Proposed Melkhout Battery Energy Storage System (BESS), Humansdorp, Eastern Cape

Draft Environmental Management Programme

Report Prepared for

Eskom

Report Prepared by

srk consulting

October 2019

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Report Prepared for

Eskom
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Acronyms

AC	Alternating Current
BA	Basic Assessment
BESS	Battery Energy Storage System
BGIS	Biodiversity GIS
BMS	Battery Management System
CR	Contractor's Environmental Representative
DEA	Department of Environmental Affairs
DBAR	Draft Basic Assessment Report
DC	Direct Current
DoE	Department of Energy
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EMP	Environmental Management Plan
FBAR	Final Basic Assessment Report
IAP	Interested and Affected Party
IPP	Independent Power Producer
Li	Lithium
PCS	Power Conversion System

MW	Megawatt
NaS	Sodium Sulphur
NEM:BA	National Environmental Management Biodiversity Act
NEMA	National Environmental Management Act
PPP	Public Participation Process
PV	Photovoltaic
RE	Resident Engineer
VRF	Vanadium Redox Flow
WEF:	Wind Energy Facility
WMA	Water Management Area

List of Definitions

Anode	An anode is an electrode through which the conventional current enters into a polarized electrical device.
Battery	An electrochemical storage device consisting of one or more cells, that converts chemical energy into electricity and is used as a source of power.
Battery Energy Storage System	Term used to describe the entire system including the battery, inverter, controller and management system.
Battery Management System	A system which manages and monitors the battery to ensure even charging and discharging.
Battery Capacity	A battery's capacity is the amount of electric charge it can deliver at the rated voltage. Battery capacity is measured in amps × hours (AH). The higher the discharge rate, the lower the capacity.
Battery Cell	The smallest component of a battery. A battery may be single celled of multi-celled.
Cathode	Negatively charged electrode by which electrons enter the electrolyte.
Charge	The process of storing energy to the BESS.
Curtailment	The reduction of output of a renewable resource below what it could have otherwise produced.
Battery Cycle	The process of charge and discharge of a battery. The number of cycles specifies the expected life of a battery.

Depth of Discharge	The Depth of discharge (DoD) refers to how much energy is cycled into and out of the battery on a given cycle, expressed as a percentage of the total capacity of the battery.
Discharge	The process of extracting stored energy from the BESS.
Dispatchable Generation	Sources of electricity that can be used on demand and dispatched at the request of power grid operators, according to market needs.
Energy capacity	The energy available for transfer either from battery energy storage system to the grid or vice versa, usually expressed in kWh.
Battery Module	An aggregation of several battery cells.
Non-dispatchable generation	Sources of electricity that cannot be turned on or off in order to meet s fluctuating electricity needs such as wind power and solar power.
Battery Pack/Stack	An aggregation of several battery modules.
Peaking Power Plant	Peaking power plants run only when there is a high demand for electricity for short periods and therefore supply power at a much higher price per kilowatt hour than base load power.
Peak shifting	Altering the time of day at which electricity is used to reduce “demand charge” on electricity.
Power Capacity:	The power available for transfer either from battery energy storage system to the grid or vice versa, usually expressed in kW.
Renewable generation smoothing	The fluctuating nature of renewable generation means that supply is not constant and requires a peaking plant to supply the load when renewable generation falls away. Grid-scale battery storage enables the smoothing out of this fluctuating generation. Charging can take place when renewable generation output is above a certain pre-defined threshold, and similarly discharge can take place below a pre-defined renewable generation output value, thus reducing the peaks and filling the troughs in generation.
Voltage Support	Battery energy storage systems may be used to support local voltage levels and stability and provides an alternative to strengthening the network in conventional ways.

1 Introduction

1.1 Background

Eskom SOC Limited (Eskom) proposes to install Battery Energy Storage Systems (BESSs) at various (existing) distribution substations throughout South Africa. SRK Consulting (South Africa) (Pty) Ltd (SRK) has been appointed by Eskom to undertake the Basic Assessment (BA) processes for the proposed BESS at the Melkhout Substation located north of Humansdorp, off the R330 in the Eastern Cape (Refer to Figure 1).

The National Environmental Management Act 107 of 1998 (NEMA) requires that an Environmental Management Programme (EMPr) be submitted along with the BA Report to demonstrate how environmental management and mitigation measures will be implemented. The BA Report contains a detailed description of the project and its impacts.

The mitigation measures apply to the following phases of the development process:

- The Design Phase: These measures relate to the detailed layout, planning and design of the BESS and associated infrastructure, and will largely be implemented by the planning and development team, prior to the commencement of any physical on-site activities.
- The Construction Phase: These mitigation measures are applicable during site preparation and construction on the site of the proposed project and must be implemented by the relevant contractors and sub-contractors.
- The Operational Phase: These mitigation measures are applicable during the long-term operation and maintenance of the BESS and must be implemented by Eskom or approved service providers.
- As it is expected that the BESS's will be maintained in the long-term and not be decommissioned[1] in the foreseeable future, measures related to decommissioning and post-closure rehabilitation are not included in the EMPr.

The management measures listed for the various phases are either:

- Essential: best practice measures which must be implemented and are non-negotiable; or
- Best Practice: recommended to comply with best practice, with adoption dependent on the proponent's risk profile and commitment to adhere to best practice, and which must be shown to have been considered and sound reasons provided by the proponent if not implemented. These measures have been italicized for ease of reference.

2 Scope of Report

The environmental management measures recorded in this EMPr are based on information supplied to SRK during the compilation of the Basic Assessment Report, including information from the applicant and the recommendations from various specialists. This EMPr has been compiled to comply with the specific requirements of the National Environmental Management Act (No. 107 of 1998) (NEMA) Environmental Impact Assessment (EIA) Regulations (2014).

It should be noted that the EMPr is written as if the project has been authorised. This approach in no way presupposes that the project will be authorised, rather, the style of writing is aimed at making

[1] Note that individual batteries would be 'decommissioned' during the operational life of the BESS. The impacts associated with this are described under 'decommissioning' in the FBAR but decommissioning of the facility as a whole is not anticipated. The management of impacts associated with decommissioning of batteries is addressed under the operational section of this EMPr.

the EMPr easier to read and more easily converted into a practical management tool should the application be approved.

SRK has exercised all due care in reviewing the supplied information provided during the course of the environmental assessment process and has included the requirements of commenting authorities. The appropriateness and practicality of the management measures presented in this EMPr has been considered in terms of comments received and discussed with the applicant as necessary.

Eskom is fully responsible for the implementation of the EMPr. SRK cannot be held responsible for failure of Eskom to comply with the EMPr. The EMPr is, by nature, a dynamic document and NEMA provides for continual updating of the EMPr, with approval from the Competent Authority.

The aim of this EMPr is to ensure that construction, operation, and maintenance activities are conducted such that potential negative environmental impacts are minimised and positive impacts are enhanced. This EMPr is not a health and safety plan and this EMPr makes no attempt to satisfy the requirements of the Occupational Health and Safety Act.

2.1 Environmental Assessment Practitioner (EAP)

2.1.1 Expertise of EAP

This EMPr was prepared by Tanya Speyers and reviewed by Rob Gardiner.

Tanya Speyers (BSc Hons) is an Environmental Scientist in the SRK Port Elizabeth office. Tanya has been involved in EIA's and environmental management for the past 7 years. Her expertise includes Basic Assessments, Environmental Impact Assessments, Environmental Management Plans, environmental compliance auditing, and Water Use License Applications.

Rob Gardiner (MSc, MBA, Pr Sci Nat) is the Principal Environmental Scientist and head of SRK's Environmental Department in Port Elizabeth. He has more than 25 years environmental consulting experience covering a broad range of projects, including Environmental Impact Assessments (EIAs), Environmental Management Systems (EMS), Environmental Management Programmes (EMPr), and environmental auditing. His experience in the development, manufacturing, mining and public sectors has been gained in projects within South Africa, Lesotho, Botswana, Angola, Zimbabwe, Suriname and Argentina.

2.1.2 Environmental Assessment Practitioner Details

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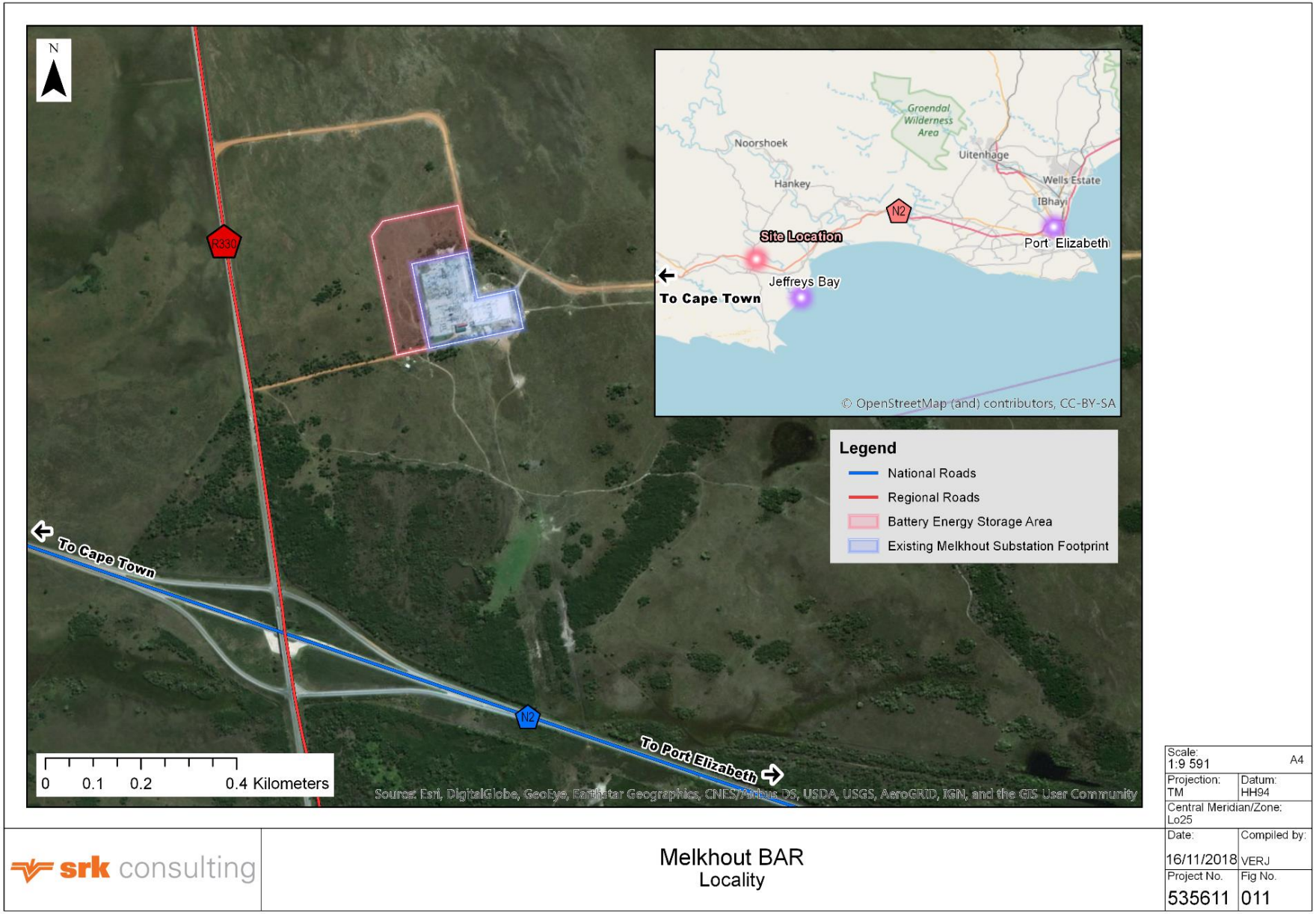

Figure 1: Locality Plan for the Melkhout BESS

3 Project Description

The Melkhout 132/66/22 kV distribution substation is situated approximately 2.5 km to the north of the town of Humansdorp in the Eastern Cape on the Remainder of Erf 499. The land is currently leased from the Kouga Local Municipality, however Eskom are in negotiations to purchase the portion occupied by the substation.

Currently four Wind Energy Facilities (WEFs) are supplying the Melkhout distribution substation. These are as follows:

- 80 MW Kouga WEF;
- 138 MW Jeffreys Bay WEF;
- 110 MW Gibson WEF; and
- 95 MW Tsitsikamma WEF.

Three of these technologies have been identified by Eskom as the most appropriate for use at the Melkhout site. These are as follows:

- Lithium Ion (Li ion);
- Sodium Sulphur (NaS); and
- Vanadium Redox Flow Battery (VRF).

Eskom proposes to utilise either a single battery technology, or a combination of two or more of the above alternatives to make up the 160 MWh capacity.

The lifecycle of the battery technologies varies from ten to twenty-five years. Eskom will include a return to supplier clause, whereby the supplier will be responsible to recycle any hazardous waste emanating from the technology operation, maintenance and finally replacement as well as meet any legislative requirement that this may require.

Certain components of the BESS such as the electrodes and electrolyte are comprised of, or contain, hazardous substances. These vary depending on the technology and are as follows for the battery technologies proposed for Melkhout:

- Lithium ion (Li ion): The components of the solid state battery include lithiated metal oxides as the cathode. While these compounds are in a solid form, and hence accidental spillage to the environment is not a significant risk factor, they are potentially dangerous (e.g. flammable, or corrosive).
- Sodium Sulphur (NaS): The components of the battery include beta-alumina solid electrolyte, sodium, and sulphur. While these materials are solid at room temperature, sodium is listed as a dangerous good in SANS 10234. These materials are intrinsic to the electric-energy storing module, are sealed within each module, are not consumed, and require no storage of additional volumes for topping up.
- Vanadium Redox Flow (VRF): Contain a vanadium electrolyte, in a strongly acidic solution. Although the dissolved vanadium is not listed as a dangerous good in SANS 10234, the medium in which it is dissolved (e.g. sulphuric acid) is listed, and the electrolyte can therefore be considered a dangerous good. While it is noted that the electrolyte is pumped through the reactive cell from holding tanks, these tanks form an integral part of the battery system and no external tanks are required for the storage of additional volumes for topping up.

The exact volume of dangerous goods to be stored on site will vary depending on which technology option or combination of technologies is chosen. Eskom have committed to ensuring that the volume on site does not amount to more than 500 m^3. A fuller discussion of technology alternatives is provided in the following section.

The BESS consists of a number of rechargeable batteries, each comprising one or more electrochemical cells. The battery cells are connected together into modules. These modules are then connected to form full battery stacks/packs (referred to as a battery panel in Figure 3).

The basic components of a BESS include the following:

- A battery stack (made up of multiple battery modules),
- The Battery Management System (BMS). This is responsible for monitoring, controlling, and protecting the battery cells, including preventing over-charge/under-charge;
- The Power Conversion System (PCS). The PCS contains the inverter to change the DC from the battery to AC for use in the grid;
- A cooling and fire suppression system; and
- External electrolyte tanks in the case of flow batteries.

These components are typically housed in containers and at utility scale, as in the case of Melkhout, multiple containers are generally required. The system will be connected to the Melkhout 132 kV line via two existing 40 MVA, 132/22 kV transformers.

Network integration equipment (e.g. power cables, control cables, isolators, circuit breakers, transformers, etc.) will be required to connect the new BESS to existing infrastructure at the Melkhout substation. The site may also require additional fencing, security equipment, lighting, and/or control room upgrades. A platform (compacted fill, earth protection layer and stone chip) for the BESS will be constructed to accommodate the containers and cable trenches to connect the BESS to the grid.

4 Impact Management

This section specifies the impact management actions required for the aspects and potential impacts related to the proposed BESS. These actions represent the manner in which the impact management objectives and outcomes, identified above, will be achieved. Where applicable, actions will include activities to:

(i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
(ii) comply with any prescribed environmental management standards or practices;
(iii) comply with any applicable provisions of the Act regarding closure, where applicable; and
(iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable.

The above are detailed in below for the design, construction and operation phases of the development.

Table 4-1: Summary of potential impacts of technology options for the proposed Melkhout BESS

Impact code	Impact Description	Li-ion		NaS		VRF	
S1	Risk from catastrophic failure (e.g. Fire)	Very Low	Insignifica nt	High	Low	-	-
C1	Surface and groundwater contamination	-	-	Medium	Low	High	Low
A3	Wetland degradation due to fire	Very Low	Insignifica nt	Very Low	Insignifi cant	-	-
V2	Loss of Vegetation due to Fire	Medium	Very Low	Medium	Very	-	-

					low		
W2	Waste Management during decommissioning	High	Low	High	Mediu m	High	Medium

Table 4-2: Summary of potential impacts of the proposed Melkhout BESS applicable to all technology alternatives

Impact Code	Impact Description	Significance without mitigation	Significance with mitigation
V1	Loss of Vegetation and Habitat	Medium	Low
V2	Loss of Species of Special Concern (SCC)	Low	Very Low
V3	Spread of Alien Invasive Species	Medium	Very Low
A1	Wetland degradation due to decreased water quality	Very Low	Insignificant
A2	Increased sedimentation of wetlands and watercourses	Insignificant	Insignificant
P1	Damage to, or destruction of paleontological resources	Low	Very Low
Ar1	Damage to archaeological resources	Very Low	Very Low
W1	Waste Management	Medium	Insignificant
A4	Impact to hydrology of the aquatic system	Low	-
GHG	Impact on Greenhouse Gas Emissions	Medium	-

Highest Positive Impact	
Highest Negative Impact	

4.1 Design Phase

The environmental management and mitigation measures that must be implemented during the Design Phase, as well as responsibilities and timelines for the implementation of these measures and monitoring thereof, are laid out in the Table below.

The key role players during the Design Phase of the project are:

- Eskom (the proponent); and
- Engineers responsible for the design of the BESS.

The roles and responsibilities during the detailed Design Phase with respect to the implementation of the EMPr are outlined below.

Eskom:

- Ensure that the engineering/design team is aware of and takes into consideration all relevant measures in the EMPr; and
- Confirm that all relevant environmental management measures in the EMPr have been incorporated into the project design on completion of the Design Phase.

Engineers:

- Take cognisance of all relevant measures in the EMPr and ensure integration thereof in the detailed design; and
- Reference the environmental management measures applicable to the Construction (Section 4.2) and Operational (Section 4.3) Phases of the project in all documents that will be applicable to future phases of the project (e.g. tender documents).

Table 4-3: Environmental management and mitigation measures that must be implemented during the Design Phase

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods[2]	Performance Indicators
Authorisations	Environmental compliance	Ensure that all required licences and permits have been obtained before the start of construction.	Eskom	Before construction commences	Keep record of all permits, licences and authorisations	Required licences/permits on file
		Appoint a suitably qualified Environmental Control Officer (ECO) to oversee construction activities.	Eskom	Before construction commences	Review appointment documentation	ECO appointment documents
		Include the EMPr in all tender documents to ensure that sufficient resources are allocated to environmental management by the Contractor.	Eskom and Engineering consultants	Prior to call for tenders	Eskom to check tender documents and contract	Incorporated in tender documents
Water supply	Impact on local water supply	Obtain approval from local municipality / water use association for supply of water required during construction.	Eskom or Contractor	Prior to construction	Request for approval from local municipality / water use association	Approval for water use
Employment	Socio-economic impacts	Set targets for the use of local labour based on the needs of the proponent and the availability of existing skills and people that are willing to undergo training.	Eskom	Call for tenders	Eskom to check tender documents and contract Keep record of how targets were	Incorporated in tender documents Percentage of local staff Percentage of

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods[2]	Performance Indicators
		Ensure that Contractors from outside the local area that tender for work meet the required targets for how many locals are given employment. Consider implementing labour-intensive rather than capital-intensive work methods wherever possible. Consider purchasing resources from local sources wherever possible.			determined Keep record of staff by origin Keep record of training provided	Previously Disadvantaged Individual (PDI) staff Number of incidents Time activities stopped Number of recurring incidents
Battery storage	Safety	Be mindful of supplier recommendations when deciding on placement (especially in relation to existing high voltage infrastructure at the substation) and stacking of battery storage containers.	Eskom and Engineering consultants	During design phase	Review design documentation	Placement of battery storage
Waste management	Litter/dumdum/incorrect disposal	Develop a waste management plan, laying out: • Expected type and amount of waste; • Measures to reduce waste; • Type and expected volume of recyclable waste; • Recycling facilities that will collect / receive waste; • Type of storage for different waste types; • Waste contractors that will collect waste;	Eskom Consultant team	During design phase	Review of design documents	Adequate provision for waste disposal
Stormwater management	Contamination of water resources	Ensure designs comply with the recommendations of the Stormwater Management Plan (SWMP), including: Ensure that storm water originating from upgradient (stormwater that could flow across the site from external areas) is diverted around the site.	Engineering consultants	During design phase	Review detailed layout plans	Approval of final design Recommendations of SWMP included in final design
Floral management	Illegal removal/destruction of flora	Appoint a suitably qualified specialist to oversee search and rescue of floral species. Obtain necessary approval from DEDEATe.	Eskom Consultant team	Prior to the start of vegetation clearance	Appointment of vegetation specialist Search and	Permit on file Floral species relocated

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods[2]	Performance Indicators
		Rescue and relocate all identified Species of Conservation Concern to areas adjacent to construction footprint areas, preferably when the bulbs are dormant (March to May).			Rescue Report	
Dust management	Visual and safety impacts	Compile a Dust Management Plan	Eskom Contractor	Prior to the start of vegetation clearance	Dust Management Plan	Dust Management Plan available
BESS container	Visual impacts	Paint the battery storage containers (and where possible, associated infrastructure such as fencing) dark grey or brown. Avoid the use of light colours (e.g. white).	Engineering consultants	During design phase	Review detailed layout plans	Compliance with measures
		Do not increase the height of existing buildings, unless specifically required for operations.				
		Be sensitive towards the use of glass or material with a high reflectivity which may cause glare and increase visual impacts.				
Traffic	Traffic congestion	Engage the road authorities to determine the optimal route to the site for construction vehicles and battery delivery vehicles.	Eskom Contractor	Prior to construction	Correspondence with road authorities	Proof of correspondence with road authorities Permission to transport battery storage containers

4.2 Construction Phase

The impacts and associated management objectives are described below for the construction phase. With the exception of the amount of space required for the footprint of the development, construction impacts are common to all of the technology alternatives and are discussed and rated independently from the technology alternatives.

The environmental management and mitigation measures that must be implemented during the Construction Phase, as well as responsibilities and timelines for the implementation of these measures and monitoring thereof, are laid out in Table 4-4 below

The key role players during the Construction Phase of the project are anticipated to be as follows:

- Eskom (the proponent);
- Resident Engineer (RE), who will oversee the activities of the contractors on site;
- Contractor(s) responsible for the construction of the battery storage project;
- Any sub-contractors hired by Contractors; and
- ECO.

The anticipated Construction Phase organogram is presented in Figure 4-1 below and shows the proposed lines of communication during this phase. All instructions relating to the EMPr will be given to the Contractor via the ECO or RE. The Contractor will report issues of concern to the RE and ECO, who in turn will engage the proponent. The ECO will report to the RE and Eskom.

Eskom will retain responsibility for ensuring that the Contractor fully implements the provisions of the EMPr.

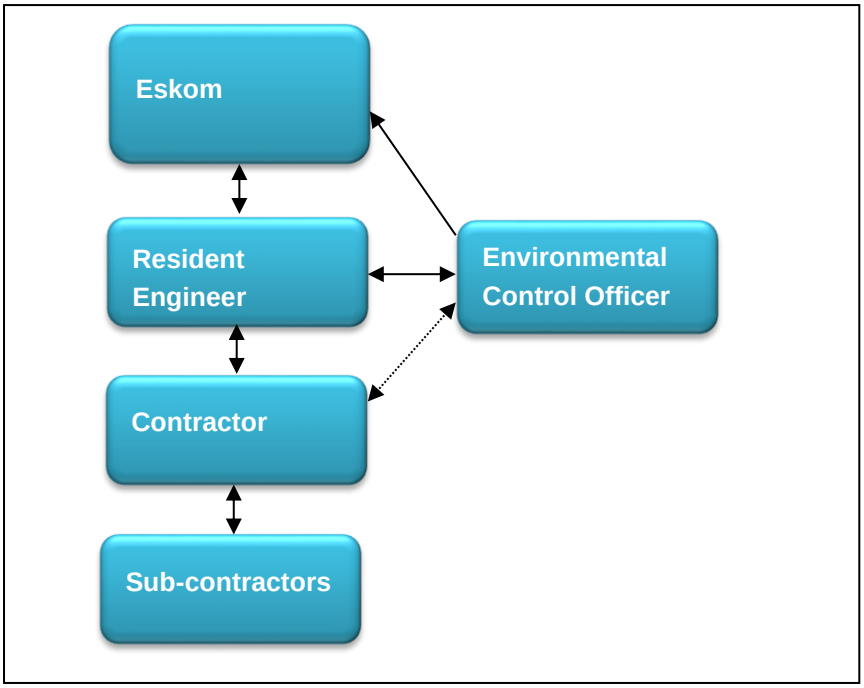

Figure 4-1: Construction Phase Reporting Structure

Key roles and responsibilities during the Construction Phase with respect to the implementation of the EMPr are outlined below.

Eskom:

Eskom has overall responsibility for management of the project. In terms of environmental management, the proponent will:

- Appoint suitably experienced Engineers who will be responsible for the overall management of activities on site during the Construction Phase;
- Appoint a suitably qualified ECO to monitor compliance with the EMPr for the duration of the Construction Phase;
- Ensure that the engineers are aware of the requirements of the EMPr, implement the EMPr and monitor the Contractor's activities on site;
- Ensure that Contractors are aware of and contractually bound to the provisions of this EMPr by including the relevant environmental management requirements in the tender and contract documents, as appropriate;
- Ensure that Contractors remedy non-compliance with the EMPr or unforeseen environmental damage timeously and to the satisfaction of the ECO and authorities (when necessary); and
- Notify the authorities should non-compliance with the EMPr or unforeseen environmental damage not be remedied timeously.

Resident Engineer:

Eskom will appoint suitably qualified Engineers, who in turn will designate a suitable RE who will be responsible for overseeing activities of the Contractor during the Construction Phase. The RE shall:

- Ensure that the Contractor is duly informed of the EMPr and associated responsibilities and implications of this EMPr prior to commencement of construction;
- Monitor the Contractor's activities (together with the ECO) with regard to the requirements outlined in the EMPr;
- Relay all instructions from the ECO to the Contractor and ensure that these are fully understood and implemented;
- Report any environmental emergencies/concerns to the ECO immediately;
- Act as a point of contact for local residents and community members; and
- Ensure that non-compliance is remedied timeously and to the satisfaction of the relevant authorities.

Contractors:

Contractors will each be required to appoint or designate a Contractor's Environmental Representative (CR) who will assume responsibility for the Contractor's environmental management requirements on site and be the point of contact between the Contractor and the ECO. Each CR shall:

- Ensure that all activities on site are undertaken in accordance with the EMPr;
- Monitor the Contractor's activities (together with the ECO) with regard to the requirements outlined in the EMPr;
- Ensure that all employees and sub-contractors comply with the EMPr;
- Immediately notify the ECO of any non-compliance with the EMPr, or any other issues of environmental concern; and
- Ensure that non-compliance is remedied timeously and to the satisfaction of the ECO.

Contractors have a duty to demonstrate respect and care for the environment. Contractors will be responsible for the cost of rehabilitation of any environmental damage that may result from non-compliance with the EMPr, environmental regulations and relevant legislation.

Sub-contractors:

All Sub-contractors will be required to:

- Ensure that all employees are duly informed of the EMPr and associated responsibilities and implications of this EMPr prior to commencement of construction;
- Ensure that all activities on site are undertaken in accordance with the EMPr;
- Monitor employees' activities (together with the ECO) with regard to the requirements outlined in the EMPr;
- Immediately notify the ECO of any non-compliance with the EMPr, or any other issues of environmental concern; and
- Ensure that non-compliance is remedied timeously and to the satisfaction of the ECO.

Each Sub-contractor has a duty to demonstrate respect and care for the environment. Sub-contractors will be responsible for the cost of rehabilitation of any environmental damage that may result from non-compliance with the EMPr, environmental regulations and relevant legislation, resulting from their presence on site.

Environmental Control Officer:

The ECO shall be a suitably qualified/experienced environmental professional or professional firm, appointed by the proponent, for the duration of the Construction Phase of the project. The ECO shall:

- Request Method Statements from Contractors prior to the start of relevant construction activities, where required, and approve these (as appropriate) without causing undue delay;
- Monitor, review and verify compliance with the EMPr, Environmental Authorisation (EA) and any other environmental permit/ approval, by Contractors as well as any sub-contractors and specialist contractors;
- Undertake site inspections at least twice a month to determine compliance with the EMPr, EA, and any other environmental permit/ approval;
- Identify areas of non-compliance and recommend corrective actions (measures) to rectify them in consultation with Eskom, the RE and the applicable Contractor, as required;
- Compile a checklist highlighting areas of non-compliance following each ECO inspection;
- Ensure follow-up and resolution of all non-compliances;
- Provide feedback for continual improvement in environmental performance;
- Respond to changes in project implementation or unanticipated site activities which are not addressed in the EMPr, and which could potentially have environmental impacts, and advise Eskom, the RE and Contractor as required; and
- Undertake a site closure inspection, which may result in recommendations for additional clean-up and rehabilitation measures.

Table 4-4: Potential environmental aspects and impacts for the construction phase as well as the associated mitigation and management measures

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
Site camp establishment	Incorrectly positioned camp/lack of demarcation can result in pollution and vegetation loss	Submit a method statement for Site Camp establishment for acceptance by the ECO at least two weeks prior to the start of construction activities.	All Contractors	Start of construction	Visual inspections Method statement	Accepted method statement Site boundaries demarcated Signage in place
		Establish a suitably fenced Site Camp at the start of the contract, which will allow for site offices, vehicle, equipment, material and waste storage areas to be consolidated as much as possible. Locate the Site Camp at a position accepted by the ECO. Provide water and / or washing facilities at the Site Camp for personnel.				
		Demarcate construction site boundaries upon establishment. Control security and access to the site. Fence off site boundaries to the satisfaction of the ECO and ensure that plant, labour and materials remain within site boundaries.				
		Designate the area beyond the boundary of the site as “No go” areas for all personnel on site. No vehicles, machinery, materials or people shall be permitted in the “No go” area at any time without the express permission of the RE in consultation with the				

[3] Unless otherwise indicated, monitoring will be undertaken by the ECO, supported by the authorities where the requirement is specifically stipulated in a licence or permit.

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		ECO.				
Labour force/ local communities	Socio-economic impacts	Set targets for the use of local labour based on the availability of existing skills and people that are willing to undergo training.	Eskom Contractors	Throughout construction	Keep record of how targets were determined Keep record of staff by origin Keep record of training provided	Percentage of local staff Percentage of PDI staff
		Maximise opportunities for the training of unskilled and skilled workers from local communities and use local Sub-Contractors where possible.				
		Meet empowerment targets relevant to the construction sector.				
		Consider implementing labour-intensive rather than capital-intensive work methods wherever possible.				
		Consider purchasing resources from local sources wherever possible.				
	Training	Provide environmental awareness training to all personnel on site at the start of their employment. Training should include discussion of: Potential impact of construction waste and activities on the environment; Suitable disposal of construction waste and litter; Key measures in the EMPr relevant to worker's activities; How incidents and suggestions for improvement can be reported; and Ensure that all attendees remain for the duration of the training and on completion sign an attendance register that clearly indicates	All Contractors	Before workers start working on-site Before new activities are undertaken	Check training attendance register Observe whether activities are executed in line with EMPr requirements	Proportion of workers that completed environmental training Compliance of workers with EMPr

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		participants' names.				
	Complaints Register / Grievances	Maintain and disclose a complaints register. The register must record: Complainant name and contact details; Date complaint was lodged; Person who recorded the complaint; Nature of the complaint; Actions taken to investigate the complaint and outcome of the investigation; Action taken to remedy the situation; and Date on which feedback was provided to complainant.	Eskom Contractor	Duration of construction activities	Keep record of all complaints	Register on site Complaints followed up and closed out
Hazardous materials	Contamination of wetlands/watercourses	The construction site camp and laydown areas for stockpiles etc. should be located on higher ground and not within the 50 m sensitivity buffers recommended for wetlands	All contractors	Throughout construction	Visual inspection of hazardous materials handling and storage areas	Number of incidents of non-compliance with safety procedures concerning hazardous materials, including waste materials. Number of spills of hazardous materials, including waste materials; Cost of cleaning up spills. Evidence of contamination and leaks.
		Design and construct hazardous material storage facilities, especially fuel storage, with suitable impermeable materials and a minimum bund containment capacity equal to 110% of the largest container within a weatherproof structure.				
		Ensure that contaminants (including cement) are not placed directly on the ground (e.g. mix cement on plastic sheeting).				
		Ensure spill kits are available				
		Develop (or adapt and implement) procedures for the safe transport,				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		handling and storage of potential pollutants.				
		Avoid unnecessary use and transport of hazardous substances.				
		Keep Material Safety Data Sheets for all hazardous materials on site and ensure that they are available for reference by staff responsible for handling and storage of materials.				
		Storage and maintenance of machinery and construction-related equipment should be done in the construction site camp and preferably on an impermeable surface				
		No wash water from washing of mechanical plant or equipment may be discharged into the surrounding environment. All wastewater must be collected in a container and allowed to evaporate. The resultant material must be disposed of as hazardous waste;				
		Appropriate solid waste disposal facilities must be provided on-site during construction and adequate signage be provided				
		Spillages should be cleaned up immediately and contaminants properly contained and disposed of using appropriate waste facilities (not to be disposed of within the natural environment). Any contaminated soil from the construction site must be removed and disposed of appropriately				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		Cement batching activities should occur in the construction camp, as far as possible, and conducted on an impermeable surface. Cement products/ wash may not be disposed of into the natural environment;				
		Drip-trays must be provided beneath standing vehicles and machinery, and routine checks should be done to ensure that these are in a good condition				
		Portable toilets must be provided where construction is occurring. Workers need to be encouraged to use these facilities and not the natural environment. Disposal slips should be kept for auditing purposes				
		All construction plant equipment, general waste, surplus rock, and other foreign materials must be completely removed from site once construction has been completed				
	Risk of fire / injury	Ensure that emergency procedures (in relation to fire, spills, contamination of the ground, accidents to employees, use of hazardous substances, etc.) are established prior to commencing construction. Submit these emergency procedures to the ECO for approval.	All Contractors	Throughout construction	Visual inspection and approval by CR, RE and ECO.	Number of safety/emergency incidents.
		Make all emergency procedures available, including responsible personnel, contact details of emergency services, etc. to all the				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		relevant personnel. Clearly demarcate emergency procedures at the relevant locations around the site.				
		Provide suitable emergency and safety signage on site, and demarcate any areas which may pose a safety risk (including hazardous substances, deep excavations etc.).				
		Advise the ECO of any emergencies on site, together with a record of action taken				
		Secure the Site Camp, particularly to restrict unauthorised access to fuels and any other hazardous substances.				
		Store all construction material and equipment in locked containers within the Site Camp. .				
Vegetation clearing	Erosion/Sedimentation of wetlands	Limit the footprint area of the construction activity to what is absolutely essential.	All contractors	Throughout construction	Visual inspection Appointment of vegetation specialist Search and Rescue Report	Size of area cleared relative to development footprint Size of area disturbed outside of construction site boundary Number of SCC relocated Permit on file. Growth of invasive vegetation
		Designate areas outside the development footprint as No go areas.				
		Ensure that no vegetation is removed or disturbed outside the delineated construction site boundary.				
		Immediately stabilize slopes that are disturbed / cleared for construction with geofabric or another appropriate erosion stabilisation technique to prevent erosion.				
		Excavated or spoil material (including any foreign materials) as well as topsoil stockpiles should not be placed within the				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		recommended 50 m buffers (preferably further away) of the wetlands or drainage line in order to reduce the possibility of material being washed downstream				
		Disturbed areas should be rehabilitated immediately after construction in the relevant area (with indigenous vegetation or using topsoil)				
		Rehabilitated areas should be monitored well and measures must be implemented to ensure that topsoil does not wash away, e.g. using swales				
		Any erosion gullies/ channels created during construction should be filled immediately to ensure silt does not drain into aquatic systems and the area revegetated				
	Loss of SSC/Destruction of habitat	Safely remove and relocate any fauna that may be physically harmed by construction activities				
		Harvesting and collection of any flora, other than that performed under a permit from the Department of Economic Development, Environmental Affairs & Tourism, must be strictly prohibited				
		Replant rescued SSCs in adjacent similar habitat on site preferably within a nearby reserves such as Lombardini Game Farm or African Whisper Private Game Reserve				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		A construction width of 15 m adjacent to the BESS area must be maintained in order to restrict the width of disturbance (site camp, laydown areas and access tracks outside of the proposed battery storage facility area) that may infringe upon the populations of SSC				
		Demarcate a no-go area around the rocky outcrop indicated on Figure 5-1. No construction related activities should be allowed to take place within the demarcated no-go areas.				
		During the construction phase, the construction area (including site camp, laydown areas and access tracks) must be clearly demarcated and all other areas deemed as no-go areas for the duration of construction				
		The position of the construction site camp should be on an already disturbed area and should be identified in consultation with the Environmental Control Officer (ECO)				
		A fire officer shall be appointed and shall be responsible for co-ordinating rapid, appropriate responses in the event of a fire;				
		No burning of vegetation, whether to clear the vegetation, or of cleared vegetation, shall be permitted; No open fires should be allowed on site;				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		A designated smoking area, outside of any areas where the risk of fire is prevalent, must be designated. Smoking shall not be permitted outside of designated smoking area;				
		Sufficient fire-fighting equipment shall be maintained and be accessible on sites at all times. In particular, such firefighting equipment shall be readily on hand in areas where hot work may be required				
		The objective of rehabilitation of natural areas must be to re-establish indigenous vegetation (coverage of at least 80% should be attained);				
		Rehabilitation of disturbed areas must commence immediately after construction has been completed in that area. Loosen compacted soils within construction footprint which do not form part of the BESS footprint (e.g. access roads, site camp area, stockpile and laydown areas, etc.); Spread stored topsoil over disturbed areas and water regularly until vegetation has sufficiently established				
		All area undergoing rehabilitation must be demarcated as no-go areas				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		During construction, erosion control measures must be implemented in areas sensitive to erosion such as exposed soil, areas with dispersive soils, etc. These measures include but are not limited to the use of sand bags, hessian sheets, silt fences and/ or replacement of vegetation.				
	Spread of Invasive vegetation	Remove any new alien invasive plant species in the construction footprint as soon as they are detected, preferably by physical removal or by spraying herbicides should physical removal not be feasible (to be conducted in conjunction with the ECO);	All contractors	Throughout construction	Visual Inspection	Growth of invasive vegetation
		Monitoring and removing of alien invasive plants should be conducted from the start of the construction phase, during clearing, until rehabilitation has been complete at the end of the liability period				
		An item should be included in the Bill of Quantities for the contractor for control of alien species. In addition, allowance should be made for multiple site visits by the ECO for the duration of the construction contract, including the defects liability period, to assess and assist in all invasive alien plant eradication and control activities				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		All invasive alien species cleared for the construction of the battery storage facility must be collected and disposed of as waste. Care must be taken not to disperse seeds or seed pods in the surrounding environment during the removal thereof				
Excavation activities	Removal of topsoil	Designate and demarcate areas to be used for topsoil stockpiling.	All contractors	Before construction commences	Visual inspection	Incidence of Erosion and Incidence of incorrect storage and harvesting of topsoil
		Remove topsoil (up to a maximum of 30 cm depth)		During vegetation clearing		
		Stockpile topsoil prior to the commencement of construction activities (stockpile no higher than 2m) and conserve topsoil for landscaping and rehabilitation.				
		Locate topsoil stockpiles in an area protected from the wind and agreed to with the ECO.				
		Ensure suitable control of run-off during the construction phase to prevent erosion of topsoil on adjacent land and undeveloped portions of the site.		During construction		
		Replace harvested topsoil in areas that are to be rehabilitated as soon as sections of the works are completed (i.e. not only following the completion of all works)				
Concrete/Cement Work	Contamination of soil/wetlands	Use Ready-Mix concrete rather than batching where possible.	All contractors	Throughout construction	Visual inspection and approval by RE and ECO.	Number of incidents of batching outside works footprint Contamination of water and soil Visible litter /
		Ensure that cement truck delivery chutes are cleaned in a designated area where				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		wastewater can be disposed of in the correct manner. A suitable washing facility is to be developed on site in consultation with the ECO.				waste on site.
		Batch cement in a bunded area within the boundaries of the development footprint only (where unavoidable).				
		Ensure that cement is mixed on mortar boards and not directly on the ground (where unavoidable).				
		Physically remove any remains of concrete, either solid, or liquid, immediately and dispose of as waste.				
		Place cement bags in bins and dispose of bags as waste to a licensed waste disposal facility.				
		Sweep / rake / stack excess aggregate / stone chip / gravel / pavers into piles and dispose at a licensed waste disposal facility.				
Waste management	Dumping/litter	Submit a method statement for waste management (including hazardous waste).	Eskom All contractors	Before start of activities on site Throughout construction	Availability of plan Visual inspection of waste collection and disposal areas Visual inspection of construction areas (litter) Check waste disposal slips	Monitor procedures to ensure the waste management plan is implemented. Presence of litter Availability of rubbish bins and skips Degree to which rubbish bins and skips are filled Total volume of general and hazardous waste storage capacity Total volume of general and hazardous waste stored on site
		Train all staff in the effects of debris and litter in the environment and appropriate disposal procedures.				
		Aim to minimise waste through reducing and re-using (packaging) material.				
		Collect recyclables separately and deliver these to suitable facilities or arrange for collection.				
		Collect all waste in bins and/or skips at the				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		construction site.				Degree to which different waste is separated Frequency of waste collection
		Prevent littering by construction staff at work sites by providing bins or waste bags in sufficient locations.				
		Provide separate bins for hazardous / polluting materials and mark these clearly. Store hazardous / polluting materials on impermeable ground until it is disposed of / collected.				
		Dispose of waste appropriately to prevent pollution of soil and groundwater.				
		Do not allow any burning or burying of waste on site.				
Stormwater management	Contamination of soil/water, erosion, sedimentation	Collect stormwater from bunded areas in a suitable container and remove from the site for appropriate disposal.	Contractors	Throughout construction	Visual inspection	Incidence of stormwater contamination Visible leaks/ water wastage Visible surface erosion Compliance with SWMP
		Use berms and stormwater drainage systems to prevent surface run-off from entering site excavations.				
		Implement measures to maximise the infiltration of stormwater on site.				
		Implement measures stipulated in the SWMP, including: Protect construction material stockpiles using berms (or another mechanism) to ensure that material cannot be mobilised by runoff and/or potentially block the stormwater system.				
		Ensure that all roads and tracks used for construction have the appropriate water diversion / erosion	Contractors	Throughout construction	Visual inspection	Visible surface erosion.

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		control structures.				
Excavation and vehicles on site	Dust management	Implement a Dust Management Plan.	Contractors	Throughout construction	Visual assessment of dust plumes Visual assessment of dust control measures	Visibility of dust coming off construction site Dust mitigation measures in place Number of days that dust plumes are visible Number of registered complaints Size of disturbed areas
		Avoid clearing of vegetation until absolutely necessary (i.e. just before excavations).				
		Regularly evaluate the effectiveness of all dust management measures. Amend how or which measures are used if necessary.				
		Stabilise exposed surfaces as soon as is practically possible.				
		Avoid excavation and handling and transport of materials which may generate dust under high wind conditions or when a visible dust plume is present.				
		Minimise dust generated off stockpiles: Locate piles in sheltered areas where possible; Place the stockpile lengthwise into the wind; Minimise the slope of the stockpile (maximum slope of 2:1); Limit stockpile sizes; Install barriers on three sides of the stockpile (maximum 50% material porosity) if required; Limit activity to the downwind side of the pile; Use the last in – first out system of stockpile management; and Cover stockpiles when not in active use for some time and / or use an environmentally friendly chemical spray to bind soil.				
		Limit vehicle speeds to 20 km/h on unconsolidated and non-vegetated areas.				
		Cover trucks transporting loose				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		material to or from site with tarpaulins, plastic or canvas.				
		Ensure that any material spilled from trucks during transport to or from the site is cleaned up immediately.				
		Use bedliners to minimise seepage and spillage of material from bottom-dumping trucks.				
		Check weather reports daily and closely observe weather patterns to enable action to be taken immediately if conditions change.				
		Limit the number of vehicles allowed on-site and restrict the movement of these vehicles over unsurfaced or unvegetated areas once they are on site to reduce dust problems.				
		Sweep roads leading from the site if wheel washing facilities do not effectively prevent mud being deposited on access roads.				
		Reduce airborne dust at construction sites through: Dampening dust-generating areas with non-potable water if available (and necessary); Use of cloth or brush-barrier fences; and Covering dumps or stockpiles of lose material with plastic sheeting or netting, especially during windy conditions.				
		Sweep roads at site entrance and exit points regularly, to				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		prevent the spread of mud / dust by construction vehicles.				
Labourers on site	Fires	Ensure that no fires are permitted on or adjacent to site. Ensure that no smoking is permitted on the site. Ensure that sufficient fire-fighting equipment is available on site. Equip all fuel stores and waste storage areas with fire extinguishers. Ensure that all personnel on site are aware of the location of firefighting equipment on the site and how the equipment is operated. Suitably maintain firefighting equipment.	Contractors	Throughout construction	Inspect attendance register for training sessions; and Inspect fire extinguishers and certificates.	Number of fire incidents Certified extinguishers in appropriate locations.
Transportation and refuelling	Contamination of soil/water with hydrocarbons	Undertake regular maintenance of vehicles and machinery to identify and repair minor leaks and prevent equipment failures. Undertake any on-site refuelling and maintenance of vehicles/machinery in designated areas. Line these areas with an impermeable surface and install oil traps. Use appropriately sized drip trays for all refuelling and/or repairs done on machinery – ensure these are strategically placed to capture any spillage of fuel, oil, etc. Clean up any spills immediately, through containment and removal of free product and appropriate disposal of contaminated soils.	All contractors	Throughout construction	Visual inspection of vehicles, barges, machinery and refuelling/maintenance areas	Number of incidents of non-compliance Number of leaks and spills Cost of cleaning up spills.

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		Keep spill containment and clean-up equipment at all work sites and for all polluting materials used at the site.				
Construction equipment/people	Injury/ death of animals	Flush out fauna before establishing site camp and site boundaries.	Contractor	Before construction commences	Visual inspection	Number of animals flushed out of area
		Do not harm, catch or kill birds or animals by any means, including poisoning, trapping, shooting or setting of snares.	Contractor	Duration of construction activities	Visual Inspection	Number of animals harmed Time period trenches are left open Number of incidents of animals found in trenches.
		Backfill trenches as soon as possible to ensure that the time the trench is exposed is kept to a minimum.				
		Open trenches must be inspected on a daily basis for animals which may have fallen or become trapped.				
		Safely remove and relocate any fauna that may be physically harmed by construction activities.				
		Do not harm, catch or kill birds or animals by any means, including poisoning, trapping, shooting or setting of snares.				
Excavation	Damage/destruction of archaeological and paleontological resources	Inform employees and contractors that archaeological or paleontological artefacts, including human skeletal remains, might be exposed during construction activities.	Contractors	Before construction commences	Visual inspection	Time to rehabilitation Size of disturbed areas.
		Empower staff to stop works on (chance) discovery of artefacts at the site.		During earthworks		
		Report the presence of graves or human remains, fragments of fossil bone, ostrich egg and stone fragments to				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		Heritage Eastern Cape.				
		Stop works and obtain a permit for the removal of artefacts from the site if any are discovered during construction.				
Construction plant	Traffic congestion	Manage construction sites and activities so as to minimise impacts on road traffic as far as possible, e.g.: • Attempt to arrange delivery of materials when it will least disrupt traffic; • Stagger deliveries if possible rather than concentrating them during "rush" hours; and • Keep construction materials and machinery at the construction site throughout the construction period, where possible.	All contractors operating vehicles	Throughout construction	Keep record of vehicles entering the site and time they enter; Keep record of incidents and complaints; and Visually inspect vehicles for any obvious faults or overloading.	Number of incidents and complaints Number of vehicles travelling to site each day Condition of vehicles.
		Notify local authorities, road authorities and affected stakeholders prior to construction activities and transport of battery storage containers.				
		Use appropriate road signage, in accordance with the South African Traffic Safety Manual, providing flagmen, barriers etc. at the various access points when necessary.				
		Ensure that large construction vehicles are suitably marked to be visible to other road users and pedestrians.				
		Ensure that vehicles transporting battery storage containers are suitably marked noting the hazardous nature				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		of their load.				
		Ensure that relevant safety measures and signage are in place when containers are delivered to site.				
		Ensure that all safety measures are observed and that drivers comply with the rules of the road.				
		Ensure that vehicle axle loads do not exceed the technical design capacity of roads utilised by the project.				
		Investigate and respond to complaints about traffic.				
Road users/ local community	Visual impacts	Paint the battery storage containers (and where possible, associated infrastructure such as fencing) dark grey or brown. Avoid the use of light colours (e.g. white).	Contractors	Throughout construction	Visual inspection	Colour of infrastructure Number of complaints
		Limit outdoor security lighting and ensure that it is as unobtrusive as possible.				
		Attach signs to structures to avoid free standing signs in the landscape during the construction period as much as possible.				
		Control litter and keep construction site as clean and neat as possible.				
Construction workers	Effluent contamination	Provide ablution facilities (i.e. chemical toilets) for all site staff at a ratio of 1 toilet per 15 workers (absolute minimum 1:25).	Contractors	Throughout construction	Visual inspections Records of waste disposal	Number of incidents of staff not using facilities Number of pollution incidents
		Secure all temporary / portable toilets to the ground to the satisfaction of the ECO to prevent them				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		toppling due to wind or any other cause.				
		Maintain toilets in a hygienic state (i.e. toilet dispensers to be provided, toilets to be cleaned and serviced regularly (at least "twice- monthly" by an appropriate waste contractor), and toilets to be emptied before long weekends and builders' holidays).				
		Remove / appoint an appropriate Sub-Contractor to remove accumulations of chemicals and treated sewage from the site and dispose of at an approved waste disposal site or wastewater treatment works.				
		Ensure that no spillages occur when the toilets are cleaned or emptied. Repeated incidents of spillage of chemicals and or waste (i.e. more than one incident), will require toilets to be placed on a solid base with a sump.				
Machinery/Equipment on site	Spills from construction activities could contaminate soil	Develop a spill response procedure for approval by the ECO. In the event of environmental pollution, e.g. through spillages, immediately stop the activity causing the problem.	Contractors	Throughout construction	Maintain register of pollution events and response Following resumption of activities, frequently inspect repaired equipment to ensure proper functioning	Number of incidents Time activities stopped Number of recurring incidents Availability and completeness of register
		Only resume activity once the problem has been stopped or (in the case of spillages) the pollutant can be captured without reaching the environment.				
		Repair faulty equipment as soon as possible.				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		Install additional bunding / containment structures around the equipment that was the source of the leak / spillage to prevent pollution from reaching the environment in future.				
		Treat hydrocarbon spills, e.g. during refuelling, with adequate absorbent material, which then needs to be disposed of at a suitable landfill.				
Site rehabilitation and closure	Erosion, Incorrect disposal of waste/dumping, Contamination of soil/water	Plan and make adequate financial provision for rehabilitation and restoration activities and clearly allocate timing and responsibility for environmental rehabilitation.	Contractor	Prior to construction	Record of financial provisioning for rehabilitation	Financial provisioning for rehabilitation in place
		Ensure that slopes are immediately stabilized to prevent erosion, using geofabric or other appropriate erosion stabilisation techniques.		Once construction is complete; or Throughout construction if it takes place in phases / different areas sequentially	Visual inspection of site Keep record of rehabilitation measures	Rehabilitation forms an integral part of operations from start-up Construction sites fully rehabilitated within five years
		Remove all construction equipment, vehicles, equipment, waste and surplus materials, including site offices, temporary fencing and diesel, from the site.				
		Clean up and remove any spills and contaminated soil in the appropriate manner.				
		Ensure that no discarded materials are buried on site or on any other land not designated for this purpose.				
		Ensure that affected areas are rehabilitated following construction.				
		Use harvested topsoil				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods3	Performance Indicators
		for rehabilitation.				
		Rehabilitate project areas with locally indigenous species or using anti-erosion measures such as biobarrier or soil saver as soon as possible after activities have ceased at each area.				
		Rehabilitate any disturbed areas as soon as construction in the area is complete.				
		Replace harvested topsoil in areas that are to be rehabilitated as soon as sections of the works are completed (i.e. not only following the completion of all works).				
		Rehabilitate all project areas as soon as possible after completion of activities in each area, including removing and/or remediating any contaminated soils.				

4.2.1 Environmental Objectives

Waste management impacts

Construction as well as small amounts of domestic waste generated during the construction phase will be removed off site and either taken to a registered waste disposal facility or to be recycled. Lack of proper management of the waste on the site may lead to wind-blown litter and dumping creating a negative visual impact and potentially impacting on aquatic ecosystems. Illegal disposal may also lead to negative ecological as well as visual impacts.

The impact management objective for this impact is:

- Prevent waste pollution of surrounding habitats; and
- Legally compliant management of solid waste.

Loss of vegetation and habitat

Permanent loss of indigenous vegetation will occur during construction due to the footprint of the development. There will also be temporary loss of vegetation due to construction activities, e.g. site camps and lay down areas. The permanent footprint of the development is likely to be in the order of four to seven hectares. The vegetation type on the site is a transition zone from Kouga Grassy Sandstone Fynbos (Least concern), and Humansdorp Shale Renosterveld (Endangered). Development of the site could potentially result in loss of habitat for endemic species as well as the irreversible loss of possible species assemblages within the site boundary. In addition, if rehabilitation of disturbed areas is not adequately conducted, further impacts to areas outside the site boundary could occur due to erosion or fires.

The impact management objective for this impact is:

- Minimise disturbance to vegetation; and
- Rehabilitate disturbed areas of the site as soon as possible.

Loss of SSC

Species of special concern (SSC) in this area are species which are endemic to this region and occur within an isolated habitat type and/or are provincially protected species. The proposed development and associated works could result in the complete loss of SSC on site if no species are rescued before construction commences. If construction activities extend to outside the construction footprint boundaries, this would have further impacts.

The impact management objective for this impact is to minimise impacts to Species of Special Concern.

Spread of Invasive Alien species

A major change in plant communities where development is concerned is generally the result of invasion of alien weeds and invasive plants. The proposed development will result in an increase in the risk of invasive alien plants establishing in the disturbed sites and spreading to the surrounding areas during and after construction. The potential for invasive alien plants infestation is relatively high due to the presence of large infestations of invasive species (predominantly *Acacia mearnsii*) within the surrounding area as well as existing infestations within the site boundary

The impact management objective for this impact is to minimise the spread of alien invasive plants.

Wetland Degradation due to decreased water quality

Construction activities could cause contamination of wetlands, watercourses, and groundwater if proper management is not practiced. Accidental spills of hydrocarbons (oils, diesel, etc.) or leakage of such substances from construction machinery may enter wetlands directly, through surface runoff during rainfall events or subsurface movement (through groundwater) and then migrate to

downstream systems. Such chemicals, fuels or pollutants would alter the water quality within the watercourse, having an effect on aquatic ecology in the form of biodiversity loss, i.e. the loss of vegetation and wetland fauna that are sensitive to changes in water quality (especially from toxicant inputs).

Wetlands 5 & 6 could be affected by contaminated runoff from the construction activities as they occur down-gradient from the proposed site. Wetlands 1, 2, 3 & 4 should not be directly affected by contaminated runoff due to the location of the wetlands to the west of the R330.

The impact management objective for this impact is:

- Minimise contamination of watercourses, wetlands and groundwater; and
- Minimise damage to or loss of aquatic biota in the wetlands.

Increased sedimentation of wetlands

During the construction phase when vegetation is cleared, large quantities of loose earth may easily be washed from the construction zone or be transported down slope during high rainfall events, resulting in increased sedimentation of aquatic systems occurring downstream. This would impact on aquatic biota but could also influence the geomorphology of aquatic systems and overall functioning in severe circumstances.

Construction of the BESS is most likely to affect the wetlands in close proximity to the site, such as Wetlands 5 & 6. Wetlands 1, 2, 3 & 4 should not be directly affected by sedimentation in runoff as the stormwater from the site will be cut off and redirected by the R330 to the west.

The impact management objective for this impact is to minimise erosion and sedimentation of wetlands.

Damage to Palaeontological Resources

The Development is planned to be constructed overlying strata of the Silurian aged Goudini Formation, the lowermost formation of the Nardouw Subgroup, which forms the upper portion of the Table Mountain Group. Piles of rock waste from previous construction phases, adjacent to the existing substation indicate that fairly fresh mudstone is likely to be disturbed. None of the material currently available for examination bore any evidence of palaeontological material. Palaeontological material is not known to be abundant in the Nardouw Subgroup and has previously been confined to trace fossils associated with the quartzites. Ongoing research by the author has, however, revealed important palaeontological assemblages in units of the Cape Supergroup formerly considered to be devoid of fossils. This is often far more important that their collection from units well-known for their palaeontological heritage

The impact management objective for this impact is to prevent destruction of possible paleontological material.

Damage to Archaeological Resources

No archaeological / historical or other heritage resources were identified within the proposed development area. However, one stone artefact was encountered, ex situ, outside the boundary of the proposed development along the gravel access road to the adjacent wind farm. The survey was limited to surface and exposed area observations and does not eliminate the possibility that archaeological heritage remains may occur below the surface. It is possible that stone artefacts may occur below the vegetation cover between the surface and 50 – 80 cm below the ground.

The impact management objective for this impact is to prevent damage to archaeological resources.

4.2.2 Compliance and Monitoring: Method Statements

A Method Statement is a document setting out specific details regarding the plant, materials, labour and method the Contractor proposes using to carry out certain activities, usually activities that may have a detrimental effect on the environment. It is submitted by the Contractor to the RE and/or ECO.

The purpose of a Method Statement is for the Contractor to provide additional details regarding the proposed methodology for certain activities, and for the RE/ECO to confirm that these meet the requirements of the EMPr and acceptable environmental practice. This allows the EMPr to be less prescriptive and affords the Contractor a certain amount of flexibility or to amend stipulations in the EMPr, if approved by the RE/ECO. It also provides a reference point to detect deviations from the agreed approach to an activity.

Each Method Statement will address environmental management aspects relevant to the activity and will typically provide detailed descriptions of items including, but not necessarily limited to:

- Nature, timing and location of activities;
- Procedural requirements and steps;
- Management responsibilities;
- Material and equipment requirements;
- Transportation of equipment to and from site;
- Method for moving equipment/material while on site;
- How and where material will be stored;
- Emergency response approaches, particularly related to spill containment and clean-up;
- Response to compliance/non-conformance with the requirements of the EMPr; and
- Any other information deemed necessary by the RE/ECO.

The following list provides examples of Method Statements that may be requested from the Contractor:

- Construction site establishment;
- Environmental awareness course preparation;
- Material and equipment storage and delivery;
- Fuel storage, dispensing and fuel spills;
- Waste management;
- Management of contaminated water;
- Erosion and stormwater control;
- Operating heavy machinery;
- Cement batching;
- Transporting battery storage containers to site; and
- Any others requested by the RE/ECO.

The Method Statements will be submitted by the Contractor to the RE/ECO no less than **7 days** prior to the intended date of commencement of an activity (or as otherwise agreed with the RE/ECO). The RE/ECO shall approve / reject the Method Statement within **2 days**. An activity for which a Method Statement has been requested shall not commence until the RE/ECO has approved of such method

and once approved, the Contractor shall abide by the relevant Method Statement. A pro forma Method Statement is attached in Appendix A, although a suitable Method Statement format can be agreed between the RE/ECO and Contractor.

Environmental records and reports required during the Construction Phase are listed in Table 4-5.

Table 4-5: Reports required during Construction

Report	Frequency	From	To
Environmental Checklist	Weekly	CR	ECO and Eskom
Environmental Compliance Report	Twice a month / following each inspection	ECO	RE and Eskom
Site Closure Report	End of Contract	ECO	RE and Eskom

Environmental Checklist

The CR will undertake weekly site inspections to check on the implementation of the EMPr, EA, and any other environmental permit/approval, by the Contractor and complete a brief report/checklist after the inspection. The completed checklists shall be submitted to the ECO at the end of each inspection. This checklist should be discussed between the CR and the ECO during the initial site inspection, and agreement reached on the preferred format and content.

Environmental Compliance Report

The ECO will prepare an Environmental Compliance Report following each site inspection, detailing any environmental issues, non-compliance and corrective actions to be implemented. These reports will be based on the ECO's observations and the weekly Environmental Checklists. Environmental Compliance Reports will be submitted to the RE and Eskom and a full record will be kept by the ECO, for submission to the Local Authority and/or DEA on request.

When more frequent site visits are undertaken by the ECO, the frequency of progress reports will increase accordingly to allow for timeous reporting of environmental issues and actions required.

Photographic Records

If the ECO identifies any areas of concern, the ECO will request photographic records, which must be submitted by the Contractor for evidential purposes. The ECO shall also keep photographic records of all construction activities and areas of concern during site inspections.

Construction Site Closure Report

The ECO will undertake a final site closure inspection on completion of the Construction Phase. The purpose of this is to confirm compliance with all site closure requirements identified by the ECO, and that the site has been left in an environmentally suitable condition. If outstanding environmental requirements are observed during this inspection, a further inspection must be carried out to confirm compliance. The Site Closure Report will be submitted to the RE and Eskom for evidential purposes, and to DEA if requested.

4.2.3 Corrective Action

Corrective action is a critical component of the implementation–review–corrective action–implementation cycle and it is through corrective action that continuous improvement can be achieved. Where repeated non-compliance is recorded, procedures may need to be altered accordingly to avoid the need for repeated corrective action.

If environmental compliance monitoring by the CR and ECO indicates non-conformance with the EMPr or approved Method Statements, the RE will formally notify the Contractor through a Corrective Action Request. The Corrective Action Request documents:

- The nature of the non-conformance/environmental damage;
- The actions or outcomes required to correct the situation; and
- The date by which each corrective or preventive action must be completed.

Upon receipt of the Corrective Action Request, the Contractor will be required to produce a Corrective Action Plan (or similar plan), which will detail how the required actions will be implemented. The Corrective Action Plan must be submitted to the RE/ECO for approval prior to implementation. Once it has been approved, the corrective action must be carried out within the time limits stipulated in the Corrective Action Request. Additional monitoring by the CR and ECO will then be required to confirm the success or failure of the corrective action.

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4.3 Operational Phase

The impacts and associated management objectives are described below for the operation phase. Operational impacts are largely dependent on the type of technology selected and therefore most impacts have been rated according to the various alternatives with the exception of impacts on the hydrology of wetlands which is common to all.

The key role players during the operational phase of the project are:

- Eskom (the proponent); and
- Contractors / Service Providers responsible for maintenance of the BESS.

Key roles and responsibilities during the operational phase with respect to the implementation of the EMPr are outlined below.

Eskom:

- Ensure that all contractors / service providers executing work for Eskom for the project are aware of the requirements of the EMPr; and
- Appoint a suitably qualified and experienced staff member to review the environmental performance of contractors.

Contractors:

- Comply with the applicable environmental commitments, procedures, restrictions and guidance specified in the EMPr;
- Co-operate fully in implementing applicable environmental procedures;
- Ensure that copies of the EMPr are available on site;
- Ensure that all personnel on site, (including any sub-contractors and their staff) are familiar with and understand the requirements of the EMPr relevant to their activities; and
- Ensure that any problems and non-conformances are remedied in a timely manner, to the satisfaction of the relevant management personnel at Eskom.

Table 4-6: Environmental management and mitigation measures that must be implemented during the Operational Phase

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods[4]	Performance Indicators
Storage of dangerous goods	Loss of containment of hazardous goods	Ensure that battery supplier user guides, safety specifications and MSDS are filed on site at all times.	Eskom	Throughout operations	Check that documents filed on site	Documents filed on site
		Operate, maintain and monitor the BESS as per supplier specifications.			Keep supplier specifications on file	Incidents of malfunctioning of battery system due to non-compliance with supplier specifications

[4] Unless otherwise indicated, monitoring will be undertaken by Eskom, supported by the authorities where the requirement is specifically stipulated in a licence or permit.

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods4	Performance Indicators
		Compile method statements for battery cell, electrolyte and battery container replacement. Maintain method statements on site.	Contractors		Method statements submitted to Eskom by Contractor	Method statements compiled and filed on site
		Develop (or adapt and implement) procedures for the safe transport, handling and storage of potential pollutants				
		Ensure that all maintenance contractors are familiar with the supplier's specifications. Maintenance activities undertaken during the Operational Phase must adhere to the applicable environmental management measures provided for the Construction Phase.	Eskom		Method statements comply with supplier specifications.	Incidents of malfunctioning of battery system due to non-compliance with supplier specifications
		Provide signage on site specifying the types of batteries in use and the risk of exposure to hazardous material and electric shock.			Visual inspection	Signage on site
		Provide signage on site specifying how electrical 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.			Visual inspection	Signage on site
		Maintain strict access control to the battery storage area.			Monitor who enters and exits the substation	Incidents of unauthorised entry
		Undertake weekly visual checks to identify signs of damage or leaks.			Weekly checks taking place	Incidents of damage to exterior of batteries
		A leak detection system to be installed				
		Secondary containment systems to be in place for the BESS				
		All spills to be cleaned immediately and workers on site to be trained on correct procedures			Method statements submitted to Eskom by Contractor	
		Adequate spill kits must be kept on site for small spills and must be accessible at all times			Visual inspection	
		In the event of a spillage or leaks, the spilled liquid must be collected in a suitable container and disposed of at a licensed hazardous waste site. The general area should be treated with an absorbing agent if necessary			Visual inspection	Incidents of damage to exterior of batteries

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods4	Performance Indicators
	Fires	A detailed fire management plan to be developed and to include the following: • Fire detection and fire suppression systems; • Short circuit detection and protection devices; • Cell level temperature monitoring devices; and • Cell level protective devices.	Eskom	Prior to operations	Emergency procedures developed	Number of incidents of non-compliance with safety procedures concerning hazardous materials, including waste materials Number of spills of hazardous materials, including waste materials Cost of cleaning up spills.
		Develop emergency procedures (in relation to fire, spills, contamination of the ground, accidents to employees, use of hazardous substances, etc.)				
		A fire officer shall be appointed and shall be responsible for co-ordinating rapid, appropriate responses in the event of a fire				
		No burning of vegetation, whether to clear the vegetation and specifically IAPs, or of cleared vegetation, shall be permitted	Eskom	Throughout operations	Visual inspection of hazardous materials handling and storage areas	
		No open fires should be allowed on site				
		A designated smoking area, outside of any areas where the risk of fire is prevalent, must be designated. Smoking shall not be permitted outside of designated smoking area				
		All invasive alien species currently surrounding the substation should be removed and disposed of as waste at a registered landfill site				
		An appropriate fire management system, as per the MSDS and the onsite Emergency Response Plan, should be implemented				
		Appropriate fire-fighting equipment must be available on site at all times and serviced at regular intervals				
		It is recommended that an eight meter fire break be maintained around the perimeter of the battery storage facility for the duration of the operational phase. The fire break should be maintained on a regular basis				
		Consider maximising the employment of local workers and formalising this policy in contracts.				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods4	Performance Indicators
		Consider purchasing resources from local sources wherever possible.				
Staff	Socio-economic impact	Ensure a quantity of appropriate remedial agent, capable of containing and/or remediating a hydrocarbon spill is available on site at all times in case of an emergency spill. The material shall be capable of handling a spill of at least 200l.	Eskom	Throughout operations Before new workers start for the first time Before new activities are undertaken	Keep record of staff by origin Attendance registers of training sessions Keep record that measure was considered and why it was (not) implemented	Percentage of local staff Percentage of goods procured locally
		Treat spills with adequate absorbent material, which then needs to be disposed of at a suitable landfill.				
Loss of containment of Dangerous Goods	Pollution of soils and wetlands	Immediately remediate and rehabilitate areas in the event of a spill of an environmentally hazardous substance.	Eskom Contractors	Throughout operations	Maintain register of pollution events and response Following resumption of activities, frequently inspect repaired equipment to ensure proper functioning	Number of incidents Time activities stopped Number of recurring incidents
		Report all spills greater than 50L to the DEA and the Local Authority within one day of an environmental incident.				
		In the event of environmental pollution, e.g. through spillages, immediately stop the activity causing the problem.				
		Only resume activity once the problem has been stopped or (in the case of spillages) the pollutant can be captured without reaching the environment.				
		Repair faulty equipment as soon as possible.				
		Determine if additional bunding / containment structures around the equipment is required.				
		Ensure that stormwater is managed according to the recommendations of the approved SWMP.				

Aspect	Impact	Mitigation measure / Procedure	Responsible	Implementation Timeframe	Monitoring Methods4	Performance Indicators
		Develop a waste management plan, laying out: • 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. Management plan to address, but not be limited to, decommissioning / replacement of batteries during the operational life of the BESS			Visually inspect adequacy of bunding	
Stormwater management	Contamination of water recources	Ensure that service providers dispose of used batteries properly by requesting and retaining receipts for disposal/refurbishment.	Eskom	Throughout operations	Visually inspect stormwater system	Compliance with SWMP
Flora	Spread of Invasive Plants	Ongoing control of invasive alien plants must be addressed by the property owner.	Eskom & Landowner	Throughout operations	Regular inspections	Growth of invasive plants on site

The impacts and associated management objectives are described below for the operational phase.

4.3.1 Technology alternative 1 (Lithium ion)

i) S1: Safety impacts due to the risk of explosion/fire for Li-ion

Overcharging, deep discharging, high temperatures and physical stress to Li-ion battery cells can cause a thermal runaway reaction, which can lead to fires and explosion. Most battery packs contain several cells and the heat of one burning cell can trigger thermal runaways in neighbouring cells. The burning of the cells will also release gases such as carbon monoxide, hydrogen fluoride, hydrogen chloride, methane, ethane, ethylene, and propylene. Utility scale Li-ion batteries are commercially available but are not yet considered a mature technology. Utility scale solid state Li-ion batteries might not yet have a commercially demonstrated track record. This means there is limited data to demonstrate failure rates in these BESS.

The impact management objective for this impact is to reduce the risk of fires.

ii) V2: Los of vegetation due to fire (Li-ion)

The potential for fire from Li-ion batteries is described in the impact above If fire were to spread to the surrounding vegetation, vegetation and habitat would be temporarily lost with potentially detrimental impacts to the associated fauna. Subsequently, in the period after the fire, invasive alien vegetation could potentially invade the area inhibiting the indigenous vegetation from re-establishing.

The impact management objective for this impact is to prevent the spread of fires.

iii) Wetland degradation due to fire (Li-ion)

If fire were to spread to the surrounding wetlands, the wetland (particularly during a dry period) the wetland vegetation and dependent biota could be significantly disturbed. Subsequently, in the period

after the fire, invasive alien vegetation could potentially invade the area inhibiting the indigenous vegetation from re-establishing.

The impact management objective for this impact is to prevent the spread of fires.

4.3.2 Technology alternative 2 (Sodium sulphur)

i) S2: Safety impacts due to the risk of explosion/fire for NaS

The NaS battery is composed of highly reactive components that produce corrosive and flammable substances. Pure sodium presents a hazard, because it spontaneously burns in contact with moisture and the molten sodium and sulphur together are a fire hazard. In addition, if the battery leaks, there is an explosion risk due to the emission of hydrogen. Most battery packs contain several cells and the heat of one burning cell can trigger thermal runaways in neighbouring cells. The burning of the cells will also release harmful gases, specifically sulphur dioxide, and potentially an aerosol of sodium hydroxide. Utility scale NaS batteries are a mature technology and there are some reports of these batteries having caught fire.

The impact management objective for this impact is to reduce the risk of fires.

ii) V2: Loss of vegetation due to fire NaS

The potential for fire from NaS batteries is described above. If fire were to spread to the surrounding vegetation, vegetation and habitat would be temporarily lost with potentially detrimental impacts to the associated fauna. Subsequently, in the period after the fire, invasive alien vegetation could potentially invade the area inhibiting the indigenous vegetation from re-establishing.

The impact management objective for this impact is to prevent the spread of fires.

iii) Wetland degradation due to fire NaS

If fire were to spread to the surrounding wetlands, the wetland (particularly during a dry period) the wetland vegetation and dependent biota could be significantly disturbed. Subsequently, in the period after the fire, invasive alien vegetation could potentially invade the area inhibiting the indigenous vegetation from re-establishing.

The impact management objective for this impact is to prevent the spread of fires.

iv) Surface and groundwater contamination impacts for NaS

The NaS batteries use hazardous materials including metallic sodium, which is combustible if exposed to water. When sodium reacts with water this produces sodium hydroxide which is considered ecotoxic. In the event of containment failure, or in the event of a fire, the molten electrolyte may contaminate the soil and groundwater.

It is recognised that battery modules are separate modules and that a loss of containment in more than one module would be significantly less probable than a loss of containment from a single module.

Soil contamination is unlikely to occur off site, however, groundwater contamination, particularly from sodium hydroxide, has the potential to migrate off site and a spatial rating of ‘Regional’ is therefore assigned. From the available information, it is not known what quantity of sodium would be contained in any specific NaS battery module. In order to estimate intensity, the release of 20 tons of sodium hydroxide has been used as a realistic worst-case scenario.

The impact management objective for this impact is to prevent the pollution of water resources.

4.3.3 Technology alternative 3 (Vanadium Redox Flow)

i) Impacts on Surface and groundwater

The electrolyte within the VRF is not flammable, it is however, corrosive as it contains a sulphuric acid based solution. Large tanks of electrolyte will be stored separately to the battery and should these tanks fail, potentially large volumes of electrolyte (approximately 21 m³ per battery container) could escape and hazardous substances may contaminate surrounding water resources as well as soil. If the cells are damaged or deteriorate over time, this may lead to potential hazardous chemical leaking out of the cells and entering the surrounding environment. Wetlands 5 & 6 could be affected by contaminated runoff from the construction activities as they occur down-gradient from the proposed site.

It is recognised that battery modules are separate modules and that a loss of containment in more than one module would be significantly less probable than a loss of containment from a single module.

Soil contamination is unlikely to occur off site, however, groundwater contamination, has the potential to migrate off site.

The impact management objective for this impact is to prevent the pollution of water resources.

4.3.4 General Operational Impacts

i) Potential impacts on hydrology of wetlands and aquatic systems

The construction of the Battery Energy Storage System (BESS) (specifically the foundation work) could alter the surrounding hydrology, most importantly the subsurface flow regime. Wetlands 5 is mostly at risk of impacts related to changes to the surrounding hydrology as it occurs directly down-gradient of the proposed site. Wetlands 1, 2, 3 & 4 are located on the opposite side of the R330 and should not be affected by hydrological changes resulting from the proposed development.

The impact management objective for this impact is to minimise impacts on hydrology of wetlands and watercourses.

5 Monitoring, Reporting and Auditing

Site inspections by an Environmental Control Officer (ECO) must be conducted on a bi-monthly basis (twice a month) during construction to ensure continued compliance with the conditions of the Environmental Authorisation and the measures contained in the approved EMPr.

Monthly audit reports are to be prepared by the ECO and submitted to the developer, engineering representative, contractor, and competent authority.

If a Contractor is appointed to undertake maintenance, a Method Statement may be requested from the Contractor. The Method Statement will be submitted by the Contractor to Eskom not less than **14 days** prior to the intended date of commencement of maintenance. Eskom shall accept / decline the Method Statement within **2 days**. An activity covered by a Method Statement shall not commence until the Site Manager has approved of such method and once approved, the Contractor shall abide by the relevant Method Statement. A pro forma Method Statement is attached in Appendix A, although a suitable Method Statement format can be agreed between the Site Manager and Contractor.

6 Environmental Awareness Plan

On-site training must be provided for all contractors and personnel during the construction phase of the project. No personnel may be allowed onto site without having been inducted on the requirements of the approved EMPr and the Environmental Authorisation conditions.

The training must deal specifically with triggers that would require the implementation of mitigation measures contained in the EMPr. These include, but are not limited to:

- Identification and avoidance of environmentally sensitive features of the site, specifically the drainage lines and wetlands;
- Identification of threatened or protected species (species of special concern);
- Identification of potential heritage resources (see **Appendix A**) for guidelines for the identification of archaeological and historical material); and
- Waste management practices.

It is incumbent upon the contractor to convey the sentiments of the EMPr to all personnel involved in the construction operations (including sub-contractors) and the specific provisions of the EMPr. This should be done via regular toolbox talks as well as more formal training sessions, and attendance registers maintained for auditing and performance management purposes.

Prepared by

Tanya Speyers

Environmental Scientist

Reviewed by

Rob Gardiner

Partner

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

Appendix A: Guidelines for the identification of Archaeological and historical material

Guidelines for the identification of archaeological and historical material

1. Human Skeletal material

Human remains, whether the complete remains of an individual buried during the past, or scattered human remains resulting from disturbance of the grave, should be reported. In general the remains are buried in a flexed position on their sides, but are also found buried in a sitting position with a flat stone capping and developers are requested to be on the alert for this.

2. Freshwater mussel middens

Freshwater mussels are found in the muddy banks of rivers and streams and were collected by people in the past as a food resource. Freshwater mussel shell middens are accumulations of mussel shell and are usually found close to rivers and streams. These shell middens frequently contain stone tools, pottery, bone, and occasionally human remains. Shell middens may be of various sizes and depths, but an accumulation which exceeds 1 m^2 in extent, should be reported to an archaeologist.

3. Stone artefacts

These are difficult for the layman to identify. However, large accumulations of flaked stones which do not appear to have been distributed naturally should be reported. If the stone tools are associated with bone remains, development should be halted immediately and archaeologists notified

4. Fossil bone

Fossil bones may be found embedded in geological deposits. Any concentrations of bones, whether fossilized or not, should be reported.

5. Large stone features

They come in different forms and sizes, but are easy to identify. The most common are roughly circular stone walls (mostly collapsed) and may represent stock enclosures, remains of wind breaks or cooking shelters. Others consist of large piles of stones of different sizes and heights and are known as isisivane. They are usually near river and mountain crossings. Their purpose and meaning is not fully understood, however, some are thought to represent burial cairns while others may have symbolic value.

6. Historical artefacts or features

These are easy to identify and include foundations of buildings or other construction features and items from domestic and military activities.

Appendix B: CV of EAP

Tanya Speyers

Environmental Scientist

Profession	Environmental Scientist
Education	BSc, Hons, Environmental Geography, Nelson Mandela Metropolitan University, 2011 BSc, Geology and Geography, Nelson Mandela Metropolitan University, 2010
Registrations/ Affiliations	None

Specialisation

Basic assessments, environmental impact assessments, waste license applications, water use license applications, environmental auditing

Expertise

Tanya Speyers's experience includes:

- environmental basic assessments;
- environmental impact assessments;
- waste license applications;
- water use license applications;
- environmental auditing

Employment

2012 – present SRK Consulting (Pty) Ltd, Environmental Scientist (Consultant), Port Elizabeth

Publications

None

Languages

English – read, write, speak (Excellent)

Afrikaans – read, write, speak (Good)

Key Experience: Environmental Impact Assessments

Location:	Victoria West, Northern Cape
Project duration & year:	2012
Client:	AF-Rom Energy Pty Ltd
Name of Project:	Environmental Impact Assessment for the proposed Dobbin 75 MW Solar Facility
Project Description:	Environmental Impact Assessment comparing two alternative Solar Panel Layouts
Job Title and Duties:	Assistance with compilation of EIA reports
Value of Project:	R400,000

Location:	Cradock, Eastern Cape
Project duration & year:	2012
Client:	AF-Rom Energy Pty Ltd
Name of Project:	Environmental Impact Assessment for the proposed Brakpoort 75 MW Solar Facility
Project Description:	Environmental Impact Assessment comparing two alternative Solar Panel Layouts
Job Title and Duties:	Assistance with compilation of EIA reports
Value of Project:	R400,000

Location:	Port Elizabeth
Project duration & year:	2010-2012
Client:	MetroWind
Name of Project:	The MetroWind Van Stadens Wind Farm
Project Description:	EIA for a 27 MW Wind Farm in the Nelson Mandela Bay Area, Eastern Cape Province
Job Title and Duties:	Liaison with environmental authorities
Value of Project:	R 1,400,000

Location:	Humansdorp Eastern Cape
Project duration & year:	March 2013 - 2014
Client:	Woodlands Dairy
Name of Project:	Proposed Woodlands Dairy Resource Recovery Plant
Project Description:	Assessment of a proposed Resource Recovery Plant to recover waste water
Job Title and Duties:	Compilation of waste licence application and Environmental Impact Assessment
Value of Project:	R400,000

Location:	Walmer, Port Elizabeth
Project duration & year:	July 2014 - present
Client:	Nelson Mandela Bay Municipality
Name of Project:	Walmer Gqebera Low-cost housing Development
Project Description:	The development of a residential site in Walmer in order to cater for the overflow of residents in Walmer Gqebera
Job Title and Duties:	Environmental Assessment Coordinator, Compilation of the environmental assessment reports
Value of Project:	R180,000

Location:	Coega Industrial Development Zone
Project duration & year:	12 months, 2016
Client:	Coega Development Corporation
Name of Project:	Coega Gas to Power Project
Project Description:	Environmental Impact Assessment and Air Emission License application for 4500 MW Combined Cycle Gas Turbine Project, including regasification unit.
Job Title and Duties:	Environmental Assessment Coordinator, Compilation of the environmental assessment reports
Value of Project:	R 800,000

Location:	Seaview, Port Elizabeth
Project duration & year:	November 2010 - current
Client:	Nelson Mandela Bay Municipality
Name of Project:	Seaview Housing EIA
Project Description:	Site suitability screening and EIA for the development of a low cost housing development and associated infrastructure.
Job Title and Duties:	Project coordinator, compilation of the EIA reports and EMP
Value of Project:	R500,000

Location:	Groot Winterhoek Mountains, Eastern Cape
Project duration & year:	2014-2017
Client:	Inyanda Energy projects (Pty) Ltd
Name of Project:	Inyanda - Roodeplaat Wind Energy Facility
Project Description:	Development of a 187 MW wind energy facility
Job Title and Duties:	Environmental Assessment Coordinator – Compilation of EIA report, liaise with specialists
Value of Project	R1 800,000

Location:	Coega IDZ
Project duration & year:	2015- ongoing
Client:	Coega Development Corporation
Name of Project:	Coega Gas to Power Plant
Project Description:	The development of gas to power facilities within the Coega IDZ
Job Title and Duties:	Project Coordinator – Compilation of EIA reports
Value of Project	-

Key Experience: Basic Assessments

Location:	Markman industrial area, Port Elizabeth
Project duration & year:	2012 - 2013
Client:	Newco
Name of Project:	Newco Tyre Recycling Development
Project Description:	Assessment for a proposed waste tyre recycling facility
Job Title and Duties:	Liaison with client and environmental authorities; project co-ordination; compilation of Basic Assessment report
Value of Project:	R 90,000

Location:	Between Graaff-Reinet and Cradock
Project duration & year:	2011 - 2012
Client:	SANRAL
Name of Project:	Proposed Upgrade of the Route 61, Section 2: Draairivier to Elinus Farm between Graaff-Reinet and Cradock
Project Description:	The rehabilitation and upgrade of the R61/2 between Graaff-Reinet and Cradock to provide a 20 year design life and to bring it up to National Roads Standards
Job Title and Duties:	Assistance with Draft and Final Basic Assessment Reports, Mining EMP
Value of Project:	R 90,000

Location:	Neave Township, Port Elizabeth
Project duration & year:	2013
Client:	Kansai Plascon
Name of Project:	Replacement of Underground Storage tanks at Kansai Plascon
Project Description:	Replacement of Underground Storage Tanks for storage of solvents
Job Title and Duties:	Compilation of Basic Assessment Reports
Value of Project:	R 70,000

Location:	Walmer, Port Elizabeth
Project duration & year:	2012-2013
Client:	Airports Company South Africa

Name of Project:	Proposed PE Airport Stormwater Upgrade
Project Description:	Assessment of the upgrade of the storm water outfall system servicing the Port Elizabeth Airport runways and surrounding area.
Job Title and Duties:	Compilation of Basic Assessment Report
Value of Project:	R135,000
Location:	Port Elizabeth, Eastern Cape
Project duration & year:	2014
Client:	Airports Company South Africa
Name of Project:	Port Elizabeth Airport Runway End Safety Area and Strip Compliance
Project Description:	Environmental Assessment for the Extension of the Runway End Safety Area to comply with the recommendations of the International Civil Aviation Authority
Job Title and Duties:	Environmental Assessment Coordinator, Compilation of the environmental assessment reports
Value of Project:	R 140,000
Location:	Cookhouse, Eastern Cape
Project duration & year:	April 2014 - 2015
Client:	Blue Crane Route Municipality
Name of Project:	Cookhouse WWTW Extension
Project Description:	Extension of the Wastewater Treatment Works in the town of Cookhouse
Job Title and Duties:	Compilation of Basic Assessment Report and WULA
Value of Project:	R 70,000
Location:	Summerstrand, Port Elizabeth
Project duration & year:	December 2014 - present
Client:	MGC Express
Name of Project:	Marine Drive Development
Project Description:	The construction of a multi storeyed apartment building along the Port Elizabeth beachfront
Job Title and Duties:	Environmental Assessment Coordinator, Compilation of the environmental assessment reports, Environmental Control Officer
Value of Project:	-
Location:	New Brighton, Port Elizabeth
Project duration & year:	2017-2018
Client:	Caltex Eastern Cape Marketer
Name of Project:	George's Motors – Decommissioning of Fuel Tanks
Project Description:	Basic Assessment for the decommissioning of fuel tanks at Georges Motors, Eastern Cape
Job Title and Duties:	Liaison with client and environmental authorities; project co-ordination; compilation of Basic Assessment report
Value of Project:	R170, 000
Location:	Addo, Eastern Cape
Project duration & year:	2017 - ongoing
Client:	Sundays River Valley Municipality
Name of Project:	Valencia Water Supply Upgrade
Project Description:	Upgrade of the water supply to Valencia Township in Addo as part of the Addo Water Supply Upgrade Project
Job Title and Duties:	Liaison with client and environmental authorities; project co-ordination; compilation of Basic Assessment report, WULA
Value of Project:	R150,000
Location:	Bethelsdorp, Port Elizabeth
Project duration & year:	2017 - ongoing
Client:	Nelson Mandela Bay Municipality
Name of Project:	Bethelsdorp Ext 30, 34 & 36
Project Description:	Basic Assessment for environmental services associated with the construction of roads, stormwater, sewer and water reticulation in Bethelsdorp

Job Title and Duties:	Liaison with client and environmental authorities; project co-ordination; compilation of Basic Assessment report
Value of Project:	R130, 000
Location:	Humansdorp, Eastern Cape
Project duration & year:	2018-2019
Client:	Eskom
Name of Project:	Melkhout Battery Energy Storage System (BESS)
Project Description:	Basic Assessment for the construction of a BESS at the existing Melkhout substation
Job Title and Duties:	Project manager - management of project team; liaison with client and authorities; project co-ordination and supervision of public participation; management of specialists, compilation of Basic Assessment reports and Environmental Management Programme.
Value of Project:	R 300 000

Key Experience: Waste License Applications

Location:	Markman industrial area, Port Elizabeth
Project duration & year:	2012 - 2013
Client:	Newco
Name of Project:	Newco Tyre Recycling Development
Project Description:	Assessment for a proposed waste tyre recycling facility
Job Title and Duties:	Compilation of waste licence application
Value of Project:	R90,000
Location:	Humansdorp Eastern Cape
Project duration & year:	March 2013 - 2014
Client:	Woodlands Dairy
Name of Project:	Proposed Woodlands Dairy Resource Recovery Plant
Project Description:	Assessment of a proposed Resource Recovery Plant to recover waste water
Job Title and Duties:	Compilation of waste licence application
Value of Project:	R140,000

Key Experience: Water Use License Applications (WULA)

Location:	Between Graaff-Reinet and Cradock
Project duration & year:	2011 - 2012
Client:	SANRAL
Name of Project:	Proposed Upgrade of the Route 61, Section 2: Draairivier to Elinus Farm between Graaff-Reinet and Cradock
Project Description:	Assessment of the rehabilitation and widening of the Route 61, Section 2 road reserve
Job Title and Duties:	Compilation of Water Use Licence Applications
Value of Project:	R 90,000
Location:	Between Mthatha and Port St Johns
Project duration & year:	2011-2013
Client:	SANRAL
Name of Project:	Proposed Rehabilitation of the Route 61, Section 8 from Majola Tea to Tombo
Project Description:	Assessment of the rehabilitation and widening of the Route 61, Section 8 road reserve
Job Title and Duties:	Compilation of Water Use Licence Applications
Value of Project:	R330,000
Location:	Walmer, Port Elizabeth
Project duration & year:	2013-2014
Client:	Airports Company South Africa (ACSA)

Name of Project:	PE Airports Stormwater Upgrade
Project Description:	Assessment of the upgrade of the storm water outfall system servicing the Port Elizabeth Airport runways and surrounding area.
Job Title and Duties:	Compilation of Water Use Licence Applications
Value of Project:	R70,000
Location:	Port Elizabeth
Project duration & year:	2011
Client:	Nelson Mandela Bay Municipality
Name of Project:	Jachtvlakte Precinct Sustainable Human Settlement
Project Description:	EIA for the Mixed-use housing, commercial and industrial development at Jachtvlakte, Nelson Mandela Bay
Job Title and Duties:	Compilation of WULA document for the proposed development.
Value of Project:	R750,000
Location:	Bloemfontein
Project duration & year:	2018-2019
Client:	Opecs
Name of Project:	Bloemfontein WWTW Package plants
Project Description:	Legal review and Water Use Applications for the construction of two package plants for the Department of Education in Bloemfontein
Job Title and Duties:	Project manager.
Value of Project:	R 250 000

Key Experience: Environmental Management Programmes

Location:	Camdeboo Local Municipality
Project duration & year:	2013-2014
Client:	Department of Roads and Public Works
Name of Project:	Environmental Management Programmes for existing gravel Borrow Pits in the Camdeboo Region
Project Description:	Assessment of borrow pit sites and application for authorisation from the Department of Mineral Resources
Job Title and Duties:	Compilation of Environmental Management Programme to gain authorisation for several borrow pits.
Value of Project:	R500,000
Location:	Eastern Cape
Project duration & year:	2017
Client:	Sakhiwo Facility Maintenance Consortium
Name of Project:	Health Facilities Refurbishment & Maintenance WWTW
Project Description:	Environmental services for the upgrade of water and sanitation facilities at five hospitals within the Eastern Cape.
Job Title and Duties:	Determine the legal environmental requirements for the proposed upgrades. Compile EMPr's for three of the hospitals
Value of Project:	

Key Experience: Water Quality Monitoring Protocols

Location:	Port Elizabeth
Project duration & year:	2013
Client:	Nelson Mandela Bay Municipality
Name of Project:	NMBM Water Quality
Project Description:	Assessment of the municipality's rivers
Job Title and Duties:	Preparation of monitoring protocols for the Papenkuils, Baakens, Shark and Hume Rivers
Value of Project:	-

Key Experience: Environmental Auditing

Location:	Coega, Eastern Cape
Project duration & year:	2014 - 2015

Client:	Afrox
Name of Project:	Afrox Air Separation Unit ECO
Project Description:	Construction of an air separation plant in the Coega IDZ
Job Title and Duties:	Monitoring construction of the Air Separation Plant, compiling monthly audit reports and liaising with the contractors, clients and CDC.
Value of Project:	R450,000
Location:	Eastern Cape
Project duration & year:	March 2015 - present
Client:	Nelson Mandela Bay Municipality
Name of Project:	Nooitgedagt Low Level Water Supply Scheme (NCLLS)
Project Description:	Construction works at the Nooitgedagt Water Treatment Works and Olifantskop and refurbishment of the NCLLS pipeline.
Job Title and Duties:	Site inspections of construction activities and compilation of audit reports for Phase 2 and Phase 3 of the NCLLS
Value of Project:	-
Location:	Graaff-Reinet
Project duration & year:	2015
Client:	Camdeboo Municipality
Name of Project:	Kroonvale Soccer Field
Project Description:	Construction of a soccer field for the community of Kroonvale in Graaff-Reinet
Job Title and Duties:	Monthly site inspections and compilation of audit reports for Phase 2 of construction
Value of Project:	-
Location:	Somerset East
Project duration & year:	2015 - present
Client:	Eastern Cape Department of Roads and Public Works
Name of Project:	BCRM Bridge Repairs ECO
Project Description:	The reconstruction of a low-level crossing along the DR 2590
Job Title and Duties:	Monthly site inspections and feedback, compilation of pre-construction and close out audit reports.
Value of Project:	R160,000
Location:	Port Elizabeth
Project duration & year:	2017- ongoing
Client:	MGC Express
Name of Project:	Marine Drive Apartment Development
Project Description:	Construction of high rise apartment building
Job Title and Duties:	Twice monthly site inspections and compilation of monthly audit reports
Value of Project:	
Location:	Pearston, Eastern Cape
Project duration & year:	2018-2019
Client:	Blue Crane Route Municipality
Name of Project:	Pearston WWTW ECO
Project Description:	Water Use Application and Auditing services for the construction work to upgrade the Pearston Waste Water Treatment Works as part of the drought relief projects for the Blue Crane Route Municipality
Job Title and Duties:	Project Manager- management of project team; liaison with client and authorities; project co-ordination; management of specialists, update of Environmental Management Programme, review of auditing reports.
Value of Project:	R 300 000
Location:	Markman, Port Elizabeth
Project duration & year:	2019
Client:	Engen
Name of Project:	Markman Engen Fuel Station

Project Description:	Environmental auditing for the construction of a fuel service station in Markman
Job Title and Duties:	Project manager, auditor, liaison with authorities and client.
Value of Project:	R 100 000

Key Experience: Amendment Applications

Location:	Victoria West, Northern Cape
Project duration & year:	2018
Client:	Afri-Coast Consulting
Name of Project:	Brakpoort Solar Amendment
Project Description:	Amendment of Environmental Authorisation
Job Title and Duties:	Apply to DEA for extension of EA time period
Value of Project:	-

Appendix C: Maps

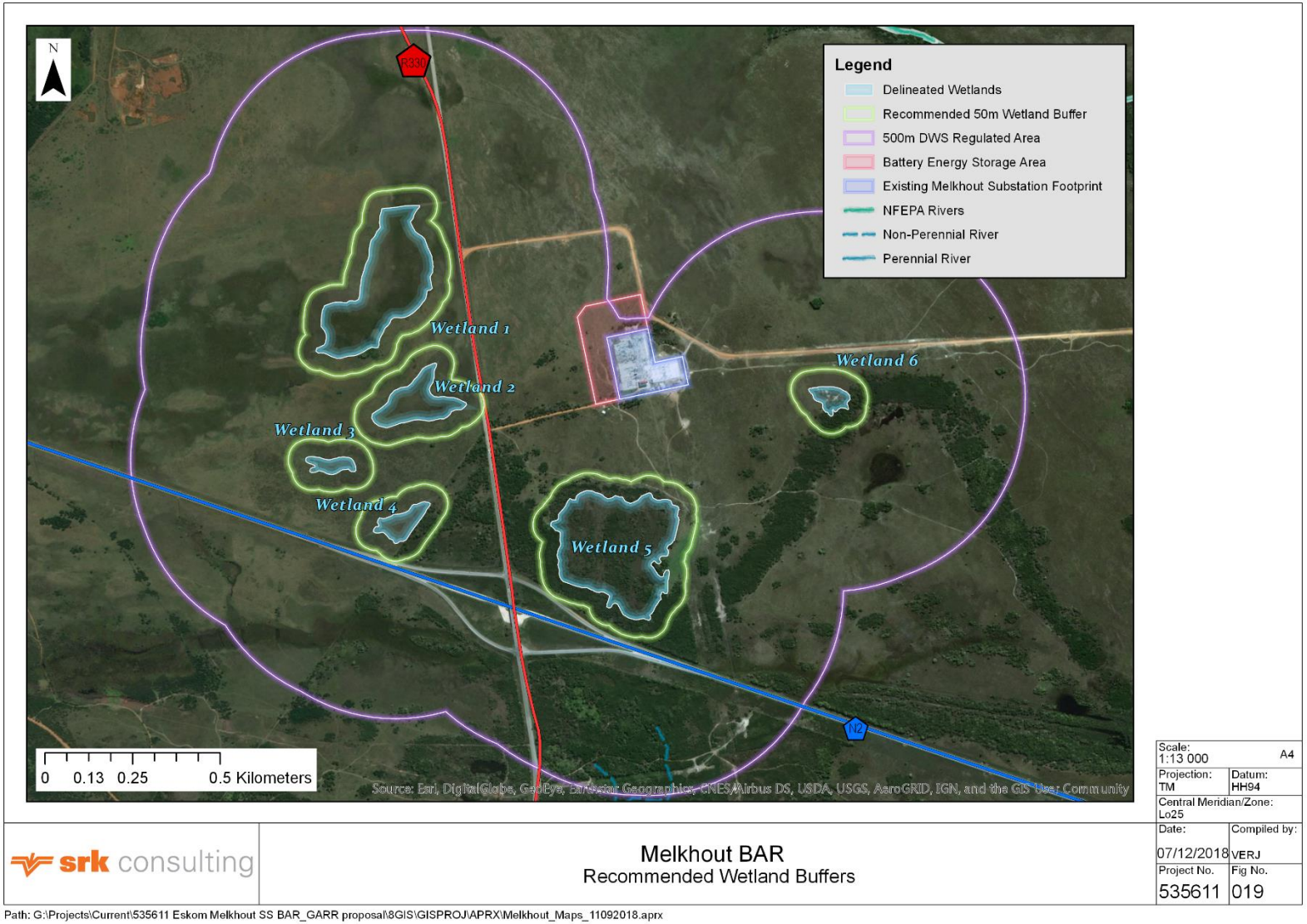

Figure 2: Wetland Buffers

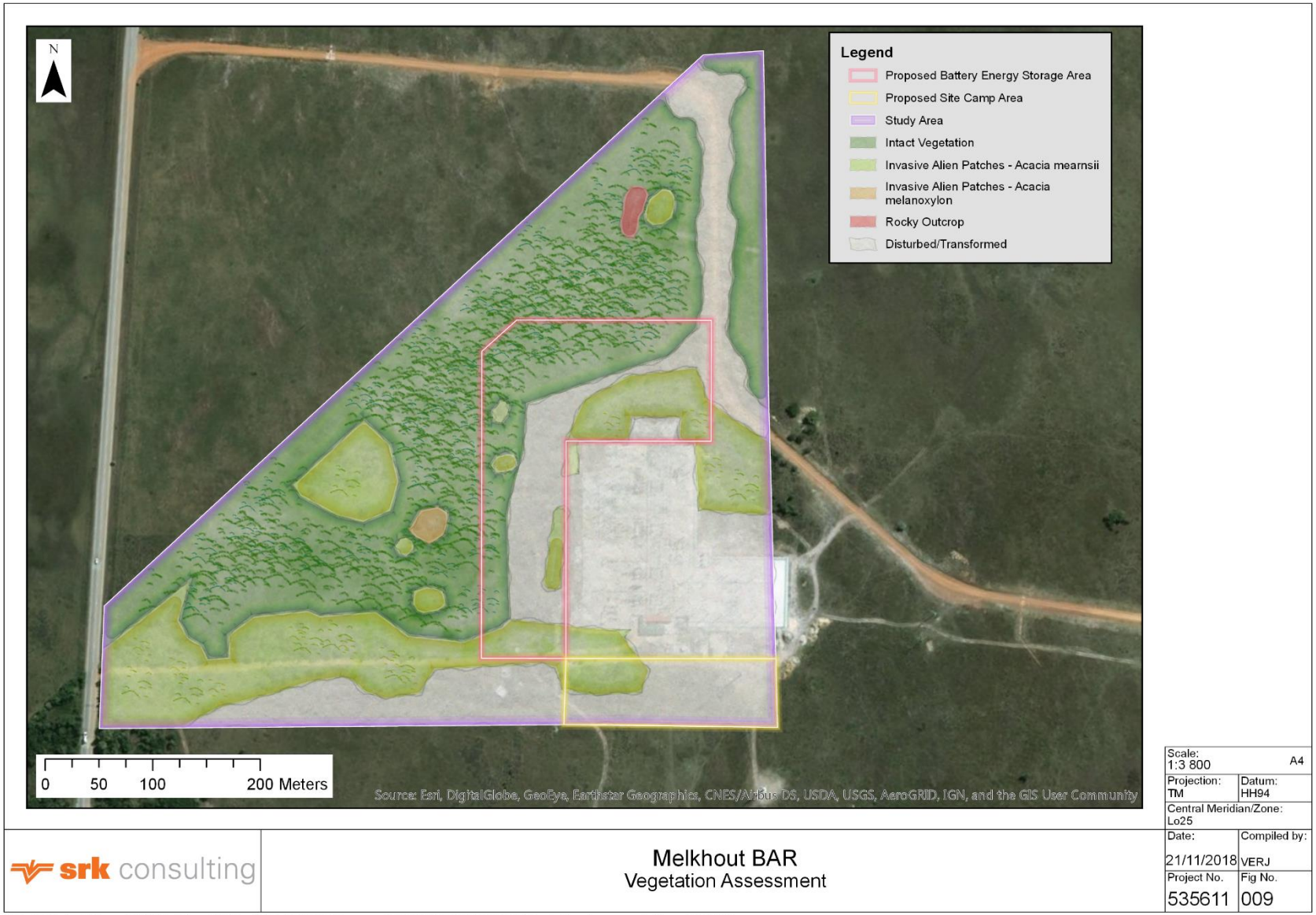

Figure 3: environmental Features

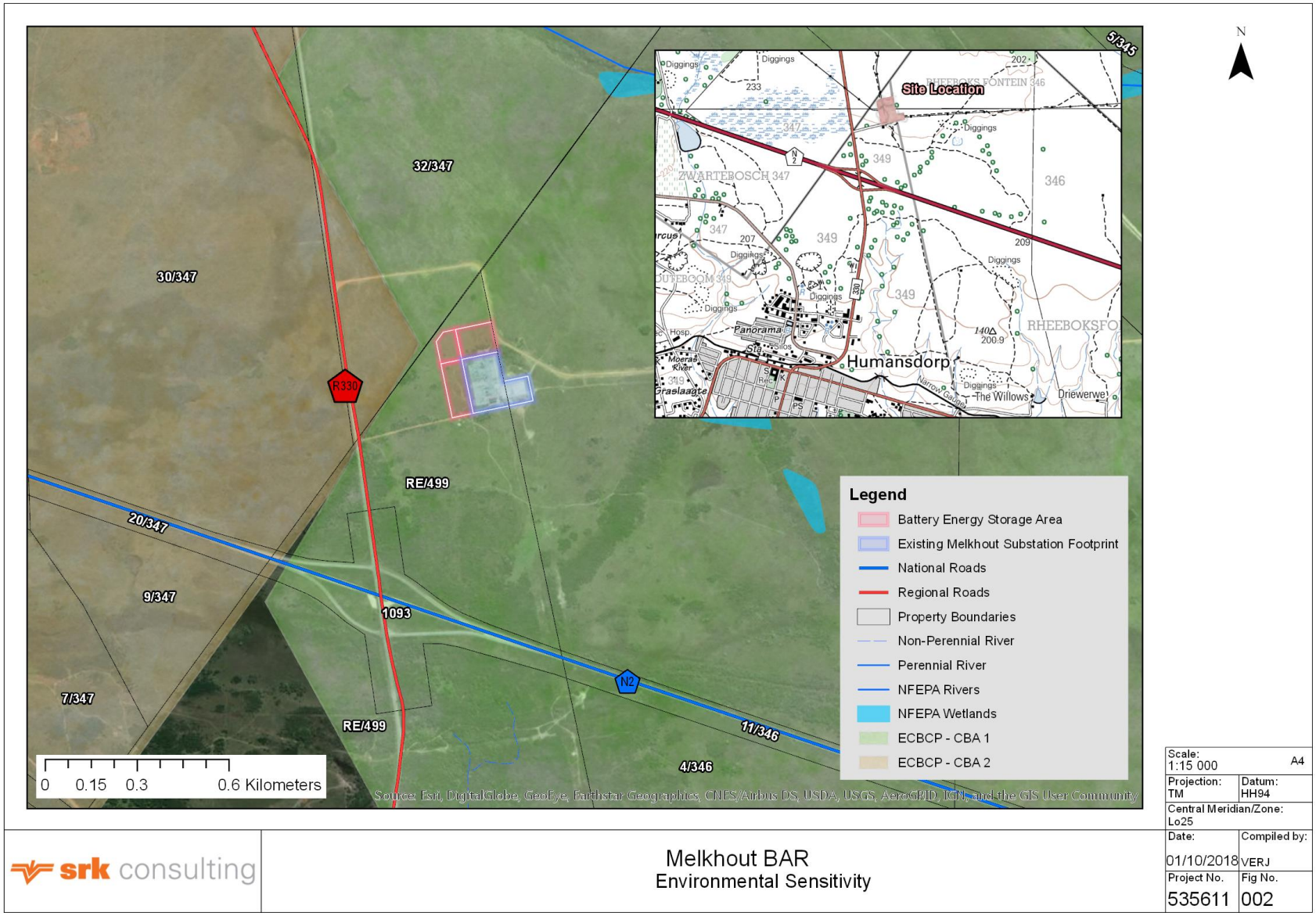

Figure 4: Critical Biodiversity Areas (ECBCP)

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