collision-susceptible species. Recommended bird diverters such as brightly coloured 'aviation' balls, thickened wire spirals, or flapping devices that increase the visibility of the lines should be fitted.	Contractor	Construction
All personnel should undergo environmental induction with regards to avifauna and in particular awareness about not harming, collecting or hunting terrestrial species (e.g. bustards, korhaans, francolin), and owls, which are often persecuted out of superstition.	Contractor	Construction
All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area.	Contractor	Construction
The use of laydown areas within the footprint of the development should be used where feasible, to avoid habitat loss and disturbance to adjoining areas.	Contractor	Construction
Any avifauna threatened by the construction activities should be removed to safety by the Environmental Officer (EO).	Contractor	Construction
If lights are to be used at night for ensuring that infrastructure on site is lit, this should be done with downward-directed low-UV type lights (such as most HPS bulbs), which do not attract insects and their avian predators, so as to minimise disturbance to birds flying over the site at night.	Contractor	Construction
All vehicles (construction or other) accessing the site should adhere to a low speed limit on site (40km/h max) to avoid collisions with susceptible avifauna, such as nocturnal and crepuscular species (e.g. nightjars and owls) which sometimes forage or rest on roads, especially at night.	Contractor	Construction
If holes or trenches need to be dug for cabling or pylons, these should not be left open and unattended for extended periods (> 1 week) of time as terrestrial avifauna or their flightless young may become entrapped therein. Holes should only be dug when they are required and should be used and filled shortly thereafter, alternately, excavated areas should be checked frequently for trapped fauna/ avifauna that require assistance to exit the excavated area.	Contractor	Construction
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.	EO	Construction
If holes or trenches need to be dug for electrical cabling / overhead powerlines or other facility infrastructure, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Holes should only be dug when they are required and should be used and filled shortly thereafter,	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
or alternately excavations must be regularly monitored so that trapped fauna can be freed		
All night-lighting should use low-UV type lights (such as HPS bulbs), which do not attract insects. The lights should also be directed downward to ensure they do not result in large amounts of light pollution.	Contractor/EO	Construction

Performance Indicator	<ul style="list-style-type: none"> » Low mortality of fauna due to construction machinery and activities. » No poaching etc of fauna by construction personnel during construction. » Removal to safety of fauna encountered during construction.
Monitoring	» Monitoring for compliance during the construction phase. All incidents to be noted.

OUTCOME 10: Protection of Heritage Resources

None of the archaeological or built environment heritage resources identified by Booth (2012) for the Wind Farm Development are located near to the proposed BESS development and as such, it is very unlikely that the proposed BESS will negatively impact on significant archaeological or built environment heritage resources. Based on the information available from heritage assessments previously conducted in the area proposed for development, the proposed development of the BESS within the Great Karoo WEF is unlikely to negatively impact significant archaeological, built environment and palaeontological heritage as long as the recommendations contained in Booth (2012) and Rossouw (2012), and repeated below, are implemented. From a heritage perspective, the proposed BESS can be located anywhere within the 500m area assessed in the screening assessment.

Project Component/s	<ul style="list-style-type: none"> » Area infrastructure (i.e. BESS footprint, temporary lay-down area and battery units, electrical transformers/switchgear and ancillary buildings). » Linear infrastructure (i.e. cabling / overhead powerlines connecting the substation, access road fencing).
Potential Impact	» Heritage objects or artefacts found on site and within the development footprint are inappropriately managed or destroyed.
Activity/Risk Source	<ul style="list-style-type: none"> » Site preparation and earthworks. » Equipment installation. » Mobile construction equipment movement on site.
Mitigation: Target/Objective	» To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation.

Mitigation: Action/control	Responsibility	Timeframe
Construction managers/foremen should be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites.	EO	Prior to construction commencing
Prior to construction, a map of the identified palaeontological resources relative to the layout of the proposed development must be emailed to the SAHRA case officer and the EO must monitor all excavations	EO, Archaeologist/palaeontologist	Prior to construction commencing

Mitigation: Action/control	Responsibility	Timeframe
associated with the BESS. Unless specifically required by SAHRA no palaeontological walkthrough is required for this map.		
All staff must be made familiarised with procedures for dealing with heritage objects/sites.	Contractor	Duration of contract, particularly during excavations
EO to alert workers to the importance of reporting fossil bones seen on site and to the possibility of encountering human remains.	EO	Construction
A Chance & Fossil Find Protocol (Appendix H.5) must be developed and implemented in the event that archaeological or palaeontological resources are found.	Developer Contractor	Construction and duration of contract
If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contacted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or paleontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.	EO Developer	Construction and duration of contract
If concentrations of archaeological heritage material, human remains and/or palaeontological finds (fossils) are uncovered during construction, all work must cease immediately and be reported to the Albany Museum (046 622 2312) and/or the South African Heritage Resources Agency (SAHRA) (021 642 4502) so that systematic and professional investigation/ excavation can be undertaken. Chance or Fossil finds should be safeguarded preferably in-situ. SAHRA contact details: 111 Harrington Street, Cape Town P.O Box 4637 Cape Town 8001 Tel: +27 (021) 462 4502 Fax: +27 (021) 462 4509 www.sahra.org.za	EO	Construction
If unmarked human burials are uncovered, the SAHRA Burial Grounds & Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490) must be alerted immediately as per section 36(6) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule.		
Reports of the monitoring by the ECO must be submitted to SAHRA upon completion of the construction phase (all audit reports).	EO	Upon completion of the construction phase
If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal	EO	Construction

Mitigation: Action/control	Responsibility	Timeframe
and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule.		
The following conditions apply with regards to the appointment of specialists: i) If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.	EO, Specialist	Construction

Performance Indicator	<ul style="list-style-type: none"> » No disturbance outside of designated work areas. » All heritage items discovered are dealt with as per the legislative guidelines.
Monitoring	<ul style="list-style-type: none"> » Observation of excavation activities by the EO throughout construction phase. » Supervision of all clearing and earthworks. » Due care taken during earthworks and disturbance of land by all staff and any heritage objects found reported. » Appropriate permits obtained from SAHRA prior to the disturbance or destruction of heritage sites (if required). » An incident reporting system will be used to record non-conformances to the EMPr.

OUTCOME 11: Appropriate handling and management of waste

The construction activities associated with the Great Karoo BESS will involve the generation of various wastes. In order to manage the wastes effectively, guidelines for the assessment, classification, and management of wastes, along with industry principles for minimising construction wastes must be implemented. The main wastes expected to be generated by the construction activities include:

- » general solid waste;
- » hazardous waste;
- » inert waste (rock and soil); and
- » liquid waste (including grey water and sewage).

Project Component/s	<ul style="list-style-type: none"> » Area infrastructure (i.e. BESS footprint, temporary lay-down area and battery units, electrical transformers/switchgear and ancillary buildings). » Linear infrastructure (i.e. cabling / overhead powerlines connecting the substation, access road fencing).
Potential Impact	<ul style="list-style-type: none"> » Inefficient use of resources resulting in excessive waste generation.

	» Litter or contamination of the site or water through poor waste management practices.
Activity/Risk Source	<ul style="list-style-type: none"> » Packaging. » Other construction wastes, including chemicals used during construction. » Hydrocarbon use and storage. » Spoil material from excavation, earthworks and site preparation.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To comply with waste management legislation. » To minimise production of waste. » To ensure appropriate waste storage and disposal. » To avoid environmental harm from waste mismanagement on site. » A waste manifest must be developed for the abluitions showing proof of disposal of sewage at appropriate water treatment works.

Mitigation: Action/Control	Responsibility	Timeframe
Construction method and materials must be carefully considered in view of waste reduction, re-use, and recycling opportunities.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans and related method statements to deal with all waste streams.	Contractor	Duration of contract
Ensure that no litter, refuse, wastes, rubbish, rubble, debris and builders wastes generated on the premises are placed, dumped or deposited on adjacent/surrounding properties, and that the waste is disposed of an appropriately licensed disposal facility.	Contractor	Duration of contract
Waste disposal at the construction site must be avoided by separating and trucking out of waste.	Contractor	Construction
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap), and contaminated waste as required. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.	Contractor	Duration of contract
Where practically possible, construction and general wastes generated on site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and temporary storage of waste streams (such as wood, metals, general refuse etc.).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors and appropriately licenced disposal facilities.	Contractor	Duration of contract
Uncontaminated waste must be removed regularly (i.e. as skips are nearing being full); other wastes must be removed for recycling/ disposal at an appropriate frequency.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area and clearly labelled before being removed from site and appropriately disposed of.	Contractor	Duration of contract
Waste must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
All sewage disposal to take place at a registered and operational wastewater treatment works. Slips of disposal to be retained as proof of responsible disposal.	Contractor	Maintenance: duration of contract within a particular area
All liquid waste must be contained in appropriately sealed vessels/ponds within the footprint of the development, and be disposed of at a designated waste management facility after use.	Contractor	Duration of contract
Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time.	Contractor	Duration of contract
SABS approved spill kits must be available and easily accessible.	Contractor	Duration of contract
Regularly serviced chemical toilet facilities and/or septic tank must be used to ensure appropriate control of sewage.	Contractor	Duration of contract
Daily inspection of all chemical toilets and septic tanks (if applicable) must be performed by environmental representatives on site.	Contractor	Duration of contract
In the event where sewage is discharged into the environment, all contaminated vegetation/ rock and soil must be removed immediately and treated as hazardous waste.	Contractor	Duration of construction
Under no circumstances may waste be burnt on site or on surrounding premises, unless the waste in question is cleared alien vegetation that is being burnt in accordance with an approved alien invasive plant management plan (refer Appendix H.6) and/or method statement.	Contractor	Duration of construction
Where a registered waste site is not available close to the construction site, the Contractor must provide an acceptable method statement to the Project Company with regard to waste management.	Contractor	Duration of construction
Implement an integrated waste management approach (Appendix H.3) that is based on waste minimisation and incorporates reduction, recycling, re-use and disposal where appropriate. Where solid waste is disposed of, such disposal shall only occur at a landfill licensed in terms of section 20(b) of the National Environmental Management Waste Act, 2008 (Act 59 of 2008).	Contractor	Duration of construction
Upon the completion of construction, the area must be cleared of potentially polluting materials. Spoil stockpiles must also be removed and appropriately disposed of or the materials re-used for an appropriate purpose.	Contractor	Completion of construction
Upon the completion of construction, all sanitation facilities (including chemical toilets) must be removed, as well as the associated waste to be disposed of at a registered waste disposal site.	Contractor	Completion of construction
Litter generated by the construction crew must be collected in rubbish bins and disposed of at an appropriate frequency, at registered waste disposal sites.	Contractor	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
All building rubble, solid and liquid waste etc. generated during the construction activities must be disposed of as necessary at an appropriately licensed refuse facility.	Contractor	Duration of construction

Performance Indicator	<ul style="list-style-type: none"> » No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests for all waste streams.
Monitoring	<ul style="list-style-type: none"> » Observation and supervision of waste management practices throughout the construction phase. » Waste collection will be monitored on a regular basis. » Waste documentation is completed and filed accordingly. » A grievance register must be maintained, in which any complaints from the external stakeholders will be logged. Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMPr.

OUTCOME 12: Appropriate handling and storage of chemicals, hazardous substances

The construction phase may involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents.

Project Component/s	<ul style="list-style-type: none"> » Laydown areas. » Temporary chemical storage areas.
Potential Impact	<ul style="list-style-type: none"> » Generation of contaminated wastes from used chemicals or chemical containers. » Soil pollution.
Activity/Risk Source	<ul style="list-style-type: none"> » Vehicles associated with site preparation and earthworks. » Construction activities of BESS area and linear infrastructure. » Hydrocarbon spills by vehicles and machinery during earthworks, vegetation clearance and transport of workers, materials and equipment and fuel storage tanks. » Accidental spills of hazardous chemicals. » Pollution from concrete mixing.
Mitigation: Target/Objective	<ul style="list-style-type: none"> » To ensure that the storage and handling of chemicals and machinery on-site does not cause pollution to the environment or harm to persons. » Prevent and contain chemical leaks. » Undertake proper waste management. » Store hazardous chemicals safely in a bunded area.

Mitigation: Action/Control	Responsibility	Timeframe
Implement an emergency preparedness plan (Appendix H.4) during the construction phase.	Contractor	Duration of Contract
Any liquids stored on site, including fuels and lubricants, must be stored in accordance with applicable legislation.	Contractor	Duration of Contract
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Losses of fuel and lubricants from the oil sumps and steering racks of vehicles and equipment must be contained using a drip tray with plastic sheeting filled with absorbent material when not parked on hard standing.	Contractor	Construction
Ensure battery transport and installation by accredited staff / contractors.	Contractor	Construction
Compile (and adhere to) a procedure for the safe handling of battery cells during transport and installation.	Contractor	Construction
<p>Establish or utilise an appropriate Hazardous Store which is in accordance with the Hazardous Substance Amendment Act, No. 53 of 1992. This should include but not be limited to:</p> <ul style="list-style-type: none"> » Designated area; » All applicable safety signage; » Firefighting equipment; » Enclosed by an impermeable bund; » Protected from the elements, » Lockable; » Ventilated; and » Have adequate capacity to contain 110% of the largest container contents. 	Contractor	Duration of Contract
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures. Where required and applicable, a NEMA Section 30 report must be submitted to DEFF within 14 days of the incident.	Contractor	Duration of contract
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents.	Contractor	Duration of contract
Spilled concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site. Check vehicles and machinery daily for oil, fuel and hydraulic fluid leaks and undertake regular high standard maintenance on vehicles.	Contractor	Duration of contract
Accidental spillage of potentially contaminating liquids and solids must be cleaned up immediately in line with procedures by trained staff with the appropriate equipment.	Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Duration of contract
All stored fuels to be maintained within an appropriate bund and on a sealed surface as per the requirements of SABS 089:1999 Part 1 and any relevant by-laws.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	Contractor	Duration of contract
Oily water from bunds at the on-site facility substation must be removed from site by licensed contractors.	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
The storage of flammable and combustible liquids such as oils must be undertaken in designated areas which are appropriately bunded, and stored in compliance with Material Safety Data Sheets (MSDS) files.	Contractor	Duration of contract
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals must be complied with.	Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations.	Contractor	Duration of contract
An effective monitoring system must be put in place to detect any leakage or spillage of all hazardous substances during their transportation, handling, installation and storage.	Contractor	Construction
Precautions must be in place to limit the possibility of oil and other toxic liquids entering the soil or clean stormwater system.	Contractor	Construction
As much material as possible must be pre-fabricated and then transported to site to avoid the risks of contamination associated with mixing, pouring and the storage and handling of chemicals and compounds on site.	Contractor	Construction
All chemicals and toxicants used during construction must be stored in bunded areas and appropriately labelled.	Contractor	Construction
All waste generated on-site during construction must be adequately managed.	Contractor	Construction
Minimise fuels and chemicals stored on site.	Contractor	Construction
Install bunds on storage areas and take other precautions to reduce the risk of spills.	Contractor	Construction
Implement a contingency plan to handle spills, so that environmental damage is avoided.	Contractor	Construction
No refuelling, servicing of plant/equipment or chemical substance storage allowed outside of designated areas.	Contractor	Construction
Drip trays should be used during all fuel/chemical dispensing and be placed beneath standing machinery/plant.	Contractor	Construction
In the case of hazardous (including petrochemical) spillages, the spill must be collected immediately and stored in a designated area until it can be disposed of in accordance with the Hazardous Chemical Substances Regulations, 1995 (Regulation 15).	Contractor	Construction

Performance Indicator	<ul style="list-style-type: none"> » No chemical spills outside of designated storage areas. » No water or soil contamination by spills. » No complaints received regarding waste on site or indiscriminate dumping. » Safe storage of hazardous chemicals. » Proper waste management.
Monitoring	<ul style="list-style-type: none"> » Observation and supervision of chemical storage and handling practices, and vehicle maintenance throughout the construction phase. » A grievances register must be maintained, in which any complaints from the community will be logged. » An incident reporting system will be used to record non-conformances to the EMPr.

- » On-going visual assessment to detect polluted areas and the application of clean-up and preventative procedures.
- » Records of accidental spills and clean-up procedures and the results thereof must be monitored on an on-going basis by the EO and ECO.
- » Records of all incidents that caused chemical pollution must be kept and a summary of the results must be reported to management annually.

6.3 Detailing Method Statements

OUTCOME 13: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk

The environmental specifications are required to be underpinned by a series of Method Statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract, and how specifications within this EMPr will be met. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Site Manager and ECO.

A Method Statement is defined as "a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications". The Method Statement must cover applicable details with regard to:

- » Responsible person/s;
- » Construction procedures;
- » Materials and equipment to be used;
- » Getting the equipment to and from site;
- » How the equipment/material will be moved while on-site;
- » How and where material will be stored;
- » The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
- » Timing and location of activities;
- » Compliance/non-compliance with the Specifications; and
- » Any other information deemed necessary by the Site Manager.

Method Statements must be compiled for all activities which affect any aspect of the environment and should be applied consistently to all activities. Specific areas to be addressed in the method statement: pre, during and post construction include:

- » Site establishment (which explains all activities from induction training to off-loading, construction sequence for site establishment and the different amenities to be established etc. Including a site camp plan indicating all of these).
- » Preparation of the site (i.e. clearing vegetation, compacting soils, and waste).
- » Soil management/stockpiling and erosion control.
- » Excavations and backfilling procedure.

- » Stipulate norms and standards for water supply and usage (i.e.: comply strictly to licence and legislation requirements and restrictions).
- » Stormwater method statement.
- » Ablution facilities (placement, maintenance, management and servicing).
- » Solid Waste Management:
 - * Description of the waste storage facilities (on site and accumulative).
 - * Placement of waste stored (on site and accumulative).
 - * Management and collection of waste process.
 - * Recycle, re-use and removal process and procedure.
- » Liquid waste management.
- » Design, establish, maintain and operate suitable pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into the surrounding environment. Should grey water (i.e. water from basins, showers, baths, kitchen sinks etc.) need to be disposed of, link into an existing facility where possible. Where no facilities are available, grey water runoff must be controlled to ensure no seepage into the surrounding environment occurs.
- » Dust and noise pollution:
 - * Describe the necessary measures to ensure that noise from construction activities is maintained within lawfully acceptable levels.
 - * Procedure to control dust at all times on the site, access roads and spoil sites (dust control shall be sufficient so as not to have significant impacts in terms of the biophysical and social environments). These impacts include visual pollution, decreased safety due to reduced visibility, negative effects on human health and ecology due to dust particle accumulation.
- » Hazardous substance storage (ensure compliance with all national, regional and local legislation with regard to the storage of oils, fuels, lubricants, solvents, wood treatments, bitumen, cement, pesticides and any other harmful and hazardous substances and materials. South African National Standards apply).
 - * Lists of all potentially hazardous substances to be used.
 - * Appropriate handling, storage and disposal procedures.
 - * Prevention protocol of accidental contamination of soil at storage and handling areas.
 - * All storage areas, (i.e. for harmful substances appropriately bunded with a suitable collection point for accidental spills must be implemented and drip trays underneath dispensing mechanisms including leaking engines/machinery).
- » Fire prevention and management measures on site.
- » Fauna and flora protection process on and off site (i.e. removal to reintroduction or replanting, if necessary).
 - * Rehabilitation, re-vegetation process and bush clearing.
- » Incident and accident reporting protocol.
- » General administration.
- » Designate access roads and relevant protocols while roads are in use.
- » Requirements on gate control protocols.

The Contractor may not commence with the activity covered by the Method Statement until it has been approved by the Site Manager (with input from the ECO), except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract. Failure to submit a method statement may result in suspension of the activity concerned until such time that an appropriate method statement has been submitted and approved.

6.4 Awareness and Competence: Construction Phase

OUTCOME 14: To ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm

To achieve effective environmental management, it is important that all personnel involved in the project are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The ECO is responsible for monitoring compliance pre, during and post construction (until rehabilitation is completed). The contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts.

The Contractors obligations in this regard include the following:

- » All Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment. This includes the discussion/explanation of site environmental matters during toolbox talks.
- » The content and requirements of Method Statements are to be clearly explained to all plant operators and general workers. All staff acting in a supervisory capacity are to have copies of the relevant Method Statements and be aware of the contents thereof.
- » Ensuring that a copy of the EMPr is readily available on-site, and that all senior site staff are aware of the location and have access to the document. Senior site staff will be familiar with the requirements of the EMPr and the environmental specifications as they apply to the construction of the facility.
- » Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training session. The training session must provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
 - * Records must be kept of those that have completed the relevant training.
 - * Training should be done either in a written or verbal format but must be appropriate for the receiving audience.
 - * Refresher sessions must be held to ensure the contractor staff are aware of their environmental obligations as practically possible.
- » All sub-contractors must have a copy of the EMPr and sign a declaration / acknowledgement that they are aware and familiar with the contents and requirements of the EMPr and that they will conduct work in such a manner as to ensure compliance with the requirements of the EMPr.
- » Contractors and main sub-contractors must have basic training in the identification of archaeological and palaeontological sites/objects, and protected flora and fauna that may be encountered on the site.
- » Awareness of any other environmental matters, which are deemed to be necessary by the ECO.
- » Ensuring that employee information posters, outlining the environmental "do's" and "dont's" (as per the environmental awareness training course) are erected at prominent locations throughout the development area.

Therefore, prior to the commencement of construction activities and before any person commences with work thereafter, adequate environmental awareness and responsibility are to be appropriately presented to all staff present on-site, clearly describing their obligations towards environmental controls and methodologies in terms of this EMPr. This training and awareness will be achieved in the following ways:

6.4.1 Environmental Awareness and Induction Training

The EO, in consultation with the contractor, shall ensure that all construction workers receive an induction presentation, as well as on-going environmental education and awareness, on the importance and implications of the EMPr and the environmental requirements it prescribes. The presentation shall be conducted, as far as is possible, in the employees' language of choice. The contractor must provide a translator from their staff for the purpose of translating should this be necessary.

As a minimum, induction training should include:

- » Explanation of the importance of complying with the EMPr;
- » Explanation of the importance of complying with the Environmental Authorisation;
- » Discussion of the potential environmental impacts of construction activities;
- » Awareness regarding sensitivities on the site, including sensitive plant species (including the use of visual aids and on-site identification);
- » The benefits of improved personal performance;
- » Employees' roles and responsibilities, including emergency preparedness (this should be combined with this induction, but presented by the contractor's Health and Safety Representative);
- » Explanation of the mitigation measures that must be implemented when carrying out their activities; and
- » Explanation of the specifics of this EMPr and its specification (no-go areas, etc.).

Environmental Awareness Training must take the form of an on-site talk and demonstration by the EO/ECO before the commencement of site establishment and construction on site. The education/awareness programme must be aimed at all levels of management and construction workers within the contractor team. A record of attendance of this training must be maintained by the EO/ECO on site. Proof of awareness training must be kept on record. Environmental induction training must be presented to all persons who are to work on the site – be it for short or long durations; Contractor's or Engineer's staff; administrative or site staff; sub-contractors or visitors to site.

This induction training should be undertaken by the EPC Contractor's EO and should include discussing Great Karoo Wind Farm (Pty) Ltd's environmental policy and values, the function of the EMPr and Contract Specifications and the importance and reasons for compliance to these. The induction training must highlight the overall do's and don't's on site and clarify the repercussions of not complying with these. The non-conformance reporting system must be explained during the induction as well. Opportunity for questions and clarifications must form part of this training. A record of attendance of this training must be maintained by the Project Company's EO and EPC Contractor's EO on site.

6.4.2 Toolbox Talks

Toolbox talks should be held on a scheduled and regular basis where foremen, environmental and safety representatives of different components of the works and sub-consultants hold talks relating to environmental practices and safety awareness on site. These talks must also include discussions on possible common incidents occurring on site and ones recommended by the on-site EO and the prevention of reoccurrence thereof. Records of attendance and the awareness talk subject must be kept on file.

6.5 Monitoring Programme: Construction Phase

OUTCOME 15: To monitor the performance of the control strategies employed against environmental objectives and standards

A monitoring programme must be in place not only to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are, or could result in significant environmental impacts for which corrective action is required. The period and frequency of monitoring will be stipulated by the EA (once issued). Where this is not clearly dictated, the Developer will determine and stipulate the period and frequency of monitoring required in consultation with Competent Authority. The Technical Director/ Project Manager will ensure that the monitoring is conducted and reported.

The following monitoring frequency is however proposed for consideration by the Competent Authority to be included in the Environmental Authorisation:

- i. Monthly ECO inspections with associated monthly inspection report for the duration of the construction phase, to be kept within the site environmental file;
- ii. Monthly submission of ECO inspection reports once the monthly report is finalised. In essence, once monthly ECO report submission to DEFF Compliance directorate for the duration of the construction phase.

The aim of the monitoring and auditing process would be to monitor the implementation of the specified environmental specifications, in order to:

- » Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications
- » Ensure adequate and appropriate interventions to address non-compliance
- » Ensure adequate and appropriate interventions to address environmental degradation
- » Provide a mechanism for the lodging and resolution of public complaints
- » Ensure appropriate and adequate record keeping related to environmental compliance
- » Determine the effectiveness of the environmental specifications and recommend the requisite changes and updates based on audit outcomes, in order to enhance the efficacy of environmental management on site
- » Aid in communication and feedback to authorities and stakeholders

All documentation e.g. audit/monitoring/compliance reports and notifications, required to be submitted to the DEFF in terms of the EA, must be submitted to the Director: Compliance Monitoring of the Department.

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

6.5.1. Non-Conformance Reports

All supervisory staff including Foremen, Engineers, EO's and the ECO must be provided the means to be able to submit non-conformance reports to the Site Manager. Non-conformance reports will describe, in detail, the cause, nature and effects of any environmental non-conformance by the Contractor.

The non-conformance report will be updated on completion of the corrective measures indicated on the finding sheet. The report must indicate that the remediation measures have been implemented timeously and that the non-conformance can be closed-out to the satisfaction of the Site Manager and ECO.

6.5.2. Monitoring Reports

A monitoring report will be compiled by the ECO in accordance with the period and frequency of monitoring as stipulated by the EA (once issued). Where this is not clearly dictated, the Developer will determine and stipulate the period and frequency of monitoring required in consultation with the Competent Authority. It is suggested that monthly ECO reports are submitted to the Competent Authority as identified above (however the period cited in the EA will take precedence). The monitoring report must be submitted to the Director: Compliance Monitoring at DEFF for their records. This Report must include details of the activities undertaken in the reporting period, any non-conformances or incidents recorded, corrective action required, and details of those non-conformances or incidents which have been closed out. The contractor must ensure that all waste manifests are provided to the ECO on a monthly basis in order to inform and update the DEFF regarding waste related activities.

6.5.3. Audit Reports

The holder of the EA must, for the period during which the EA and EMPr remain valid, ensure that project compliance with the conditions of the EA and the EMPr are audited in accordance with the audit requirements of the Environmental Authorisation and the EIA Regulations, 2014 (as amended) where applicable, and that the audit reports are submitted to the Director: Compliance Monitoring of the DEFF.

It is suggested that an audit report is compiled by an independent auditor within 30 days of completion of the construction phase (i.e. within 30 days of site handover). This Report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the EA conditions and the requirements of the EMPr.

6.5.4. Final Audit Report

A final environmental audit report must be compiled by the ECO, or an independent auditor and be submitted to DEFF upon completion of the rehabilitation activities. The Report must be submitted as directed in the environmental authorisation or within 30 days of completion of rehabilitation activities where this is not specified in the EA. This Report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the EA conditions and the requirements of the EMPr.

CHAPTER 7: MANAGEMENT PROGRAMME: REHABILITATION

Overall Goal: Undertake the rehabilitation measures in a way that:

- » Ensures rehabilitation of disturbed areas following the execution of construction works, such that residual environmental risks are remediated or curtailed.

7.1. Objectives

In order to meet this goal, the following objective, actions and monitoring requirements are relevant:

OUTCOME 16: Ensure appropriate rehabilitation of disturbed areas such that residual environmental risks are remediated or curtailed

Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular operation and maintenance operations. Rehabilitation must be undertaken in an area as soon as possible after the completion of construction activities within that area.

Project Component/s	» All areas affected by construction activities and not required for operation.
Potential Impact	» Environmental integrity of the site undermined resulting in reduced visual aesthetics, erosion and increased runoff, and the requirement for on-going management intervention.
Activity/Risk Source	» Temporary construction areas. » Other disturbed areas/footprints.
Mitigation: Target/Objective	» Ensure and encourage site rehabilitation of disturbed areas. » Ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed.

Mitigation: Action/Control	Responsibility	Timeframe
Implement an appropriate Revegetation and Rehabilitation Plan (refer Appendix H.7)	Contractor	Following execution of the works
All temporary facilities, equipment, and waste materials must be removed from site as soon as construction is completed.	Contractor	Following execution of the works
All left-over construction material must be removed from site once construction on a land portion is completed.	Contractor	Following execution of the works
The site should be rehabilitated with locally occurring species to restore ecosystem structure and function.	Contractor	Following execution of the works
Erosion management within the development area should take place in accordance with the Erosion Management Plan (refer Appendix H.8). This should make provision for monitoring of the development area for at least 3 years after the decommissioning phase.	Contractor	Following execution of the works

Mitigation: Action/Control	Responsibility	Timeframe
All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.	Contractor	Following execution of the works
Level any remaining soil removed from excavation pits that remained on the surface instead of allowing small stockpiles of soil to remain on the surface.	Contractor	Following execution of the works
The area must be shaped to a natural topography.	Contractor	Following completion of construction activities in an area
No planting or importing any listed invasive alien plant species (all Category 1a, 1b and 2 invasive species) to the site for landscaping, rehabilitation or any other purpose must be undertaken.	Contractor	Following completion of construction activities in an area
Compacted areas must be ripped (perpendicularly) to a depth of 300mm (or as determined by an ecologist based on the local conditions), and the area must be top soiled and re-vegetated.	Contractor	Following completion of construction activities in an area
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	Contractor	Following completion of construction activities in an area
Topsoil from all excavations and construction activities must be salvaged and reapplied during reclamation. Soils must be replaced in the correct sequence / profile.	Contractor	Following completion of construction activities in an area
Re-vegetated areas may need to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	Contractor in consultation with rehabilitation specialist (if required)	Post-rehabilitation
Erosion control measures must be used in sensitive areas such as steep slopes, hills, and drainage systems if necessary.	Contractor, in consultation with EO and rehabilitation specialist (if required)	Post-rehabilitation
On-going alien plant monitoring and removal must be undertaken on all areas of natural vegetation on an annual basis.	Developer	Post-rehabilitation
Alien vegetation management at the site should take place according to the Alien Invasive Management Plan. This should make provision for alien monitoring and management annually for at least 3 years after decommissioning. Woody aliens should be controlled using the appropriate alien control techniques as determined by the species present. This might include use of herbicides where no practical manual means are feasible.	Developer	Post-rehabilitation

Performance Indicator	<ul style="list-style-type: none"> » All portions of the site are cleared of equipment and temporary facilities. » Topsoil is replaced on all areas and stabilised where practicable or required after construction and temporally utilised areas. » Disturbed areas are rehabilitated and an acceptable plant cover achieved on rehabilitated sites. » The completed site is free of erosion and alien invasive plants.
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Monitoring

- » Rehabilitated areas must be monitored (responsibility of the Project Company and EPC Contractor's EO) on a weekly basis throughout the construction phase, and on a monthly basis thereafter to the point where the area has been rehabilitated to a satisfactory level.
- » On-going inspection of rehabilitated areas in order to determine the effectiveness of rehabilitation measures implemented during the operational lifespan of the facility.
- » On-going alien plant monitoring and removal should be undertaken on an annual basis.

CHAPTER 8: OPERATION MANAGEMENT PROGRAMME

Overall Goal: To ensure that the Great Karoo BESS operation does not have unforeseen impacts on the environment and to ensure that all impacts are monitored and the necessary corrective action taken in all cases. In order to address this goal, it is necessary to operate the facility in a way that:

- » Ensures that operation activities are properly managed in respect of environmental aspects and risks.
- » Enables the operational activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to farming practices or effects on local residents.

8.1. Outcomes

In order to meet this goal, the following outcomes have been identified, together with necessary actions and monitoring requirements.

OUTCOME 17: Establish clear reporting, communication, and responsibilities in relation to overall implementation of the EMPr during operation

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Operations Manager, and Technical/SHEQ Manager for the operation phase of this project are detailed below. These resources can be the same as those for the wind farm, where relevant.

The **Operations Manager** will:

- » Ensure that adequate resources (human, financial, technology) are made available and appropriately managed for the successful implementation of the operational EMPr.
- » Conduct annual basis reviews of the EMPr to evaluate its effectiveness.
- » Take appropriate action as a result of the findings and recommendations in management reviews and audits.
- » Provide forums to communicate matters regarding environmental management, internal staff, key stakeholders, auditors and relevant authorities (as applicable).

The **Technical/SHEQ Manager** will:

- » Manage and report on the facility's environmental performance.
- » Maintain a register of all known environmental impacts and manage the monitoring thereof.
- » Conduct internal environmental audits and co-ordinate external environmental audits.
- » Liaise with statutory bodies such as the National and Provincial Department of Environmental Affairs, Forestry and Fisheries (DEFF) on environmental performance and other issues.
- » Conduct environmental training and awareness for the employees who operate and maintain the facility.
- » Compile environmental policies and procedures.
- » Liaise with interested and affected parties on environmental issues of common concern.
- » Track and control the lodging of any complaints regarding environmental matters.

OUTCOME 18: Limit the ecological footprint of the Great Karoo BESS

Project Component/s	Presence and operation of the facility including <ul style="list-style-type: none"> » Movement of vehicles to and from the site.
Potential Impact	<ul style="list-style-type: none"> » Alien plant invasion » Erosion » Pollution » Faunal Impacts
Activities/Risk Sources	<ul style="list-style-type: none"> » Alien plant invasion in and around the road. » Unregulated runoff from the access road. » Human presence during road maintenance activities » Pollution from maintenance vehicles due to oil or fuel leaks etc. » Maintenance activities which may lead to negative impacts such as pollution, herbicide drift etc.
Mitigation: Target/Objective	» Low ecological footprint of the BESS and associated infrastructure during operation.

Mitigation: Action/Control	Responsibility	Timeframe
Vegetation control should be by manual clearing and herbicides should not be used except to control alien plants in the prescribed manner.	Project Company / Contractor	Operation
Annual monitoring for alien plant species - with follow up clearing as needed – or as per the frequency stated in the alien invasive management plan developed for the site (refer Appendix H.6)	Project Company / Contractor	Operation
Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location.	Project Company / Contractor	Operation
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.	Contractor	Operation
All vehicles accessing the site should adhere to a low speed limit on site (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.	Contractors	Operation
There should be follow-up rehabilitation and re-vegetation of any remaining bare areas with indigenous perennial shrubs and succulents from the local area.	Contractors	Operation
Any injuries or mortalities of avifauna observed at the BESS should be reported to the EO and recorded for monitoring purposes. Should repeated injuries or fatalities occur, an avifaunal expert should be consulted to identify and remedy the cause of the problem	Contractors / Specialist	Operation
Movements by vehicles and personnel should remain within the BESS and substation area and should not stray from the approved access and maintenance routes.	Contractors	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Any raptor nests that are discovered on the power line structures (where constructed) should be reported to the Environmental Officer, while utmost care should be taken to not disturb these nests during routine maintenance procedures.	Contractors	Operation
Alien management at the site should take place in accordance with the Alien Invasive Management Plan for the project (refer Appendix H.6).	Contractors	Operation
Regular monitoring for alien plant proliferation during the operation phase to ensure that no alien invasion problems have developed as result of the disturbance, as per the Alien Invasive Management Plan for the BESS project (refer Appendix H.6).	Contractors, EO	Operation
Woody alien plant species should be controlled on at least an annual basis using the appropriate alien control techniques as determined by the species present.	Contractors, EO	Operation
Erosion management within the development area should take place according to the Erosion Management Plan for the BESS project (refer Appendix H.8). This should make provision for monitoring of the development area for at least 3 years after the decommissioning phase.	Contractors	Operation
The site access road should have run-off control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.	Contractors, EO	Operation
Regular monitoring for erosion during operation to ensure that no erosion problems have developed as a result of the disturbance, as per the Erosion Management Plan for the BESS project (refer Appendix H.8).	Contractors, EO	Operation
All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.	Contractors	Operation
Annual site inspection for erosion or water flow problems – with follow up remedial action where problems are identified.	Project Company / Contractor	Operation

Performance Indicator	<ul style="list-style-type: none"> » No erosion problems experience on the site » Low abundance of alien plants.
Monitoring	<ul style="list-style-type: none"> » Annual monitoring with records of alien species presence and clearing actions. » Annual monitoring with records of erosion problems and mitigation actions taken with photographs.

OUTCOME 19: Ensure appropriate operation and maintenance of the battery energy storage system

Project Component/s	» Battery Energy Storage System.
Potential Impact	<ul style="list-style-type: none"> » Fire and safety risks » Leakages and impacts on soils and water resources.
Activities/Risk Sources	» Inappropriate operation and maintenance of BESS.

Mitigation: Target/Objective	» To avoid and or minimise the potential risk of associated with the operation and maintenance of the BESS.
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Mitigation: Action/Control	Responsibility	Timeframe
Compile (and adhere to) a procedure for the safe handling of battery cells	O&M Contractor/ Project Company	Operation
Ensure that battery supplier user guides, safety specifications and MSDS are filed on site at all times.	O&M Contractor / Project Company	Operation
Operate, maintain and monitor the BESS as per supplier specifications.	O&M Contractor / Project Company	Operation
Vehicle movement through drainage lines is to be limited as far as possible.	O&M Contractor / Project Company	Operation
Where erosion takes place, the managing agent must inspect the degree of erosion and propose suitable mitigation measures to prevent further erosion.	O&M Contractor / Project Company	Operation
Compile method statements for approval by the Technical/SHEQ Manager/EO for battery cell, electrolyte and battery cell/ container replacement. Maintain method statements on site.	O&M Contractor / Project Company	Operation
Ensure that all maintenance contractors/ staff are familiar with the supplier's specifications.	O&M Contractor / Project Company	Operation
Provide signage on site specifying the types of batteries in use and the risk of exposure to hazardous material and electric shock.	O&M Contractor / Project Company	Operation
Provide signage on site specifying how electrical and chemical fires should be dealt with by first responders, and the potential risks to first responders (e.g. toxic fumes). Provide suitable firefighting equipment on site.	O&M Contractor / Project Company	Operation
Maintain strict access control to the battery storage area.	O&M Contractor / Project Company	Operation
Undertake regular visual checks on BESS equipment to identify signs of damage or leaks.	O&M Contractor / Project Company	Operation
Provide environmental awareness training to all personnel on site. Training should include discussion of: <ul style="list-style-type: none"> o Potential impact of electrolyte spills on groundwater; o Suitable disposal of waste and effluent; o Key measures in the EMPr relevant to worker's activities; o How incidents and suggestions for improvement can be reported. Ensure that all attendees remain for the duration of the training and on completion sign an attendance register that clearly indicates participants' names.	O&M Contractor / Project Company	Operation

Performance Indicator	<ul style="list-style-type: none"> » BESS operated and maintained in accordance with supplier specifications. » Appropriate signage on site. » Employees appropriately trained. » Required documentation available on site. » Firefighting equipment and training provided before the operation phase commences.
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Monitoring	» The O&M contractor/ Project Company must monitor indicators listed above to ensure that they have been met.
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OUTCOME 20: Ensure the implementation of an appropriate fire management plan and general management measures during the operation phase

The following below can be used as a guide for appropriate fire management (also refer to **Appendix H.4** of the EMPr):

Project Component/s	» Operation and maintenance of facility and associated infrastructure.
Potential Impact	» Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences. In addition, fire can pose a risk to the facility infrastructure.
Activities/Risk Sources	» The presence of operation and maintenance personnel and their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	» To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
Prepare and annually review a fire risk assessment.	O&M Contractor / Project Company	Operation
Establish a fire-fighting management plan during operation.	O&M Contractor / Project Company	Operation
Provide adequate firefighting equipment on site and ensure that it is suitably maintained.	O&M Contractor / Project Company	Operation
Equip all hazardous substance stores and waste storage areas with fire extinguishers.	O&M Contractor / Project Company	Operation
Ensure that all personnel on site are aware of the location of firefighting equipment on the site and how the equipment is operated.	O&M Contractor / Project Company	Operation
Liaise with the local fire-fighting department with regards to emergency procedures.	O&M Contractor / Project Company	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	O&M Contractor / Project Company	Operation
Fire breaks should be established and maintained where and when required. Cognisance must be taken of the relevant legislation when planning and burning firebreaks (in terms of timing, etc.).	O&M Contractor / Project Company	Operation
Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.	O&M Contractor / Project Company	Operation
Provide suitable emergency and safety signage on site, and demarcate any areas which may pose a safety risk (including hazardous substances.). Emergency numbers for local police, fire department and the Local Municipality must be placed in a prominent clearly visible area on site.	O&M Contractor / Project Company	Operation
Alien Invasive species should be regularly controlled in order to decrease the fire risk associated with the site.	O&M Contractor / Project Company	Operation

Mitigation: Action/Control	Responsibility	Timeframe
Designated smoking areas must be established with suitable receptacles for disposal.	O&M Contractor / Project Company	Operation
Contact details of the local fire and emergency services must be readily available.	O&M Contractor / Project Company	Operation
The fire risk on site is a point of discussion that must take place as part of the environmental induction training prior to commencement of construction.	O&M Contractor / Project Company	Operation
The contractor must also comply with the requirements of the Occupational Health and Safety Act with regards to fire protection.	O&M Contractor / Project Company	Operation

Performance Indicator	<ul style="list-style-type: none"> » Firefighting equipment and training provided before the operation phase commences. » Firebreak implemented and maintained. » Emergency contact details available on site.
Monitoring	<ul style="list-style-type: none"> » The O&M contractor must monitor indicators listed above to ensure that they have been met.

OUTCOME 21: Appropriate handling and management of waste

The operation of the facility will involve the generation of limited waste products, most significantly spent battery components which must be appropriately managed.

Project Component/s	<ul style="list-style-type: none"> » BESS components.
Potential Impact	<ul style="list-style-type: none"> » Contamination of water or soil because of poor waste management. » Inappropriate handling and disposal of waste.
Activity/Risk Source	<ul style="list-style-type: none"> » Maintenance activities related to operation of the BESS infrastructure
Mitigation: Target/Objective	<ul style="list-style-type: none"> » Comply with waste management legislation. » Minimise production of waste. » Ensure appropriate waste disposal. » Avoid environmental harm from waste disposal.

Mitigation: Action/Control	Responsibility	Timeframe
Develop a waste management plan, detailing: <ul style="list-style-type: none"> » Expected type and amount of waste; » Measures to reduce waste; » Type of storage for different waste types; » Waste contractors that will collect waste; and » Monitoring procedures to ensure the waste management plan is implemented. 	O&M Contractor / Project Company	Operation and maintenance
Ensure that service providers dispose of used batteries properly by requesting and retaining receipts for disposal/refurbishment.	O&M Contractor / Project Company	Operation and maintenance
Storage areas for any waste must be appropriately sealed and banded.	O&M Contractor / Project Company	Operation
All structures and/or components replaced during maintenance activities must be appropriately disposed of at an appropriately	O&M Contractor / Project Company	Operation

Mitigation: Action/Control	Responsibility	Timeframe
licensed waste disposal site or sold to a recycling merchant for recycling.		
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	O&M Contractor / Project Company	Operation
All food waste and litter at the site should be placed in bins with lids and removed from the site on a regular basis.	O&M Contractor / Project Company	Operation
Waste handling, collection, and disposal operations must be managed and controlled by a waste management contractor.	O&M Contractor / Project Company	Operation
All sewage disposal to take place at a registered and operational wastewater treatment works or via an implemented sewage system on site. Where appropriate, proof of disposal to be retained as proof of responsible disposal.	O&M Contractor / Project Company	Operation
Used oils and chemicals: » Appropriate disposal must be arranged with a licensed facility in consultation with the administering authority. » Waste must be stored and handled according to the relevant legislation and regulations.	O&M Contractor / Project Company	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	O&M Contractor / Project Company	Operation
Hazardous waste and general waste must be stored and disposed of separately.	O&M Contractor / Project Company	Operation
Separation and recycling of different waste materials should be supported.	O&M Contractor / Project Company	Operation
Immediately report significant spillages and initiate an environmental site assessment for risk assessment and remediation if necessary.	O&M Contractor / Project Company	Operation
On-site battery maintenance should be done over appropriate sealed surfaces with appropriate containment measures and any hazardous substances must be disposed of appropriately	O&M Contractor / Project Company	Operation
Defective or broken components must be removed and stored within a designated covered storage area prior to being removed from the site.	O&M Contractor / Project Company	Operation

Performance Indicator	<ul style="list-style-type: none"> » No complaints received regarding waste on site. » Internal site audits identifying that waste segregation recycling and reuse is occurring appropriately where possible. » Provision of all appropriate waste manifests. » No contamination of soil or water as a result of the BESS.
Monitoring	<ul style="list-style-type: none"> » Waste collection must be monitored on a regular basis. » Records of accidental spills and clean-up procedures and the results thereof must be audited by the Project Company Environmental Manager / EO during the operation phase. » Waste documentation must be completed and made available for inspection. » An incidents/grievances register must be maintained, in which any complaints from the community must be logged. » Complaints must be investigated and, if appropriate, acted upon.

- » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the Project Company Environmental Manager / EO.
- » All appropriate waste disposal certificates accompany the monthly reports.

OUTCOME 22: Appropriate handling and management of hazardous substances and dangerous goods

The operation of the facility will involve the storage of chemicals and hazardous substances (solvents or heavy metal substances where Li-Ion batteries are involved, or sulphuric acid and Vanadium in the case of Vanadium Redox-flow batteries).

Project Component/s	» Area infrastructure (i.e. BESS footprint and battery units, electrical transformers/switchgear and control units as applicable).
Potential Impact	» Contamination of water or soil because of poor materials management. » Unsafe operational practices leading to containment breaches of hazardous materials
Activity/Risk Source	» Maintenance activities related to operation of the BESS infrastructure
Mitigation: Target/Objective	» Comply with relevant legislation regarding the handling and storage of hazardous and dangerous goods. » Ensure appropriate storage, containment and handling of chemicals and hazardous substances.

Mitigation: Action/Control	Responsibility	Timeframe
Ensure signage on all battery storage areas indicating as a minimum: » The battery type (and chemical name/s). » Who to contact (immediately) if a spill or leak is detected. » MSDS sheets (alternatively ensure that these are available on site).	O&M Contractor / Project Company	Operation and maintenance
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	O&M Contractor / Project Company	Operation and maintenance
Storage areas for hazardous substances must be appropriately sealed and bunded.	O&M Contractor / Project Company	Operation
All hazardous materials must be stored in the appropriate manner (stored in sealed containers within a clearly demarcated designated area) 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.	O&M Contractor / Project Company	Operation
Care must be taken to ensure that spillage of oils and other hazardous substances are limited during maintenance. Handling of these materials should take place within an appropriately sealed and bunded area. Should any accidental spillage take place, it must be cleaned up according to specified standards regarding bioremediation.	O&M Contractor / Project Company	Operation and maintenance
Immediately report significant spillages and initiate an environmental site assessment for risk assessment and remediation if necessary.	O&M Contractor / Project Company	Operation

Mitigation: Action/Control	Responsibility	Timeframe
<p>Emergency response arrangements and systems such as foam pourers, fire-fighting systems and cooperation with emergency responders must be implemented. Preventive measures could include maintenance procedures to prevent the occurrence of a catastrophic loss of containment, as well as strict control of ignition sources and other measures which may be required according to standards such as those prescribed by the South African National Standards system.</p>	<p>O&M Contractor / Project Company</p>	<p>Operation</p>

<p>Performance Indicator</p>	<ul style="list-style-type: none"> » No complaints received regarding storage of hazardous and dangerous goods on site. » No contamination of soil or water.
<p>Monitoring</p>	<ul style="list-style-type: none"> » Check vehicles and machinery monthly for oil, fuel and hydraulic oil leaks. » Undertake high standard maintenance of the vehicles and machinery. » Monitor hydrocarbon spills from vehicles and machinery during operations continuously and record the volume and nature of the spill, location and clean up actions. » Records of accidental spills and clean-up procedures and the results thereof must be audited by the Project Company Environmental Manager / EO during the operation phase. » Complaints must be investigated and, if appropriate, acted upon.

CHAPTER 9: MANAGEMENT PROGRAMME: DECOMMISSIONING

The lifespan of the proposed Great Karoo BESS facility is linked to the operational life-span of the Great Karoo WEF and is expected to be 20 years or more. Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life or if it is no longer required. The lifespan of Great Karoo BESS could be extended depending on the condition of the infrastructure. An assessment will be undertaken prior to the end of the lifecycle of the plant to determine whether the plant should be decommissioned or whether the operation of the plant should continue.

It is most likely that decommissioning activities of the infrastructure of the facility discussed in the BA process would comprise the disassembly, removal, recycling, resale and disposal of the infrastructure and components. Decommissioning activities will involve disassembly of the production units and ancillary infrastructure, demolishing of buildings, removal of waste from the site and rehabilitation to the desired end-use. Future use of the site after decommissioning of the Great Karoo BESS facility could possibly form part of an alternative industry that would be able to utilise some of the existing infrastructure associated with the facility. This would however be dependent on the development plans of the area at the time.

As part of the decommissioning phase the developer will undertake the required permitting processes applicable at the time of decommissioning.

The relevant mitigation measures contained under the construction section should be applied during decommissioning and therefore are not repeated in this section. **All decommissioning phase activities must be conducted in accordance with the regulations in effect at the time.**

9.1. Outcomes

Within a period of at least 6 months prior to the decommissioning of the site, a Decommissioning Method Statement must be prepared and submitted to the Local Planning Authority, as well as the Provincial and National Environmental Authority (unless the prevailing legislation at the time requires a different approach). This method statement must cover site restoration, soil replacement, landscaping, conservation, and a timeframe for implementation. Furthermore, this decommissioning must comply with all relevant legal requirements administered by any relevant and competent authority at that time.

The outcomes of the decommissioning phase of the proposed project are to:

- » Follow a process of decommissioning that is progressive and integrated into the short- and long-term project plans that will assess the closure impacts proactively at regular intervals throughout project life.
- » Implement progressive rehabilitation measures, beginning during the construction phase.
- » Leave a safe and stable environment for both humans and animals and make their condition sustainable.
- » Return rehabilitated land-use to a standard that can be useful to the post-project land user.
- » Where applicable, prevent any further soil and surface water contamination by maintaining suitable storm water management systems.
- » Maintain and monitor all rehabilitated areas following re-vegetation, and if monitoring shows that the objectives have been met, apply for closure.

9.2. Approach to the Decommissioning Phase

It is recommended that planning of the decommissioning of the project and rehabilitation of the site should take place well in advance (at least two years) of the planned decommissioning activities. Important factors that need to be taken into consideration are detailed below.

Two possible scenarios for this decommissioning phase are detailed below:

SCENARIO 1: TOTAL DECOMMISSIONING OF THE FACILITY

If the decision is taken at the end of the project lifespan to totally decommission the facility, i.e. make the land available for an alternative land use, the following should take place:

- » All concrete and imported foreign material must be removed from site.
- » The ground must be naturally contoured or levelled (where appropriate) and covered with subsoil and topsoil where exposed by the decommissioning activities.
- » Infrastructure not required for the post-decommissioning use of the site must be removed and appropriately disposed of, recycled or resold as appropriate, in accordance with applicable regulations at the time of decommissioning.
- » Access roads and servitudes not required for the post-decommissioning use of the site must be rehabilitated. If necessary, an ecologist should be consulted to give input into rehabilitation specifications.
- » Tracks that are to be utilised for the future land use operations should be left *in-situ*. The remainder of the tracks to be removed (ripped) and topsoil replaced.
- » All ancillary buildings and access points are to be removed unless they can be used for the future land use.
- » Underground electric cables are to be removed if they cannot be used in the future land use.
- » All material or components must be re-used or recycled wherever possible.
- » Where not possible to recycle, materials should be appropriately disposed of.
- » The competent authority may grant approval to the owner not to remove the landscaping and underground foundations.
- » The site must be seeded with locally sourced indigenous vegetation (unless otherwise dictated by the future land use) to allow revegetation of the site.
- » Monitor rehabilitated areas quarterly for at least two years (expected) following decommissioning, and implement remedial action as and when required, or as frequently as determined by a qualified botanist at the time of decommissioning.

SCENARIO 2: PARTIAL DECOMMISSIONING OF THE FACILITY

Should more advanced technology become available it may be decided to continue to use the site as a battery energy storage system. Much of the existing infrastructure is likely to be re-used in the upgraded facility. In this case, all infrastructure that will no longer be required for the upgraded facility must be removed as described for Scenario 1. The remainder of the infrastructure should remain in place or upgraded depending on the requirements of the new facility. Any upgrades to the facility at this stage must comply with relevant legislation.

9.2.1. Identification of structures for post-closure use

Access roads should be assessed in conjunction with the future land users to determine if these could be used. Where not required, these access roads should be decommissioned and rehabilitated.

9.2.2. Removal of infrastructure

All infrastructure must be dismantled and removed. Inert material must be removed from site and disposed of at a suitably registered landfill site. The facility components must be removed and recycled where possible or disposed of at a suitably registered landfill site. All foundations must be removed to a depth of 1m. Hard surfaces must be ripped to a depth of 1m and vegetated.

9.2.3. Soil rehabilitation

The steps that should be taken during the rehabilitation of soils are as follows:

- » The deposited soils must be ripped to ensure reduced compaction;
- » An acceptable seed bed should be produced by surface tillage;
- » Restore soil fertility;

9.2.4. Establishment of vegetation

The objective is to restore the development area to a self-sustaining cycle, i.e. to realise the re-establishment of the natural nutrient cycle with ecological succession initiated.

The objectives for the re-vegetation of reshaped and top-soiled land are to:

- » Prevent erosion;
- » Restore the land to the agreed land capability;
- » Re-establish eco-system processes to ensure that a sustainable land use can be established without requiring fertilizer additions; and
- » Restore the biodiversity of the area as far as possible.

9.2.5. Maintenance

Established vegetation requires regular maintenance. If the growth medium consists of low-fertility soils, then regular maintenance will be required until the natural fertility cycle has been restored.

9.2.6. Monitoring

The purpose of monitoring is to ensure that the objectives of rehabilitation are met and that the rehabilitation process is followed. The physical aspects of rehabilitation should be carefully monitored during the progress of establishment of desired final ecosystems.

The following items should be monitored continuously:

- » Erosion status; and
- » Vegetation species diversity.

