

APPENDIX G: ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)



**CEN INTEGRATED ENVIRONMENTAL
MANAGEMENT UNIT**

Environmental and Rural Development Specialist

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

PROPOSED LITTLE FISH (CASCADES) EMBEDDED SMALL

HYDRO PROJECT, BLUE CRANE ROUTE MUNICIPALITY,

EASTERN CAPE

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Chapter

1

Chapter 1: Introduction to the Environmental Management Programme

1.1 Background

CEN Integrated Environmental Management Unit (CEN IEM Unit) was appointed by Navitas Power Equipment (NAVITAS) to undertake the environmental assessment for the Proposed Little Fish Embedded Small Hydro Power Facility, Blue Crane Route Municipality in the Eastern Cape.

The purpose of this document is to provide a framework for the management of environmental impacts associated with the Little Fish Embedded Small Hydro Project (3.1MW) located on Portion 1 of the Farm Langverwacht 131, Portion 32 of the Farm Doornkraal 117 and Farm No. 437, Division of Somerset East, Ward 6, Blue Crane Route Local Municipality, Sarah Baartman District Municipality, Eastern Cape.

This Environmental Management Programme (EMPr) is a framework Programme and does not provide specific management plans detailing how management actions are to be implemented, but rather is structured around a number of activities and identifies where more detailed Method Statements should be developed by the contractors and the subcontractors respectively.

The EMPr also identifies and clarifies the roles and responsibilities of key role-players in the implementation of the specific requirements of the EMPr as well as in monitoring, reporting, auditing and review requirements which are components of the construction phase environmental management system.

1.2 Environmental Assessments Undertaken for the Development

A Basic Assessment was done for the proposed Little Fish Embedded Small Hydro Project under the EIA Regulations (2014). This EMPr has been drafted during the Basic Assessment phase and includes the mitigation measures recommended in the Basic Assessment Report.

1.3 Details of the Authors

The details and expertise of the persons who prepared the EMPr are provided below, as per the requirements of the EIA Regulations, 2014.

The reports were prepared by Mrs Lucille Behrens. Lucille has a B.Sc. (Hons) in Environmental Management, and over 10 years experience.

All reports are reviewed and approved by Dr Mike Cohen, Director at CEN IEM Unit and the project-specific EAP. Mike has over 30 years of experience, has a D.Sc. in Wildlife Management, is a registered Professional Natural Scientist (PrSciNat), a member of IAIA and Institute of Ecologists and Environmental Scientists.

Refer to Appendix 3 for the Curriculum Vitae.

1.4 Methodology

A number of steps are essential in order to ensure that environmental damage will be minimised or eliminated:

1. Potential impacts must be identified and their significance assessed.
2. Suitable mitigation measures need to be defined.
3. A system to ensure that the necessary mitigation is being implemented must be established.
4. The effectiveness of the management must be monitored.
5. The Project Manager, Resident Engineer, Environmental Control Officer and the representatives of the developer must be in a position to verify the work undertaken and to monitor the environmental management process.

The purpose of this EMP is to describe:

1. How adverse environmental impacts will be managed;
2. How environmental damage or degradation will be mitigated;
3. How site rehabilitation will be undertaken; and
4. What monitoring is necessary to ensure that the above measures are successful.

The EMP should be viewed as a dynamic document, which may require updating and / or revision during the operation and decommissioning of the project.

1.5 Purpose and Scope of the Environmental Management Programme

This EMP deals with the planning and design, construction, rehabilitation and operational phases of the Little Fish Embedded Small Hydro Project.

The EMP is intended primarily as a management tool for the developer and contractors who will be appointed to undertake the required work, to ensure that environmentally acceptable practices are followed during all phases of the project.

The EMP outlines structures and procedures to be employed by the Developer, Resident Engineer and the contractors. It is aimed at minimising and managing environmental impacts during the construction and operational phases of the project. The specific aims of the EMP are to:

1. Formulate procedures to rectify impacts created through the construction and to minimise any additional potential secondary environmental impacts.
2. Suggest methods to ensure compliance with the EMP, including record keeping.

The successful implementation of this EMP is dependent on its forming part of the project's management system. Without regular checks on performance and corrections of deviations from the environmental objectives, procedures and targets, the EMP will fall into disuse and become ineffective. The EMP, therefore, includes various elements of an Environmental

Management System such as objectives and targets, the allocation of responsibilities, checking of corrective action, regular audits, and management review of the system.

1.5.1 For Whom is the Programme Intended

The EMPr is a management tool and will be used primarily by the Developer, Project Manager, Resident Engineer and the Contractors responsible for the onsite work.

It is recommended that this EMPr is kept on-site at all times and should be available to the public upon request.

1.6 Structure for this Environmental Management Programme

Chapter 1 of this EMPr serves to introduce the scope of the EMPr and the constraints of the project. The purpose of the EMPr is also explained. The EMPr is designed for use by the Developer, Project Manager, Resident Engineer and Contractors to rectify any adverse environmental impact associated with the project.

Chapter 2 identifies the land in question and presents application details. The environment, which will be affected by the development, was fully described in the basic assessment report and is not repeated in this report.

Chapter 3 briefly discusses environmental policy. It presents a suggested organisational structure for the project to ensure that responsibilities are allocated and that there is adequate control over the work.

Chapter 4 recommends general environmental management requirements - with specific objectives and targets - which apply to all stages and elements of the construction process and rehabilitation process.

Chapter 5 presents elements of the Environmental Management System designed to facilitate the implementation, management and regular audit of the EMPr.

A Glossary of Terms is presented in **Chapter 6**.

Chapter 2: Description of Project and Environmental Management Impacts

The following section identifies the land in question. The environment, which will be affected by the development, was fully described in the environmental assessment report and is not repeated here.

2.1 Project Location

The proposed Little Fish Embedded Small Hydro Project will be located outside an urban area on Portion 1 of the Farm Langverwacht 131, Portion 32 of the Farm Doornkraal 117 and Farm No. 437, Somerset East. The proposed site falls within the boundaries of the Blue Crane Route Local Municipality (BCRM), of the Sarah Baartman District Municipality (SBDM) of the Eastern Cape Province.

2.2 Project Description

The hydro power unit will utilise water from the Orange River - Fish River – Sundays River Canal Water Transfer Scheme (also referred to as the Orange – Fish – Sundays Canal) which discharges into the Little Fish River. Approximately 8 cumecs of water for the hydro powerhouse will be diverted from the Orange – Fish – Sundays Canal via a new take-off channel located upstream of the Cascades section. The Cascades section is a length of steep natural river drainage between the concrete Orange – Fish – Sundays Canal and the Little Fish River. The majority of the water from the Orange – Fish – Sundays Water Transfer Canal would discharge into the Little Fish River via the hydropower system instead of flowing down the Cascades.

In order to generate hydropower, water will be channelled from the Orange – Fish – Sundays Water Transfer Canal into a pipeline (1800mm diameter), for approximately 690m, which will then flow into an intermediate penstock pool (approximately 90m²). From the intermediate penstock pool the water would enter steel pipelines (1200mm diameter) and be conveyed to the primary penstock pool (approximately 90m²), over a distance of approximately 190m. The water is then conveyed for approximately 140m by steel penstock pipelines (1600mm diameter) from the primary penstock pool to the turbine power house. Anchors along the length of the pipelines would be used to anchor the pipelines from the Canal to the hydro power house. The penstock pipeline from the primary penstock pool to the turbine power house will manipulate a gross head of 53m (net / available head of 50.4m) that can be utilised for hydropower generation.

The hydro power house will be situated at the bottom end of the penstock pipeline where the water will enter the turbines. The hydro power house will be of a nature and size to

accommodate multiple turbines and controllers in a parallel system. The hydro power house (approximately 480m²) will be a complete new structure located at the base of a rocky cliff approximately 25m from the Little Fish River.

After driving the hydro power turbines, all the diverted water will be returned via a return slip (approximately 25m in length) into the Little Fish River, approximately 280m downstream of the existing discharge point of the Cascades. Infrastructure, such as sluice-gates and screens, would be constructed in order to regulate the flow of water and prevent debris and fauna from entering the turbines in the hydro power house. A bypass will be provided in order to retain water ecology and aquatic life.

Sluice-gates constructed in the canal outlet structure at the entrance to the take-off channel will regulate the approximately 8 cumecs of water required to operate the hydro power unit. The water exiting the hydro powerhouse into the Little Fish River via the return slipway is anticipated to be free of any contaminants such as hydrocarbons (oil, lubricants) and will be heated by less than 0.5 °C.

The proposed Little Fish Embedded Small Hydro Project will generate approximately 3.1MW electricity from hydro power, i.e. generate electric power from the movement of water. The proposed Little Fish Embedded Small Hydro Project will utilise a parallel Francis Turbine System which is considered to be the most efficient system for this project based on the head and flow at the Orange – Fish – Sundays Water Transfer Canal. The parallel system in which the turbines will be arranged, allows for multiple turbines to utilise the same penstock pipeline. Three 1200kW Francis type hydro generators are proposed for the Little Fish Embedded Small Hydro Project.

In a typical installation, water is fed from a water source, through a pipe into a turbine. The water enters the turbine under immense pressure. The pressure of the flowing water on the turbine blades causes the shaft of the turbine to rotate. The rotating shaft is connected to an electrical generator which converts the motion of the shaft into electrical energy.

A transmission line of 22kV, i.e. power line, of approximately 11km would need to be constructed in order to feed electricity produced into the electricity distribution network of the BCRM. The transmission line would join the Somerset-East Main Substation, and is located to the north of the hydro power site. The transmission line's design will conform to ESKOM standards. It is anticipated that the transmission line will follow adjacent to existing roads. Step-up and step-down transformers will be required to accommodate the operating voltages of the hydro power house and the Eskom power line.

Access to the property is from the Bloemhof gravel road. Thereafter access is gained to overall site from an existing gravel road. A new gravel access road would be constructed in order to gain access to the penstock pools. The new access road is approximately 1000m in length and would follow adjacent to the pipelines. The existing gravel road would be utilised to gain access to the hydro power house and discharge point.

2.3 Legislative Framework

The proposed Little Fish Embedded Small Hydro Project includes activities that may have a detrimental effect on the environment as listed in GN R.983 and GN R.985 (Government Gazette 38282 of 4 December 2014) (Table 1).

The process to be followed in the application for an Environmental Authorisation regarding the relevant activities is a Basic Assessment process, as described in the EIA Regulations, 2014, published in terms of Section 24(5) and 44 of the NEMA.

The proposed Little Fish Embedded Small Hydro Project may not commence without an Environmental Authorisation from the DEDEAT.

➤ **Table 1: EIA Listed Activities**

Listed activity as described in GN 983, 984 and 985	Description of project activity
<p>GNR 983 – Listing Notice 1 Activity 1: The development of facilities or infrastructure for the generation of electricity from a renewable resource where— (ii) the output is 10 megawatts or less but the total extent of the facility covers an area in excess of 1 hectare; excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs within an urban area</p>	<p>The proposed Little Fish Embedded Small Hydro Project entails the development of a small hydro power station to generate approximately 3.1MW from hydro power. The site is approximately 10ha in extent (including the linear activities). The activity is applicable.</p>
<p>GNR 983 – Listing Notice 1 Activity 9: The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water— (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where— (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve; or (b) where such development will occur within an urban area</p>	<p>The combined length of the pipelines and return slip is approximately 1045m. The pipelines vary in size from 1200mm to 1800mm. The activity is applicable.</p>
<p>GNR 983 – Listing Notice 1 Activity 11: The development of facilities or infrastructure for the transmission and distribution of electricity— outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.</p>	<p>A transmission power line will be required to connect from the small hydro power station to the Eskom grid in order to feed electricity produced into the distribution network. The proposed Little Fish Embedded Small Hydro Project is located outside an urban area. The power line will operate at a voltage of 22kV. This activity is not applicable as the threshold of 33kV is not met.</p>
<p>GNR 983 – Listing Notice 1 Activity 12: The development of— (i) canals exceeding 100 square metres in size; (x) buildings exceeding 100 square metres in size, (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.</p>	<p>Infrastructure for the proposed Little Fish Embedded Small Hydro Project is located within 32m of a watercourse. This includes the following: the powerhouse, approximately 480m² and the return slip (discharge canal). Discharge outlet into the Little Fish River. The activity is applicable.</p>
<p>GNR 983 – Listing Notice 1 Activity 14: The development of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.</p>	<p>“Dangerous goods” that are likely to be associated with the proposed project, include fuel stores for construction purposes. The storage capacity is unknown, but would not exceed 500m³. The activity may be applicable.</p>
<p>GNR 983 – Listing Notice 1 Activity 19: The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from— (i) a watercourse; but excluding where such infilling, depositing, dredging, excavation, removal or moving— (b) is for maintenance purposes undertaken in accordance with a maintenance management</p>	<p>The proposed return slip and discharge point is located within a watercourse, i.e. Little Fish River, and more than 5m³ of material will be removed and deposited. The activity is applicable.</p>

Listed activity as described in GN 983, 984 and 985	Description of project activity
plan; or (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.	
<p>GNR 983 – Listing Notice 1 Activity 27: The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for—</p> <ul style="list-style-type: none"> (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan. 	<p>The site is approximately 10ha in extent, including the linear routes, i.e. penstock pipelines and access road, for the hydro power system. Clearance of vegetation will be required for the construction of the penstock pools, the hydropower house, the penstock pipelines, the return slip, and the access road.</p> <p>The activity is applicable.</p>
<p>GNR 983 – Listing Notice 1 Activity 28: Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.</p>	<p>The site is currently zoned for agriculture and located outside an urban area. The site is approximately 10ha in extent, including the linear routes, i.e. penstock pipelines and access road, for the hydro power system.</p> <p>The activity is applicable.</p>
<p>GNR 985 – Listing Notice 3 Activity 4: The development of a road wider than 4 metres with a reserve less than 13,5 metres. (b) In Eastern Cape, iii. Outside urban areas, in: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans</p>	<p>The construction of access roads to the proposed hydro power system. The site is located outside an urban area, within a Terrestrial Critical Biodiversity Area (CBA2) of the Eastern Cape Biodiversity Conservation Plan (ECBCP), as well as in a CBA of the Addo Biodiversity Sector Plan.</p> <p>The activity is applicable.</p>
<p>GNR 985 – Listing Notice 3 Activity 10: The development of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres.</p> <p>(b) In Eastern Cape: ii. Outside urban areas, in: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ii) Areas on the watercourse side of the development setback line or within 100 metres from the edge of a watercourse where no such setback line has been determined;</p>	<p>“Dangerous goods” that are likely to be associated with the proposed project, include fuel stores for construction purposes.</p> <p>The site is located outside an urban area, within a Terrestrial Critical Biodiversity Area (CBA2) of the Eastern Cape Biodiversity Conservation Plan (ECBCP), as well as in a CBA of the Addo / Blue Crane Route Biodiversity Sector Plan. The hydro power house is located within 100m of the Little Fish River.</p> <p>The activity is applicable.</p>
<p>GNR 985 – Listing Notice 3 Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan</p> <p>(a) In Eastern Cape, ii. Within critical biodiversity areas identified in bioregional plans</p>	<p>More than 300m² of vegetation will be cleared for the hydro power system.</p> <p>The site is located outside an urban area, within a Terrestrial Critical Biodiversity Area (CBA2) of the Eastern Cape Biodiversity Conservation Plan (ECBCP), as well as in a CBA of the Addo / Blue Crane Route Biodiversity Sector Plan.</p> <p>The activity is applicable.</p>
<p>GNR 985 – Listing Notice 3 Activity 14: The development of— (i) canals exceeding 10 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area</p>	<p>Infrastructure for the proposed Little Fish Embedded Small Hydro Project is located within 32m of a watercourse. The footprint of the associated infrastructure will exceed 10m². This</p>

Listed activity as described in GN 983, 984 and 985	Description of project activity
exceeds 10 square metres in size; (x) buildings exceeding 10 square metres in size, (xii) infrastructure or structures with a physical footprint of 10 square metres or more where such development occurs — (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; (c) In Eastern Cape: ii. Outside urban areas, in: (ff) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	includes the following: the powerhouse, approximately 480m ² , and the return slip (discharge canal). Discharge outlet into the Little Fish River. The site is located outside an urban area, within a Terrestrial Critical Biodiversity Area (CBA2) of the Eastern Cape Biodiversity Conservation Plan (ECBCP), as well as in a CBA of the Addo / Blue Crane Route Biodiversity Sector Plan. The activity is applicable.

2.4 Summary of Impacts

Phase	Alternative 1 (Preferred)			No Go
	Planning & Design	Construction & Decommission	Operational	
Ecological: Loss of vegetation				
Significance before mitigation	None	Moderate (-)	Moderate (-)	Moderate (+)
Significance after mitigation	None	Low (-)	Low (-)	Moderate (+)
Ecological: Loss of habitat containing species of special concern				
Significance before mitigation	Moderate (-)	Moderate (-)	Moderate (-)	Moderate (-)
Significance after mitigation	Low (-)	Low (-)	Low (-)	Moderate (-)
Ecological: Potential Spread of Alien Vegetation				
Significance before mitigation	None	Moderate (-)	Moderate (-)	Moderate (-)
Significance after mitigation	None	Low (-)	Low (-)	Low (-)
Ecological: Potential Loss of Aquatic Health				
Significance before mitigation	None	Moderate (-)	Moderate (-)	No change in status
Significance after mitigation	None	Low (-)	Low (-)	No change in status
Ecological: Soil, surface and groundwater pollution				
Significance before mitigation	None	Moderate (-)	Moderate (-)	No change in status
Significance after mitigation	None	Low (-)	Low (-)	No change in status
Ecological: Impacts to Fauna and Avifauna				

Phase	Alternative 1 (Preferred)			No Go
	Planning & Design	Construction & Decommission	Operational	
Significance before mitigation	None	Moderate (-)	Moderate (-)	No change in status
Significance after mitigation	None	Low (-)	Low (-)	No change in status
Air Quality: Dust and Air Pollution				
Significance before mitigation	None	Moderate (-)	Low (-)	No change in status
Significance after mitigation	None	Low (-)	Low (-)	No change in status
Heritage Resources: Loss of heritage resources				
Significance before mitigation	None	Low (-)	None	No change in status
Significance after mitigation	None	Very Low (-)	None	No change in status
Land use: Loss of Agricultural Land				
Significance before mitigation	None	Moderate (-)	Moderate (-)	Moderate (+)
Significance after mitigation	None	Low (-)	Moderate (-)	Moderate (+)
Land use: Soil Erosion				
Significance before mitigation	None	Moderate (-)	Moderate (-)	No change in status
Significance after mitigation	None	Low (-)	Low (-)	No change in status
Waste Management: Liquid and solid waste				
Significance before mitigation	None	Moderate (-)	Moderate (-)	Moderate (-)
Significance after mitigation	None	Low (-)	Low (-)	Moderate (-)
Social: Noise Pollution				
Significance before mitigation	None	Moderate (-)	Low (-)	No change in status
Significance after mitigation	None	Low (-)	Low (-)	No change in status
Social: Health, safety and security				
Significance before mitigation	None	Moderate (-)	Moderate (-)	No change in status
Significance after mitigation	None	Low (-)	Low (-)	No change in status
Social: Employment opportunities				
Significance before mitigation	None	Moderate (+)	Moderate (+)	Moderate (-)

Phase	Alternative 1 (Preferred)			No Go
	Planning & Design	Construction & Decommission	Operational	
Significance after mitigation	None	Moderate (+)	Moderate (+)	Moderate (-)
Social: Existing services & infrastructure				
Significance before mitigation	Moderate (-)	Moderate (-)	Moderate (-)	No change in status
Significance after mitigation	Low (-)	Low (-)	Low (-)	No change in status
Traffic Impact				
Significance before mitigation	None	Moderate (-)	Moderate (-)	No change in status
Significance after mitigation	None	Low (-)	Low (-)	No change in status
Renewable energy: Production of cleaner energy				
Significance before mitigation	None	None	High (+)	High (-)
Significance after mitigation	None	None	High (+)	High (-)

2.5 Construction and Operational Activities

Construction Phase

The construction phase can be broadly divided into three phases, namely: preparation, construction and testing and commissioning.

Phase 1: Preparation of the site for construction, surveying and mapping the foundation points with GPS co-ordinates, on-site secured storage facilities, site camp and toilets. Clearing of vegetation. Areas that require clearing include penstock pipelines, hydro power house, construction and laydown areas, and new access road.

Phase 2: Construction of all civil activities. This phase includes the construction of the proposed new access road, penstock pools, equipment housing structures, delivery and installation of equipment. This phase also entails the execution of the power transmission equipment installation.

Phase 3: Testing and Commissioning of equipment. This entails the installation and connection of the control equipment to the generating equipment and safety systems. This phase entails the final inspection and dry testing of the complete installation with reference to civil works, construction finishes, mechanical equipment, electronic equipment and electrical circuits.

Operational and Maintenance Phase

The operational phase consists of monitoring, inspections and regular maintenance of the hydro power equipment. Clearance of vegetation may also be required for maintenance purposes. Reactive repairs – measures are taken to restore the operation and safety of the hydro power plant immediately after becoming aware they have been affected by a malfunction.

Chapter 3: Organisational Requirements

3.1 Introduction

The Developer and their appointed Project Managers must make the Resident Engineer and Contractors aware of their environmental objectives and policy.

3.2 Background to Environmental Policy

An environmental policy is a statement of the environmental values of an organisation. It conveys these environmental values to employees, demonstrates to stakeholders the importance that senior management attaches to environmental protection and management, and provides a guiding framework for conducting the organisation's business in an environmentally compatible manner.

The philosophy behind the EMPr is for it to become an effective means of managing environmental performance by:

1. Enabling the identification of critical environmental issues;
2. Developing action plans and setting targets;
3. Ensuring environmental performance;
4. Raising environmental awareness among management, staff and the community which it serves; and,
5. Providing appropriate training.

3.3 Organisational Overview

Managers should be familiar with the requirements of the EMPr and should execute all construction, decommissioning and maintenance activities in an environmentally responsible manner.

This overview offers a perspective of the proposed organisation of the EMPr and the recommended responsibilities of key members of the project team. Ultimate responsibility and public accountability for the EMPr and the general environmental management during the construction phase resides with the Developer.

The Contractors are responsible for implementing and managing the EMPr during the construction phase. It is recommended that the Contractors appoint a member of their team as the Contractor's Environmental Officer who is responsible for ensuring that the requirements of the EMPr are implemented on a day to day basis. The Contractors report to

the Resident Engineer or his representative regarding compliance with the conditions as stipulated in the EMPr. The Resident Engineer or his representative works through the Environmental Control Officer to assist with environmental management.

An Environmental Control Officer (ECO) is appointed by the Developer (through the Resident Engineer or his representative) to assist and advise on the implementation of the EMPr. The ECO is to conduct monthly audits and must be available for discussion.

Where procedures in the EMPr and methods delineated in the Method Statements are persistently transgressed and appropriate corrective action is not implemented, the ECO through the Resident Engineer or his representative may order the suspension of related activities or impose a fine on the transgressor.

Regular meetings should be held to ensure that the EMPr is effectively implemented.

3.4 Roles and Responsibilities for the Implementation of the Environmental Management Programme

This section defines the roles of the key parties involved in the implementation of the EMPr for the Proposed Little Fish Embedded Small Hydro Project and mitigation measures presented in the Basic Assessment Report relevant to the various phases of the development.

3.4.1 Authorities

The authorities are responsible for the timely processing and issuing of the necessary permits and authorisations for the Proposed Little Fish Embedded Small Hydro Project. The authorities will ensure that the Developer complies with the terms that are stipulated within the Environmental Authorisation (should one be issued). Where necessary, the authorities will assist the Developer in understanding and meeting the specified requirements.

The authorities may perform random controls to ensure compliance with the conditions. In such case, the Developer will assist the authorities in every possible way so as to facilitate the control. In case of long-term non-compliance, the Developer will be required to provide an action plan with corrective measures for approval by the authorities.

3.4.2 Developer

The Developer, as the project initiator, has the overall accountability and responsibility for environmental management during the design, construction and operational phases.

The EMPr forms part of tender documentation to the Contractor and becomes legally binding on the Contractor and anyone acting on behalf of the Contractor or the Developer during construction, operation and decommissioning activities.

With respect to the EMPr, the Developer is responsible for:

1. Reviewing and approving management plans prepared by the Project Engineers, Contractors and Sub-Contractors.
2. An Environmental Control Officer (ECO) is to be appointed, whose primary role shall be to monitor compliance regarding the environmental management activities during the construction phase of the development.

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3. Reviewing and approving any environmental monitoring programmes that are recommended by the ECO or the authorities.
 4. Advising on actions to be taken in the event of incidents or public complaints.
 5. Distribution of copies of the EMPr to the project team, including Contractors and Sub-Contractors.

3.4.3 Resident Engineer

All obligations relevant to the Developer concerning the implementation of the EMPr, will apply to the Resident Engineer or his representative, contractors and sub -contractors associated with the construction phase of the Proposed Little Fish Embedded Small Hydro Project. The Developer will inform the Resident Engineer or his representative of these obligations, as well as of the Method Statements required in terms of these obligations, and will control their implementation. The Resident Engineer or his representative is to convey the requirements of the EMPr to the contractors and their sub-contractors; and ensure that they comply with these obligations.

The Resident Engineer is to ensure that the EMPr forms part of the tender documentation to the Contractor and becomes legally binding on the Contractor and anyone acting on behalf of the Contractor during construction.

It is the responsibility of the project engineers, contractors and sub -contractors to prepare and implement Method Statements which detail the means they will employ in order to meet the objectives set in the EMPr.

The contractors and sub-contractors will be required, where specified, to provide Method Statements to the Resident Engineer or his representative setting out in detail how the management actions will be implemented in order to ensure that the environmental management objectives will be achieved.

The Resident Engineer or his representative working in close cooperation with the ECO ensures that the EMPr is implemented. The Resident Engineer or his representative is the direct link between the ECO and the Contractors and sub-contractors.

Specific responsibilities include:

1. Advising the Developer on the appointment of any specialist if required.
2. Attending Project Progress Meetings, where the performance of the EMPr is discussed and / or reviewed.
3. Commission of monitoring programme recommended by the ECO.
4. Ensuring that measures are taken to address any problems in the implementation of the EMPr.
5. Briefing the contractors regarding their EMPr responsibilities and ensure that they implement the conditions of the EMPr.
6. Formalising systems and delegating authority to ensure that the EMPr is effectively implemented.
7. Regular site inspections and monitoring to ensure compliance with the prescribed procedures in the EMPr.
8. Devising a Corrective Action Procedure for implementing corrective and preventive action.
9. Regular consultation with the ECO, as appropriate.

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10. Facilitating the implementation of a general and specific environmental awareness training programme.
 11. Devising a system to evaluate the training programme regularly and recommend changes as required.
 12. The creation, in consultation with the ECO, of a Method Statement pro-forma, for distribution to the appropriate contractors and their sub-contractors.
 13. The examination, revision and approval, of contractors Method Statements.
 14. Keeping records of waste disposal, audits, inspections, monitoring and corrective actions.
 15. Ensuring that copies of the EMPr are available to all contractors and sub-contractors.
 16. Identification of any new significant environmental impacts and their associated aspects, and the necessary environmental management requirements to manage them.
 17. Organising audits on the implementation of the EMPr.

3.4.4 Contractors and Sub-Contractors

The Contractor/s and sub-contractors have final responsibility and are accountable to the Developer for the effective implementation and monitoring of the EMPr.

The Contractor and sub-contractors are responsible to the Resident Engineer or his representative for the effective implementation of the EMPr within their respective line functions.

Specific responsibilities include:

1. Appointing a Contractor's Environmental Officer who is responsible for ensuring that the requirements of the EMPr are implemented on a day to day basis.
2. The full implementation of all of the requirements of the EMPr in terms of the approved method statements.
3. Ensuring that all sub-contractors are familiar with and implement the EMPr.
4. Identifying procedures applicable to the activities they perform and / or control.
5. Identifying, in consultation with the Resident Engineer or his representative which sub-contractors are responsible for compiling (which) method statements.
6. Compiling method statements to meet the procedures and targets.
7. Submitting method statements to the Resident Engineer or his representative for approval.
8. Devising a system for monitoring compliance with method statements and procedures.
9. Identifying environmental training needs and implementing the environmental awareness training programme commissioned by the Resident Engineer or his representative.
10. Implementing corrective and preventive actions recommended by the Resident Engineer or his representative.
11. Reviewing of the EMPr implementation and effectiveness at site meetings with the Resident Engineer or his representative and the ECO.
12. Ensuring regular internal auditing of the implementation of the EMPr.

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13. Maintaining and submitting records of waste disposal activities and corrective actions taken to rectify environmental problems on site.
 14. Attending EMPr monitoring meetings with the Resident Engineer or his representative.
 15. Keeping of a complaints register on site.

3.4.5 Environmental Control Officer

An ECO is to be appointed by the Developer / Project Manager to advise and assist the Resident Engineer or his representative and project team where necessary and to monitor the implementation of the EMPr. The ECO reports to the Developer through the Resident Engineer or his representative. The ECO role is to be fulfilled by a person with previous experience in environmental management and compliance monitoring regarding construction processes.

The ECO's duties include:

1. Supporting and advising the Resident Engineer or his representative, especially as regards to the review of Method Statements, auditing, monitoring and corrective and preventive action.
2. Undertaking monthly environmental site audits.
3. Recommending environmentally appropriate solutions to environmental problems.
4. Recommending additional environmental management measures as appropriate.
5. Attending Project Progress Meetings, as necessary or on a basis determined by the Developer and the Resident Engineer or his representative.
6. Providing a monthly report on environmental compliance to the Developer and Project Manager / Resident Engineer.

It must be noted that the ECO is responsible for providing an independent evaluation of compliance with the EMPr and not for enforcement of the conditions of the EMPr. The responsibility of enforcement of the conditions of the EMPr lies with the Developer and Project Manager, while the DEA or DEDEAT's Environmental Management Inspectors may also enforce existing and potentially new conditions through compliance notices.

3.5 Method Statements

The appropriate Contractors must submit Method Statements to the Resident Engineer or his representative and ECO outlining proposed construction activities, phasing and procedures and methods to comply with the targets stipulated in this EMPr. Method Statements should, where applicable, include Site Establishment Drawings and Plans with sufficient detail to assess the potential impact of the site facilities or to assess the degree of safeguarding provided against pollution and other impacts.

Method Statements indicate how the procedures will be applied in order to meet the relevant targets and are central to the proper implementation of the EMPr. It is anticipated that in addition to assessing the systems and performance of the EMPr, the ECO will scrutinise the formulation of, and adherence to "Method Statements" in some detail.

Method Statements must be submitted before any work on the project is undertaken. The various method statements must be approved by the Resident Engineer or his representative (in consultation with the ECO). The Resident Engineer or his representative and Contractor must keep copies of these Method Statements and letters of approval (including conditions attached) in a Method Statements file.

The Resident Engineer or his representative (and the ECO) must approve any deviations from the approved Method Statements.

All amendments must be in writing and must be submitted to the Resident Engineer or his representative.

3.6 Meetings

It is anticipated that Progress Meetings, attended by the Resident Engineer or his representative and other members of the project team will be held on a regular basis. It is recommended that a minimum of one meeting every month be held where the EMPr can be discussed, this can be done during the Monthly Site Progress Meeting. The discussions on the EMPr must continue for the life of the construction of the Proposed Little Fish Embedded Small Hydro Project with the last meeting being held two months after construction has been terminated. This final meeting should be preceded by a final site audit by the ECO. The audit will be presented at this final meeting.

The Resident Engineer or his representative may call for additional meetings in response to particular environmental problems. The ECO will attend progress meetings if requested to do so by the Resident Engineer or his representative. The ECO shall decide whether other specialists (archaeologist, etc.) need to attend various meetings or not. At each of the meetings, Contractors will report performance against their defined EMPr objectives and targets.

Chapter 4: Environmental Management Programme Requirements

4.1 Introduction

The Environmental Management Requirements are designed to address the legislation as well as the issues and impacts raised through the environmental assessment as they relate to the Proposed Little Fish Embedded Small Hydro Project.

Please note that specific measures have been included as implementation measures instead of separate management plans.

Each of the Environmental Management Requirements is presented as follows:

- A. **Objective:** potentially significant impacts to be mitigated.
- B. **Aspects:** activities likely to cause significant impacts; this list is not exhaustive and other unspecified activities might also cause the respective significant impacts.
- C. **Procedure:** steps and/or actions required to manage (and minimise) the relevant aspects.
- D. **Target:** the (quantitative) level of performance, sometimes determined by legislation, which must be met.
- E. **Responsibility:** main persons responsible for procedures.

Applicable environmental legislation is listed as one of the Environmental Management Requirements in the EMP. However, the list provided is not exhaustive and it is the responsibility of the Resident Engineer or his representative and the Contractors to ensure compliance with all environmental (and other) legislation.

4.2 Legislation

The following list of environmental legislation applies to the Proposed Little Fish Embedded Small Hydro Project. The list presented here is not necessarily exhaustive. Ultimately, the Developer, Resident Engineer or his representative and the Contractors are responsible for ensuring identification of and compliance with all appropriate legislation at the national, provincial and local level.

➤ **Table 2: Applicable Legislation**

Title of legislation, policy or guideline	Applicability to the project	Administering authority	Date
National Environmental Management Act (NEMA, No. 107 of 1998, as amended)	In terms of Section 24 of NEMA the impacts associated with listed activities must be considered, investigated, assessed and reported on to the competent authority. This is required in order to obtain an Environmental Authorisation for the undertaking of the proposed activities.	Department of Environmental Affairs (DEA) – Competent Authority Eastern Cape Department of Economic Development, Environmental Affairs & Tourism (DEDEAT) – Commenting Authority	1998
GNR 983 of the EIA Regulations (2014)	Listed activities 1, 9, 11, 12, 14, 19, 27, and 28 per GNR 983, require a basic assessment to be undertaken.	DEA – Competent Authority DEDEAT – Commenting Authority	2014
GNR 985 of the EIA Regulations (2014) promulgated in terms of NEMA	Listed activities 4, 10, 12, and 14 per GNR 985, require a basic assessment to be undertaken.	DEA – Competent Authority DEDEAT – Commenting Authority	2014
National Environmental Management: Air Quality Act [NEM:AQA] (Act No. 39 of 2004) and Regulations	The listed activities promulgated under NEM:AQA are not applicable to the proposed project. Sections 32 and 34 regarding dust and noise control may be applicable during the construction phase.	DEA	2004
National Heritage Resources Act, 1999 (Act No. 25 of 1999) [NHRA]	Section 38 of NHRA refers to the following activities that require correspondence with the heritage authorities: 38(a) The construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length 38(c)(i) Any development or other activity which will change the character of a site exceeding 5 000 m ² in extent 38(d) The re-zoning of a site exceeding 10 000 m ² in extent. A heritage impact assessment has been undertaken. No objects or artefacts were identified that require a heritage permit for removal or destruction.	South African Heritage Resource Agency (SAHRA) Eastern Cape Provincial Heritage Resources Authority (ECPHRA)	1999
National Environmental Management: Biodiversity Act (Act No. 10 of 2004) [NEMBA]	NEMBA provides for the management and conservation of South Africa's biodiversity within the framework of NEMA. This involves the protection of	DEA	2004

Title of legislation, policy or guideline	Applicability to the project	Administering authority	Date
	species and ecosystems that warrant national protection. NEMBA also regulates alien and invader species. No threatened ecosystems will be affected.		
National Forest Act (Act84 of 1998) [NFA]	The NFA recognises that natural forests and woodlands form an important part of the environment and need to be conserved and developed according to the principles of sustainable management. The NFA in this regard protects indigenous trees from destruction, damage or removal, and require permits prior to their removal, etc. No forest area or protected trees are located on site.	Department of Agriculture, Forestry and Fisheries (DAFF)	1998
Nature & Environmental Conservation Ordinance (No. 19 of 1974) [NECO]	These provide for the protection of species and require permits prior to the removal thereof.	Eastern Cape DEDEAT	1974
National Environmental Management: Waste Act No. 59 of 2008 (NEM:WA)	The NEM:WA regulates waste management in order to protect human and environmental health, by providing reasonable measures for the prevention of pollution and ecological degradation, and for securing ecologically sustainable development. It also provides for national norms and standards for regulating the management of waste by all spheres of government, providing for specific waste management measures for licensing and the control of waste management and remediation activities associated with contaminated land. This legislation provides for compliance and enforcement of the above requirements. No person may commence, undertake or conduct a waste management activity, except in accordance with the requirements or standards prescribed and a waste management licence issued in respect of that activity, if a licence is required. There are no activities listed in the waste management listed	National DEA, Eastern Cape DEDEAT	2008

Title of legislation, policy or guideline	Applicability to the project	Administering authority	Date
	activities that are applicable to the proposed development.		
National Water Act, 1998 (Act No. 36 of 1998)	Provides for tiered regulatory control over 11 water uses, as identified in Section 21 of the NWA. A person who wishes to use or who uses water in a manner that is not covered under Schedule 1, General Authorisations, or in a manner that is not regarded or declared as an existing lawful use, may only use that water under the authority of a Water Use Licence. Section 21 (c) and (i) water use activities are applicable.	Department of Water and Sanitation	1998
Conservation of Agricultural Resources Act (No 43 of 1983) and regulations [CARA]	CARA provides for the implementation of control measures for alien and invasive plant species.	DAFF	1983
Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (No 36 of 1947) and regulations	Sections 3 to 10 relates to the control of the use of registered pesticides, herbicides (weed killers) and fertilisers. Special precautions must be taken to prevent workers from being exposed to chemical substances in this regard.	DAFF	1947
Occupational Health and Safety Act (No 85 of 1993) and regulations	Sections 8 and 9 relates to general duties of employers and employees. The construction regulations would be applicable during the construction phase.	Department of Labour	1993

It is recommended that the Developer and Resident Engineer or his representative and / or the Contractors obtain copies of all relevant legislation. An updated file of all legislation should be maintained at the Resident Engineer or his representative's office.

Copies of the Environmental Authorisation and the EMPr are to be kept at the site office

4.3 Environmental Commitment

All persons involved must be made aware of the environmental goals and policy of the Developer and of the appointed project managers and contractors, and encouraged to develop a commitment to compliance with the environmental legislation and to being good neighbours.

4.4 Planning and Design

The following section identifies the management actions that must be completed prior to the commencement of construction activities.

4.4.1 Environmental Authorisation Conditions

Objective

To ensure that all conditions and requirements of the Environmental Authorisation and the EMPr stipulated as pre-requisites for construction are met.

Aspect

Actions are to be completed by the Developer prior to the commencement of the relevant construction activity.

Procedure

Review the full Environmental Authorisation and convey the outstanding actions to the responsible team member.

Targets

Ensure that all requirements of the Environmental Authorisation are in place and that any approval is obtained in writing prior to commencing any construction activities.

Responsibility

Developer

4.4.2 Site Planning for Construction

Prior to construction commencing the Resident Engineer in consultation with the ECO and other project staff must compile a “detailed” site plan indicating where the various infrastructures will be located and which areas of the selected site will be utilised for construction and associated operations. The plan should include items such as the location of topsoil stockpile sites. Plans for the location of construction roads / tracks, turning circles, working areas and facilities should seek to minimise the total area that is to be disturbed. A plan of drainage works and the final drainage pattern should generally be included in the rehabilitation plan for the site. Plans for the removal and disposal of wastes and any hazardous or contaminated materials (such as; fuel drums, soil which has been contaminated with leaked fuel or oil, and alien weed infested soil) should be described, as appropriate for the scale of the operation. The construction camp site should also be located on this plan.

The ‘construction planning’ team should plan for the final rehabilitation and restoration of the site before commencing with any construction. For final rehabilitation and restoration of the site to be successful, it is essential that the future rehabilitation requirements be considered in the planning stages and that operators plan for progressive rehabilitation while operations are ongoing.

The following issues (Table 3) must be addressed and where appropriate shown on the Environmental Management Site Plan:

➤ **Table 3: Issues to be addressed in the Site Plan**

Issue	Nature / Description
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Issue	Nature / Description
Sequence of events	Description of the nature of the process required. Briefly describe the sequence of events that will take place from the time that the contractor moves onto site to the time when the site is handed over to the Project Developer.
Health and safety	Potential risks and hazards and precautions that will be taken. Cooking area, hazardous materials site, first aid kit, fuel store, security issues, fire control. Safety of surrounding sensitive receptors (e.g. residents and road users).
On site toilets	How many required for the particular development? How long are the toilets required on site? Location of toilets (Site Plan)
Workforce	Number of on-site workers Training of workforce in terms of environmental awareness Management of workforce, particularly sub-contractors
Transport and traffic	Transport required for site workers Routes to be used by construction vehicles Demarcate location of traffic turning circle and parking areas (Site Plan)
Infrastructure and associated equipment	Nature and extent of infrastructure construction
Topsoil	Approximation of quantity to be excavated Where to be stockpiled (Site Plan) How long to be stockpiled Area required for stockpile
Earthworks/cleaning	Volume of material to be excavated/cleaned Duration of operations Where stocks to be kept on site (Site Plan) How long to be kept on site Where, when and how to be disposed of
Equipment needed for construction activities	Area required for material and equipment storage Duration of works Nature of equipment and necessary materials
Drinking water	Quantity required Duration of period in which required Source of water Location of potable water (Site Plan)
Cooking/Eating/Rest areas	Area required Equipment required e.g. gas stoves, matches etc. Location - must take into consideration the vegetation conditions (Site Plan)
Existing structures	Indication of location of any structures that need to be removed and/or protected
Life of project	Working hours Time frame
Construction site	Work area required Location of construction site and work area (Site Plan)

Issue	Nature / Description
Environmentally sensitive areas and possible environmental risks associated with construction activities	A training programme on possible environmental risks that may result from construction activities and how to deal with these (including a reporting structure) must be made available prior to construction commencing
Waste management	Litter drums - number, type, size, location (Site Plan) Construction of a waste transfer station within the site boundaries Closest registered waste disposal site (Location map) Waste management plan Recycling / material re-use options

Objective

1. To Plan the construction site together with access routes and associated work areas to allow for sound environmental management and effective rehabilitation of the total site.

Aspect

1. All activities related to the construction of the Proposed Little Fish Embedded Small Hydro Project, and construction camp.

Procedure

1. Compile an annotated base Plan / map of the site indicating the various activity zones, roads and tracks, all stockpile areas, campsites and all other areas which will be used or altered during the construction phase.
2. Indicate details of the access and internal roads and track.
3. Indicate all “no go” areas.
4. Note the location of registered waste disposal sites.
5. Vehicle parking area must be located within the defined activity zone.
6. Designate a main entrance to the construction site. This entrance should be a stabilised access or crossover access point. Identify the best location to place the entry / exit point. It should ideally be located in an elevated position with little or no water flowing to it from upslope and away from any down slope stormwater structures. All deliveries should be able to be made through this point.
7. Once the final details of the site plan have been determined, the Resident Engineer or his representative / and / or the ECO should photograph the proposed construction site and surrounding areas.
8. The site camp to be located in an already disturbed area with existing access, to minimise additional disturbance and clearing of vegetation. Only shrubs are to be removed for the construction camp area and laydown areas. Grass is to be left in place.

Targets

Approved site plan before commencing with construction.

Responsibility

Developer, Resident Engineer

4.4.3 Hydropower Infrastructure and Access Road

Objective

1. Loss of habitat containing Species of Special Concern (SSCs), including protected species.
2. To adhere to Eskom requirements infrastructure.

Aspect

1. Removal of SSCs within the footprint area.
2. No damage to Eskom infrastructure

Procedure

1. SCCs and Protected Plants identified on site should be removed from the pipeline footprint, once surveyed and pegged, and replanted in the same general area, but outside the pipeline footprint, as part of search and rescue efforts.
2. Permits must be obtained from the DEDEAT prior to the removal of protected and SSCs.
3. Where feasible, development of linear structures should be restricted to existing cleared/transformed areas and gravel roads / pathways. The power line and pipeline footprints should be kept to a minimal width and length.
4. Eskom approval per requirements for work in or near Eskom servitudes or infrastructure.
5. Implementation of the DEA's Generic Environmental Management Programme Overhead Powerline Construction.

Targets

1. Transplanting succulents and geophytes SSCs.

Responsibility

Developer, Resident Engineer

4.5 Construction

This section presents the environmental requirements for the construction activities. The requirements are worded in broad terms and details of the actions to be undertaken must be presented in the Method Statement for each aspect. Method statements are compiled by the Contractors or their sub-contractors and approved by the Resident Engineer or his representative and the ECO.

4.5.1 Restriction of Working Areas

Objective

1. To restrict access to the site in order to reduce the potential for accidents, dust generation, water pollution, fires, and environmental damage to flora, fauna and other sensitive environmental elements.
2. To keep the demarcated and /or fenced off work area as small as possible.

Aspects

1. Effective demarcation of the construction site.
2. Minimising of traffic within construction areas.
3. Control of vehicles entering the site.

Procedure

1. Prior to any construction beginning, the actual site to be worked must be clearly defined and demarcated by means of highly visible durable materials, e.g. orange netting, no danger tape is to be used.
2. All construction material and machinery required for construction to be located within the demarcated activity zone. Vegetation within the demarcated zone may be cleared while vegetation outside of the zone must be left intact.
3. The demarcated area must cover as small an area as possible. This will prevent the unnecessary trampling of vegetation during the construction and operational phases. It will also result in a smaller area requiring rehabilitation.
4. Once the demarcated area has been approved, a written motivation to alter the boundary must be submitted to the Resident Engineer or his representative for consideration and (possible) approval.
5. The markings of the site must be maintained throughout the construction period, as and where determined by the Resident Engineer or his representative.
6. No activities or dumping may take place outside of the demarcated activity zone. This is to ensure that unnecessary damage is not done to the surrounding areas. It will also ensure the safety of people working on site and people moving in the vicinity of the site.
7. Construction workers are not to be accommodated on-site.
8. At the end of construction activities all components of the marking system (netting and/or poles) must be removed, to the satisfaction of the Resident Engineer or his representative. All damaged areas must be fully rehabilitated.
9. Vehicles must be instructed to remain on the track and deviations from the approved track must not be permitted, as this leads to creating multiple tracks and increasing the potential for erosion. In exceptional circumstances where a vehicle is forced to deviate from an approved track (e.g. to fight fires) the deviation must be rehabilitated

immediately after such an event. All deviations must be reported to the Resident Engineer or his representative.

10. Turning of vehicles should only take place within a clearly demarcated “turn area” located adjacent to the construction site. The contractors must co-ordinate the loading and offloading of material during the construction phase so as to ensure that vehicular movement is in one direction only at any one time and that sidetracks are not created on the site.
11. Production of an Area Restriction Method Statement which includes the access road.
12. Where feasible, development of power lines, pipelines and associated structures should be restricted to existing cleared areas and gravel roads / pathways.
13. The power line and pipeline footprints should be kept to a minimal width and length.

Targets

1. Approved Area Restriction Method Statement.
2. Controlled access to the site for the contractors, work crews, sub-contractors.
3. Prohibited access to the public, with adequate sign posting.

Responsibility

Developer, Resident Engineer, Contractor

4.5.2 Flora and Fauna Management

Environmental impacts, such as erosion caused by storm water run-off and weed invasion, increase proportionally with the increasing area of disturbance. It is very important that the total disturbed area be minimised. Land clearing and disturbance provides opportunity for the invasion of exotic weeds. The construction of roads can also provide an avenue by which exotic species can be transported into an area. Weed invasion can be minimised by taking measures to ensure that construction operations do not introduce exotic species to an area, and also by adopting measures to manage weed infestations at the site until such time as native species have become established after rehabilitation.

Objective

1. To minimise damage to indigenous flora and fauna utilising the construction site and the surrounding areas.
2. To re-vegetate the area as necessary to alleviate erosion potential and to improve any aesthetic issues.
3. To ensure minimum disturbance to indigenous flora and fauna occupying the area influenced by construction.
4. To control and prevent alien vegetation growth.

Aspects

Areas to be cleared for construction, areas to be re-vegetated; lighting of fires

Procedure

1. The Conservation of Agricultural Resources Act (Act 43 of 1983) states that no person shall dispense any weed in the country, and the National Environmental Management: Biodiversity Act (Act No 10 of 2004) regulates alien and invasive species. In accordance with the Act every effort must be made to ensure that the site and other clearly marked areas relating to the operation and decommissioning is kept free of weeds or invasive plants.

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2. Care must be taken to remove all alien vegetation, which invades the site. The site must be inspected weekly by the Contractor's Environmental Officer.
 3. Removal of alien vegetation (either physically (preferred) or through chemical means) must be included as a routine activity during the construction phase.
 4. A Flora and Fauna Method Statement incorporating the procedures and the site maintenance plan, including timing and physical boundaries, must be submitted by the appropriate contractors to the Resident Engineer or his representative for approval.
 5. All cleared areas adjacent to the work area to be re-vegetated and maintained to control erosion and minimise dust.
 6. Where possible, vegetation occurring inside the demarcated activity zone should be cut to ground level, leaving the roots and soil undisturbed rather than removed. This will assist in preventing soil erosion if any heavy rains fall during the construction period.
 7. All the areas cleared must be rehabilitated with suitable indigenous vegetation upon completion of the construction works.
 8. Fires are to be prohibited on and adjacent to the site.
 9. Excess soil from excavations must not be spread on the surrounding vegetation.
 10. Surrounding vegetation is a valuable resource that can be needlessly destroyed by brief activities with heavy machinery and indiscriminate use of the area by humans. All site workers must be informed of the limits of the site and should be instructed not to utilise areas outside of the defined activity zone.
 11. Vegetation that was cleared may provide useful fauna habitat. Logs, limbs and stumps should be cleared and stockpiled separately to the topsoil stripping operation.
 12. Rehabilitation should be undertaken in a progressive manner. Re-vegetation of the disturbed areas with indigenous material should be undertaken as soon as construction activities at an individual site have been completed.
 13. Work areas must be clearly demarcated, e.g. with droppers and/or orange netting but not with danger tape, so that construction workers limit their impact to these areas alone.
 14. All construction vehicles must stay on single demarcated access tracks.
 15. The site camp to be located in an already disturbed area with existing access. Only shrubs are to be removed for the construction camp area and laydown areas. Grass is to be left in place.
 16. Fires are to be prohibited on and adjacent to the site.
 17. An expert who holds a Competency Certificate to handle Dangerous and Venomous Reptiles should be contracted to remove animals.

Targets

1. Approved Flora and Fauna Method Statement.
2. All vertebrate species encountered must be relocated from the demarcated areas immediately prior to beginning with construction work.
3. No fires are permitted.

Responsibility

Resident Engineer, Contractor

4.5.3 Cultural Historic, Archaeological and Palaeontological

Objective

To limit damage to possible cultural historic, archaeological and palaeontological artefacts and sites, features and objects.

Aspects

Clearing of sites, excavations and related activities

Procedure

1. The Resident Engineer or his representative must ensure that all staff are trained to recognise potential cultural historic, archaeological and palaeontological artefacts and sites. The Resident Engineer or his representative must also ensure that a system is in place to halt the specific activity if such a site is identified. The Resident Engineer or his representative may consider offering a reward to personnel who identify such sites.
2. Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, shall cease immediately and the find brought to the immediate attention of the Resident Engineer or his representative who will report it to the Eastern Cape Provincial Heritage Resources Authority (ECPHRA, 043 6422811). The area will be fenced off with a radius of 20m around the unearthed item, demarcated as a no-go area and access will be prohibited.
3. The Resident Engineer or his representative must then arrange for the appointment of a qualified archaeologist to examine the site and recommend further action.
4. Following consultation with the archaeologist and ECPHRA, the Resident Engineer or his representative will be responsible for approving the Contractor's resumption of normal activities.
5. Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site.
6. Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the National Heritage Resources Act (Act No. 25 of 1999), Section 51.(1).
8. Human remains confirmed younger than 60 years (to be confirmed by the police forensic unit or archaeologist) are to be reported directly to the nearest police station.

Targets

2. No cultural historic, archaeological or palaeontological artefacts or sites may be purposefully damaged or destroyed. (It is illegal to disturb fossils or other historic and or cultural sites and objects without the prior consent of the Eastern Cape Provincial Heritage Resources Authority).

Responsibility

Developer, Resident Engineer, Contractor

4.5.4 Soil Management

Topsoil is usually the darker, upper soil layer. Though only 10 - 30 cm deep it contains nutrients, minerals, seed, and organic matter, which helps to bind it all together. The regenerative capacity of the natural soil should be protected during the construction activities. Topsoil is a very important requirement for low cost revegetation of disturbed sites.

Objective

To reduce the size of all stripped areas and to store stripped topsoil separately for use in site rehabilitation and landscaping once construction has been completed.

Aspects

Storage of stockpiles of soil, conservation of additional topsoil areas, erosion control.

Procedure

1. The shallow topsoil layer to be stockpiled separately from the subsoil layers, should the excavation exceed 0.5m.
2. Topsoil must be stripped from the work area and stockpiled on an area outside of the immediate work area, but inside the demarcated work area.
3. Site clearing and construction should be undertaken in a progressive manner (i.e. the entire development area should not be cleared at once, but should rather be undertaken in stages) so as to minimise the area of soil exposed at any one time.
4. Wherever possible, stripped topsoil should be placed directly onto an area being rehabilitated. This avoids stockpiling and double handling of the soil. Topsoil placed directly onto rehabilitation areas contains viable seed, nutrients and microbes that allow it to revegetate more rapidly than topsoil that has been in stockpile for long periods.
5. Topsoil must be stockpiled separately from the subsoil layers and used during reinstatement thus allowing plants to rapidly re-colonise the bare soil areas.
6. Do not strip topsoil when saturated, as this will exacerbate the damage to the soil structure. If topsoil must be stockpiled, it deteriorates in quality while stockpiled.
7. Stockpiled soils shall be neat, and the dumped soil shall be flattened immediately after placement to ensure minimum exposure to wind and water.
8. Topsoil stockpiles are not to be higher than 2 m and steeper than 1:3.
9. Stormwater runoff to be diverted away from stockpiles.
10. Silt fences to be included around stock piles.
11. Vegetation being cleared may contain small amounts of seed, or provide useful fauna habitat. Logs, limbs and stumps should be cleared and stockpiled separately to the topsoil stripping operation. Smaller sized vegetative material may provide useful mulch for later use in erosion control works, or else it should be combined with the topsoil.
12. Topsoil must be utilised in the rehabilitation of the site once the construction work has been completed. Any excess topsoil must be removed from the site. Excess topsoil can be used in erosion control works on any other disturbed area.
13. *Cynodon dactylon* (kweek/Quick Grass) should be used to revegetate the topsoil stockpiles if they are to be left for longer than 90 days. A typical seeding rate would be 6 kg seed per hectare. (Applicable only where stockpiled soil will be retained for longer than 3 months). For shorter periods a mulch of natural vegetation cut on site

during the clearing operation (grass and shrubs) can be placed over the stockpiled soil.

14. The maintenance of soil erosion control measures must be strictly monitored and reported.
15. Compaction of clayey soil should be kept to a minimum during the construction phase, particularly in wet areas, in order to optimise the successful rehabilitation of disturbed soil.
16. Topsoil and subsoil should be conserved and returned once development is complete, to encourage recruitment from the soil-stored seed bank. This is particularly important for the project site, as the soil layer is likely extremely limited due to the presence of gravel, and shallow bedrock.
17. Soil level / landscape contours should be restored to its original state (where feasible), in order to encourage encroachment of neighbouring vegetation into disturbed areas, and allow wind-blown seed establishment i.e. all topsoil, subsoil and gravel stockpiles should be levelled to blend into the landscape upon completion.
18. Anti-erosion measures to be included to disperse run-off so as to reduce the volume and velocity of surface water flow and vulnerable areas to be stabilised

Targets

1. Approved Topsoil Preservation Method Statement.
2. All topsoil must be separately stripped and stored.

Responsibility

Resident Engineer, Contractor

4.5.5 Air Quality Management

Objective

1. To minimise nuisance and potential health problems, and potential damage to flora, associated with dust and/or sand.
2. Air pollution from construction activities.

Aspects

1. Vehicle movement, stockpiling (of sand) and site clearing.
2. Poorly maintained construction vehicles and burning materials for warmth during winter by contraction staff.

Procedure

1. Staff should be trained to report dust-generating activities as soon as they detect them.
2. Dust can be suppressed by a combination of:
 - a) Daily spraying of exposed areas with water (not potable or contaminated water), at a frequency to be determined by the Resident Engineer or his representative.
 - b) Compacting exposed areas.
 - c) Using environmentally acceptable chemical and other suppression methods where appropriate.

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- d) Covering long-term stockpiles or temporarily re-vegetating them.
 - e) Halting dust generating activities when wind speed exceeds 35 km/h.
 - f) Imposing a 25 km/h speed limit on access roads.
 - g) Re-vegetating exposed areas during the operating and decommissioning phases.
3. Prompt rehabilitation and wetting down of recently cleared areas to minimize dust creation.
 4. Stockpiles (e.g. soil) should be maintained for as short a time as possible and should be enclosed by wind breaking enclosures of similar height to the stockpile. Stockpiles should be situated away from the site boundary, main roads, and nearby receptors and should take into account the predominant wind direction.
 5. Until vegetation used in rehabilitation efforts has established, temporary stabilization methods must be used (e.g. protecting exposed soils with coarse granular materials, mulches, or straw).
 6. Construction should be undertaken in a phased manner, so as to limit the size of the area to be exposed at any one time.
 7. The Contractor will be responsible for the continued control of dust arising from his operations. Should a dust control method prove to be ineffective by the Project Manager and ECO, alternative methods will need to be conducted by the Contractor. Any changes in the dust control methods shall be for the cost of the Contractor.
 8. Any complaints about dust recorded in the complaints register must be immediately investigated by the Resident Engineer or his representative and addressed. Contact details (e.g. telephone number) should be located at the entrance of the site for reporting of excessive dust after hours.
 9. The Resident Engineer or his representative (advised by the ECO) must implement a more rigorous dust-monitoring programme (instrument measurement) if there are persistent complaints about dust in the area. Dust levels are not to exceed 1200mg/m²/day (30 day average) for rural areas.
 10. No waste, vegetation or any other material shall be burnt in compliance with smoke control regulations issued in accordance with the Air Quality Act (Act 39 of 2004).
 11. Trucks transporting any form of soil or waste should be covered with a tarpaulin.
 12. The speed of the traffic on the access roads needs to be kept slow (25 km/h) to curb any unnecessary dust.
 13. Vehicles and machinery will be maintained in good running condition.
 14. No waste may be buried.

Targets

1. Approved Air Quality Method Statements.
2. Dust levels are not to exceed 600mg/m²/day averaged over an annual period for industrial and rural areas.
3. Excessive dust generation as determined visually by the ECO, Resident Engineer or his representative is not permitted.

Responsibility

Resident Engineer, Contractor

4.5.6 Noise Management

Objective

To avoid noise disturbance with particular reference to construction and decommissioning activities on the site.

Aspects

Operation of construction equipment, assorted maintenance and vehicle operation, construction staff.

Procedure

1. Where possible the contractors must use equipment, which limits noise generation.
2. Any complaints pertaining to noise and vibrations as recorded in the complaint register must be immediately investigated by the Resident Engineer or his representative and addressed. SABS 0103 - 1983 Code of Practice indicates that an increase of ambient noise levels by 5 dB (A) will induce "sporadic complaint" from the community.
3. Construction activities to be limited to weekdays between 07:00 and 17:00; and Saturdays until 13:00. No work is to be undertaken on Sundays or public holidays.
4. Vehicles and machinery to be kept in good working order with the prescribed mufflers and silencers.
5. Attempts must be made to schedule noisy activities so that they occur simultaneously and over as short a period as possible.
6. Vibration inducing activities must also be simultaneously scheduled wherever possible.
7. A formal noise monitoring programme must be implemented by the Resident Engineer or his representative if there are persistent complaints.
8. A Noise and Vibration Method Statement must be submitted by the appropriate contractors to the Resident Engineer or his representative for approval.
9. No loud music will be allowed on site or in the construction camp.
10. No construction staff to be housed on site.

Targets

1. Approved Noise and Vibration Method Statement.
2. The Occupational Health and Safety Act 85 of 1993 stipulates that noise in excess of 85 dB (A) at 1 metre from equipment are not permitted.
3. Excessive noise as determined subjectively by the Resident Engineer or his representative.

Responsibility

Resident Engineer, Contractor

4.5.7 Aquatic Health, Water Quality and Stormwater Management

Sediment derived from erosion by water, and other water borne contaminants such as diesel and oil, are often sources of pollution arising from construction activities. If environmental management is inadequate, water quality may be affected beyond the boundary of the project.

Objective

1. To minimise the potential contamination of ground and surface water
2. To minimise soil erosion.

Aspects

1. Poorly maintained equipment and vehicles, vehicle parking areas, and contaminated run-off during the construction.
2. Spillages from construction materials, such as diesel, oils and cement.
3. Construction activities leading to soil erosion.

Procedure

1. The Resident Engineer or his representative shall ensure that all precautions are taken to ensure that no surface or ground water becomes polluted.
2. Ensure all construction machinery is in sound working order and free of leaks from oil, fuel or hydraulic and excessive exhaust fume emissions.
3. Establish a dedicated area for construction vehicles, machinery or equipment to refuel and where cement can be mixed. Vehicle re-fuelling and cement mixing must only take place on impervious surfaces.
4. No vehicle must be refuelled, serviced or repaired on the construction site, except in designated areas. Only emergency repairs to be conducted on site, all regular service maintenance to be conducted off site.
5. Temporary storm-water runoff basins and drainage ditches may have to be constructed in order to capture storm-water.
6. Wherever possible, drainage works should seek to mimic natural drainage patterns and utilise natural drainage lines with retained vegetation.
7. Anti-erosion measures to be included to disperse run-off so as to reduce the volume and velocity of surface water flow and vulnerable areas to be stabilised.
8. A cut-off drain or diversion banks above all excavation/cuts will help prevent stormwater from entering the site. Cut-off drains should discharge into vegetated natural drainage lines or via a level sill that distributes run-off across a stable vegetated area.
9. Contour drains can also be used to capture and slow down stormwater that would otherwise gather momentum as it travels down the slope. Rate of run-off increases dramatically following vegetation removal; hence the total area exposed should be kept to a minimum.
10. Gradients on access tracks should be controlled, drainage structures well maintained, and regular cross drains or culverts installed.
11. Sedimentation into drainage lines must be minimised through the effective stabilisation (e.g. gabions and Reno mattresses) and the re-vegetation of cleared areas.

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12. Details of storage of all chemicals must be submitted to the Resident Engineer or his representative for approval.
 13. Emergency plans must be in place in case of spillages onto road surfaces and/or open areas. Spill kits for small spills to be kept on site.
 14. Contaminated soil (e.g. in vehicle parking areas, under generators) must be removed to an appropriate permitted solid waste disposal facility. Waste manifests to be kept by contractors to prove legal disposal of contaminated soil.
 15. Environmental awareness training must ensure that staff is aware of the need to prevent water pollution.
 16. A Water Quality Method Statement must be submitted by the appropriate contractor(s) to the Resident Engineer or his representative for approval.
 17. Should a polluting incident occur, the Resident Engineer or his representative shall immediately contact the regional office of the Department of Water Affairs (DWA) (requirement of National Water Act). Cleanup shall take place in consultation with the DWA.
 18. To prevent scouring and erosion during heavy rains via surface run-off, appropriate (best practice) gabion protection works and rehabilitation of all disturbed areas, including the pipeline trench with appropriate indigenous vegetation.
 19. Strict use and management of all hazardous materials used on site.
 20. Strict management of potential sources of pollution (hydrocarbons from vehicles & machinery, cement during construction, etc.).
 21. Containment of all contaminated water before it can enter the adjacent watercourse.
 22. Chemicals must be stored safely on site, on an impermeable lined surface and surrounded by lined bunds. Chemical storage containers must be regularly inspected so that any leaks are detected early.
 23. Littering and contamination of water sources during construction must be prevented by effective construction camp and site management.
 24. The design of the powerhouse and return slipway should ensure that high flows are not impeded, ensuring that scouring and flood damage does not occur.
 25. Appropriate (best practice) gabion or other erosion and flood protection works should be constructed for the powerhouse and return slip.
 26. Appropriate erosion-protection works to be constructed and suitable indigenous vegetation re-established on all disturbed areas along the new water channel, penstock pipes and penstock pools
 27. Silt fences to be included around stock piles and along the boundaries adjacent to the watercourse.

Targets

1. Approved Water Management Method Statement.
2. Government Gazette 665 of 6 September 2013 governing effluent quality.
3. No contamination of groundwater.

Responsibility

Resident Engineer, Contractor

4.5.8 Solid and Liquid Waste Management

Objective

1. To limit the potential for groundwater and surface water pollution as well as the visible and malodorous accumulation of waste materials.
2. To prevent littering and associated environmental impacts.
3. Limit the amount of waste to be disposed of at a landfill.

Aspects

General construction and decommissioning activities

Procedure

1. Good housekeeping to be undertaken at all times. No illegal dumping or burning of waste allowed. Waste is not to be buried.
2. Environmental awareness training to be undertaken with the construction workers regarding health and environmental impacts from illegal dumping.
3. Toilet facilities must be made available to construction staff. If portable chemical toilets are used, these are to be secured to the ground and cleaned at least weekly. Water should be provided for washing and sanitary bins for women. Waste to be disposed of at a wastewater treatment works.
4. A system for identifying, classifying and disposing of solid waste must be devised.
5. Waste should be classified as domestic (including litter), hazardous, or recyclable.
6. Waste materials (e.g. paper and glass) must be sorted and sent for recycling, where the quantity allows this and if the facilities are available. Certain waste materials are valuable and could be sold to (local) entrepreneurs for further use.
7. No littering is permitted on site; litterbins with secured lids must be provided throughout the site. These litter bins must be predator and scavenger proof.
8. Centralised eating facilities must be provided for workers to facilitate litter control.
9. All non-hazardous solid waste must be removed on a regular basis and disposed of off-site at suitably permitted waste facilities (Somerset East licenced landfill site). This includes any building rubble left after construction.
10. Domestic and general construction waste to be disposed of at a licenced landfill site (i.e. Somerset East). The Contractor may not utilise the municipal waste collection services for disposal of waste. Proof of disposal must be kept at the site office by the Contractor.
11. When hazardous wastes are already present at the site, the contractor or subcontractor who first discovers the material is responsible for notifying the Resident Engineer, developer, and / or land owner. The local authority, the provincial authority and the Department of Water and Environmental Affairs must also be notified. Because the hazardous waste was present at the site prior to construction activities, the developer or owner typically is responsible for ensuring that the hazardous wastes are handled and disposed of properly.
12. When hazardous wastes are produced at the site, the contractor or subcontractor who produces the hazardous waste typically is responsible for ensuring its proper handling and disposal. Hazardous waste (e.g. old oil) to be stored separately in impermeable (i.e. leak proof) containers, and sent for recycling.

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13. Hazardous materials must only be disposed of at an approved hazardous waste disposal facility. No hazardous waste material to be disposed of as general waste.
 14. A register of waste disposal (including waste manifests) and sorting records must be retained by the contractors and submitted to the Resident Engineer or his representative for auditing purposes.
 15. Appropriate temporary disposal areas must be covered and be on an impermeable floor.
 16. Excess soil and stone removed during the excavations should be used in site levelling.
 17. Excess material not being reused, should be removed from the site and disposed of at a registered waste site (Somerset East licenced landfill site).
 18. A Waste Management Method Statement must be submitted by the appropriate contractor to the Resident Engineer or his representative for approval.
 19. The requirements of the Waste Act (Act 59 of 2008), Health Act (Act 50 of 1992) and the National Environment Management Act (Act 107 of 1998) are applicable to waste management.
 20. Cleared vegetation to be mulched or disposed of at the Somerset East licensed landfill site. Stockpiles of vegetation not to be left on site due to fire hazard.

Targets

1. Approved Waste Management Method Statement.
2. National Environmental Management: Waste Act (Act 59 of 2008) restricting waste disposal to permitted sites.
3. National Water Act (Act 36 of 1998)
4. All waste material must be removed from the site and suitably disposed of; no solid wastes shall be stored on-site for more than one week (i.e. 7 days).
5. Most materials from building and construction sites can be recycled or reused.

Responsibility

Resident Engineer, Contractor

4.5.9 Fuel and Hazardous Material Management

Hazardous materials and related waste includes the following materials:

- a) Ignitable (flashpoint of less than 140 degrees), such as paint thinners, paints, paint and varnish strippers, epoxy resins, adhesives, degreasers, and spent cleaning solvents.
- b) Corrosive (acids with a pH less than 2 or bases with a pH greater than 12.5), such as rust removers, cleaning fluids, and battery acids.
- c) Reactive (explosive or violently reactive), such as cyanide, plating waste, bleaches, and waste oxidizers.
- d) Toxic (meeting certain concentrations), such as materials containing metals (e.g., mercury, cadmium, or lead) or solvents (e.g., carbon tetrachloride or methyl ethyl ketone). Materials may include adhesives, paints, coatings, polishes, varnishes, thinners, or treated woods.
- e) Batteries;

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- f) Pesticides (as defined by the Universal Waste definition); and
 - g) Any other hazardous waste or material.

Objective

To ensure that materials are appropriately stored in order to minimise the potential for pollution and accidents.

Aspects

Storage of fuels solvents, and other hazardous and toxic substances

Procedure

1. Fuel, solvents and other hazardous or toxic substances must be securely stored in a restricted, locked facility approved by the Resident Engineer or his representative.
2. Fuel and hazardous materials containers must be properly and boldly labelled.
3. Chemicals must be stored safely on site, on an impermeable lined surface and surrounded by lined bunds. Chemical storage containers must be inspected daily so that any leaks are detected early.
4. Storage facilities must be maintained and fire-fighting equipment in proportion to the fire risk that is presented by the type of construction and other on-site activities and materials used on site is to be available and kept in good operating order at all times.
5. An emergency response plan (e.g. in case of fire or spillages) must be formulated, including steps taken to manage the capture and treatment of polluted water.
6. Generators and fuel supply needed for equipment during the construction phase must be placed on trays, which rest on clean river sand. This is to prevent any oil or fuel spills. The river sand (clean or contaminated) must be removed from the site once construction has been completed. All contaminated material must be disposed of at a registered hazardous waste disposal facility. Construction vehicles are also to be parked over drip trays.
7. No cement or concrete should be mixed on the soil surface or on plastic sheeting. Cement mixing is to undertaken in trays.
8. Cement mixers must be placed on large trays to prevent accidental spills onto the soil surface. Where cement or concrete is mixed on the soil, contaminated soils should be removed and disposed of at a registered waste disposal site.
9. The Resident Engineer must ensure that the contractors obtain material safety data sheets for all materials used on site. Where applicable, all site workers must be informed of the hazardous nature of the materials being used.
10. A Fuels and Hazardous Materials Storage Method Statement must be submitted by the appropriate contractor to the Resident Engineer or his representative for approval.
11. The provisions of the Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act 36 of 1947) and the Hazardous Substances Act (Act 15 of 1973) must be adhered to.
12. Strict use and management of all hazardous materials used on site.
13. Strict management of potential sources of pollution (hydrocarbons from vehicles & machinery, cement during construction, etc.).
14. Containment of all contaminated water before it can enter the adjacent watercourse.

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15. Littering and contamination of water sources during construction must be prevented by effective construction camp and site management.
 16. Spill kits for small spills to be kept on site.

Targets

1. Approved Fuels and Hazardous Materials Storage Method Statement.
2. Approved Emergency Response Procedure.
3. Fuels and hazardous liquids must be stored in an impervious, bunded and covered area with a capacity of 110% of the largest single storage tank.

Responsibility

Resident Engineer, Contractor

4.5.10 Traffic Management

Objective

Potential increases in traffic within the area, with resultant potential congestion, road damage, road safety, noise, etc. issues.

Aspects

1. Increased traffic on local roads, etc.
2. Traffic safety impact due to additional traffic.
3. Deterioration of public road network.

Procedure

1. Signage is to be displayed regarding construction activities.
2. Construction vehicles are to keep to the speed limits.
3. Regular maintenance of road during construction phase.
4. Trucks transporting any form of soil or waste should be covered with a tarpaulin.

Targets

No accidents

No spillages of any material onto roads.

Responsibility

Resident Engineer, Contractor

4.5.11 Socio-Economic, Health, Safety and Security

Objective

1. To ensure the health and safety of the construction workforce.
2. To ensure that activities associated with construction, particularly the presence of the workforce, do not create social problems or exacerbate any which may already exist.

Aspects

1. Staff and surrounding community welfare, health and safety.
2. Fire management

Procedure: Health, Safety, Security and Fire Management

1. Adequate ablution facilities and chemical toilet facilities must be erected and maintained in good order on the site for the duration of the construction and decommissioning phase. Toilets must be secured to the ground. Toilets should be removed from site when construction is completed. Waste must be disposed of at a registered waste site.
2. Adequate clean drinking water must be available to construction staff at all times during the construction period.
3. An area must be demarcated for staff to conduct all necessary cooking activities. The site must be selected to ensure that there is no risk of fires. It would be advisable to ensure that small gas cookers are available on site, if needed.
4. Work crews are not to be housed on site and where feasible should be accommodated in suitable residential areas in close proximity to the construction site.
5. Awareness training to be undertaken with the construction workers regarding health and environmental impacts from illegal dumping.
6. HIV and STD awareness training with construction staff.
7. Security to be provided after hours to protect equipment in the construction camp.
8. Excavations to be demarcated with orange netting. Excavations are to be checked daily, prior to work commencing, for any animals.
9. Shoring of deep excavations to ensure the safe workings of site staff.
10. The construction area must be demarcated and access controlled for the duration of the construction period.
11. Signage is to be displayed regarding construction activities.
12. Construction vehicles must adhere to speed limits and must be made aware of the possibility of people walking and living in close proximity to the site.
13. The Contractor to have a health and safety plan.
14. General risks associated with the construction activities should be addressed through compliance with the relevant health and safety procedures and regulations.
15. Access to and from the construction site(s) should be closely monitored and contractors should be required to make the necessary arrangements for the transport of workers to and from the site on a daily basis.
16. Visitors to report to the Site Office, and appropriate Protective Personal Equipment (PPE) to be worn by visitors.
17. Discuss the safety and security issues, as well as construction schedule with the local community policing forum and local SAPS.
18. Adjacent landowners are to be notified 14 days prior to construction commencement.
19. Fire-fighting equipment in proportion to the fire risk that is presented by the type of construction and other on-site activities and materials used on site is to be available and kept in good operating order at all times.
21. Any welding or other sources of heating of materials must be done in a controlled environment, under appropriate supervision, in such a manner as to minimise the risk of fires and/or injury to staff. No "hot work" is to be undertaken on days where the Fire Danger Index is "orange" or "red".
22. Smoking will not be permitted in those areas where there is a fire hazard. These areas include the fuel storage areas and any area where the vegetation or other

material may support the rapid spread of an initial flame. Where possible, these areas (e.g. at the chemical and hazardous substances storage area) are to be demarcated with no-smoking signs.

23. Installation of hydropower equipment should be undertaken by a trained professional.

Procedure: Employment

1. A policy of employing local people should be implemented wherever possible. This will ensure that benefits of the construction are provided to local communities and will prevent an influx of job seekers to the site. This policy must be finalised before the hiring of sub-contractors.
2. Local sub-contractors should be employed wherever possible to maximise the localised economic benefits of the project.
3. Access to the construction site must be strictly controlled.
4. A mechanism must be established to receive and address complaints from the staff.

Procedure: Existing Services and Infrastructure

1. Eskom approval per requirements for work in or near Eskom servitudes or infrastructure and Renewable Energy Generation Plant Setbacks to Eskom Infrastructure.
2. Implementation of the DEA's Generic Environmental Management Programme Overhead Powerline Construction.

Targets

1. The Contractor shall ensure compliance with the Occupational Health and Safety Act (Act 85 of 1993) and the relevant regulations.
2. No fires or accidents.

Responsibility

Resident Engineer, Contractor

4.6 Rehabilitation Management

The term 'rehabilitation' is used to encompass all of those measures, which seek to repair disturbed or degraded land, and to return such land to a stable and non-polluting state, which is suitable for the proposed future use of the land. The rehabilitation of the construction and surrounding area is an integral part of the development. Progressive rehabilitation refers to the rehabilitation of areas that are no longer required for the construction activities while the other operations continue. Progressive rehabilitation is an important component of any development and should be implemented where feasible.

The main aims of rehabilitation work are to:

- a) Achieve long-term stabilisation of all disturbed areas to minimise ongoing erosion;
- b) Re-vegetate all disturbed areas with suitable plant species;
- c) Minimise visual impact of disturbed areas; and
- d) Ensure that disturbed areas are safe for future uses.

Establishment of a self-sustaining cover of vegetation is the best low maintenance stabiliser of disturbed sites in the long term. Generally, the vegetation type, which existed before the disturbance, or a similar vegetation type will be most successful afterwards, following an initial re-establishment period.

Objective

1. To revegetate areas that has been disturbed during the construction phase.
2. To re-establish a native vegetation cover, which is similar in species composition to that, which existed before the disturbance and to prevent erosion on the site; and manage adverse visual impacts from critical viewpoints. The site should be left in a stable state that blends in with the surrounding area.

Aspects

1. Dismantling and removal of all construction infrastructure, re-vegetation and landscaping of disturbed areas on site, replacement of topsoil.
2. Ensuring that adequate erosion control measures are in place.

Procedure

1. All construction infrastructure, equipment, materials and wastes must be removed from the site upon completion of construction (or earlier, in a phased manner, if possible).
2. Rehabilitation of surplus tracks and turning areas, camp sites and stockpiles (i.e. areas not required to be cleared of vegetation during operations).
3. Knobs and stockpiles should be levelled and waste rock / overburden pushed into hollows, i.e. soil erosion areas that have no vegetation in order to restore eroded areas.
4. All compacted and previously used construction areas shall be scarified / ripped to a depth of 150 mm prior to topsoil being replaced. Ripping will promote water infiltration and root penetration. Ripping should be carried out when the soil is relatively dry to increase soil break-up.
5. Stored topsoil must be replaced uniformly on disturbed areas to a depth of at least 150 mm. Re-spread soil should be left with a rough surface with many suitable locations for lodgement and germination of seeds. Avoid spreading soil when saturated or sticky, as compaction and other damage to the soil structure will occur.

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6. These areas must be landscaped to improve the aesthetic appearance of the site; suitably landscaped berms of topsoil may be created as part of the erosion control programme.
 7. Any excess topsoil (not used in landscaping) must be disposed of in an environmentally acceptable manner.
 8. All disturbed areas must be re-vegetated with suitable indigenous (i.e. naturally occurring in the area) vegetation, e.g. grass species - *Cynodon dactylon*. There must be no signs of erosion. All visible alien plants must be removed from disturbed sites and the disturbed site rehabilitated.
 9. A Site Rehabilitation Method Statement must be submitted by the contractors to the Resident Engineer or his representative for approval.
 10. The soil erosion measures installed need to be checked weekly.

Targets

1. Approved Site Rehabilitation Method Statement.
2. Site rehabilitation to be completed within one month after the end of the construction period, or by an alternative date stipulated by the Resident Engineer or his representative.

Responsibility

Developer, Resident Engineer, Contractor

4.7 Operation

This section presents the environmental requirements during the operational phase.

4.7.1 Flora and Fauna Management

Objective

1. Limit the spread of alien vegetation.
2. Disturbance to fauna and avifauna from operational activities.

Aspects

1. Controlling the spread of alien vegetation.
2. Overhead transmissions lines may present a potential collision risk or electrocution to avifauna.

Procedure

1. Alien and noxious plant regrowth to be monitored monthly by the Developer and area to be kept free of alien invasive and noxious plants.
2. Removal of alien vegetation either physically (preferred) or through chemical means.
3. All overhead power lines to include bird deflectors.
4. Electrical cabling and connecting distribution lines to be underground, if feasible.
5. An expert who holds a Competency Certificate to handle Dangerous and Venomous Reptiles should be contracted to remove animals.
6. Vegetation regrowth within the access roads, penstock pipelines and transmission line to be controlled, i.e. removed physically or through chemical means by the operational contractor.
7. Shrubs and trees located on the boundary of the site should be left intact and not removed.
8. DEDEAT Permits to be obtained for any removal of SCCs and Protected Plants within the hydropower system due to maintenance requirements.

Targets

No alien or invasive species within the site area.

Responsibility

Developer

4.7.2 Air Quality Management

Objective

1. To minimise nuisance and potential health problems, and potential damage to flora, associated with dust and/or sand.
2. Air pollution from operational activities.

Aspects

1. Vehicle movement, and cleared areas.

Procedure

1. Vehicles must adhere to speed limits on access gravel road (25 km/h).
2. No materials shall be burnt.
3. Maintaining re-vegetated areas to limit exposed soils.
4. No waste may be buried.
5. Contact details (e.g. telephone number) should be located at the entrance of the site for reporting of excessive dust after hours.
6. Trucks transporting any form of soil or waste should be covered with a tarpaulin.

Targets

1. Dust levels are not to exceed 1200mg/m²/day (30 day average) for rural areas.

Responsibility

Developer

4.7.3 Socio-Economic, Health, Security and Fire Management

Objective

Health, safety, security and fire management

Aspects

1. To ensure the health and safety of the maintenance workforce.
2. To ensure that activities associated with construction, particularly the presence of the workforce, do not create social problems or exacerbate any which may already exist.
3. To minimise risks for veld fires.

Procedure: Health, Safety and Security (including Fire Management)

1. Maintenance to be undertaken by trained personnel only. Trained personnel shall wear appropriate electrically insulating Personal Protective Equipment (PPE) during inspection operations.
2. Adjacent landowners are to be notified 14 days prior to operational commencement.
3. Additional security aspects to be considered, e.g. security to check the site on a regular basis and security alarms to be considered.
4. Fire-fighting equipment in proportion to the fire risk that is presented by the type of materials used on site is to be available and kept in good operating order at all times.
5. The access road surrounding the penstock pools and pipeline to act as a potential firebreak.
6. Maintenance procedures to include regular inspection of electrical connections. Faulty wiring to be replaced immediately.
7. Proper grounding of the electrical system to reduce the risk of fire.
8. Maintenance to be undertaken in accordance with the manufacturer's guide.

Procedure: Employment

1. Up skilling of local labour to skilled positions.

Procedure: Existing Services and Infrastructure

1. Eskom approval per requirements for work in or near Eskom servitudes or infrastructure and Renewable Energy Generation Plant Setbacks to Eskom Infrastructure.
2. Implementation of the DEA's Generic Environmental Management Programme Overhead Powerline Construction for maintenance operations.

Targets

1. All equipment maintained and operated per manufacturer's guide.
2. No fires.

Responsibility

Developer

4.7.4 Aquatic Health, Stormwater Management and Erosion Prevention

Objective

Poor drainage management can lead to damage or destruction of the rehabilitation investment.

Aspects

1. An increase in bare ground results in an increase in stormwater / surface water flow which may cause erosion.

Procedure

1. Erosion control measures must be maintained, and ensure areas remain stabilised.
2. Anti-erosion measures to be included to disperse run-off so as to reduce the volume and velocity of surface water flow and vulnerable areas to be stabilised.
3. Sedimentation into drainage lines must be minimised through the effective stabilisation (e.g. gabions and Reno mattresses) and the re-vegetation of cleared areas.
4. Broken, or damaged or equipment are to be replaced/ repaired immediately.
5. An effective long-term operational and management plan should be drawn up and implemented by the Applicant.

Targets

1. Controlling and prevention of soil erosion.
2. Stormwater drainage.
3. Post-construction stormwater run-off not to exceed pre-construction stormwater run-off.

Responsibility

Developer

4.7.5 Solid and Liquid Waste Management

Objective

1. To limit the potential for groundwater and surface water pollution as well as the visible and malodorous accumulation of waste materials.
2. To prevent littering and associated environmental impacts.
3. Limit the amount of waste to be disposed of at a landfill.

Aspects

1. If waste is not disposed of correctly, there is a possibility that waste may be blown into the surrounding environment or being illegally disposed of

Procedure

1. Waste storage and collection must comply with the National Domestic Waste Collection Standards (21 January 2011) and Norms and Standards for the Storage of Waste, GN 926 of 29 November 2013.
2. Waste to be sorted and recycled where possible. A register of waste disposal (including waste manifests) and sorting records must be retained for auditing purposes.
3. No hazardous waste material to be disposed of as general waste.
4. No illegal dumping, burying or burning of waste allowed.
5. Oil-based liquids should be treated and disposed of as hazardous waste.
6. Chemical toilets to be utilised during the maintenance periods and proof of disposal is required to be kept for auditing purposes.
7. Decommissioned, faulty or broken equipment is to be taken off site and recycled. If items are unable to be recycled, to be disposed of at an appropriate landfill site.
8. Proof of waste disposal must be kept.

Targets

Compliance with the National Environmental Management: Waste Act (Act 59 of 2008) and associated regulations (e.g. Norms and Standards for the Storage of Waste, GN 926 of 29 November 2013)

Responsibility

Developer

4.7.6 Traffic Management

Objective

Potential increases in traffic within the area, with resultant potential congestion, road damage, road safety, noise, etc. issues.

Aspects

1. Increased traffic on local roads, etc.
2. Traffic safety impact due to additional traffic.

Procedure

1. Vehicles are to keep to the speed limits.

Targets

No accidents.

No spillage of any material onto roads.

Responsibility

Developer

4.8 Response to Public Complaints

The Resident Engineer or his representative must respond to queries and complaints from the public regarding construction activities within 14 days. In responding to such queries and / or complaints the Resident Engineer or his representative must document all such communications in a complaints register. All queries and complaints must be reported to the Developer. All remedial action taken on a complaint must be recorded in the complaints register.

Refer to Appendix 1 for a copy of the complaint form.

Chapter 5: Environmental Management and Monitoring

5.1 Introduction

This chapter outlines the systems to ensure that the EMPr is effectively implemented, including monitoring requirements, corrective action, and auditing. The training, incentives and supporting documentation required to effect implementation of the EMPr are also described.

5.2 Environmental Compliance Monitoring

The Resident Engineer or his representative is responsible for monitoring the procedures and targets applicable to each environmental management requirement.

Environmental compliance audits are to be undertaken at least once a month by the ECO.

For each of the environmental management requirements, the following specific elements should be monitored. This list is intended as a guide and is not necessarily exhaustive; and consequently, other elements might need to be monitored to ensure compliance with the relevant target.

5.2.1 Restriction of Access to Sites

The Contractor's Environmental Officer to inspect the demarcated area on a daily basis and inform the contractors of any violations or areas where markings must be replaced.

5.2.2 Flora and Fauna Management

1. All animal mortalities must be recorded and reported to the Resident Engineer or his representative.
2. A list of plants that are relocated and used in rehabilitation must be kept and their survival success documented.
3. Alien and noxious plant regrowth to be monitored and area to be kept free of alien invasive and noxious plants.

5.2.3 Cultural Historic, Archaeology and Palaeontology

During earthmoving, excavation and site rehabilitation the Contractor's Environmental Officer must monitor for potential cultural historic, archaeological and palaeontological sites daily, or more frequently at his discretion.

5.2.4 Preservation of Topsoil

1. Daily checks, at the discretion of the Environmental Officer, need to be undertaken on the storage of the topsoil and the state of the vegetation or mulch covering the topsoil.
2. Checks on the erosion of the area must be carried out daily, and it must be ensured that the erosion minimisation measures installed are effective.

5.2.5 Air Quality

1. Dust must be visually monitored on a daily basis, or more frequently in conditions conducive to dust generation, as determined by the Environmental Officer.
2. The Contractor's Environmental Officer must implement a formal dust monitoring programme and dust suppression techniques be revised, if persistent complaints are recorded.

5.2.6 Noise and Vibration

1. The Contractor's Environmental Officer must subjectively monitor noise and vibration levels on a frequent basis.
2. The Contractor's Environmental Officer must implement a formal noise-monitoring programme if persistent complaints are recorded.

5.2.7 Water Quality

1. The Contractor's Environmental Officer must visually inspect runoff basins, drainage ditches and sediment traps on a daily basis to ensure that they are in an acceptable condition.
2. Other potential sources of surface and groundwater pollution must be inspected daily.

5.2.8 Waste Management and Site Housekeeping

1. The Contractor's Environmental Officer must inspect on-site waste disposal facilities / temporary storage areas daily, to ensure that they are sufficient and that they are properly maintained.
2. During site inspections the Contractor's Environmental Officer must check for waste material, which is inappropriately (temporarily) disposed of or stored.
3. A record must be kept of waste that is disposed of at the landfill site.
4. The Contractor's Environmental Officer must monitor the site for litter and other waste material.

5.2.9 Fuel and Hazardous Material Management

1. The Contractor's Environmental Officer must ensure that materials are stored in the designated area set aside for that purpose.
2. During daily site inspections the Contractor's Environmental Officer must check storage facilities to ensure that they are in a proper state of repair.
3. A record must be kept of any spills and what follow-up action was taken.

5.2.10 Social Issues

The Contractor's Environmental Officer must monitor the site regularly (as part of daily inspections) and be alert to potential social problems on and off site.

5.2.11 Site Rehabilitation

1. The Contractor's Environmental Officer must monitor site landscaping, re-vegetation and alien plant regrowth, commencing after construction.
2. Monitor the erosion control measures.

5.3 Corrective and Preventative Action / Management of Environmental Problems

The Resident Engineer must devise a Corrective Action Procedure for implementing corrective and preventive action. The Corrective Action Procedure is to be implemented by all contractors and subcontractors on site.

This system should:

- a) Report non-compliance with procedures or targets identified during monitoring and inspections (on Incident Forms, Appendix 1).
- b) Report other failures creating environmental problems.
- c) Report imminent non-compliance and potential environmental problems.
- d) Through the Resident Engineer or his representative delegate responsibility for corrective and preventive action.
- e) Document the resolution of the reported non-compliance or environmental problem.
- f) Impose disciplinary action where persistent non-compliance occurs.

Where possible, the Environmental Corrective Action Procedure should be integrated with the Quality, Health, Safety and, possibly, Maintenance, Corrective Action Procedures.

All contractors and sub-contractors must retain copies of the Corrective Action Procedure and other appropriate documentation and submit copies of all documentation to the Resident Engineer or his representative at a frequency to be determined by the Resident Engineer or his representative. The Resident Engineer or his representative must report to the Developer on a monthly basis on the implementation of the EMPr.

5.4 Documentation

The Environmental Officer and Resident Engineer or his representative must devise forms (i.e. pro forma) for:

-
- a) Daily, weekly and monthly (or as appropriate) monitoring of environmental management requirements and targets (these should be integrated with those for Quality, Health, Safety and, possibly, Maintenance).
 - b) Noncompliance (time, offender), including a register of “offenders”.
 - c) Recommended corrective action.
 - d) Resolution of noncompliance problems.
 - e) Method Statements.
 - f) Logging complaints received in a complaints register.
 - g) Evaluating the environmental awareness training programme.
 - h) Evaluating the job-specific environmental training programmes.
 - i) Auditing of activities.

These records are to be made available for review by the Developer. The Resident Engineer or his representative, Contractor and sub-contractors must keep a record of all meetings attended, waste disposal documents, audits undertaken and other environmental issues as appropriate.

5.5 Environmental Awareness Training

The Contractors and the Resident Engineer or his representative are responsible for ensuring that all personnel have a general environmental awareness as well as specific knowledge of the potential environmental impacts associated with their work activities. All personnel associated with the project must understand the purpose and benefits of the EMP. The appropriate training must occur as part of an induction programme, i.e. before commencing on-site work, and should also focus on the benefits of sound environmental management.

Specific elements of environmental awareness training should include (list is not intended to be exclusive or exhaustive):

1. Ability to recognise archaeological and palaeontological artefacts.
2. Awareness on the importance of site rehabilitation.
3. Management and minimising of waste, including waste separation. Instruction in temporary waste storage and disposal systems and facilities.
4. Water conservation and water quality protection.
5. Awareness of existing social problems in the area.
6. Incentives and rewards for good environmental practice.
7. Instruction in erosion control measures.
8. Acceptable behaviour with regard to flora and fauna.
9. Maintenance of equipment to prevent the accidental discharge or spill of fuel, oil, lubricants, and other chemicals.
10. Responsible handling of chemicals and spills.
11. Environmental emergency procedures and incident reporting.

In the event that new personnel are brought onto site by the Contractor during the project, these personnel are to undergo environmental awareness training prior to any work being undertaken. The Contractor is to include environmental awareness training in the toolbox talks on a monthly basis.

The Resident Engineer or his representative must devise a system (including appropriate records) to evaluate the training programme and recommend changes as appropriate (e.g. to coincide with the phasing of construction activities and re-training in areas of high rates of non-compliance).

5.6 Environmental Administration Matters

5.6.1 Penalties

Transgressions relate to actions by the Contractor, Sub-contractor or Contractor team member whereby damage or harm is inflicted upon the environment or any feature of the environment and where any of the conditions or specifications of the EMPr are infringed upon.

In the instance of environmental damage, the damage, where possible, is to be repaired and rehabilitated using appropriate measures, as specified and undertaken by appropriate specialists, for the account of the Contractor or other guilty party.

Where infringement of the specifications or conditions of the EMPr is registered, appropriate remedial action or measures are to be implemented for the account of the Contractor. Where non-repairable damage is inflicted upon the environment or non-compliance with any of the EMPr conditions is registered, the Contractor may face a monetary penalty to an amount specified by the ECO in conjunction with the Resident Engineer or his representative. A first offence warning may be implemented.

5.6.2 Incentives

Where commendable performance by a Contractor, Sub-contractor or team member is noted for work undertaken on site, in particular with regard to compliance with the specifications of the EMPr, the ECO in conjunction with the Resident Engineer or his representative may issue an Environmental Performance Certificate to the individual or team which has earned such recognition.

Chapter

6

Chapter 6: Glossary of Terms

Term	Explanation
Ambient (air)	Current surrounding atmospheric condition
dB(A) (decibels A-scale)	A frequency-weighted noise unit used for traffic and industrial noise measurement
Environment	The surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation
Environmental Aspect	An element of an organisation's activities, products or services that can interact with the environment
Environmental Control Officer	An independent person who is responsible for undertaking site inspections to audit and report on compliance with environmental specifications with the Environmental Management Programme.
Environmental Impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services
Environmental Impact Assessment (EIA)	A study of the environmental consequences of a proposed course of action. An environmental evaluation or assessment is a study of the environmental effects of a decision, activity or undertaking. It is most often used within an IEM Planning process as a decision support tool to compare different options
Environmental Management Programme (EMPr)	A tool used to prescribe management mechanisms or methods for the prevention of undue or reasonably avoidable adverse environmental impacts and for the enhancement of the positive environmental benefits of a development.
Environmental Management System	The part of the overall management system that includes organisational structure, Planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy
Exotic	Any Plant species not falling under the indigenous definition.
Integrated Environmental Management (IEM)	A process that involves the authorities and public, and integrates environmental issues with all aspects of planning.
Invasive	Tending to displace, or increase in cover relative to, surrounding vegetation.
Palaeontology	(study of) life in geological past

Chapter

7

Chapter 7: References

Department of Environment Affairs and Tourism. 1997. Guidelines for Comprehensive Environmental Impact Reports. Unpublished Memorandum.

Department of Environment Affairs. The integrated environmental management procedure. Guideline document 1, Department of Environment Affairs, Pretoria, 1992, p 19.

Environmental Management Plans, Integrated Environmental Management, Information Series 12, Department of Environmental Affairs (DEA), Pretoria.

National Environmental Management Act 107 of 1998 (NEMA).

Appendix 1: Environmental Incident Log and Complaint Form

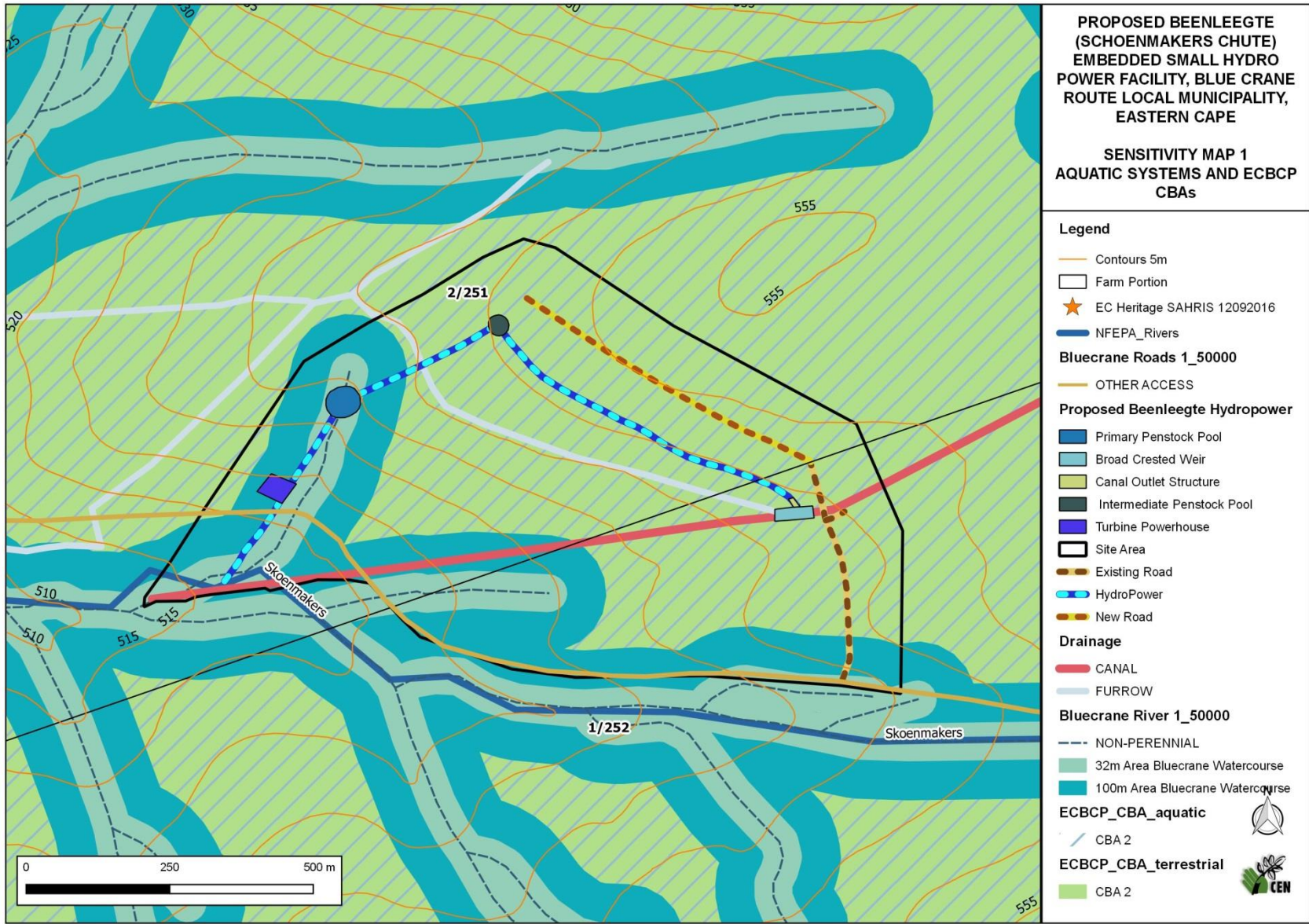
Environmental Incident Log

Date	Environmental Incident	Notes- Include an explanation if possible for the condition / incident and persons responsible. Include photographic records and other material	Corrective Action	Signature

Complaint Form

Complaint Record Sheet	File No Reference	Date	
Complaint Lodged By:			
Capacity of Complainant			
Complaint Logged by			
Details of Complaint:			
Proposed Remedial Action			
Notes by ECO / Auditor			
ECO	Date	Auditor	Date
Resident Engineer	Date		

Appendix 2: Environmental Sensitivity Map



Appendix 3: Curriculum Vitae

CEN
Integrated Environmental Management Unit
36 River Road
Walmer
Port Elizabeth
6070
South Africa



Telephone: 041 - 581-2983 / 581-7811

Fax: 0865042549

Email: steenbok@aerosat.co.za / lucille@environmentcen.co.za

Reg No: 1996/032402/23

CURRICULUM VITAE

LUCILLE BEHRENS

Name of Firm	CEN Integrated Environmental Management Unit
Date of birth	20 August 1976
Position in Firm	Senior Environmental Scientist
Specialisation	Environmental Management
Nationality	South African
Years of experience	12
HDI Status	White female, no disabilities
Languages	English, Afrikaans

KEY QUALIFICATIONS

Lucille has 12 years' experience in the Environmental Management field. Lucille has undertaken a number of Environmental Impact Assessments (i.e. Basic Assessments; Scoping and EIA) under the EIA Regulations of 2006 and 2010. Her roles have included being the Environmental Assessment Practitioner (EAP), Assistant EAP, Project Manager and Environmental Scientist for EIA related projects. Her responsibilities have included undertaking environmental assessments, compilation of regulated EIA's (i.e. scoping reports, EIA reports, Basic assessments and EMPs) and incorporating specialists into the EIA team for any required specialist studies. Lucille has also undertaken and been involved with the regulated public participation process required for EIAs.

Her experience in compiling environmental management plans relate to construction, maintenance operations and wildlife management. Lucille has been involved in environmental compliance monitoring and auditing (environmental control officer) on a number of construction sites and borrow pits. She has also gained experience in GIS mapping.

Lucille has also been involved in waste studies and sustainable development projects, for example green procurement, elimination of illegal dumping strategies and water conservation and demand management plan.

EDUCATION

Qualification	Institution	Year
BSc (Hons) (Environmental Monitoring and Modelling)	UNISA	2008
BSc (Environmental Management)	UNISA	2005
BA (Hons) (Criminology)	University of Pretoria	1998
BA	University of Pretoria	1997

COURSES & CONFERENCES

Course / Conference	Date
Management Training Session – Nelson Mandela Metropolitan University: Business School	2006
The Environment And the Project Cycle	March 2008
Technical and Business Report Writing	March 2009
Institute of Waste Management South Africa – Eastern Cape Mini Conference	August 2009
Project Management, Incl. MS Projects	March 2010
Legal Workshop on the Key Implications of the National Environmental Management: Integrated Coastal Management Act	April 2010
Environmental Awareness and Legal Liability for Management	May 2010
Green Star SA Accredited Professional Course	September 2011
WASTECON	October 2012
Contaminated Land Workshop	February 2013
Water Law in South Africa Workshop	August 2013
Institute of Waste Management of Southern Africa – Eastern Cape Conference: The Green Revolution	September 2013
National Wetlands Indaba	October 2013
IWRM, the NWA, and Water Use Authorisations, focusing on Water Use License Applications – Procedures, Guidelines, IWWMP's and Monitoring, Carin Bosman Sustainable Solutions	September 2014

PROFESSIONAL MEMBERSHIP / REGISTRATION

Institution Name	Membership	Year Joined
International Association of Impact Assessments (South Africa)	Member (No. 2668)	2010

EMPLOYMENT RECORD
August 2013 – Present: CEN IEM Unit

On 1 August 2013, Lucille joined the CEN Integrated Environmental Management Unit as **Senior Environmental Scientist**. Her responsibilities include:

- Project management,
- Environmental Impact Assessments (basic assessment, scoping and EIA and associated public participation),
- Co-ordinating and assessing specialist studies,
- Environmental Management Plans/Programmes,
- Environmental Compliance Monitoring,
- GIS mapping.

July 2007 – July 2013: BKS (Pty) Ltd / AECOM SA (Pty) Ltd

On 1 October 2012 Lucille was appointed as a **Senior Environmental Scientist** for the Infrastructure and Management Sector of BKS in Port Elizabeth after BKS and its subsidiaries rebranded on 1 November 2012 to become AECOM SA (Pty) Ltd. Her responsibilities included:

- Project management, including financial management on projects,
- Environmental Impact Assessments (basic assessment, scoping and EIA and associated public participation),
- Co-ordinating and assessing specialist studies,
- Environmental Management Plans/Programmes,
- Environmental Compliance Monitoring,
- Waste and Sustainability Strategies,
- Business development focusing within the Eastern Cape, KwaZulu Natal.
- GIS mapping.

In 2009, Lucille was promoted to **Senior Environmental Scientist** and was responsible for project management, environmental impact assessments (basic assessment, scoping and

EIA and associated public participation), environmental management plans, environmental compliance monitoring, waste and sustainability strategies within the Eastern Cape.

In 2007, Lucille joined BKS (Pty) Ltd as an **Environmental Scientist**. Her responsibilities included undertaking environmental impact assessments (basic assessment, scoping and EIA and associated public participation), compiling environmental management plans and undertaking environmental compliance monitoring.

August 2000 – June 2007: Shamwari Game Reserve (Mantis Collection)

Lucille was the **Wildlife / Environmental Co-Ordinator** for Shamwari Game Reserve (Mantis Collection) from November 2003 – June 2007. During this time, her responsibilities included the following:

Compiling environmental management plans for construction operations and wildlife management for reserves in South Africa, United Arab Emirates and Morocco. Undertaking environmental compliance monitoring of construction sites within game reserves. Monitoring environmental aspects (e.g. water usage) within Mantis game reserves and organising related wildlife permits.

In November 2001, Lucille transferred to the Wildlife Department as the PA to the Wildlife Director.

In 2000, Lucille joined Shamwari Game Reserve and during this time her roles included Personal Assistant to the General Manager, Switchboard Operator and Reservationist.

June 1999 – July 2000: Formax

Computer room supervisor, Data Capturer

1997: University of Pretoria

Practical Tutor, Information Science Department

EXPERIENCE RECORD – SELECTED PROJECTS

ENVIRONMENTAL IMPACT ASSESSMENTS:

- Basic Assessment for the Proposed Coega Kop Wellfield and Water Treatment Works – *NMBM*
- Basic Assessment for the Proposed Recreational Water Park in Uitenhage - *Ntlangani Group of Companies*
- Scoping and EIA for the Proposed Kei Road Water Treatment Works and Conveyance – *Aurecon*
- Basic Assessment for the Upgrading of the Emsengeni Access Road, Kirkwood – *LA Consulting Engineers*
- Basic Assessment for the Proposed Stormwater Management Infrastructure in Colchester, Nelson Mandela Bay Municipality - *NMBM*
- Basic Assessment for the Proposed Hydro Power projects in Somerset East - *Navitas*
- Basic Assessment for the Proposed Alexandria Community Health Centre - *Archworxs*
- Scoping & Environmental Impact Assessment for the Kei Road Water Conveyance (pipeline and water treatment works) - *Aurecon*
- Basic Assessment for the St Francis Stormwater Upgrade - *Aurecon*
- Basic Assessment for the Patensie Prison WasteWater Treatment Works - *Aurecon*
- Basic Assessment for the Proposed SACE Ranger PV Plant, Uitenhage – *SACE*.
- Basic Assessment of the Proposed Clearing of Vegetation for Fence Construction at SAPS Training Institute, Addo, Sundays River Valley Municipality – *Engineering Advice & Services*.
- Basic Assessment for Construction and Operation of a Filling Station with Rest and Retail Facilities, an Agri-Business Retail / Wholesale Facility adjacent to the Nanaga Farm Stall on the Remainder of Portion 8 Nanaga Hoogte No 229, Sundays River Valley Municipality – *Pantheon Trust*

- Scoping and EIA, and Water Use Licence Application for the Proposed Malabar Phase 2 Extension 6 Housing Development - *NMBM*
- Basic Assessment and Water Use Licence Applications for Proposed Gqunu Village Bridge Crossing and Road Upgrades - *Department of Land Reform and Rural Development*.
- Scoping and Environmental Impact Assessment (Environmental Authorisation and Waste Management Licence) for a proposed private GLB+ Waste Disposal Facilities in Springs– *Vereeniging Refractories*

ENVIRONMENTAL MANAGEMENT PROGRAMMES:

- Coastal Management Programme for the Nelson Mandela Bay Municipality
- Environmental Management Programme for Existing Gravel Borrow Pits for Routine Road Maintenance - *EC Department of Roads & Public Works*
- Environmental Management Plan: Port Elizabeth Airport Storm Water – *ACSA*
- Borrow Pit / Quarry Authorisation Application: Elandsdrift Dam - *Department of Water Affairs*

ENVIRONMENTAL COMPLIANCE MONITORING:

- Environmental Control Officer: Construction of the Kuyga Rising Main – *Hatch Goba*
- Environmental Control Officer: Upgrading of Access Roads in Moses Mabida, Kirkwood – *LA Consulting Engineers*
- Environmental Control Officer: Upgrading of Stormwater Infrastructure in Summerstrand – *Hatch Goba*
- Environmental Control Officer: Upgrading of Roads and Stormwater in Nomathamsanqa, Addo – *LA Consulting Engineers*
- Environmental Control Officer: Fonteins Hoek Quarry For The Upgrading Of The Elandsdrift Barrage - *Department of Water Affairs*
- Environmental Control Officer: Rehabilitation of the Churchill Pipeline at the Van Stadens River Mouth, Phase 2 - *Nelson Mandela Bay Municipality*
- Environmental Control Officer: Construction of Recreational Facilities for Van Der Kemp's Kloof Nature Reserve - *Nelson Mandela Bay Municipality*
- Environmental Control Officer: Upgrading of Gravel Roads and Stormwater in Cluster E – *Letsunyane Associates*
- Performance Assessment of 9 Borrow Pits in the Kouga Local Municipality - *Cacadu District Municipality*

SUSTAINABILITY PROJECTS:

- Environmental Screening Assessment for Portion 62 of Ongegunde Vryheid No 746, St Francis – *Aurecon*
- Water Conservation and Demand Management Plan for the Dube TradePort, including King Shaka International Airport – *Dube TradePort*
- Environmental Management System for the Nelson Mandela Bay Municipality 2010 Multi-Purpose Stadium – *Nelson Mandela Bay Municipality*
- Strategy for the Elimination of Illegal Dumping and Maintenance of Municipal Land - *Nelson Mandela Bay Municipality*
- Green Procurement Plan for the Nelson Mandela Bay Municipality - *Nelson Mandela Bay Municipality*
- Helenvale Waste Study - *Cabitech Project Managers*

Michael Cohen

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Facsimile: 086 504 2549
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Date of Birth:

18 January 1945

Nationality:

South African

Languages:

English (mother tongue), Afrikaans (good)

Qualifications:

B.Sc. (Zoology, Psychology. Wits. RSA).
B.Sc. (Hons) (Wildlife Management. U Pretoria).
M.Ag. (Wildlife and Fisheries Ecology: Texas A&M). (1973)
D.Sc. (Wildlife Management. U Pretoria). (1988)

Institutions:

South African Council of Natural Scientists (SACNAS)
Professional Member - Institute of Ecologists and Environmental Scientists

Member - International Association for Impact Assessment - South African Chapter

Member of IUCN Commission on National Parks and Protected Areas. (CNPPA) (1994 -1996)

Member of IUCN World Commission on Protected Areas (1997 – current)

Honorary Member of the Institute of Environment and Recreation Management of Africa 1995

Appointed to the Board of the Institute of Ecologists and Environmental Scientists - April 1997-May 2000

Referee to environmental assessment practitioners applying to the Interim Certification Board for Environmental Assessment Practitioners (ICB) for professional certification (2001 - present)

Appointed to the Council of the Provincial Heritage Resource Authority. Ministry of Sport, Arts and Culture. Province of the Eastern Cape 2003 (Resigned)

Professional History:

May 1996 – Present

Environmental Consultant: CEN Integrated Environmental Management Unit

July 1995 - May 1996

Director: Eastern Cape Nature Conservation. Ministry of Economic Affairs, Environment and Tourism. Left to start own consultancy business

January 1993 - June 1995

Regional Director: Cape Nature Conservation. Eastern Cape Region

October 1985 - December 1992

Deputy Director: Environment. Chief Directorate: Environmental Conservation
Directorate: Environmental Management Department of Environment Affairs

July 1983 - September 1985

Assistant Director: Environment Chief Directorate: Environmental Conservation
Department of Environment Affairs

March 1981 - July 1983

Chief Professional Officer Chief Directorate: Environmental Conservation Department of
Environment Affairs

June 1978 - February 1981

Regional Ecologist: Transvaal Nature Conservation Division: Eastern Region (TPA)

August 1976 - May 1978

Officer-in-Charge. Suikerbosrand Nature Reserve Transvaal Nature Conservation
Division (TPA)

1972 - July 1976

Research Assistant Eugene Marais Chair of Wildlife Management University of Pretoria

Specialist Courses:

- ✿ 1993 Completed the certificate course in Public Management at the University of Pretoria. The certificate was awarded Cum Laude
- ✿ 1989 Completed course in Practical Techniques in Environmental Impact Assessment conducted by the Environmental Evaluation Unit at the Graduate School of Business, University of Cape Town
- ✿ 1973 Completed the International Seminar on the Administration of National Parks and Equivalent Reserves held in the United States, Canada and Mexico
- ✿ 1973 Completed short course in Tropical Ecology while at Texas A & M University

International Experience:

- ✿ Nominated as a member of an international team to evaluate the professional

activities of the Nature and National Parks Protection Authority of Israel
(Evaluation was to be conducted during November 2000)

- ✿ 1994 - Represent South Africa as Scientific Councillor on the Convention on Migratory Species - Nairobi, Kenya
- ✿ 1994 - Alternate delegate for South Africa at the Conference of the Parties of the Convention on Migratory Species - Nairobi, Kenya
- ✿ 1994 -Member of the negotiations team for the African Eurasian Waterfowl Agreement - Nairobi, Kenya
- ✿ 1993 -Represent South Africa as Scientific Councillor on the Convention on Migratory Species - Bonn, Germany
- ✿ 1992 -Visit to Israel to hold preliminary discussions on a bilateral agreement on Nature and Environmental Conservation
- ✿ 1992 -Participate in the IV World Congress on National Parks and Protected Areas - Caracas - Venezuela - Present two papers at the Congress and participate in numerous working groups on a wide range of protected area issues
- ✿ 1991 - 1995 South African Representative on the Scientific Council for the Convention on Migratory Species
- ✿ 1990 -Visit to England and Israel (met with a variety of nature and environmental conservation organisations) for discussion on joint projects and for discussions on national and regional protected area systems plans
- ✿ 1989 -Member of South African delegation to the XV Antarctic Treaty meeting, Paris
- ✿ 1988 -Delegate to the 17th IUCN General Assembly - Costa Rica
- ✿ 1986 -Seminar on Environmental Education - Israel

Specialisation in Firm:

Integrated Environmental Management, Environmental Impact Assessment, Rural Development, Natural Resource Planning and Management

Recent Experience:

Environmental Impact Assessment:

2006 – To Present - Selected Projects

- ✿ Scoping Exercise for a Proposed Pilot Aquaculture Operation for the Grow-Out of *Penaeus vannamei* Prawn Larvae For Commercial Purposes Within the Coega Industrial Development Zone at Port Elizabeth Eastern Cape Province Ballastrada Trade and Investments (Pty) Ltd, Trading as SeaArk Africa
- ✿ Environmental Management Plan for a Pilot Aquaculture Operation for the Grow-Out of *Litopenaeus vannamei* Prawn Larvae For Commercial Purposes, Coega Industrial Development Zone at Port Elizabeth, Eastern Cape Province
- ✿ Environmental Assessment for a Proposed Interpretive Centre, Day Visitor Site and Boardwalk Trail in the, Baviaanskloof Mega-Reserve Wilderness Foundation
- ✿ Environmental Assessment for a Proposed Residential Development, Remainder of Erf 328 Kabeljous River Jeffrey's Bay
- ✿ Environmental Assessment for the Augmentation of the Jeffrey's Bay Bulk Water Supply System (Pump Station, Supply Mains from Churchill Supply Mains and 5 MI Reservoir)
- ✿ Environmental Assessment for the Proposed Augmentation of the Jeffrey's Bay Main Electrical Substation
- ✿ Environmental Assessment for a Proposed Residential Development, Remainder of Farm Noorsekloof 327, Jeffrey's Bay
- ✿ Environmental Assessment for the Proposed Rezoning and Subdivision of Portion of Portion 8 of the Farm Kabeljous River No. 321, Jeffrey's Bay

- ✿ Sensitivity Assessment for the Subdivision of Portion 1 (Remaining Extent) of the Farm Klein Buffelsfontein No 477/1
- ✿ Environmental Assessment for a Proposed Resort Development, Portion 84 of the Farm De Stades No. 485, Beachview
- ✿ Environmental Assessment for the Rezoning and Subdivision of the Remainder of the Farm Boschkloof No. 896, Division of Humansdorp
- ✿ Environmental Assessment for the Rezoning of Portion B of the Remainder of Farm 428 to “Special Zone Nursery”
- ✿ Environmental Management Programme Report for a Proposed Sand, Clay and Calcrete Mining Operation in the Coega Valley on Portions 1 and 4 of the Farm Welbedachtsfontein, 300, Port Elizabeth
- ✿ Environmental Assessment for Subdivision and Rezoning of Erf 483 Bushman’s River for Residential Development
- ✿ Environmental Assessment for the Rezoning of Farms 328/1, 328/2 and Farm 779, Jeffrey’s Bay, Kabeljous-on-Sea

2001 – 2004 Selected Projects

- ✿ Environmental Assessment for the Extension of the Tsitsikamma Golf Estate.
- ✿ Environmental Assessment for a Residential Development in Jeffrey’s Bay.
- ✿ Environmental Assessment for a Township Development in Jeffrey’s Bay
- ✿ Environmental Assessment for Luxury Lodges and a Tent camp on the Mkambati Nature Reserve
- ✿ Environmental Assessment for a Boat Launch Facility at Gwe-Gwe, Mkambati Nature Reserve
- ✿ Environmental Assessment for a Boat Launch Facility at Kings Beach Port Elizabeth
- ✿ Environmental Assessment for the Port Elizabeth Golf Course Estate

- ✿ Environmental Assessment for a Resort Development on the Kromme River
- ✿ Environmental Assessment for the Establishment of a Presidential Suite at the Eagles Cragg Lodge, Shamwari Game Reserve
- ✿ Environmental Assessment for the Establishment of a Golfing Estate at the Port Elizabeth Golf Club
- ✿ Environmental Assessment for the Eskom Tsitsikamma 66kV powerline
- ✿ Environmental Assessment for three resorts in the Zuurrberg Area
- ✿ Environmental Assessment for a Satellite Resort on the Gorah Concession Area, Addo Elephant National Park
- ✿ Environmental Assessment for the Alicedale Golf Resort Development
- ✿ Environmental Assessment for three lodges on the Lalibella Game Reserve
- ✿ Environmental Assessment for the closure of the Marina Martinique Small Boat Harbour
- ✿ Environmental Assessments for two caravan parks on the Gamtoos River
- ✿ Environmental Assessment for the upgrading of the Road from Flagstaff to Holy Cross
- ✿ Biophysical Environmental Assessment on the proposed ESKOM Power line to feed the Aluminium Smelter at Coega
- ✿ Environmental Assessment of the Bayethe Game Reserve
- ✿ Environmental Assessment of Eagles Cragg Game Lodge – Shamwari Game Reserve
- ✿ Environmental Impact Assessment on the Sanderlings Coastal Wetland Resort
- ✿ Scoping Report for boat mooring facilities on the Kromme River to serve a residential resort

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