PROPOSED WESLEY-PEDDIE 132KV POWER LINE FOR THE AUTHORISED UNCEDO LWETHU WIND ENERGY FACILITY, EASTERN CAPE PROVINCE

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

Submitted as part of the Final Basic Assessment Report

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PROJECT DETAILS

DEA Reference No.	:	14/12/16/3/3/1/1149
Title	:	Environmental Impact Assessment Process Environmental Management Programme: Proposed Wesley – Peddie 132kV power line for the authorised Uncedo Lwethu Wind Energy Facility
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DEFINITIONS AND TERMINOLOGY

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

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

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

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

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

Cumulative impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

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

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

Drainage line: A drainage line is a lower category or order of watercourse that does not have a clearly defined bed or bank. It carries water only during or immediately after periods of heavy rainfall i.e. non-perennial and riparian vegetation may or may not be present.

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

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

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

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

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

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

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

Environmental impact assessment: Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

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

Environmental management plan/ programme: An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

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

Hazardous waste: Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment (Van der Linde and Feris, 2010;pg 185).

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act of 2000).

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

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

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

National integrated resource plan: Commissioned by NERSA in response to the National Energy Policy's objective relating to affordable energy services, in order to provide a long-term, cost-effective resource plan for meeting electricity demand, which is consistent with reliable electricity supply and environmental, social, and economic policies.

Perennial and non-perennial: Perennial systems contain flowing or standing water for all or a large proportion of any given year, while non-perennial systems

are episodic or ephemeral and thus contain flows for short periods, such as a few hours or days in the case of drainage lines.

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

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

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

Riparian: the area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as riparian wetlands. However, some riparian areas are not wetlands (e.g. an area where alluvium is periodically deposited by a stream during floods but which is well drained).

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

Waste: Any substance, whether or not that substance can be reduced re-used, recycled and recovered; that is surplus, unwanted, rejected, discarded, abandoned or disposed of which the generator has no further use for the purposes of production. Any product which must be treated and disposed of, that is identified as waste by the minister of Environmental affairs (by notice in the Gazette) and includes waste generated by the mining, medical or other sectors, but: A by-product is not considered waste, and portion of waste, once re-used, recycled and recovered, ceases to be waste (Van der Linde and Feris, 2010; pg 186).

Wetland: land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (Water Act 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface (Cowardin et al., 1979).

Water course: as per the National Water Act means -
(a) a river or spring;
(b) a natural channel in which water flows regularly or intermittently;
(c) a wetland, lake or dam into which, or from which, water flows; and
(d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

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Appendices:

PROJECT DETAILS *CHAPTER 1*

Just Energy (Pty) Ltd was issued an environmental authorisation for the community based wind energy facility located on a site 5 km north-east of Wesley. The authorised project is phase 2 of the Riverbank Wind energy facility and it is referred to as Uncedo Lwethu Wind Energy Facility (DEA Ref no 12/12/20/1836/2). Through detailed feasibility studied it was determined that an alternative grid connection is required to connect the Uncedo Lwethu to the existing Eskom Peddie Substation, which is located approximately 30km north west of the authorised wind farm.

Just Energy is now proposing the construction of a 132kV overhead power line (approximately 30km in length) to connect the Uncedo Lwethu Wind Energy Facility to the Eskom Peddie Substation located within the Ngqushwa Local Municipality within the Eastern Cape Province. A new application for environmental authorisation has therefore been submitted and accepted on April 2014 by the DEA (DEA Ref No: 14/12/16/3/3/1/1174) and pertains to the following infrastructure that triggers a Basic Assessment Process. The proposed development entails the following:

» The construction of the 132kV overhead power line; and
» Access roads for the construction of the power line.

Based on a pre-feasibility analysis undertaken by Arup and Thabile Engineering for Just Energy (dated July 2014, refer to Appendix J3), power line route alternatives were considered for the proposed project. The following technical considerations were taken into account:

- Future Development and obtaining current development plans from local municipality
- Land-use (agriculture /industrial) for present and future
- Technical crossings (road/rail/power lines/pipelines)
- Length of power line route which would be required to be constructed and number of bend points of the line
- Access roads for the construction of the power line.
- Number of properties to be traversed by each alternative (and the number of landowners with which negotiations would be required for a servitude)
- Cost versus benefit analysis for each option

Two alternatives were provided for further assessment through the Basic Assessment (refer to Figure 1). A corridor of 300m was assessed for the proposed power line route, within which the final servitude would be placed to avoid environmental sensitivities.

» **Alternative 1 (preferred alternative):** The power line corridor starts on the farm Sandflat 149, within the authorised wind energy facility site, which is located approximately 5km north east of Wesley. From here it runs north for ~ 4.8km before it turns north west near the small settlement of Tuwa and crosses the R72 towards KwaNdaba. The area is characterised by dense ground cover. From the R72 to Kwandaba the route traverses ploughed fields. The corridor includes at least two old homesteads to the north of KwaNdaba. From KwaNdaba, the route runs in a north-westerly direction towards Wooldridge over a series of hills and through the Gqutywa River valley. This section is characterised by dense thicket vegetation. Near Kwahoyi the route turns in a westerly direction and follows the gravel road along a ridge towards Wooldridge, passing small settlements adjacent to the gravel road. The corridor descends down into Birha River valley, and continuesin a north westerly direction following the gravel road to the top of the plateau. Here the route departs from the gravel road towards the northern end of Feni where it turn sharply to the south west and continues between settlements and the Nkwekazi dam. The hill slopes are disturbed by soil erosion, borrow pits and contoured ploughed fields. From Feni the route turns north west again towards the Peddie Substation and crosses the R345 and N2. The power line runs parallel to the existing 66kV line for approximately 6.5 km up to the Peddie Substation. This alternative was identified as the preferred alternative because of its shortest distance transversing the most sensitive habitats present within the study area. In addition, the route is close to existing roads and power line servitudes.

» **Alternative 2:** This alternative corridor starts on the farm Sandflat 149 which is located approximately 5km north east of Wesley. From here it runs north for about 4.8km before it turns north west near the small settlement of Tuwa and crosses the R72 towards KwaNdaba. At this point, the corridor diverges from Alternative 1 and runs in a westerly direction towards the south of Tuku. The route runs in a north-westerly direction through a series of high hills and the Gqutywa River valley. This section is characterised by dense thicket vegetation. This section of the route is 20km long and traverses multiple farms and the Birha River. The corridor rejoins the common alignment with Alternative 1 at the top of the plateau. Here the route departs from the gravel road towards the northern end of Feni where it turn sharply to the south west and continues between settlements and the Nkwekazi dam. The

hill slopes are disturbed by soil erosion, borrow pits and contoured ploughed fields. From Feni the route turns north west again towards the Peddie Substation and crosses the R345 and N2. The power line runs parallel to the existing 66kV line for approximately 6.5 km up to the Peddie Substation. This route traverses areas characterised by natural dense vegetation

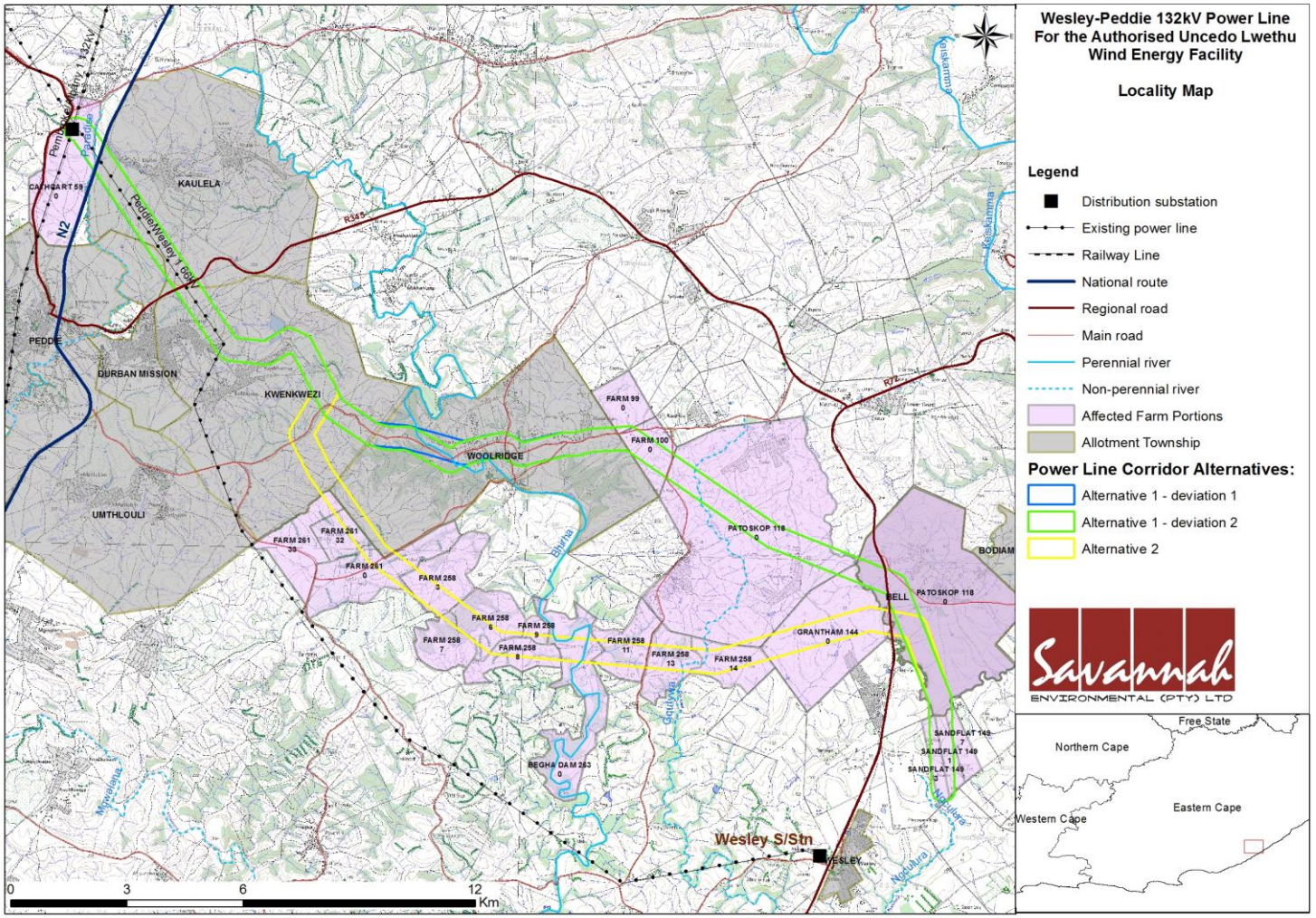


Figure 1: Locality map showing the power corridor for the Uncedo Lwethu Wind Energy Facility. Refer to Appendix A fro size A3 map

1.1. Potential impacts

The following conclusion regarding the proposed power line has been made:

» **Ecology:** The development of the power line will result in vegetation loss and disturbances to fauna. The high biodiversity and presence of many unique species, and the numerous many drainage lines and high biodiversity contribute to the CBA (Critical Biodiversity Area) status of large parts of the study area. The impact on ecology is expected to be of **high significance** in sensitive areas. It is expected that many of the impacts can be further reduced to **low significance** with effective management of power line site. For the plant species of special concern, it is recommended that these species are identified within the development footprint and rescued before construction commences.

» **Avifauna:** The proposed site has drainage lines which serve as flight paths for numerous bird species, as well as ridges where raptors often hunt, making use of updrafts. The most sensitive section is in the central region, where natural vegetation is fairly intact and other environmental factors and the landscape culminate in a high bird diversity and density. Given the wide ranging species likely to be affected, impacts could occur almost anywhere along the alignment. The proposed power line will possibly affect populations of bird species in terms of collision and electrocution mortality risk, unless commitment is made to mitigating these effects. Therefore, if no mitigation is implemented, the impacts on birds as a result of the 132kV power line may have a **medium significance**. With the implementation of mitigation measures, this impact can be reduced to one of **low significance.** Responsible implementation of the required mitigation measures should therefore reduce impacts to sustainable levels.

» **Heritage:** Apart from a few occasional weathered Middle Stone Age stone tools observed along the power line route no other archaeological sites/materials of any significance were observed. However, it is possible that sites/materials are covered by soil and vegetation and may only be exposed during the construction of the power line. The power line corridor traverses historic farmer homestead sites, a graveyard and graves. These sensitive areas that were identified must be considered in the planning of the final layout. Although direct impacts on marked graves and graveyards are not expected, buffer zones must be implemented to prevent any possible damage to them during construction workIn general, the proposed power line is of **low** archaeological significance.

Social and land use: The power line will have a positive impact through the creation of employment and transfer of skills to the local people. It is not expected that the proposed infrastructure will significantly alter the outcome of the potential visual impacts associated with the Uncedo Lwethu Wind Farm and

existing power lines. The potential visual impacts associated with the proposed power line should not alter/influence the outcome of the project decision-making. Visual impacts of the power line will be of a **low significance**

A sensitivity map has been prepared from the findings of the Basic Assessment studies undertaken (refer to **Figure 2**). .

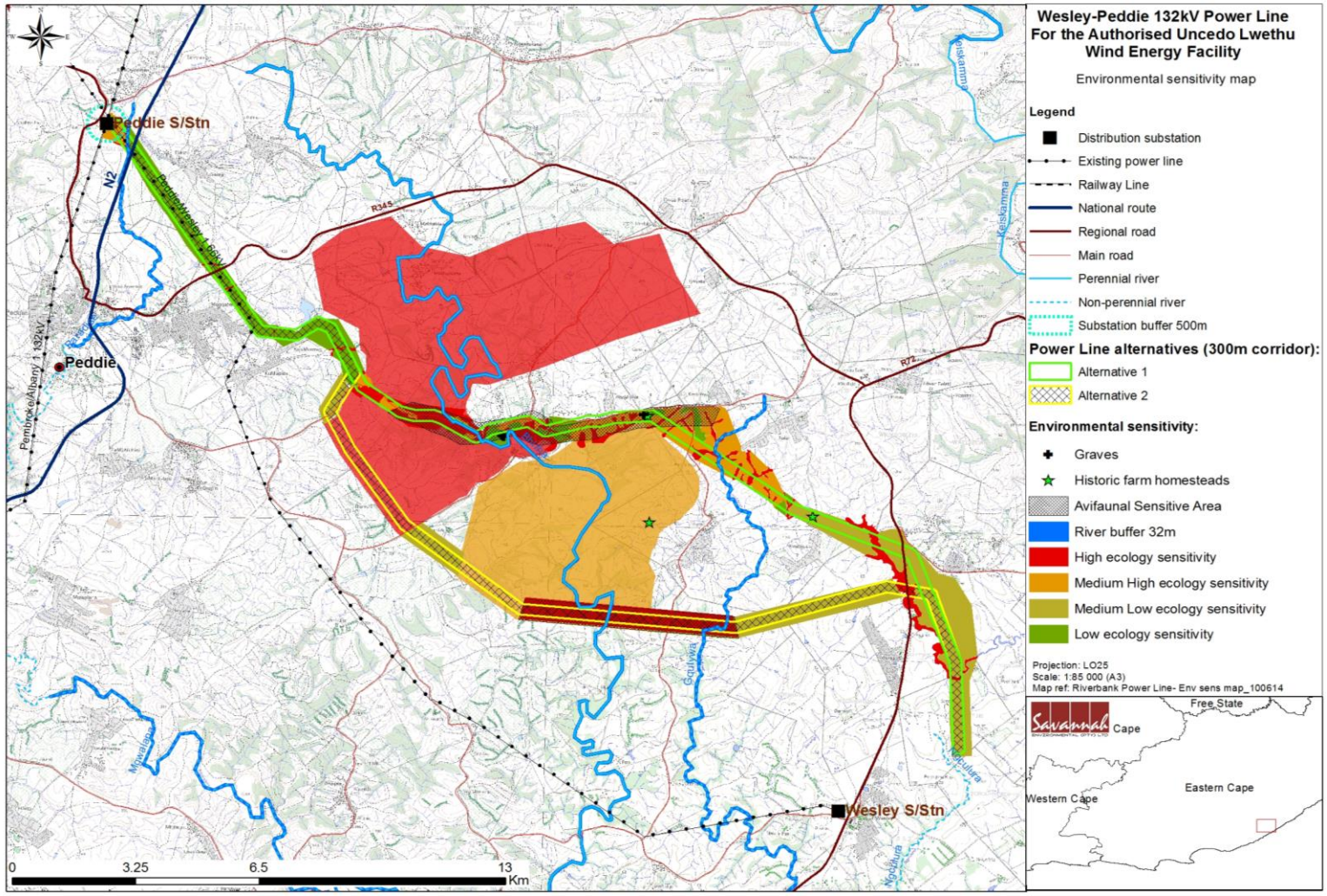


Figure 2: Map depicting the environmental sensitivity of the proposed corridor alternatives. Refer to Appendix A for A3 size maps

1.2. Activities and Components associated with the Construction of Power Line

The table below illustrates activities undertaken during the construction, operation and decommissioning phases of the proposed power line

Activities Associated with the Construction Phase:

Activity	Description
Pre-construction surveys	Prior to initiating construction, a number of detailed surveys will be required including, but not limited to: » *Geotechnical survey* – the geology and topography of the study area will be confirmed. The geotechnical study will look at flood potential, foundation conditions, potential for excavations, and the availability of natural construction materials. This study will serve to inform the type of foundations required to be built and the extent of earthworks and compaction required in the establishment of any internal access roads. » *Site survey* – this will be required to finalise the design layout of the power line. The finalisation will need to be confirmed in line with the Environmental Authorisation issued for the power line.
Establishment of access roads	» The site can be accessed via R72 in Wesley and R345 in Peddie. Existing gravel roads can be used to access the power line servitude. » Access track construction (if required) would normally comprise of compacted rock-fill with a layer of higher quality surfacing stone on top. The strength and durability properties of the rock strata at the proposed site are not known at this stage; this will need to be assessed via a geotechnical study to be conducted by the project proponent. » The final layout of the access roads will be determined following the identification of site related sensitivities.
Undertake site preparation	» Site preparation activities will include clearance of vegetation at the proposed power line site. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site.
Transport of components and equipment to site	» The components for the proposed power line will be transported to site, in sections, by road. Some of the components for the power line may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)[1] by virtue of the dimensional limitations (i.e. length and weight). The typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, and compaction equipment etc.) as well as components required for the establishment of the power line. » In some instances, the dimensional requirements of the loads to be transported during the construction phase may require alterations to the existing road infrastructure (e.g. widening on corners), and protection of road-related structures (i.e. bridges, culverts, etc.) because of abnormal loading.
Establishment of Laydown Areas on Site	» Laydown and storage areas will be required for the typical construction equipment which will be required on site, and within the development footprint.
Undertake site	» Once construction is complete and all construction equipment is removed, the site must be rehabilitated where

[1] A permit will be required for the transportation of any abnormal loads on public roads.

Activity	Description
rehabilitation	practical and reasonable. On full commissioning of the power line, any access points to the site that are not required during the operational phase must be closed and prepared for rehabilitation.

Operation and Maintenance Phase:

The operational phase of the power line is expected to extend over a period of approximately 40 years with plant maintenance, depending on the energy requirements of the country. Maintenance activities will include keeping the power line operational and maintenance of access roads. The proposed power line will be operated by Eskom and will require routine maintenance work throughout this period. The site will be accessed using existing roads as far as possible as well as access roads established during the construction phase.

Activity	Description
Site operation and maintenance	» The access to the site and the internal access roads will be maintained during the operational phase.

Decommissioning Phase

The power line is expected to have a lifespan of more than 40 years (with maintenance) and the infrastructure would only be decommissioned once it has reached the end of its economic life. If economically feasible/desirable the decommissioning activities would comprise the disassembly and replacement of the individual components with more appropriate technology/ infrastructure available at that time. However, if not deemed so, then the power line would be completely decommissioned which would include the following decommissioning activities.

Activity	Description
Site preparation	Site preparation activities will include confirming the integrity of the access to the site to accommodate the required equipment (e.g. lay down areas and decommissioning camp) and the mobilisation of decommissioning equipment.
Disassemble existing components	The components would be disassembled, and reused and recycled (where possible), or disposed of in accordance with regulatory requirements.

PURPOSE AND OBJECTIVES OF THE EMPR CHAPTER 2

An Environmental Management Programme (EMPr) is defined as "an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts associated with the planning, construction, operation and decommissioning of a project are avoided or mitigated, and that the positive benefits of the projects are enhanced."[2] The objective of this EMPr is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMPr is to ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation. An effective EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project.

The EMPr provides specific environmental guidance for the construction and operation phases of a project, and is intended to manage and mitigate construction and operation activities so that unnecessary or preventable environmental impacts do not result. These impacts range from those incurred during start up (i.e. site clearing and site establishment), during the construction activities themselves (i.e. erosion, noise, dust, and visual impacts), during site rehabilitation (i.e. soil stabilisation, re-vegetation), during operation and during decommissioning (i.e. similar to construction phase activities).

This EMPr has been compiled in accordance with Section 33 of the EIA Regulations and will be further developed in terms of specific requirements listed in any authorisations or permit issued for the proposed project. The EMPr has been developed as a set of environmental specifications (i.e. principles of environmental management), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools).

This EMPr has the following objectives:

» Outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction and rehabilitation, operation, and decommissioning phases of the project in order to manage and

[2] Provincial Government Western Cape, Department of Environmental Affairs and Development Planning: *Guideline for Environmental Management Plans*. 2005

minimise the extent of potential environmental impacts associated with the power line.

» Ensure that all the phases of the project do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
» Identify entities responsible for the implementation of the measures and outline functions and responsibilities.
» Propose mechanisms and frequency for monitoring compliance, and preventing long-term or permanent environmental degradation.
» Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the BA process.

The management and mitigation measures identified within the Basic Assessment (BA) process are systematically addressed in this EMPr, and ensure the minimisation of adverse environmental impacts to an acceptable level.

Just Energy (Pty) Ltd must ensure that the implementation of the project complies with the requirements of all environmental authorisations, permits, and obligations emanating from relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMPr and through its integration into the contract documentation. Since this EMPr is part of the BA process, it is important that this document be read in conjunction with the Basic Assessment Report compiled for this project. This will contextualise the EMPr and enable a thorough understanding of its role and purpose in the integrated environmental management process. Should there be a conflict of interpretation between this EMPr and the environmental authorisation, the stipulations in the environmental authorisation shall prevail over that of the EMPr, unless otherwise agreed by the authorities in writing. Similarly, any provisions in legislation overrule any provisions or interpretations within this EMPr.

This EMPr shall be binding on all the parties involved in the construction and operational phases of the project, and shall be enforceable at all levels of contract and operational management within the project.

STRUCTURE OF THIS EMPR *CHAPTER 3*

The first two chapters provide background to the EMPr and the proposed project, while the chapters which follow consider the following:

» Key legislation applicable to the development;
» Planning and design activities;
» Construction activities;
» Operation activities; and
» Decommissioning activities.

These chapters set out the procedures necessary for the construction of the proposed power line to minimise environmental impacts and achieve environmental compliance. For each of the phases of implementation, an over-arching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The EMPr has been structured in table format in order to show the links between the goals for each phase and their associated objectives, activities/risk sources, mitigation actions, monitoring requirements and performance indicators. A specific EMPr table has been established for each environmental objective. The information provided within the EMPr table for each objective is outlined below.

OBJECTIVE: Description of the objective, which is necessary to meet the overall goals; which take into account the findings of the BA specialist studies.

Project Component/s	» List of project components affecting the objective.
Potential Impact	» Description of potential environmental impact if objective is not met.
Activity/Risk Source	» Description of activities which could affect achieving objective.
Mitigation: Target/Objective	» Description of the target and/or desired outcomes of mitigation.

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

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

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

» Planned activities change;
» Modification to or addition to environmental objectives and targets;
» Relevant legal or other requirements are changed or introduced; or
» Significant progress has been made on achieving an objective or target such that it should be re-examined to determine if it is still relevant, should be modified, etc.

3.1. Project Team

This draft EMPr was compiled by and had input from:

EMP Compilers	
Karen Jodas	Savannah Environmental
Geraldine Mogashane	Savannah Environmental
Marianne Strohbach	Savannah Environmental
Blair Zoghby	Savannah Environmental
Johannes Binneman	Eastern Cape Heritage Consultants cc

KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT CHAPTER 4

The following legislation and guidelines have informed the scope and content of this EMPr Report:

- National Environmental Management Act (Act No 107 of 1998).
- EIA Regulations, published under Chapter 5 of the NEMA (GNR R545, GNR 546 in Government Gazette 33306 of 18 June 2010).
- Guidelines published in terms of the NEMA EIA Regulations, in particular:
  - Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010).
  - Public Participation in the EIA Process (DEA, 2010).
  - Integrated Environmental Management Information Series (published by DEA)
- International guidelines, including the Equator Principles.

Several other Acts, standards, or guidelines have also informed the project process and the scope of issues addressed and assessed in the BA Report. A review of legislative requirements applicable to the proposed project is provided in Table 4.1.

Table 4.1: Relevant legislative and permitting requirements applicable to the proposed power line

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
National Legislation			
National Environmental Management Act (Act No. 107 of 1998)	» NEMA requires, inter alia, that: * Development must be socially, environmentally, and economically sustainable. * Disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied. * A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions. » EIA Regulations have been promulgated in terms of Chapter 5. Activities which may not commence without an environmental authorisation are identified within these Regulations. » In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed and reported on to the competent authority charged by NEMA with granting of the relevant	» National Department of Environmental Affairs » Eastern Cape DEDEAT	» The Final BA Report is to be submitted to the DEA for review and decision making. » The EC DEDEAT will act as the commenting authority.

	environmental authorisation. » In terms of GNR 543 of 18 June 2010, a Basic Assessment Process is required to be undertaken for the proposed project.		
National Environmental Management Act (Act No. 107 of 1998)	» A project proponent is required to consider a project holistically and to consider the cumulative effect of potential impacts. » In terms of the Duty of Care provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with a project is avoided, stopped or minimised.	» National Department of Environmental Affairs	» While no permitting or licensing requirements arise directly, the holistic consideration of the potential impacts of the proposed project has found application in the BA process. » The implementation of mitigation measures are included as part of the Draft EMP and will continue to apply throughout the life cycle of the project.
National Environmental Management: Biodiversity Act (Act No. 10 of 2004)	» In terms of the Biodiversity Act, the developer has a responsibility for: * The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations). * The application of appropriate environmental management tools to ensure integrated environmental management of activities. * Limit further loss of biodiversity and conserve endangered	» National Department of Environmental Affairs » Eastern Cape DEDEAT	» The Minister of Environmental Affairs has published a list of critically endangered, endangered, vulnerable, and protected species in GNR 151 in Government Gazette 29657 of 23 February 2007 and the regulations associated therewith in GNR 152 in GG29657 of 23 February 2007, which came into effect on 1 June 2007. Should the applicant carry out any activities that endanger the listed species then a permit will have to be applied for.

	ecosystems. » In terms of S57, a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 4. In this regard the Minister of Environmental Affairs has published a list of critically endangered, endangered, vulnerable, and protected species in GNR 151 in Government Gazette 29657 of 23 February 2007 and the regulations associated therewith in GNR 152 in GG29657 of 23 February 2007, which came into effect on 1 June 2007. » In terms of S75, (1) The control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs. (2) Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment. (3) The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to		

	prevent such species from producing offspring, forming seed, regenerating, or re-establishing itself in any manner. » In terms of GNR 152 of 23 February 2007: regulations relating to listed threatened and protected species, the relevant specialists must be employed during the EIA Phase to incorporate the legal provisions as well as the regulations associated with listed threatened and protected species (GNR 152) into specialist reports in order to identify permitting requirements. » In terms of GNR 1477 of 2009: Draft National List of Threatened Ecosystems published under S52(1)(a) of the Act provides for the listing of threatened or protected ecosystems based on national criteria. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the National Spatial Biodiversity Assessment (2011). » GNR1187 Amendment of Critically Endangered, Endangered, Vulnerable and Protected Species List published under S56(1)of the Act.		
National Environmental Management: Waste Act,	» The purpose of this Act is to reform the law regulating waste management	» National Department of Environmental Affairs	» As no waste disposal site is to be associated with the proposed project,

2008 (Act No. 59 of 2008)	in order to protect health and the environment by providing for the licensing and control of waste management activities. To set standards for waste management on the project » The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. » In terms of the regulations published in terms of this Act (GN 921 of 29 November 2013), a Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities. » Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that (a) The containers in which any waste is stored, are intact and not corroded or in any other way rendered unlit for the safe storage of waste; (b) Adequate measures are taken to prevent accidental spillage or leaking; (c) The waste cannot be blown away; (d) Nuisances such as odour, visual impacts and breeding of vectors do not arise; and (e) Pollution of the environment and	» Eastern Cape DEDEAT	no permit is required in this regard. » Waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of this Act, as detailed in the EMPr. » The volumes of waste to be generated and stored on the site during construction and operation of the power line will not require a waste license (provided these remain below the prescribed thresholds).

	harm to health are prevented.		
National Environmental Management: Air Quality Act (Act No. 39 of 2004)	» S18, S19 and S20 of the Act allow certain areas to be declared and managed as "priority areas" » Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards » The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act.	» National Department of Environmental Affairs » Eastern Cape DEDEAT	» While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction phase of the project. it is expected that there will be short term dust generation and emissions from vehicles and machinery
National Water Act (Act No. 36 of 1998)	» Under S21 of the act, water uses must be licensed unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation. » In terms of S19, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing, or recurring.	» National Department of Water Affairs » Provincial Department of Water Affairs	» A General Authorisation or a Water Use License would be required for river and/or wetland crossings.
Environment Conservation Act (Act No. 73 of 1989)	» National Noise Control Regulations (GN R154 dated 10 January 1992)	» National Department of Environmental Affairs » Local Authorities	» There is no requirement for a noise permit in terms of the legislation. » Any noisy activities carried out during the construction phase that could present an intrusion impact to the local community should be limited to 6:00am

			to 6:00pm Monday to Friday and 13:00 on Saturday (excluding public holidays). » Should these specific activities need to be undertaken outside of these times, the surrounding communities will need to be notified and appropriate approval will be obtained from the DEA and the Local Municipality.
National Heritage Resources Act (Act No. 25 of 1999)	» S38 states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including » The construction of a road, power line, pipeline, canal or other similar linear development or barrier exceeding 300 m in length; » Any development or other activity which will change the character of a site exceeding 5 000 m^2 in extent » The relevant Heritage Authority must be notified of developments such as linear developments (i.e. roads and power lines), bridges exceeding 50 m, or any development or other activity which will change the character of a site exceeding 5 000 m^2; or the re-zoning of a site exceeding 10 000 m^2 in extent. This notification must be provided in the early stages of initiating that development, and details regarding the location, nature	» South African Heritage Resources Agency » EC Provincial Heritage Resources Authority	» A permit may be required should heritage sites be unearthed on site during the construction phase.

	and extent of the proposed development must be provided. » Standalone HIAs are not required where an EIA is carried out as long as the EIA contains an adequate HIA component that fulfils the provisions of S38. In such cases only those components not addressed by the EIA should be covered by the heritage component.		
National Forests Act (Act No. 84 of 1998)	» In terms of S15(1) no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license granted by the Minister to an (applicant and subject to such period and conditions as may be stipulated". » GN 1042 provides a list of protected tree species.	» Department of Agriculture, Forestry and Fisheries	» A permit would need to be obtained for any protected trees that may be affected.
National Veld and Forest Fire Act (Act 101 of 1998)	» Provides requirements for veldfire prevention through firebreaks and required measures for fire-fighting. Chapter 4 places a duty on landowners to prepare and maintain firebreaks, and Chapter 5 places a duty on all landowners to acquire equipment and have available personnel to fight fires.	» Department of Agriculture, Forestry and Fisheries	» While no permitting or licensing requirements arise from this legislation, this act will find application during the operational phase of the project in terms of fire prevention and management.

	» In terms of S12 the applicant would be obliged to burn firebreaks to ensure that should a veldfire occur on the property, that it does not spread to adjoining land. » In terms of S13 the firebreak would need to be wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material. » In terms of S17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.		
Hazardous Substances Act (Act No. 15 of 1973)	» This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising, or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. » Group I and II: Any substance or	» Department of Health	» It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled.

	mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared to be Group I or Group II hazardous substance; » Group IV: any electronic product; » Group V: any radioactive material. » The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.		
Provincial Legislation			
Nature Conservation Ordinance (Act No. 19 of 1974)	» Article 63 prohibits the picking of certain fauna (including cutting, chopping, taking, and gathering, uprooting, damaging, or destroying). » Schedule 1 and 2 list endangered and protected animals respectively » Schedule 3 lists endangered flora and Schedule 4 lists protected flora. » Articles 26 to 47 regulate the use of wild animals.	» Eastern cape DEDEAT	» Permitting or licensing requirements may arise from this legislation for the proposed activities to be undertaken for the proposed project.

MANAGEMENT PROGRAMME: PLANNING AND DESIGN CHAPTER 5

Overall Goal: undertake the planning and design phase in a way that:

» Ensures that the design responds to the identified environmental constraints and opportunities.
» Ensures that adequate regard has been taken of any landowner and community concerns and that these are appropriately addressed through design and planning (where appropriate).
» Ensures that the best environmental options are selected for the linear components, including the access roads and power line alignments.
» Enables the construction activities to be undertaken without significant disruption to other land uses and activities in the area.

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

5.1 Objectives

OBJECTIVE: Ensure the design responds to identified environmental constraints and opportunities

In order to minimise impacts associated with the construction and operation of the power line and watercourse crossings, the following is required to be undertaken during the final design phase:

» Geotechnical survey – this will investigate flood potential, foundation conditions, potential for excavations, and the availability of natural construction materials. This study will serve to inform the type of foundations required to be constructed for the power line and watercourse crossings, and the extent of earthworks and compaction required in the establishment of the internal access roads.
» A storm-water management plan – this will detail how storm-water runoff can be managed to reduce velocities and volumes of water that could lead to erosion and potential sedimentation of drainage systems.

The implementation of the EMPr within this area will minimise and/or mitigate impacts on the environment, specifically on the ecology of the project area.

Project	» Power line

Component/s	
Potential Impact	» Soil erosion; » Impacts on ecology & birds; and » Impact on heritage sites.
Activities/Risk Sources	» Positioning of all the facilities components.
Mitigation: Target/Objective	» The design responds to the identified environmental constraints and opportunities.

Mitigation: Action/Control	Responsibility	Timeframe
Undertake pre-construction walk-through footprint investigations for protected flora and burrowing terrestrial vertebrates. The final footprint investigation (walkthrough) is aimed to fully inform the developer, responsible conservation authority (that will issue the relevant permits and authorisations), contractors and ECO about: » Protected and red data species that will be affected by the development- * indicating the red-data and protection status of each species observed (what red-data classification, which legislation). » Location of protected plant species within the footprint area – either individually mapped or approximate areas of occurrence (alternatively, for linear structures, between which structures or other markers). » Identification of the affected species by providing a representative photo record that enables ECOs and contractors to identify such plants. » How many specimens per species will be affected – relatively accurate estimate to the nearest 50, more accurate if less than 50. » Which species can be successfully relocated, which and how many will have to be destroyed. » Location and nature of any nesting sites or active burrows of vertebrate species (birds, amphibians, reptiles and mammals), mapped by GPS, that will have to be inspected and cleared/relocated prior to construction by the contractor or duly appointed person(s). » Location and nature of any alien invasive species that will have to be cleared by the contractor. » Location and nature of any other significant	Developer, carried out by Specialist	Design review phase

Mitigation: Action/Control	Responsibility	Timeframe
environmental concerns, e.g. extreme gully erosion that will need to be addressed by the contractor to prevent any unnecessary (further) degradation of the development footprint. » Location of heritage site.		
The above pre-construction footprint investigations must be used to draft the following: » A comprehensive search and rescue program for plants and possible burrowing animals. » A comprehensive alien invasive species eradication and management plan- * Basic requirements of these EMPr are listed under the Construction and operational Phase EMPr.	Developer, carried out by Specialist	Design review phase
Obtain permits for protected plant removal and relocation (if applicable) prior to commencement of any activity related to this development.	Developer, or contractor responsible for vegetation clearing	Pre-commencement
Where water course crossings are required, the engineering team must provide an effective means to minimise the potential upstream and downstream effects of sedimentation and erosion (erosion protection) as well minimise the loss of riparian vegetation (small footprint). This has been proposed by the design team in the prepared design crossings and includes energy dissipation structures such as gabions and reno mattresses.	Developer	Design
Use design-level mitigation measures recommended in respect of habitat and ecosystem intactness and prevention of species loss as detailed within the BA Report- » This includes positioning components of the development as close as possible together and in close proximity to other existing or planned developments in the area. » Strictly adhere to existing tracks/roads where ever possible to gain access to the site. » Sites for storing, mixing, and handling topsoil stockpiles (if necessary) or any introduced materials, including all machinery or processing implements, must be placed in an ecologically least sensitive area and at least 500 m from any type of wetland. Such sites must be clearly indicated in site plans and the	Developer	Prior to submission of final construction layout plan

Mitigation: Action/Control	Responsibility	Timeframe
drafting of relevant detailed method statements and/or management plans requested from the relevant contractor or environmental firm.		
Access roads and machinery turning points must be planned to minimise the impacted area, avoid the initiation of accelerated soil erosion and prevent unnecessary compaction and disturbance of topsoils, prevent obstruction or alteration of natural water flow.	Developer	Design phase
Compile a comprehensive storm water management and erosion control plan for the footprint area as part of the final design of the project- » Basic requirements of these plans are listed under the Construction and Operational Phase EMPr.	Developer and relevant specialist	Design phase
» Depending on the final layout and taking all potential impacts, fire risks and maintenance requirements into consideration, it has to be decided upon and made clear: * Permissible vegetation: maximum height, desirable density and composition. * Maintenance of this vegetation – mowing, small livestock grazing, etc. Note: due to the close proximity of rivers to the site, there should be no application of herbicides. * Permissible terrestrial fauna that could be allowed to migrate/return to the area below/between the pylons – including species that must be excluded due to potential damage to the development.	Developer, in consultation with relevant specialist	Design phase
Compile a comprehensive vegetation rehabilitation management plan.	Developer and relevant specialist	Design phase
Depending on the type of pylons selected for the development, a response and management plan must be drafted and available to deal with accidental breakages. This plan must include as a minimum: » How and where broken components and any potential harmful substances can be disposed of – it must also be indicated if any material can be recycled, and where materials must then be taken for recycling- * The above will have to be incorporated into the waste management plan to be developed for the site.	Developer and relevant waste management specialist	Design phase

Performance Indicator	» Grid connection and road alignments meet environmental objectives. » Ecosystem fragmentation is kept to a minimum. » Ecosystem functionality is retained and any degradation prevented.
Monitoring	» Ensure that the design implemented meets the objectives and mitigation measures in the BA Report through review of the design by the Project Manager, and the ECO prior to the commencement of activity.

OBJECTIVE: Ensure all environmental sensitivities and possible impacts are fully accounted for and methods in place for mitigation prior to commencement of activity

The power line cuts through vegetation of the Albany Centre of Endemism, including smaller sections of highly diverse Albany Thicket. Other vegetation crossed includes grasslands, mixed shrublands and riparian thickets. As soils are dispersive and erosion on steeper slopes wide-spread, the intactness and conservation of a dense vegetation cover is not only important to limit species and habitat loss, but also to protect soils from accelerated erosion.

The clearing of vegetation for new servitudes should thus be kept to an absolute minimum, especially in the more sensitive vegetation types

Project Component/s	» Power line; and » Access/construction roads and maintenance tracks.
Potential Impact	» Placement of the development that damages and degrades the environment unnecessarily, particularly with respect to habitat destruction, loss of indigenous flora, damage to niche habitats, establishment, and persistence of alien invasive plants, and causing accelerated erosion.
Activities/Risk Sources	» Alignment of power line; and » Alignment of access/construction roads and maintenance tracks.
Mitigation: Target/Objective	» To ensure selection of best environmental option for alignment of proposed infrastructure; and » To ensure that environmental sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	Responsibility	Timeframe
The following actions must be avoided: » All riparian vegetation around natural streams	Developer	Prior to submission of

Mitigation: Action/Control	Responsibility	Timeframe
and drainage lines- o Ensure that a buffer of at least 32 m, preferably more, is maintained around all streams and drainage lines and their riparian vegetation to maintain the species diversity and buffering capacity of these plains surrounding riparian vegetation. » Clearing of high sensitivity vegetation, especially on steep slopes- o Aim to stay as close as possible to existing roads and already disturbed servitudes where the line crosses through sensitive vegetation.		final construction layout plan
Undertake pre-construction walk-through footprint investigations for protected flora and burrowing terrestrial vertebrates: The final footprint investigation (walkthrough) is aimed to fully inform the developer, responsible conservation authority (that will issue the relevant permits and authorisations), contractors, EO and ECO about: » Protected and red data species that will be affected by the development- * indicating the red-data and protection status of each species observed (what red-data classification, which legislation). » Location of protected plant species within the footprint area – either individually mapped or approximate areas of occurrence (alternatively, for linear structures, between which structures or other markers). » Identification of the affected species by providing a representative photo record that enables ECOs and contractors to identify such plants . » How many specimens per species will be affected – relatively accurate estimate to the nearest 100, more accurate if less than 50. » Which species can be successfully relocated, which and how many will have to be destroyed. » Location and nature of any nesting sites or active burrows of vertebrate species (birds, amphibians, reptiles and mammals), mapped by GPS, that will have to be inspected and cleared/relocated prior to construction by the	Developer, carried out by Specialist	Design review phase

Mitigation: Action/Control	Responsibility	Timeframe
contractor or duly appointed person(s). » Approximate location and nature of any alien invasive species that will have to be cleared by the contractor. » Location and nature of any other significant environmental concerns, e.g. extreme gully erosion that will need to be addressed by the contractor to prevent any unnecessary (further) degradation of the development footprint. » Note: should more than 1000 specimens of any critically endangered or endangered species be affected, as risk assessment report for that species must be prepared according to Section 15 of the NEMA:BA Draft Threatened or Protected Species Regulations, Gazetted General Notice 388 of 2013.		
The above pre-construction footprint investigations will be used together with results from the ecological specialist report to draft the following: » A comprehensive search and rescue program for plants and possible burrowing animals. » A comprehensive alien invasive species eradication and management plan- * Basic requirements of these EMPs are listed under the Construction and operational Phase EMP.	Developer, carried out by Specialist	Design review phase
Obtain permits for protected plant removal and relocation prior to commencement of any activity related to this development- » As a minimum, permits will be required for the removal of protected species listed in the vegetation descriptions of the ecology report.	Developer, or contractor responsible for vegetation clearing	Pre-commence-ment
Use design-level mitigation measures recommended in respect of habitat and ecosystem intactness and prevention of species loss as detailed within the EIA Report- » Strictly adhere to existing tracks/roads where ever possible to gain access to the sites. » Sites for storing, mixing, and handling any introduced materials, including all machinery or processing implements, must be placed in an ecologically least sensitive area and at least 500 m from any type of wetland. Such sites must be clearly indicated in site plans and the drafting of relevant detailed method statements and/or	Developer	Prior to submission of final construction layout plan

Mitigation: Action/Control	Responsibility	Timeframe
management plans requested from the relevant contractor or environmental firm.		
Access roads and machinery turning points must be planned to minimise the impacted area, avoid the initiation of accelerated soil erosion and prevent unnecessary compaction and disturbance of topsoils, prevent obstruction or alteration of natural water flow.	Developer	Design phase
Compile a comprehensive erosion control plan for the footprint area as part of the final design of the project- » Basic requirements of these EMPs are listed under the Construction and Operational Phase EM.P	Developer and relevant specialist	Design phase

Performance Indicator	» Grid connection and road alignments meet environmental objectives. » All associated temporary and permanent infrastructure and access/maintenance track alignments meet environmental objectives. » Ecosystem fragmentation is kept to a minimum. » Ecosystem functionality is retained and any unjustified disturbance and degradation prevented.
Monitoring	» Ensure that the design implemented meets the objectives and mitigation measures in the BA Report through review of the design by the Project Manager, and the ECO prior to the commencement of construction.

OBJECTIVE: Minimise storm water runoff (guideline for stormwater management plan)

Management of storm water will be required during the construction and operational phases of the watercourse crossing and power line. A detailed storm water management plan is required to be compiled as part of the final design to ensure compliance with applicable regulations and to prevent off-site migration of contaminated storm water or increased soil erosion. The section below provides a guideline for the management of storm water on site and will need to be supplemented with the relevant method statements during the construction and operation phases of the power line.

Project Component/s	» Storm water management components. » Any hard engineered surfaces (i.e. access roads).

Potential Impact	» Poor storm water management and alteration of the hydrological regime (i.e. drainage lines).
Activities/Risk Sources	» Construction of the power line and access roads (i.e. placement of hard engineered surfaces).
Mitigation: Target/Objective	» Appropriate management of storm water to minimise impacts on the environment.

Mitigation: Action/Control	Responsibility	Timeframe
A Method Statement for the management of storm water which also considers the recommendations below is to be submitted to the ECO prior to the commencement of construction. This Method Statement must be approved by the Site Manager/ Site Engineer prior to implementation.	Developer	Pre-construction
Reduce the potential increase in surface flow velocities and the resultant impact on the localised drainage system through increased sedimentation.	Developer	Planning and design
Design measures for storm water management needed to allow for surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows.	Developer	Planning and design

Performance Indicator	» Appropriate storm water management measures included within the power line and watercourse crossings design. » Sound water quality and quantity management during construction and operation.
Monitoring	» Devise a suitable surface water quality monitoring plan for implementation during construction and operation.

OBJECTIVE: Search and Rescue of All Translocatable Indigenous Plants

Prior to any earthworks (including road construction) within areas of natural vegetation, a plant Search and Rescue program should be developed and implemented. Principles for the Search and Rescue program are included in **Appendix D.** The section below provides a guideline for the Search & Rescue Plan on site and will need to be supplemented with the relevant methodology depending on the final placement of infrastructure and findings of the ecological walk through survey.

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.

Potential Impact	» Substantially increased loss of natural vegetation at construction phase and waste of on-site plant resources, and lack of locally sourced material for rehabilitation of disturbed areas.
Activities/Risk Sources	» Construction related loss and damage to remaining natural vegetation as a result of heavy machinery, etc.
Mitigation: Target/Objective	» Rescue, maintenance and subsequent replanting of vegetation in development footprints within any areas of natural vegetation on site

Mitigation: Action/Control	Responsibility	Timeframe
Search and Rescue (S&R) of certain translocatable, selected succulents, shrubs and bulbs occurring in development footprints (i.e. new roads and tracks, laydown areas, and pylons positions) must take place. All such development footprints must be surveyed and pegged out as soon as possible, and then a local horticulturist with Search and Rescue experience should be appointed to undertake the S&R. All rescued species must be bagged (and cuttings taken where appropriate) and kept in the horticulturist's or a designated on-site nursery. These plants must be appropriately maintained (through watering, etc.) at this nursery to ensure viability to reuse in rehabilitation. The plants must be returned to site once all construction is completed and rehabilitation of disturbed areas is required. As far as possible, replanting should only occur in spring or early summer (August to November), once the first rains have fallen, in order to facilitate establishment. If not possible, replanted plants should be maintained on the site (through watering, etc.) until re-established.	Contractor Specialist	Prior to construction
Plants that can be considered for rescue are all bulbs and succulents, and certain shrubs.	Contractor	Prior to construction

Performance Indicator	» Horticulturist to submit list of target species to botanist for approval. » Rescue of material. » Replanting in rehabilitation areas to cover 40% of these areas within 3 months of replanting.
Monitoring	» ECO to monitor Search and Rescue. » Horticulturist to liaise with botanist. » Botanist to review rehabilitation success after 3 months of replanting of rehabilitation areas.

MANAGEMENT PROGRAMME: CONSTRUCTION CHAPTER 6

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

» Ensures that construction activities are properly managed in respect of environmental aspects and impacts.
» Enables construction activities to be undertaken without significant disruption to other land uses and activities in the area, in particular concerning noise impacts, farming practices, traffic and road use, and effects on local residents.
» Minimises the impact on the indigenous natural vegetation, and habitats of ecological value.
» Minimises impacts on fauna (including birds) in the study area.
» Minimises the impact on heritage sites should they be uncovered.
» Establishes an environmental baseline during construction activities on the site, where possible.

6.1 Institutional Arrangements: Roles and Responsibilities for the Construction Phase

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

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

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Manager; Site Manager; Safety, Health and Environment Representative; Environmental Control Officer (ECO) and Contractor for the construction phase of this project are as detailed below.

Project Manager will:

» Ensure all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these.
» Ensure that Just Energy and its Contractor(s) are made aware of all stipulations within the EMPr.
» Ensure that the EMPr is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes.
» Be fully conversant with the BA for the project, the EMPr, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation.

Site Manager (Just Energy's on-site Representative) will:

» Be fully knowledgeable with the contents of the BA and risk management.
» Be fully knowledgeable with the contents and conditions of the Environmental Authorisation (once issued).
» Be fully knowledgeable with the contents of the EMPr.
» Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.
» Have overall responsibility of the EMPr and its implementation.
» Conduct audits to ensure compliance to the EMPr.
» Ensure there is communication with the Project Manager, the ECO, and relevant discipline engineers on matters concerning the environment.
» Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site.
» Confine activities to the demarcated construction site.

Environmental Control Officer (ECO) (independent of Just Energy as well as Eskom, but could be the same resource as that used for the larger Just Energy Wind Farm) will be responsible for monitoring, reviewing, and verifying compliance by the Contractor with the environmental specification and accordingly will:

» Be fully knowledgeable with the contents within the BA.
» Be fully knowledgeable with the contents within the conditions of the Environmental Authorisation (once issued).
» Be fully knowledgeable with the contents within the EMPr.
» Be fully knowledgeable with the contents within all relevant environmental legislation, and ensure compliance with them.

» Ensure that the contents of this document are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.
» Ensure that the compliance of the EMPr is monitored through regular and comprehensive inspection of the site and surrounding areas.
» Ensure that if the EMPr conditions or specifications are not followed then appropriate measures are undertaken to address this.
» Monitoring and verification must be implemented to ensure that environmental impacts are kept to a minimum, as far as possible.
» Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
» Ensure that activities on site comply with all relevant environmental legislation.
» Ensure that a removal is ordered of any person(s) and/or equipment responsible for any contravention of the specifications of the EMPr.
» Ensure that the compilation of progress reports for submission to the Project Manager, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit.
» Ensure that there is communication with the Site Manager regarding the monitoring of the site.
» Ensure that any non-compliance or remedial measures that need to be applied are reported.
» Independently report to DEA in terms of compliance with the specifications of the EMPr and conditions of the Environmental Authorisation (once issued).

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

» Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
» A copy of the EMPr must be easily accessible to all on-site staff members.
» Employees must be familiar with the requirements of this EMPr and the environmental specifications as they apply to the construction of the power line.
» Prior to commencing any site works, all employees and sub-contractors must have attended an environmental awareness training course which must

provide staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
» Staff will be informed of environmental issues as deemed necessary by the ECO.

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

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

Roles and responsibilities should be confirmed and updated throughout the construction phase in order to ensure effective environmental management and communication between parties.

6.2 Objectives

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

OBJECTIVE: Minimise impacts related to inappropriate site establishment

The Contractor must take all reasonable measures to ensure the safety of the public in the surrounding area.

Project	» Power line; and

Component/s	» Access road.
Potential Impact	» Hazards to landowners and public; » Damage to indigenous natural vegetation, due largely to ignorance of where such areas are located; and » Loss of threatened plant species.
Activities/Risk Sources	» Open Excavations; and » Movement of construction vehicles in the area and on-site.
Mitigation: Target/Objective	» To secure the site against unauthorised entry; » To protect members of the public/landowners/residents; and » No loss of or damage to sensitive vegetation in areas outside the immediate development footprint.

Mitigation: Action/Control	Responsibility	Timeframe
Secure site, working areas and excavations in an appropriate manner, as agreed with the ECO.	Contractor	Site establishment, and duration of construction
Where necessary control access, fence, and secure area.	Contractor	Site establishment, and duration of construction
Fence and secure contractor's equipment camp.	Contractor	Site establishment
Where the public could be exposed to danger by any of the works or site activities, the contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English, Afrikaans and any other relevant local languages, all to the approval of the Site Manager.	Contractor	Site establishment and duration of construction
All unattended open excavations shall be adequately demarcated and/or fenced. Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access/haul routes.	Contractor	Site establishment and duration of construction
Establish appropriately bunded areas for storage of hazardous materials (i.e. fuel to be required during construction).	Contractor	Site establishment
All development footprints should be appropriately fenced off and clearly demarcated.	Contractor	Site establishment, and duration of construction
Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers (1 toilet per every 15 workers) at appropriate locations	Contractor	Site establishment, and duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
on site. Provide sanitary bins for female workers.		
Ablution or sanitation facilities should not be located within 100 m from a 1:100 year flood line including drainage lines.	Contractor	Site establishment, and duration of construction
Supply adequate (closable, tamper proof) waste collection bins at site where construction is being undertaken. Separate bins should be provided for general and hazardous waste. As far as possible, provision should be made for separation of waste for recycling.	Contractor	Site establishment, and duration of construction

Performance Indicator	» Site is secure and there is no unauthorised entry. » No members of the public/ landowners injured. » Appropriate and adequate waste management and sanitation facilities provided at construction site.
Monitoring	» An incident reporting system will be used to record non-conformances to the EMPr. » ECO to monitor all construction areas on a continuous basis until all construction is completed. Non-conformances will be immediately reported to the site manager.

OBJECTIVE: Appropriate management of the construction site and construction workers

It is expected that low skilled and semi-skilled positions will be filled by locals living in and around the area. This will however be dependent on the skills availability in the area. Workers not living in the area, including those required for skilled positions will be transported to site on a daily basis and will not be housed on site. However, the security team will be required on site at all times

Project Component/s	» Power line; and » Access road.
Potential Impact	» Damage to indigenous natural vegetation and sensitive areas; » Damage to and/or loss of topsoil (i.e. pollution, compaction etc.); » Impacts on the surrounding environment due to inadequate sanitation and waste removal facilities; and » Pollution/contamination of the environment.
Activities/Risk Sources	» Vegetation clearing and levelling of equipment storage area/s; » Access to and from the equipment storage area/s; » Ablution facilities; and

	» Contractors not aware of the requirements of the EMPr, leading to unnecessary impacts on the surrounding environment.
Mitigation: Target/Objective	» Limit equipment storage within demarcated designated areas; » Ensure adequate sanitation facilities and waste management practices; and » Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment.

Mitigation: Action/Control	Responsibility	Timeframe
No vehicles to refuel within drainage lines/ riparian vegetation. Refuelling must only be done at the construction camp.	Contractor	Construction
As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	Contractor	Site establishment, and during construction
Rehabilitate all disturbed areas at the construction equipment camp as soon as construction is complete within an area.	Contractor	Duration of Contract
Ensure waste removal facilities are maintained and emptied on a regular basis.	Contractor	Site establishment, and duration of construction
The terms of this EMPr and the Environmental Authorisation (if issued) must be included in all tender documentation and Contractors contracts.	Developer	Tender process
Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm. This can be achieved through the provision of appropriate environmental awareness training to all personnel. Records of all training undertaken must be kept.	Contractor	Duration of construction
Contractors must use chemical toilets/ablution facilities situated at designated areas of the site; no ablution activities will be permitted outside the designated areas. These facilities must be regularly serviced by appropriate contractors. A minimum of one toilet shall be provided per 15 persons at each working area such as the Contractor's camp.	Contractor and sub-contractor/s	Duration of contract
Cooking and eating of meals must take place in a designated area. No firewood or kindling may be gathered from the site or surrounds. No fires should be allowed on site.	Contractor and sub-contractor/s	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area. Particular attention needs to be paid to food waste.	Contractor and sub-contractor/s	Duration of contract
Fire fighting equipment and training must be provided before the construction phase commences. The project manager should liaise with the local municipality regarding cooperation with fire fighting.	Contractor and sub-contractor/s	Duration of contract
Draft Code of conduct for construction workers.	Contractor and sub-contractor/s	Pre-construction
Contractors must ensure that all workers are informed at the outset of the construction phase of the conditions contained in the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.	Contractor and sub-contractor/s	Construction
On completion of the construction phase, all construction workers must leave the site within one week of their contract ending.	Contractor and sub-contractor/s	Construction

Performance Indicator	» The construction equipment camps have avoided sensitive areas, as approved by the ECO. » Ablution and waste removal facilities are in a good working order and do not pollute the environment due to mismanagement. » All areas are rehabilitated promptly after construction in an area is complete. » Excess vegetation clearing and levelling is not reported by the ECO. » No complaints regarding contractor behaviour or habits. » Appropriate training of all staff is undertaken prior to them commencing work on the construction site. » Code of Conduct drafted before commencement of construction phase.
Monitoring	» Regular audits of the construction camps and areas of construction on site by the ECO. » Proof of disposal of sewage at an appropriate wastewater treatment works. » An incident reporting system should be used to record non-conformances to the EMPr. » Observation and supervision of Contractor practices throughout construction phase by the ECO. » Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE: Maximise local employment and business opportunities associated with the construction phase

Although limited, employment opportunities could be created during the construction phase, specifically for semi-skilled and unskilled workers, use should be made of local labour as far as possible.

Project Component/s	» Power line; and » Access roads.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business.
Activities/Risk Sources	» Contractors who make use of their own labour for unskilled tasks, thereby reducing the employment and business opportunities for locals; » The inflow of various specialists from outside the study area and even abroad; and » Sourcing of individuals with skills similar to the local labour pool outside the municipal area.
Mitigation: Target/Objective	» Employment of a maximum number of low-skilled to semi-skilled workers for the project from the local area where possible.

Mitigation: Action/Control	Responsibility	Timeframe
Construction workers should be recruited, as far as possible, from the local area in and around the Wesley and Peddie Community area (construction workers should be able to provide proof of having lived in the area for five years or longer).	Contractor	Duration of construction
Tender documentation should contain guidelines for the involvement of labour, entrepreneurs, businesses, and SMMEs from the local sector.	Contractor	Pre-construction
Develop a database of local BEE service providers and ensure that they are informed of tenders and job opportunities.	Contractor	Pre-construction and construction

Performance Indicator	» The involvement of local labour and previously disadvantaged individuals is promoted. » Labour, entrepreneurs, businesses, and SMMEs from the local sector are awarded jobs, where possible, based on requirements in the tender documentation.
Monitoring	» Developer and or appointed ECO must monitor indicators listed

	above to ensure that they have been met for the construction phase.

OBJECTIVE: Minimise impacts related to traffic management and transportation of equipment and materials to site

The construction phase of the project will be the most significant in terms of generating traffic impacts; resulting from the transport of equipment and materials and construction crews to the site and the return of the vehicles after delivery of materials.

Project Component/s	» Delivery of any component required within the construction phase.
Potential Impact	» Impact of heavy construction vehicles on road surfaces, and possible increased risk in accidents involving people and animals; » Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted; and » Deterioration of road pavement conditions (both surfaced and gravel road) due to abnormal loads.
Activities/Risk Sources	» Construction vehicle movement; » Speeding on local roads; » Degradation of local road conditions; » Site preparation and earthworks; » Foundations or plant equipment installation; » Transportation of ready-mix cement from off-site batching plant to the site; » Mobile construction equipment movement on-site; and » Power line construction activities.
Mitigation: Target/Objective	» Minimise impact of traffic on local traffic volume, existing infrastructure, property owners, animals, and road users; and » To ensure all vehicles are roadworthy and all materials/equipment are transported appropriately and within any imposed permit/licence conditions.

Mitigation: Action/Control	Responsibility	Timeframe
Appropriate dust suppression techniques must be implemented to minimise dust from gravel roads. These could include the use of water or other appropriate dust suppressants, as determined by the local site conditions.	Developer and ECO	Construction

Mitigation: Action/Control	Responsibility	Timeframe
Construction vehicles and those transporting materials and goods should be inspected by the contractor or a sub-contractor to ensure that these are in good working order and not overloaded.	Contractor	Construction
Strict vehicle safety standards should be implemented and monitored.	Contractor and ECO	Construction
All relevant permits for abnormal loads must be applied for from the relevant authority.	Contractor (or appointed transportation contractor)	Pre-construction
A designated access to the proposed site must be created to ensure safe entry and exit.	Contractor	Pre-construction
No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the contractor.	Contractor	Duration of contract
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	Contractor (or appointed transportation contractor)	Pre-construction
Any traffic delays resulting from the presence of construction traffic must be co-ordinated with the appropriate authorities.	Contractor	Duration of contract
The movement of all vehicles within the site must be on designated roadways.	Contractor	Duration of contract
Signage must be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards). Flagman should be deployed at intersections of access and major roads.	Contractor	Duration of contract
Appropriate maintenance of all vehicles of the contractor must be ensured.	Contractor	Duration of contract
An appropriate speed limit should be implemented for vehicles travelling on site in order to minimise dust generation and ensure safety of personnel and the environment.	Contractor	Duration of contract
All vehicles of the contractor travelling on public roads must adhere to the specified speed limits and all drivers must be in possession of an appropriate valid driver's license. Vehicles should be covered with tarpaulins	Contractor	Duration of contract

Performance Indicator	» Vehicles keeping to the speed limits. » Vehicles are in good working order and safety standards are implemented.

	» Local residents and road users are aware of vehicle movements and schedules. » No construction traffic related accidents are experienced. » Local road conditions and road surfaces are up to standard. » Complaints of residents are not received (e.g. concerning the speeding of heavy vehicles).
Monitoring	» Developer and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE: To avoid and or minimise the potential impact on current and future farming activities during the construction phase.

Project component/s	» Construction phase activities associated with the establishment of the power line and associated infrastructure.
Potential Impact	» The footprint of the power line corridor and associated infrastructure will result in a loss of land that will impact on farming activities on the site.
Activities/risk sources	» The footprint occupied by the power line and associated infrastructure.
Mitigation: Target/Objective	» To minimise the loss of land taken up by the power line and associated infrastructure and to enable farming activities to continue where possible, specifically grazing.

Mitigation: Action/control	Responsibility	Timeframe
Minimise the footprint of the power line and watercourse crossings and the associated infrastructure as far as possible.	Contractor and the developer	Pre-construction
Rehabilitate disturbed areas on completion of the construction phase.	Contractors	Construction

Performance Indicator	» Meeting/s held with farmers during construction phase. .
Monitoring	» ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: Management of dust and air emissions

During the construction phase, limited gaseous or particulate emissions are anticipated from exhaust emissions from construction vehicles and equipment on-site, as well as vehicle entrained dust from the movement of vehicles on the main and internal access roads.

Project Component/s	» Power line; and » Access roads
Potential Impact	» Dust and particulates from vehicle movement to and on-site, foundation excavation, road construction activities, road maintenance activities, temporary stockpiles, and vegetation clearing affecting the surrounding residents and visibility; and » Release of minor amounts of air pollutants (for example NO_2, CO and SO_2) from vehicles and construction equipment
Activities/Risk Sources	» Clearing of vegetation and topsoil; » Excavation, grading, scraping, levelling, digging, drilling; » Transport of materials, equipment, and components on internal access roads; » Re-entrainment of deposited dust by vehicle movements; » Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces; and » Fuel burning vehicle and construction engines.
Mitigation: Target/Objective	» To ensure emissions from all vehicles and construction engines are minimised, where possible, for the duration of the construction phase; and » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements for the duration of the construction phase.

Mitigation: Action/Control	Responsibility	Timeframe
Roads must be maintained in a manner that will ensure that nuisance from dust emissions from road or vehicle sources are not visibly excessive.	Contractor	Site establishment and construction
Ensure that any damage to roads because of construction activities is repaired before completion of the construction phase.	Contractor	Site establishment and construction
Appropriate dust suppressant must be applied on all exposed areas and stockpiles as required to minimise/control airborne dust. These could include the use of water or other appropriate dust suppressants, as determined by the local site conditions.	Contractor	Duration of contract
Haul vehicles moving outside the construction site carrying material that can be wind-blown must be	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
covered with tarpaulins if required by the wind conditions.		
An appropriate speed limit should be implemented for vehicles travelling on site in order to minimise dust generation and ensure safety of personnel and the environment.	Contractor	Duration of contract
Dust-generating activities or earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased during periods of high winds if excessive visible dust is blowing toward nearby residences outside the site.	Contractor	Duration of contract
Strictly control vibration pollution from compaction plant or excavation plant.	Contractor	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable once construction in an area is completed.	Contractor	Completion of construction
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Contractor	Duration of contract
All vehicles must be covered with tarpaulins	Constractors	Duration of constract

Performance Indicator	» No complaints from affected residents or community regarding dust or vehicle emissions. » Dust suppression measures implemented for all heavy vehicles that require such measures during the construction phase commences. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed. » All heavy vehicles equipped with speed monitors before they are used in the construction phase in accordance with South African vehicle legislation. » Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.
Monitoring	» Monitoring must be undertaken to ensure emissions are not exceeding the prescribed levels via the following methods: » Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » A complaints register must be maintained, in which any complaints from residents/the community will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMPr.

OBJECTIVE: Minimisation of development footprint and disturbance to topsoil

In order to minimise impacts on flora, fauna, and ecological processes, the development footprint should be limited.

Project Component/s	» Power line; and. » Access roads.
Potential Impact	» Impacts on natural vegetation; » Impacts on soil; and » Loss of topsoil.
Activity/Risk Source	» Site preparation and earthworks; » Excavation of foundations; » Construction of site access road; » Site preparation (e.g. compaction); » Power line construction activities; and » Stockpiling of topsoil, subsoil and spoil material.
Mitigation: Target/Objective	» To retain natural vegetation, where possible; » To minimise footprints of disturbance of vegetation/habitats; » Remove and store all topsoil on areas that are to be excavated; and use this topsoil in subsequent rehabilitation of disturbed areas; and » Minimise spoil material.

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary clearing.	Contractor in consultation with Specialist	Pre-construction
The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on flora and fauna and their habitats is restricted.	Contractor	Site establishment & duration of contract
Construction activities must be restricted to demarcated areas so that impact on flora and fauna is restricted.	Contractor	Site establishment & duration of contract
Any fill material required must be sourced from a commercial off-site suitable/permitted source, quarry or borrow pit. Where possible, material from foundation excavations must be used as fill on-site.	Contractor	Duration of contract
Excavated topsoil must be stockpiled in designated areas separate from base material at a maximum height and covered until replaced during rehabilitation.	Contractor	Site establishment & duration of contract
Topsoil must not be stripped or stockpiled when it is	Contractor	Site

Mitigation: Action/Control	Responsibility	Timeframe
raining or when the soil is wet as compaction will occur.		establishment Maintenance: for duration of contract
As far as possible, the maximum topsoil stockpile height must not exceed 2 m in order to preserve micro-organisms within the topsoil, which can be lost due to compaction and lack of oxygen. Stockpiles should be used within six months to ensure seeds are viable.	Contractor	Duration of contract

Performance Indicator	» Minimal disturbance outside of designated work areas. » Minimise clearing of existing vegetation. » Topsoil appropriately stored.
Monitoring	» Observation of vegetation clearing and soil management activities by ECO throughout construction phase. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE: Limit impacts on vegetation communities and species of special concern to limit the loss of biodiversity

Prior to commencement of any activity, including earthworks (grading, road construction, etc.) within areas of natural vegetation a plant Search and Rescue program should be developed and implemented, preceded by a meticulous investigation of all footprint areas by a suitably qualified botanist, conducted during the optimal growing season especially along the more diverse shrubland and thicket areas.

Project Component/s	Project components affecting the objective: » Grid connection and associated servitudes; » Access/maintenance tracks; and » Temporary construction camps.
Potential Impact	» Substantially increased loss of species of conservation concern and other natural vegetation at construction phase, waste of on-site plant resources, lack of locally sourced material for rehabilitation of disturbed areas; and » Increased cost of rehabilitation.
Activities/Risk Sources	» Construction related loss and damage to remaining natural and semi-natural vegetation.
Mitigation: Target/Objective	» Rescue, maintenance and subsequent replanting of at least all bulbous protected plant species within the specific land portion.

Mitigation: Action/Control	Responsibility	Timeframe
Ecological footprint investigation and recording by GPS of localities of all red data species and indication of presence of other species of conservation concern as described in 8.1.1 (Design Phase).	Ecologist	Prior to commencement of activity
» the following should be avoided: o cutting down trees; o loss of species of conservation concern by implementing a meticulous Search and Rescue program where especially all smaller epiphytes, geophytes and succulents, e.g. Orchids, *Haworthia* and *Bergeranthus* species, will be removed and relocated to prevent them being crushed by moving vehicles and other construction activities; o damage to natural vegetation by using	Developer, Contractor, EO, to be monitored by ECO	Prior to commencement of activity and during construction

Mitigation: Action/Control	Responsibility	Timeframe
existing roads and tracks as far as possible and aim to stay as close as possible to existing servitudes and already disturbed areas; and o accelerated erosion by avoiding clearance of vegetation on steep slopes or adjacent to drainage lines where such clearing will initiate accelerated erosion, later leading to donga erosion.		
» Search and Rescue (S&R) of all protected plants that will be affected by the development, especially species occurring in development footprints (i.e. new roads and tracks, laydown areas, and pylons positions) should take place. o The necessary permits must be in place. » Plants that can be considered for rescue and included in subsequent rehabilitation programs are all tubers, bulbs, and indigenous succulents. » All development footprints must be surveyed and pegged out as soon as possible, after which a local horticulturist with Search and Rescue experience should be appointed to undertake the S&R. » All rescued species must be transplanted immediately or bagged (or succulents left to first air-dry before planting) and kept in the horticulturist's or a designated on-site nursery, and should be returned to site or land portion once all construction is completed and rehabilitation of disturbed areas is required. » Replanting must occur in spring to early summer once sufficient rains have fallen, in order to facilitate establishment.	Horticultural Contractor, monitored and approved by ECO	Prior to construction
All excavations, etc., through sensitive areas must be excavated carefully in order to minimise damage to surrounding areas and biodiversity. » Excavations must be checked on a daily basis for the presence of trapped animals. » Any animals found must be removed in a safe manner, unharmed, and placed in an area where the animal will be comfortable. » If the ECO or contractor is unable to assist in the movement of a fauna species, ensure a member of the conservation authorities assists with the translocation.	Contractor, EO, monitored by ECO	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
» All mammal, large reptiles and avifauna species found injured during construction will be taken to a suitably qualified veterinarian or rehabilitation centre to either be put down in a humane manner or cared for until it can be released again. Note: Excavated material that needs to be discarded should be used to fill up and permanently close the old mine pits on the property.		

Performance Indicator	» Rescue of species of conservation concern . » No damage or injury to fauna. » Re-establishment of rescued species.
Monitoring	» ECO to monitor Search and Rescue, continue search and rescue operations during the construction process where it becomes necessary after the initial S&R. » It may be possible that geophytic species may emerge during construction that were not accounted for in the original S&R plan – once observed the ECO should consult the botanists on the identification and possible S&R for those plant species. The necessary permits must be obtained.

OBJECTIVE: Protection of vegetation

Some loss of vegetation is an inevitable consequence of the development and some individuals of protected or red-data listed species are also likely to be impacted. Although affected individuals of some species can be translocated, this only partially mitigates the impact as not all individuals may survive and some habitat is no longer available for use as a result of transformation or the presence of permanent infrastructure.

Project component/s	» Power line; and » Access roads.
Potential Impact	» Loss of intact vegetation; » Loss of individual s of listed species; » Erosion; and » Alien plant invasion.
Activity/risk source	» Site preparation and earthworks; » Construction-related traffic; » Foundations or plant equipment installation; » Mobile construction equipment; » Power line construction activities; and » Dumping or damage by construction equipment outside of demarcated construction areas.
Mitigation: Target/Objective	» To retain natural vegetation in the high and moderate sensitive areas on the site; » To minimise footprints of disturbance of vegetation/habitats on-site; » No loss of individuals of protected plant species; » No alien plant invasion; » Minimal soil erosion; and » Rehabilitation of disturbed areas.

Mitigation: Action/control	Responsibility	Timeframe
Demarcate important or sensitive areas as no-go areas. It is recommended that orange plastic mesh be used.	Contractor/ECO	Construction
Areas to be cleared will be clearly marked in the field to eliminate unnecessary clearing.	Contractor in consultation with Specialist	Pre-construction
The extent of clearing and disturbance to the native vegetation will be kept to a minimum so that the impact on flora is restricted.	Contractor	Site establishment & duration of contract
A site rehabilitation programme must be implemented.	Contractor in	Duration of

Mitigation: Action/control	Responsibility	Timeframe
	consultation with Specialist	contract
Monitor the site for erosion problems and identify areas where additional intervention such as additional revegetation or erosion control such as silt traps may be necessary.	Contractor/ECO	Construction
Monitor disturbed areas for the presence and establishment of alien species. » Alien species present should be cleared on a regular basis.	Contractor/ECO	Construction

Performance Indicator	» No disturbance outside of designated work areas. » Minimised clearing of existing/natural vegetation. » Limited impacts on areas of identified and demarcated sensitive habitats/vegetation.
Monitoring	» Observation of vegetation clearing activities by ECO throughout construction phase. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Minimisation of disturbance to and loss of vegetation, topsoil and ecosystem functionality

Immediately after clearing of vegetation, the soil surface must be inspected for signs of erosion and stabilised as soon as possible. After completion of construction, such erosion stabilisation should preferably be with a cover of vegetation. A perennial vegetation cover of at least 60%, preferably more, will be desirable.

The aim of the first vegetation cover is to form a protective, relatively dense indigenous layer to slow runoff, increase moisture infiltration into the soil, and gradually change the soil nutrient status in order for it to be more favourable for other desirable indigenous vegetation to become established.

The first vegetation layer must be developed further until a desirable end state, as determined during the design phase and taking the original vegetation description as guideline, is established

Project Component/s	Project components affecting the objective: » Grid connection and associated servitudes; » Access/maintenance tracks; and » Temporary construction camps.
Potential Impact	» Within the footprint, a change of plant species composition with lower productivity and agricultural potential can be expected due to removal, disturbance and continued long-term shading of vegetation; » A largely reduced vegetation cover will cause the ecosystem to be more prone to erosion and irreversible degradation; » Disturbance of indigenous vegetation creates opportunities for the establishment of invasive vegetation or creation of surfaces that do not support the permanent (re-) establishment of vegetation; » Loss of natural regeneration potential of soils; and » Loss of agricultural potential of soils.
Activity/Risk Source	» Site preparation and earthworks; » Excavation of foundations; » Creation of site access/maintenance tracks; and » Power line construction activities.
Mitigation: Target/Objective	» Recreate a non-invasive, acceptable vegetation cover that will facilitate the establishment of desirable and/or indigenous species; and » Prevent and accelerated erosion of ecosystem degradation.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Rehabilitation of surface		
Prior to the application of topsoil: » subsoil shall be shaped and trimmed to blend in with the surrounding landscape or used for erosion mitigation measures; » compacted soil shall be ripped to a depth greater than 25 cm and the trimmed by hand to prevent re-compacting the soil; » any foreign objects, concrete remnants, steel remnants or other objects introduced to the site during the construction process shall be cleared before ripping, or shaping and trimming of any landscapes to be rehabilitated takes place; ans » shaping will be to roughly round off cuts and fills and any other earthworks to stable forms, sympathetic to the natural surrounding landscapes.	Contractor, EO, monitored by ECO	During and after construction
Application of topsoil » topsoils shall be spread evenly over the ripped or	Contractor, EO, monitored by	During and after

Mitigation: Action/Control	Responsibility	Timeframe
trimmed surface, if possible not deeper than the topsoil indigenous originally removed; » the final prepared surface shall not be smooth but furrowed to follow the natural contours of the land; » the final prepared surface shall be free of any pollution or any kind of contamination; and » care shall be taken to prevent the compaction of topsoil.	ECO	construction
Soil stabilisation » Mulch, if available from shredded vegetation, shall be applied by hand to achieve a layer of uniform thickness. Mulch must be from indigenous vegetation and not alien invasive species. » Mulch shall be rotovated into the upper 20 cm layer of soil- o this operation shall not be attempted if the wind strength is such as to remove the mulch before it can be incorporated into the topsoil. » Measures shall be taken to protect all areas susceptible to erosion by installing temporary and permanent drainage work as soon as possible- o where natural water flow-paths can be identified, subsurface drains or suitable surface drains and chutes need to be installed. » Additional measures shall be taken to prevent surface water from being concentrated in streams and from scouring slopes, banks or other areas. » Runnels or erosion channels developing shall be back-filled and restored to a proper condition- o such measures shall be effected immediately before erosion develops at a large scale. » Where erosion cannot be remedied with available mulch or rocks, geojute or other geotextiles shall be used to curtail erosion.	Contractor, EO, monitored by ECO	Construction phase Operational phase, followed up until desired end state is reached
Revegetation		
» Revegetation of the final prepared area is expected to occur spontaneously to some degree where topsoils could be re-applied within 6 months. » Revegetation will be done according to an approved planting/landscaping plan according to the desirable end states and permissible vegetation.	Contractor, EO, monitored by ECO	Construction phase Operational phase, followed up until desired end state is reached

Mitigation: Action/Control	Responsibility	Timeframe
Re-seeding: » revegetation can be increased where necessary by hand- seeding indigenous species- o previously collected and stored seeds shall be sown evenly over the designated areas, and be covered by means of rakes or other hand tools; and o commercially available seed of grass species naturally occurring on site can be used as alternative. » re-seeding shall occur at the recommended time to take advantage of the growing season; and » in the absence of sufficient follow-up rains after seeds started germinating, irrigation of the new vegetation cover until it is established shall become necessary to avoid loss of this vegetative cover and the associated seedbank. Natural water bodies should not be used to for irrigation.	Contractor, EO, monitored by ECO	Construction phase Operational phase, followed up until desired end state is reached
Planting of species: » the composition of the final acceptable vegetation will be based on the vegetation descriptions of the original ecological EIA investigation, and will include rescued plant material; » geophytic plants shall be planted in groups or as features in selected areas; » during transplanting care shall be taken to limit or prevent damage to roots; and » plants should be watered immediately after transplanting to help bind soil particles to the roots (or soil-ball around rooted plants) and so facilitate the new growth and functioning of roots.	Contractor, EO, monitored by ECO	Construction phase Operational phase, followed up until desired end state is reached
Traffic on revegetated areas: » designated tracks shall be created for pedestrian of vehicle traffic where necessary; » Disturbance of vegetation and topsoil must be kept to a practical minimum, no unauthorised off road driving will be allowed; and » All livestock shall be excluded from newly revegetated areas (using fences (which can later be removed),, until vegetation is well established. » Off-road driving should only be permitted during emergencies, for example fires	Contractor, EO, monitored by ECO	Construction phase Operational phase
Establishment » The establishment and new growth of revegetated and	Contractor, EO, monitored by	Construction phase

Mitigation: Action/Control	Responsibility	Timeframe
replanted species shall be closely monitored- o Where necessary, reseeding or replanting will have to be done if no acceptable plant cover has been created.	ECO	Operational phase, followed up until desired end state is reached
Monitoring and follow-up treatments		
Monitor success of rehabilitation and revegetation and take remedial actions as needed according to the respective plan: » Erosion shall be monitored at all times and measures taken as soon as detected: and » where necessary, reseeding or replanting will have to be done if no acceptable plant cover has been created.	ECO during construction, suitable designated person / contractor after that	Construction phase Operational phase
Weeding: » It can be anticipated that invasive species and weeds will germinate on rehabilitated soils- o These need to be hand-pulled before they are fully established and/or reaching a mature stage where they can regenerate. o Where invasive shrubs re-grow, they will have to be eradicated according to the Working for Water specifications. o <u>No chemicals should be used, clearing should be by hand or mechanical methods only</u>.	Contractor, EO, monitored by ECO	Construction phase Operational phase

Performance Indicator	» No activity in identified no-go areas. » Natural configuration of habitats as part of ecosystems or cultivated land is retained or recreated, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist. » The structural integrity and diversity of natural plant associations is recreated or maintained. » Indigenous biodiversity continually improves according to the pre-determined desirable end state. o This end state, if healthy, will be dynamic and able to recover by itself after occasional natural disturbances without returning to a degraded state. » Ecosystem function of natural landscapes and their associated vegetation is improved or maintained.
Monitoring	» Fortnightly inspections of the site by ECO during construction. » An incident reporting system must record non-conformances to the

	EMP. » Quarterly inspections and monitoring of the site by the ECO or personnel designated to the rehabilitation process until 80% of the desired plant species have become established- o These inspections should be according to the monitoring protocol set out in the rehabilitation plan. » Thereafter annual inspections according to the minimal monitoring protocol.

OBJECTIVE: Limit the damage to wetlands and watercourses

The study area is situated in the Albany Thicket Biome and Albany Centre of Endemism. The high biodiversity and presence of many unique species, and the numerous many drainage lines and high biodiversity contribute to the CBA (Critical Biodiversity Area) status of large parts of the study area

Project component/s	Construction of: » Power line; and » Access roads.
Potential Impact	» Damage to the watercourse (such as erosion, siltation, dumping of waste within the wetland) that will impact on ecosystem functioning.
Activity/risk source	» Construction, environmental management.
Mitigation: Target/Objective	Target: No damage to the drainage line, wetlands and watercourses within the project area.

Mitigation: Action/control	Responsibility	Timeframe
Where possible, power line structures should be placed outside of the wetland 50 m buffer area. Where this is not possible, infrastructure and access roads must be: » Aligned with existing roads; » Should go around wetlands where possible; » Should cross watercourses perpendicularly to reduce the footprint; » Infrastructure should not be placed within drainage lines; » Disturbed areas should be rehabilitated immediately; » Stormwater and runoff should be controlled; and	Construction team, management, environmental officer.	Construction

Mitigation: Action/control	Responsibility	Timeframe
» Adequate bridges and culvert structures should be provided at the crossings.		
Where wetlands or drainage lines can't be avoided, a permit or General Authorisation from the Department of Water Affairs will need to be obtained.	Developer	Design and construction

Performance Indicator	» No disturbance outside of designated work areas. » Minimised clearing of existing/natural vegetation. » Limited impacts on areas of identified and demarcated sensitive habitats/vegetation.
Monitoring	» An Environmental control officer should monitor the habitat loss before and after construction. » The wetlands should be monitored for the presence and development of erosion features downstream of any construction on site.

OBJECTIVE: Minimise the establishment and spread of alien invasive plants

On-going alien plant monitoring and removal should be undertaken on all areas of natural vegetation on an annual basis.

Project Component/s	» Power line; and » Access roads.
Potential Impact	» Invasion of natural vegetation surrounding the site by declared weeds or invasive alien species.
Activities/Risk Sources	» Construction, environmental management.
Mitigation: Target/Objective	» There is a target of no alien plants within project control area during the construction and operation phases.

Mitigation: Action/Control	Responsibility	Timeframe
Avoid creating conditions in which alien plants may become established: » Keep disturbance of indigenous vegetation to a minimum. » Rehabilitate disturbed areas as quickly as possible. » Do not import soil from areas with alien plants.	Contractor	Construction and operation
Establish an on-going monitoring programme to detect and quantify any alien species that may become	Contractor	Construction and

Mitigation: Action/Control	Responsibility	Timeframe
established and identify the problem species (as per Conservation of Agricultural Resources Act and Biodiversity Act).		operation
Immediately control any alien plants that become established using registered control methods.	Contractor	Construction and operation

Performance Indicator	» For each alien species: number of plants and aerial cover of plants within project area and immediate surroundings.
Monitoring	» On-going monitoring of area by ECO during construction. » Annual audit of project area and immediate surroundings by qualified botanist. » If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site or per unit area), age and/or size classes of plants and aerial cover of plants. » The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area. » The environmental manager should be responsible for driving this process. » Reporting frequency depends on legal compliance framework.

OBJECTIVE: Minimise soil degradation and erosion

The soil on site may be impacted in terms of:

» Soil degradation including erosion (by wind and water) and subsequent deposition elsewhere (i.e. into the drainage lines).
» Uncontrolled run-off relating to construction activity (excessive wetting, uncontrolled discharge, etc.) will also lead to accelerated erosion and possible sedimentation of the drainage lines.
» Degradation of the natural soil profile due to excavation, stockpiling, compaction, pollution and other construction activities will affect soil forming processes and associated ecosystems. Degradation of parent rock is considered low as there are no deep excavations envisaged.

Management of erosion will be required during the construction phase of the power line and watercourse crossings. An erosion management plan is required to ensure compliance with applicable regulations and to prevent increased soil erosion and sedimentation of the downstream environment. The section below

provides a guideline for the management of erosion on site and will need to be supplemented with the principles for erosion management contained in the Erosion Management plan included in **Appendix C.**

Project Component/s	Project components affecting the objective: » Grid connection and associated servitudes; » Access/maintenance tracks; and » Temporary construction camps.
Potential Impact	» Loss of topsoil and natural resources and biological activity within the topsoil; » Loss of natural regeneration potential of soils; and » Loss of agricultural potential of soils.
Activity/Risk Source	» Rainfall and wind erosion of disturbed areas; » Excavation, stockpiling and compaction of soil; » Concentrated discharge of water from construction activity and new infrastructure; » Storm water run-off from sealed, altered or bare surfaces; » Construction equipment and vehicle movement on site; » Power line construction activities; » Roadside drainage ditches; and » Premature abandonment of follow-up monitoring and adaptive management of rehabilitation.
Mitigation: Target/Objective	» To minimise erosion of soil from site during construction; » To minimise deposition of soil into streams and drainage lines; » To minimise damage to vegetation by erosion or deposition; » To minimise damage to soil, animals and vegetation by construction activity; » No accelerated overland flow related surface erosion as a result of a loss of vegetation cover; » No reduction in the surface area of natural drainage lines and other wetland areas as a result of the establishment of infrastructure; » Minimal loss of vegetation cover due to construction related activities; » No increase in runoff into drainage lines as a result of construction of project related infrastructure; and » No increase in runoff into drainage lines as a result of road construction.

Mitigation: Action/Control	Responsibility	Timeframe
Identify and demarcate construction areas for general construction work and restrict construction activity to these areas. Prevent unnecessary destructive activity within construction areas (prevent over-excavations and unnecessary clearing).	Contractor, EO, monitored by ECO	Before and during construction
New access roads and other servitudes to be carefully	Contractor, EO,	Before and

Mitigation: Action/Control	Responsibility	Timeframe
planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement, and compaction of soil. Special attention to be given to roads and tracks that cross drainage lines and sensitive vegetation.	monitored by ECO	during construction
Rehabilitate disturbance areas as soon as construction in an area is completed as per the rehabilitation plan.	Contractor, EO, monitored by ECO	Immediately after construction, monitored during operational phase
General Erosion control measures: » Runoff control and attenuation can be achieved by using any or a combination of sand bags, logs, silt fences, storm water channels and catch-pits, shade nets, geofabrics, seeding or mulching as needed on and around cleared and disturbed areas- o Ensure that all soil surfaces are protected by vegetation or a covering to avoid the surface being eroded by wind or water. » Ensure that heavy machinery does not compact areas that are not meant to be compacted as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area. » Prevent the concentration or flow of surface water or storm water down cut or fill slopes or roads and ensure measures to prevent erosion are in place prior to construction. » Storm water and any runoff should be discharged into retention swales or areas with rock rip-rap. These areas should be grassed with indigenous vegetation. These energy dissipation structures should be placed in a manner that flows are managed prior to being discharged back into the natural water courses, thus not only preventing erosion, but also supporting the maintenance of natural base flows within these systems, i.e. hydrological regime (water quantity and quality) is maintained. » Mitigate against siltation and sedimentation of wetlands using the above mentioned structures and ensure that no structures cause erosion. » Minimise and restrict site clearing to areas required for construction purposes only and restrict	Contractor, EO, monitored by ECO	Construction, operational phase

Mitigation: Action/Control	Responsibility	Timeframe
disturbance to adjacent undisturbed natural vegetation. » Vegetation clearing should occur in parallel with the construction progress to minimise erosion and/or run-off. Bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment. » If implementing dust control measures, prevent over-wetting, saturation, and run-off that may cause erosion and sedimentation. » Water course / river crossings should not trap any run-off, thereby creating inundated areas, but allow for free flowing water.		
Control depth of excavations and stability of cut faces/sidewalls	Contractor, EO, monitored by ECO	Site establishment & duration of contract
Compile a comprehensive storm water management method statement, as part of the final design of the project and implement during construction and operation.	Contractor, EO, monitored by ECO	Site establishment & duration of contract
Where access roads cross natural drainage lines or wetlands, culverts (or other appropriate measures) must be designed to allow free flow. Regular maintenance must be carried out.	Contractor, EO, monitored by ECO	Construction phase Operational phase, monitored throughout
All vehicles on site must be appropriate to access the site. No off-road driving is permitted unless authorised by the ECO.	Contractor, EO, monitored by ECO	Pre-construction, Construction & operation
4x4's or diff lock vehicles must be used in wet slippery conditions to reduce the erosion on the roads.	Contractor, EO, monitored by ECO	Pre-construction, Construction & operation

Performance Indicator	» Minimal level of soil erosion around site. » Minimal level of increased siltation in drainage lines or pans. » Minimal level of soil degradation. » Acceptable state of excavations, as determined by EO & ECO. » Progressive return of disturbed and rehabilitated areas to the desired end state (Refer also to the Plant Rescue and Rehabilitation Plan).
Monitoring	» Fortnightly inspections of the site by ECO. » Fortnightly inspections of sediment control devices by ECO.

	» Fortnightly inspections of surroundings, including drainage lines by ECO. » Immediate reporting of ineffective sediment control systems. » An incident reporting system must record non-conformances according to the EMP.

OBJECTIVE: Protection of heritage resources

Apart from a few stone tool occurrences of mainly Middle Stone Age origin near the start of the power line route and a few occasional stone tools observed along the route, no other sites/remains of significance were observed. The main impact on the pre-colonial archaeological heritage sites/remains (if any) will be the physical disturbance of the material and its context

It was established through the heritage impacts assessment that the power line route traverses several historic farmer homestead sites, a graveyard and graves. Although direct impacts on marked graves and graveyards are not expected, buffer zones must be implemented to prevent any possible damage to them during construction work. Graves and graveyards are emotionally loaded social features and any damage during construction will create serious negative impact in the community

Project Component/s	» Power line; and » Access roads.
Potential Impact	» Heritage objects/ artefacts/ Unidentified Sites/ Burial and Grave Sites (found on site are inappropriately managed or destroyed.
Activity/Risk Source	» Site preparation and earthworks; » Foundations or plant equipment installation; » Mobile construction equipment movement on site; and » Power line and access roads construction activities.
Mitigation: Target/Objective	» To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation.

Mitigation: Action/control	Responsibility	Timeframe
Areas required to be cleared during construction must be clearly marked in the field to avoid unnecessary disturbance of adjacent areas.	Contractor in consultation with Specialist	Pre-construction
Project employees and any contract staff will maintain, at all times, a high level of awareness of the possibility of discovering heritage sites. Familiarise all staff and contractors with procedures for dealing with heritage objects/sites.	Developer/ Contractor	Duration of contract
If a heritage object is found i.e. grave/ burial site, or archaeological site, work in that area will be stopped immediately, and appropriate specialists brought in to assess to site, notify the administering authority of the item/site, and undertake due/required processes.	Developer, and Contractor in consultation with Specialist	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
Apply for sampling permits from SAHRA for work on any archaeological sites identified as needing intervention. The ECHRA should be kept informed	Developer in consultation with Specialist	Pre-construction
Placement of pylons should avoid potential sites of high archaeological sensitivity such as pans, rocky ridges and river beds.	Developer in consultation with Specialist	Pre-construction
The Method Statement, including contact details should be drafted to stipulate what procedures should be followed	Constractor	Pre-construction

Performance Indicator	» Zero disturbance outside of designated work areas. » All heritage items located are dealt with as per the legislative guidelines.
Monitoring	» Observation of excavation activities by ECO throughout construction phase. » Supervision of all clearing and earthworks. » Due care taken during earthworks and disturbance of land by all staff and any heritage objects found reported. » Appropriate permits obtained from SAHRA prior to the disturbance or destruction of heritage sites. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE: Minimisation of visual impacts associated with construction

During the construction phase heavy vehicles, components, equipment and construction crews will frequent the area and may cause, at the very least, a cumulative visual nuisance to landowners and residents in the area as well as road users. The placement of lay-down areas and temporary construction camps should be carefully considered in order to not negatively influence the future perception of the project. Secondary visual impacts associated with the construction phase, such as the sight of construction vehicles, dust and construction litter must be managed to reduce visual impacts. The use of dust-suppression techniques on the access roads (where required), timely removal of rubble and litter, and the erection of temporary screening will assist in doing this.

Project Component/s	» Power line; and » Laydown areas.
Potential Impact	» Visual impact of general construction activities; and » Potential scarring of the landscape due to vegetation clearing.
Activity/Risk	» The viewing of the above mentioned by observers on or near

Source	the site.
Mitigation: Target/Objective	» Minimal visual intrusion by construction activities and construction accommodation and intact vegetation cover outside of immediate works areas.

Mitigation: Action/Control	Responsibility	Timeframe
Reduce the construction period through careful planning and productive implementation of resources.	Developer or contractor	Planning
Plan the placement of lay-down areas in order to minimise vegetation clearing.	Developer or contractor	Planning
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	Developer or contractor	Construction
Ensure that good house-keeping practises are maintained, ensuring that rubble, litter, and disused construction materials are managed and removed regularly.	Developer or contractor	Construction
Reduce and control construction dust using approved dust suppression techniques.	Contractor	Construction
As far as possible, restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.	Contractor	Construction
Rehabilitate all disturbed areas, construction areas, roads, and servitudes to acceptable visual standards.	Contractor	Construction

Performance Indicator	» Vegetation cover on and near the site is intact with no evidence of degradation or erosion. » Construction site is kept in a neat and tidy state.
Monitoring	» Monitoring of vegetation clearing during construction. » Monitoring of rehabilitated areas post construction.

OBJECTIVE: Protection of avifauna from collision and electrocution

During the operation, the threat of collision with the power line is the biggest potential threat to avifauna, particularly sensitive, collision prone species that may occur in the study area. The threat of electrocution while perching on the power line and associated infrastructure serves as a threat to certain sensitive species, depending on the power line structures implemented.

Project Component/s	» Power line.
Potential Impact	» Collision and Electrocution events with the overhead power

	line.
Activities/Risk Sources	» Operation of the power line without appropriate mitigation measures. » Electrocution events occur when bird perches on an electrical structure and causes an electrical short circuit by bridging the gap between live components and/or live and earthed components.
Mitigation: Target/Objective	» Maintain a low number of collision, and electrocution events.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Ensure bird-friendly tower designs are implemented to minimise the risk of electrocutions.	Contractor	Construction
Identify the exact power line spans requiring marking to reduce the potential for collision.	Developer and ornithologist	Construction
Fit bird flappers to new lines in identified sensitive Areas.	Contractor	Construction
Insulate live components at support structures.	Contractor	Construction
Line to avoid areas with high bird densities or areas which attract birds.	Developer	Pre-Construction
Large form markers should be placed with sufficient regularity (at least 5-10m).	Eskom contractors Environmental control officer	Operation
Utilise the Eskom mono pole bird friendly structure which will significantly minimise the number of electrocutions on the power line.	Eskom contractor Environmental Control Officer	Construction (design) and operation

Performance Indicator	» Minimal collision or electrocution events.
Monitoring	» Observation of electrocution or collision events with the power line. » Monitor power line servitude for mortalities.

OBJECTIVE: Appropriate handling and management of waste

The main wastes expected will include general construction waste, hazardous waste (i.e. fuel), and liquid waste (including grey water and sewage).

In order to manage the wastes effectively, guidelines for the assessment, classification, and management of wastes, along with industry principles for minimising construction wastes must be implemented. A waste management plan is included as **Appendix B** of this EMPr.

Project Component/s	» Power line; and » Access roads.
Potential Impact	» Inefficient use of resources resulting in excessive waste generation; and » Litter or contamination of the site or water through poor waste management practices.
Activity/Risk Source	» Packaging; » Other construction wastes; » Hydrocarbon use and storage; and » Spoil material from excavation, earthworks, and site preparation.
Mitigation: Target/Objective	» To comply with waste management legislation; » To minimise production of waste; » To ensure appropriate waste storage and disposal; » To avoid environmental harm from waste disposal; and » A waste manifests should be developed for the ablutions showing proof of disposal of sewage at appropriate water treatment works.

Mitigation: Action/Control	Responsibility	Timeframe
Construction method and materials must be carefully considered in view of waste reduction, re-use, and recycling opportunities.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Duration of contract
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap), and contaminated waste as required. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.	Contractor	Duration of contract
Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.). The waste must be	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
kept away from scavenging animals..		
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Uncontaminated waste must be removed at least weekly for disposal; other wastes must be removed for recycling/ disposal at an appropriate frequency.	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	Contractor	Duration of contract
Waste must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
Spilled cement must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Duration of contract
Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time.	Contractor	Duration of contract
Regularly serviced chemical toilets facilities must be used to ensure appropriate control of sewage. Waste from these toilets should be disposed of at a licensed wastewater treatment works.	Contractor	Duration of contract
Upon the completion of construction, the area must be cleared of potentially polluting materials.	Contractor	Completion of construction
Dispose of all solid waste collected at an appropriately registered waste disposal site. Waste disposal shall be in accordance with all relevant legislation and under no circumstances may waste be burnt on site. Waste must not be buried on site	Contractor	Duration of construction
Where a registered waste site is not available close to the construction site, provide a method statement with regard to waste management.	Contractor	Duration of construction
Proof of appropriate disposal of all waste must be obtained from the waste contractors and kept on file.	Contractor	Duration of construction

Performance Indicator	» No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately.

	» Provision of all appropriate waste manifests for all waste streams.
Monitoring	» Observation and supervision of waste management practices throughout construction phase. » Waste collection will be monitored on a regular basis. » Waste documentation completed. » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE: Appropriate handling and storage of chemicals, hazardous substances

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

Project Component/s	» Power line; and » Access roads.
Potential Impact	» Release of contaminated water from contact with spilled chemicals; and » Generation of contaminated wastes from used chemical containers.
Activity/Risk Source	» Vehicles associated with site preparation and earthworks; » Construction activities of area and linear infrastructure; and » Hydrocarbon use and storage.
Mitigation: Target/Objective	» To ensure that the storage and handling of chemicals and hydrocarbons on construction camp does not cause pollution to the environment or harm to persons and » To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons.

Mitigation: Action/Control	Responsibility	Timeframe
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Contractor	Duration of contract
Corrective action must be undertaken immediately if a potential/actual leak or spill of a polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
as much as practically possible and implementing preventive measures.		
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents.	Contractor	Duration of contract
Spilled cement must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles must not to take place on-site (except for emergencies). If repairs of vehicles must take place, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Duration of contract
All stored fuels to be maintained within a bund and on a sealed surface.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area, over drip trays. Refuelling must be done at construction camp.	Contractor	Duration of contract
The storage of flammable and combustible liquids such as oils must be in designated areas which are appropriately bunded, and stored in compliance with Material Safety Data Sheets (MSDS) files.	Contractor	Duration of contract
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled with.	Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations	Contractor	Duration of contract
The sediment control and water quality structures used on-site must be monitored and maintained in an operational state at all times.	Contractor	Duration of contract
Upon the completion of construction, the area must be cleared of potentially polluting materials.	Contractor	Completion of construction
Waste water from chemical toilets must be taken to a waste water treatment plant for disposal.	contractor	Construction

Performance Indicator	» No chemical spills outside of designated storage areas. » No unattended water or soil contamination by spills.

	» No complaints received regarding waste on site or indiscriminate dumping.
Monitoring	» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase. » A complaints register must be maintained, in which any complaints from the community will be logged. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE: Noise control

Traffic movement to and from the site, particularly of heavy-duty vehicles during construction, could potentially result in a noise impact.

Project component/s	» Power line; and » Access roads.
Potential Impact	» Nuisance noise from construction affecting the surrounding community.
Activity/risk source	» Site preparation and earthworks; » Construction-related transport; » Foundations or plant equipment installation; and » Power line construction activities.
Mitigation: Target/Objective	» To minimise noise to any surrounding residences from the construction activities; » To comply with Noise Control Regulations and SANS Guidelines; and » To ensure noise levels are acceptable at residences in close proximity to construction activities.

Mitigation: Action/control	Responsibility	Timeframe
On-site construction activities must be limited to 6:00am to 6:00pm Monday – Friday and 1:00pm on Saturday (excluding public holidays) (in terms of the Environment Conservation Act). Should construction activities need to be undertaken outside of these times, the surrounding communities will be notified and appropriate approval will be obtained from DEAT and/or the Local Authority.	Contractor	Duration of contract
Construction noise must be managed according to the Noise Control Regulations and SANS 10103.	Contractor	Duration of contract

Mitigation: Action/control	Responsibility	Timeframe
All construction equipment, including vehicles, must be properly and appropriately maintained in order to minimise noise generation.	Contractor	Duration of contract

Performance Indicator	» No complaints received concerning noise.
Monitoring	» A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE: To avoid and or minimise the potential risk of increased veld fires during the construction phase

The increased presence of people on the site could increase the risk of veld fires, particularly in the dry season

Project Component/s	» Construction and establishment activities associated with the establishment of power line including infrastructure etc.
Potential Impact	» Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences.
Activities/Risk Sources	» The presence of construction workers and their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	» To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
Ensure that open fires on the site for cooking or heating are not allowed except in designated areas.	Developer and contractors	Duration of construction
Provide adequate firefighting equipment onsite.	Developer and contractors	Duration of construction
Provide fire-fighting training to selected construction staff.	Contractors	Duration of construction
Compensate farmers / community members at full market related replacement cost for any losses, such as livestock, damage to infrastructure etc.	Contractors	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
Join Fire Protection Agency	Developer	Pre-construction
Smoking should preferably not be permitted on site. If it is it should be at designated sites in the presence of a fire extinguisher	Developer and contractors	Duration of construction

Performance Indicator	» Conditions contained in the Construction EMPr. » Designated areas for fires identified on site at the outset of the construction phase. » Fire fighting equipment and training provided before the construction phase commences. » Compensation claims settled within 1 month of claim being verified by Community MF. .
Monitoring	» Just Energy and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: Limit damage to drainage lines

Construction within drainage lines has been minimised as far as possible. Where impacts are unavoidable, mitigation measures are required to minimise impacts on these systems

Project Component/s	» power line and associated access road.
Potential Impact	» Damage to water course areas by any means that will result in hydrological changes (includes erosion, siltation, dust, direct removal of soil of vegetation, dumping of material within wetlands). The focus should be on the functioning of the watercourse as a natural system.
Activities/Risk Sources	» Construction and operation of power line; » Construction of access roads; and » Construction of watercourse crossings.
Mitigation: Target/Objective	» No damage to the delineated watercourses within project footprint (i.e. no-go area); and » Minimise damage to watercourse areas where crossings are to be built or upgraded.

Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitate any disturbed areas as soon as possible once construction is completed in an area.	Developer and contractors, ECO	Duration of construction

Mitigation: Action/Control	Responsibility	Timeframe
Control storm water and runoff water through the implementation of a storm water management plan for the site.	Contractors, ECO	Duration of construction
Obtain a permit as required in terms of the National Water Act from DWA to impact on any wetland or water resource.	Developer	Duration of construction

Performance Indicator	» No impacts on water quality, water quantity, riparian vegetation, natural status of watercourses.
Monitoring	» Habitat loss in watercourses should be monitored before and after construction. » The presence and development of erosion features downstream of any construction through wetlands must be monitored. » The ECO should be responsible for driving this process. » An incident reporting system must be used to record non-conformances to the EMPr/IWWMP. » Public complaints register must be developed and maintained on site.

6.3 Detailing Method Statements

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

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

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

» Construction procedures;

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

Specific method statements required may include:

- Site establishment (which explains all activities from induction training to offloading, construction sequence for site establishment and the different amenities and to be established etc. Including a site camp plan indicating all of these).
- Preparation of the site (i.e. Clearing vegetation, compacting soils and removing existing infrastructure and waste).
- Soil management/stockpiling and erosion control.
- Excavations and backfilling procedure.
- Stipulate norms and standards for water supply and usage (i.e.: comply strictly to licence and legislation requirements and restrictions)
- Stipulate the storm water management procedures recommended in the storm water management method statement.
- Ablution facilities (placement, maintenance, management and servicing)
- Solid Waste Management:
  - Description of the waste storage facilities (on site and accumulative).
  - Placement of waste stored (on site and accumulative).
  - Management and collection of waste process.
  - Recycle, re-use and removal process and procedure.
- Liquid waste management:
  - The design, establish, maintain and operate suitable pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into rivers, streams or existing drainage systems.
- Dust and noise pollution
  - Describe necessary measures to ensure that noise from construction activities is maintained within lawfully acceptable levels (construction activities generating output levels of 85 dB(A) near human settlement, are to be confined to working hours (06h00 - 18h00 Mondays to Fridays) and (06:00-13:00 Saturdays)
  - Procedure to control dust at all times on the site, access roads, borrow pits and spoil sites (dust control shall be sufficient so as not to have

significant impacts in terms of the biophysical and social environments). These impacts include visual pollution, decreased safety due to reduced visibility, negative effects on human health and the ecology due to dust particle accumulation.

» Hazardous substance storage (Ensure compliance with all national, regional and local legislation with regard to the storage of oils, fuels, lubricants, solvents, wood treatments, bitumen, cement, pesticides and any other harmful and hazardous substances and materials. South African National Standards apply).
  * Lists of all potentially hazardous substances to be used.
  * Appropriate handling, storage and disposal procedures.
  * Prevention protocol of accidental contamination of soil at storage and handling areas.
  * All storage areas, (ie: for harmful substances appropriately bunded with a suitable collection point for accidental spills must be implemented and drip trays underneath dispensing mechanisms including leaking engines/machinery).
» Fire prevention and management measures on site.
» Fauna and flora protection process on and off site (ie removal to reintroduction or replanting, if necessary).
  * Rehabilitation and re-vegetation process.
» Incident and accident reporting protocol.
» General administration
» Designate access road and the protocol on while roads are in use.
» Requirements on gate control protocols.

The Contractor may not commence the activity covered by the Method Statement until it has been approved by the Site Manager, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract.

Failure to submit a method statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved. The ECO should monitor the construction activities to ensure that these are undertaken in accordance with the approved Method Statement.

6.4 Awareness and Competence: Construction Phase

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

To achieve effective environmental management, it is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts.

The Contractors obligations in this regard include the following:

» Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
» Ensuring that a copy of the EMPr is readily available on-site, and that all site staff are aware of the location and have access to the document.
» Employees will be familiar with the requirements of the EMPr and the environmental specifications as they apply to the construction of the power line.
» Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course.
» The course should be sufficient to provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
» Awareness of any other environmental matters, which are deemed necessary by the ECO.
» Ensuring that employee information posters, outlining the environmental "do's" and "don'ts" (as per the environmental awareness training course) are erected at prominent locations throughout the site.
» Ensure that construction workers have received basic training in environmental management, including the storage and handling of hazardous substances, minimisation of disturbance to sensitive areas, management of waste, and prevention of water pollution.
» Records must be kept of those that have completed the relevant training.
» Training should be done either in a written or verbal format but must be appropriate for the receiving audience.
» Refresher sessions must be held to ensure the contractor staff are aware of their environmental obligations as practically possible, detailed below.

6.4.1 Environmental Awareness Training

Environmental Awareness Training must take the form of an on-site talk and demonstration by the ECO before the commencement of site establishment and construction on site. The education/awareness programme should be aimed at all

levels of management and construction workers within the contractor team. A record of attendance of this training must be maintained by the ECO on site.

6.4.2 Induction Training

Environmental induction training must be presented to all persons who are to work on the site – be it for short or long durations; Contractor's or Engineer's staff; administrative or site staff; sub-contractors or visitors to site.

This induction training should include discussing the developer's environmental policy and values, the function of the EMPr and Contract Specifications and the importance and reasons for compliance to these. The induction training must highlight overall do's and don'ts on site and clarify the repercussions of not complying with these. The non-conformance reporting system must be explained during the induction as well. Opportunity for questions and clarifications must form part of this training. A record of attendance of this training must be maintained by the SHE Officer on site.

6.4.3 Toolbox Talks

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

6.5 Monitoring Programme: Construction Phase

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

A monitoring programme must be in place not only to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are, or could result in significant environmental impacts for which corrective action is required. The period and frequency of monitoring will be stipulated by the Environmental Authorisation (once issued). The Project Manager will ensure that the monitoring is conducted and reported.

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

» Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications.
» Ensure adequate and appropriate interventions to address non-compliance.
» Ensure adequate and appropriate interventions to address environmental degradation.
» Provide a mechanism for the lodging and resolution of public complaints.
» Ensure appropriate and adequate record keeping related to environmental compliance.

An independent Environmental Control Officer (ECO) must be appointed, and must have the appropriate experience and qualifications to undertake the necessary tasks. The ECO will ensure compliance with the environmental authorisation (once issued), EMPr, relevant permits and licences and the environmental legislation during construction, and will conduct monitoring activities on a regular basis. The ECO will report any non-compliance or where corrective action is necessary to the Site Manager, DEA and/or any other monitoring body stipulated by the regulating authorities.

The ECO shall remain on site on a full-time basis as long as construction activities dictate. Thereafter provided compliance is maintained, monthly or bi-weekly site compliance inspections would be sufficient, reducing as construction proceeds. However, in the absence of the ECO there should be a designated environmental officer present to deal with any environmental issues that may arise such as fuel or oil spills.

6.5.1. Non-Conformance Reports

All supervisory staff including Foremen, Resident Engineers, and the ECO must be provided the means to be able to submit non-conformance reports to the Site Manager. Non-conformance reports will describe, in detail, the cause, nature and effects of any environmental non-conformance by the Contractor. Records of penalties imposed may be required by the relevant authority within 48 (forty eight) hours.

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

6.5.2. Monitoring Reports

A monitoring report will be compiled by the ECO on a monthly basis and must be submitted to DEA for their records. This report should include details of the activities undertaken in the reporting period, any non-conformances or incidents recorded, corrective action required, and details of those non-conformances or incidents which have been closed out.

6.5.3. Final Audit Report

A final environmental audit report must be compiled by an independent auditor and be submitted to DEA upon completion of the construction and rehabilitation activities (within 30 days of completion of the construction phase (i.e.: within 30 days of site handover)) and within 30 days of completion of rehabilitation activities. This report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions and the requirements of the EMPr.

MANAGEMENT PROGRAMME: REHABILITATION CHAPTER 7

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

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

7.1. Objectives

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

OBJECTIVE: Ensure appropriate rehabilitation of disturbed areas such that residual environmental impacts are remediated or curtailed

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

Project Component/s	» Power line; and » Access roads.
Potential Impact	» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion and increased runoff, and the requirement for on-going management intervention.
Activity/Risk Source	» Temporary construction areas; » Temporary access roads/tracks; » Power line servitudes; and » Other disturbed areas/footprints.
Mitigation: Target/Objective	» Ensure and encourage site rehabilitation of disturbed areas and » Ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed.

Mitigation: Action/Control	Responsibility	Timeframe
All temporary facilities, equipment, and waste materials must be removed from site.	Contractor	Following execution of the works
All temporary fencing and danger tape must be removed once the construction phase has been	Contractor	Following completion of

Mitigation: Action/Control	Responsibility	Timeframe
completed.		construction activities in an area
The area that previously housed the construction equipment camp is to be checked for spills of substances such as oil, paint, etc. and these must be cleaned up.	Contractor	Following completion of construction activities in an area
All hardened surfaces within the construction equipment camp area must be ripped, all imported materials removed, and the area shall be top soiled and re-vegetated.	Contractor	Following completion of construction activities in an area
Temporary roads must be closed and access across these blocked.	Contractor	Following completion of construction activities in an area
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	Contractor	Following completion of construction activities in an area
A rehabilitation plan should be drawn up that specifies the rehabilitation process and must be approved by the ECO.	Contractor, Developer and ECO	Pre-construction
Where disturbed areas are not To be used during the construction of the proposed power line, these areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-use of native/) indigenous plant species removed from disturbance areas in the rehabilitation phase to be determined by a botanist, as applicable.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
Re-vegetated Areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achie6ed.	Developer in consultation with rehabilitation specialist	Post-rehabilitation
Erosion control measures must be used in sensitive areas such as areas with steep slopes .	Developer consultation with ECO and rehabilitation specialis4 (if required)	Post-rehabilitation

Mitigation: Action/Control	Responsibility	Timeframe
Ongoing plant monitoring and removal must be undertaken on all areas of natural Vegetation on an annual basis.	Developer	Post-rehabilitation

Performance Indicator	» All portions of site, including construction equipment camp and working areas, cleared of equipment and temporary facilities. » Topsoil replaced on all areas and stabilised where practicable or required after construction and temporally utilised areas. » Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites. » Complete site free of erosion alien invasive plants.
Monitoring	» On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented. » On-going alien plant monitoring and removal should be undertaken on an annual basis.

MANAGEMENT PROGRAMME: OPERATION CHAPTER 8

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

» Ensures that operation activities are properly managed in respect of environmental aspects and impacts.
» Enables the proposed facility operation activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to farming practices, traffic and road use, and effects on local residents.
» Minimises impacts on fauna using the site.

An environmental manager must ensure the implementation of the operational EMPr.

8.1. Objectives

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

OBJECTIVE: Protection of Indigenous natural vegetation, fauna and maintenance of rehabilitation

Indirect impacts on vegetation and fauna during operation could result from maintenance activities and the movement of people and vehicles /n site and in the surrounding area. In order to ensure the long-term environmental integrity of the site following construction, maintenance of the areas rehabilitated post-construction must be undertaken until these areas have successfully re-established.

Project component/s	» Service road utilised during regular maintenance; and » Areas disturbed during the construction phase and subsequently rehabilitation completion.
Potential Impact	» Disturbance to or loss of vegetation and/or habitat.
Activity/Risk Source	» Movement of employee vehicles within and around site.
Mitigation: Target/Objective	» Maintain minimised footprints of disturbance of vegetation/habitats on-site; and

	» Ensure and encourage plant growth in non-operational areas of post-construction rehabilitation.

Mitigation: Action/Control	Responsibility	Timeframe
Vehicle movements must be restricted to designated roadways.	Contractor	Operation
No disturbance of vegetation outside of the project site must occur.	Contractor	Operation
Existing roads must Be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Contractor	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.	Contractor	Operation

Performance Indicator	» No further disturbance to vegetation or terrestrial faunal habitats. » Continued improvement of rehabilitation efforts. » No disturbance of vegetation outside of project site.
Monitoring	» Regular inspection to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas.

OBJECTIVE: Protection of avifauna from collision and electrocution

During the operation, the threat of collision with the power line is the biggest potential threat to avifauna, particularly sensitive, collision prone species that may occur in the study area. The threat of electrocution while perching on the power line and associated infrastructure serves as a threat to certain sensitive species, depending on the power line structures implemented.

Project Component/s	» Power line.
Potential Impact	» Collision and Electrocution events with the overhead power line.
Activities/Risk Sources	» Operation of the power line without appropriate mitigation measures.
Mitigation: Target/Objective	» Maintain a low number of collision, and electrocution events.

Mitigation: Action/Control	Responsibility	Timeframe
Ensure bird-friendly tower designs are implemented to minimise the risk of electrocutions.	Contractor	Construction
Identify the exact power line spans requiring marking to reduce the potential for collision.	Developer and ornithologist	Construction
Fit bird flappers to new lines in identified sensitive Areas.	Contractor	Construction
Insulate live components at support structures.	Contractor	Construction
Line to avoid areas with high bird densities or areas which attract birds.	Developer	Pre-Construction

Performance Indicator	» Minimal collision, or electrocution events.
Monitoring	» Observation of electrocution or collision events with the power line. » Monitor power line servitude for mortalities.

OBJECTIVE: Minimise soil degradation and erosion

The soil on site may be impacted in terms of:

» Soil degradation including erosion (by wind and water) and subsequent deposition elsewhere is of a concern across the entire site which is underlain by fine grained soil which can be mobilised when disturbed, even on relatively low slope gradients (accelerated erosion).
» Uncontrolled run-off relating to construction activity (excessive wetting, uncontrolled discharge, etc.) will also lead to accelerated erosion and possible sedimentation of drainage systems.
» Degradation of the natural soil profile due to pollution.

Management of erosion will be required during the operation phase of the power line and watercourse crossings. An erosion management plan is required to ensure compliance with applicable regulations and to prevent increased soil erosion and sedimentation of the downstream environment. The section below provides a guideline for the management of erosion on site and will need to be supplemented with the principles for erosion management contained in the Erosion Management plan included in **Appendix C**

Project Component/s	» Power line; and » Access roads.

Potential Impact	» Soil degradation; » Soil erosion; » Increased deposition of soil into drainage systems; and » Increased run-off over the site.
Activities/Risk Sources	» Poor rehabilitation of cleared areas; » Rainfall - water erosion of disturbed areas; » Wind erosion of disturbed areas; and » Concentrated discharge of water from construction activity.
Mitigation: Target/Objective	» Ensure rehabilitation of disturbed areas is maintained; » Minimise soil degradation (i.e. wetting); » Minimise soil erosion and deposition of soil into drainage lines; and » Ensure continued stability of embankments/excavations.

Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitate disturbance areas should the previous attempt be unsuccessful.	Contractor	Operation
Maintain erosion control measures implemented during the construction phase (i.e. run-off attenuation on slopes (sand bags, logs), silt fences, storm water catch-pits, and shade nets).	Contractor	Operation

Performance Indicator	» Acceptable level of soil erosion around site, as determined by the site manager. » Acceptable level of increased siltation in drainage lines, as determined by the site manager.
Monitoring	» Inspections of site on a bi-annual basis. » Water management plan.

MANAGEMENT PROGRAMME: DECOMMISSIONING CHAPTER 9

The infrastructure associated with the power line and would only be decommissioned in the event that the Uncedo Lwethu Wind Energy Facility was decommissioned and the roads and power line were no longer required by the community. The infrastructure which will be utilised for the Uncedo Lwethu wind energy facility is expected to have a lifespan of 20 to 30 years (with maintenance). The decommissioning activities of the wind turbines and all associated infrastructure would need to comply with the legislation relevant at the time.

Should the activity ever cease or become redundant, the applicant shall undertake the required actions as prescribed by legislation at the time and comply with all relevant legal requirements administered at any relevant and competent authority at that time.

FINALISATION OF THE EMPR CHAPTER 10

The EMPr is a dynamic document, which must be updated to include any additional specifications as and when required. It is considered critical that this draft EMPr be updated to include site-specific information and specifications following the final walk-through survey by specialists of the power line, and development site. This will ensure that the construction and operation activities are planned and implemented considering sensitive environmental features.

APPENDIX A:
GRIEVANCE MECHANISM FOR PUBLIC COMPLAINTS AND ISSUES

GRIEVANCE MECHANISM / PROCESS

AIM

The aim of the grievance mechanism is to ensure that grievances / concerns raised by local landowners and or communities are addressed in a manner that is:

» Fair and equitable;
» Open and transparent; and
» Accountable and efficient.

It should be noted that the grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. However, the aim should be to address grievances in a manner that does not require a potentially costly and time consuming legal process.

Proposed generic grievance process

» Local landowners, communities and authorities will be informed in writing by the proponent (the renewable energy company) of the grievance mechanism and the process by which grievances can be brought to the attention of the proponent.
» A company representative will be appointed as the contact person for grievances to be addressed to. The name and contact details of the contact person will be provided to local landowners, communities and authorities.
» Project related grievances relating to the construction, operational and or decommissioning phase must be addressed in writing to the contact person. The contact person should assist local landowners and or communities who may lack resources to submit/prepare written grievances.
» The grievance will be registered with the contact person who, within 2 working days of receipt of the grievance, will contact the Complainant to discuss the grievance and agree on suitable date and venue for a meeting. Unless otherwise agreed, the meeting will be held within 2 weeks of receipt of the grievance.
» The contact person will draft a letter to be sent to the Complainant acknowledging receipt of the grievance, the name and contact details of Complainant, the nature of the grievance, the date that the grievance was raised, and the date and venue for the meeting.
» Prior to the meeting being held the contact person will contact the Complainant to discuss and agree on who should attend the meeting. The people who will be required to attend the meeting will depend on the nature of the grievance. While the Complainant and or proponent are entitled to invite their legal representatives to attend the meeting/s, it should be made clear that to all the parties involved in the process that the grievance

mechanism process is not a legal process. It is therefore recommended that the involvement of legal representatives be limited.

» The meeting will be chaired by the company representative appointed to address grievances. The proponent will provide a person to take minutes of and record the meeting/s. The costs associated with hiring venues will be covered by the proponent. The proponent will also cover travel costs incurred by the Complainant, specifically in the case of local, resource poor communities.

» Draft copies of the minutes will be made available to the Complainant and the proponent within 4 working days of the meeting being held. Unless otherwise agreed, comments on the Draft Minutes must be forwarded to the company representative appointed to manage the grievance mechanism within 4 working days of receipt of the draft minutes.

» In the event of the grievance being resolved to the satisfaction of all the parties concerned, the outcome will recorded and signed off by the relevant parties. The record should provide details of the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.

» In the event of a dispute between the Complainant and the proponent regarding the grievance, the option of appointing an independent mediator to assist with resolving the issue should be discussed. The record of the meeting/s will note that a dispute has arisen and that the grievance has not been resolved to the satisfaction of all the parties concerned.

» In the event that the parties agree to appoint a mediator, the proponent will be required to identify three (3) mediators and forward the names and CVs to the Complainant within 2 weeks of the dispute being declared. The Complainant, in consultation with the proponent, will identify the preferred mediator and agree on a date for the next meeting. The cost of the mediator will be borne by the proponent. The proponent will provide a person to take minutes of and record the meeting/s.

» In the event of the grievance, with the assistance of the mediator, being resolved to the satisfaction of all the parties concerned, the outcome will recorded and signed off by the relevant parties, including the mediator. The record should provide details on the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.

» In the event of the dispute not being resolved, the mediator will prepare a draft report that summaries the nature of the grievance and the dispute. The report should include a recommendation by the mediator on the proposed way forward with regard to the addressing the grievance.

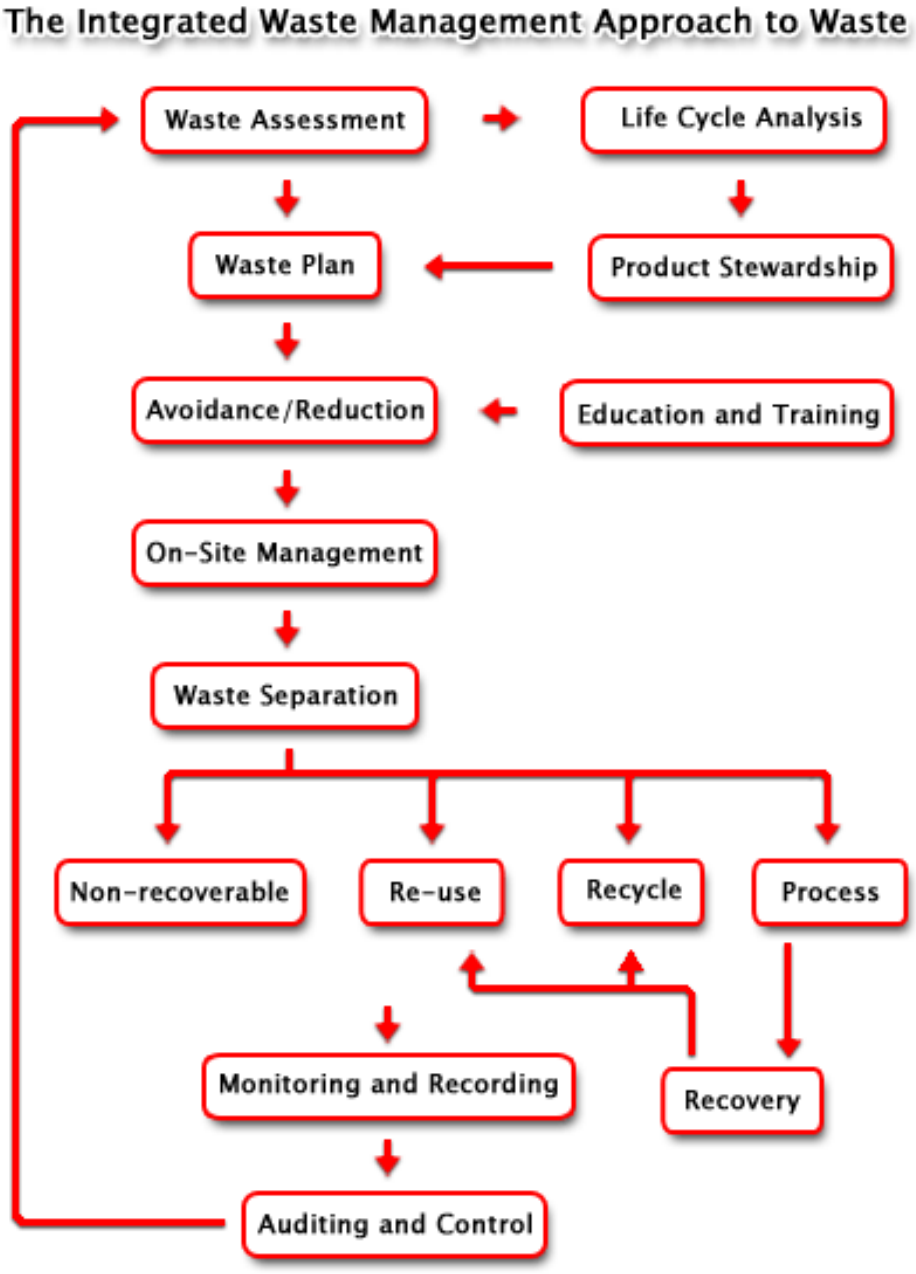
» The draft report will be made available to the Complainant and the proponent for comment before being finalised and signed by all parties. Unless otherwise agreed, comments on the draft report must be forwarded to the company representative appointed to manage the grievance mechanism within 4 working days.

The way forward will be informed by the recommendations of the mediator and the nature of the grievance. As indicated above, the grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. In the event of the grievance not being resolved to the satisfaction of Complainant and or the proponent, either party may be of the opinion that legal action may be the most appropriate option

APPENDIX B:
GUIDELINES FOR INTEGRATED MANAGEMENT OF CONSTRUCTION WASTE

GUIDELINE FOR INTEGRATED MANAGEMENT OF CONSTRUCTION WASTE

Waste is broadly defined by the Department of Water Affairs in 1994 as: 'an undesirable or superfluous by-product, emission, residue or remainder of any process or activity'. An integrated approach to waste management on site is needed. Such an approach is illustrated in the figure below.



Source: http://www.enviroserv.co.za/pages/content.asp?SectionId=496

1. Waste Assessment

A detailed waste assessment is necessary to understand the waste types and volumes being produced. In order to achieve this, construction practices must be measured and analysed.

2. Waste Plan

A waste plan must be developed to provide appropriate solutions for managing the entire waste stream on site. The objective of the plan should be to reduce the volumes of waste to disposal and thereby to reduce the cost of management of the waste stream without compromising environmental standards. The plan should include recovery, re-use and recycle recommendations.

Construction Waste Management is the practice of reducing the actual waste that goes to the landfill site. Waste reduction is best met by recycling, and construction wastes offer several opportunities in this regard. In fact, 80% of the wastes found in construction waste piles are recyclable in some form or another. Wood, concrete, bricks, metals, glass and even paint offer several options for recycling.

There are three basic steps for construction waste management, i.e. Reduce, Reuse, and Recycle. **Reduce** is the prevention of the waste from arising and optimising material usage. Waste avoidance and waste reduction can be achieved through improved education and training - by improving efficiencies and by making staff environmentally aware.

Reuse is using existing materials instead of throwing these away. Reusing does not mean that it needs to be reused on the same construction site. Selling or donating waste materials to a third party is one option of construction waste management.

Recycle is somewhat limited since it only allows for those items that can be used on-site. The most important step for recycling of construction waste is on-site separation. Initially, this will take additional effort and training of construction personnel. Targets should be set for the levels of recycling. Once separation habits are established, on-site separation can be done at little or no additional cost.

3. What to Recycle

Before recycling construction waste, identify who will accept it. This is important in designating type of waste to separate, and in making arrangements for drop-off or delivery of materials. Materials that can be recycled include:

» Cardboard and Paper
» Wood

» Metals
» Plastics
» Glass
» Paints, Stains, Solvents and Sealants
» Oil

4. Materials Separation

Successful recycling requires good clean uniform collections of single waste types. This is most effectively achieved by separating the waste streams close to source rather than at the landfill site. Containers for material recycling must be set up on site and clearly labelled. Construction personnel must be trained in material sorting policy, and bins must be monitored periodically to prevent waste mixing as a result of construction employees throwing rubbish into the bins.

Some materials will require bins or storage that protect these from rain. Other bins may be locked to prevent tampering.

5. Recycling and Waste Minimisation Guidelines

» *Wood*
  * Optimise building dimensions to correspond to standard wood dimensions in order to reduce the need for cutting.
  * Store wood on level blocking under cover to minimize warping, twisting and waste.

» *Metals*
  * During construction, separate metals for recycling, including copper piping, wire, aluminium, iron and steel, nails and fasteners, galvanized roofing. It is critical to keep lead out of landfills because it could leach into groundwater.

» *Cardboard and Paper*
  * Avoid excessively packaged materials and supplies. However, be sure packaging is adequate to prevent damage and waste.
  * As far as possible, use recyclable packaging.
  * Separate cardboard waste, bundle, and store in a dry place.
  * Minimise the number of blueprints and reproductions necessary during the design and construction process.

» *Plastic*
  * Avoid excessively packaged materials and supplies. However, be sure packaging is adequate to prevent damage and waste.
  * As far as possible, use recyclable packaging.

Since more than 60 different types of plastic resins exist, the Plastics Federation of South Africa has adopted a voluntary number coding system for each category of plastics to aid in their sorting by material type for recycling (Bruyns et al, 2002). The most common resin types are itemised in Table 1.

Table 1: Identification System for Plastic

Id Number	Plastic Resin Type
1	PET (polyethylene terephthalate)
2	HDPE (high-density polyethylene)
3	PVC (polyvinyl chloride) or V (vinyl)
4	LDPE (low-density polyethylene)
5	PP (polypropylene)
6	PS (polystyrene)
7	Other (laminates, etc.)

» *Paints, Stains, Solvents and Sealants*
  * Unused materials should be taken to a hazardous waste collection facility.

6. On-site Management

Good supervision of the waste management programme on site is critical to success. Management of the entire on-site program is critical to ensure smooth operations.

7. Auditing and Control

The success of the waste plan is determined by measuring criteria such as waste volumes, cost recovery from recycling, cost of disposal. Recorded data can indicate the effect of training and education, or the need for education. It will provide trends and benchmarks for setting goals and standards. It will provide clear evidence of the success or otherwise of the plan. Finally, good record keeping and control, becomes a continuous waste assessment process, allowing the waste plan to be improved and adjusted as required.

8. Useful contacts:

http://www.transpaco.co.za/page5.htm
Transpaco, a manufacturing and distribution company operating extensively in the plastics and packaging industries, conducts plastic reclamation and recycling.

http://www.jclenterprises.co.za/
JCL Enterprises for plastic sales of quality recycled plastic materials as well as the recycling of plastic.

http://www.rosefoundation.org.za/
The Rose Foundation specialises in the collection and recycling of used motor (engine) oil.

Information Sources:

http://www.greenbuilder.com/sourcebook/ConstructionWaste.html#Guidelines
http://www.enviroserv.co.za/pages/Content.asp?SectionID=587
http://www.enviroserv.co.za/pages/content.asp?SectionId=496
Programme for the Implementation of the National Waste Management Strategy. DEAT, May 2000
Residential Construction Waste Management Demonstration and Evaluation. Prepared for U.S. Environmental Protection Agency by NAHB Research Center, May 2, 1995

APPENDIX C:
EROSION MANAGEMNT PLAN

PRINCIPLES FOR EROSION MANAGEMENT

1. Purpose

An Erosion Management Plan addresses the management and mitigation of significant impacts relating to soil erosion. The objective of the plan is to provide:

» A general framework for erosion management, which enables the contractor to identify areas where erosion can be accelerated from their action.
» An outline of general methods to monitor, manage and rehabilitate erosion in ensuring that all erosion caused by this development is addresses.

2. Legislation and Standards

Soil conservation pertaining to erosion has been a topic within legislation form the 1930's till today in South Africa. Relevant legislation:

» Conservation of Agricultural Resources Act No 43 of 1983
» Environmental Conservation Act No 73 of 1989
» National Forestry Act No 84 of 1998
» National Environmental Management Act No 107 of 1998
» The Department of Water Affairs and Forestry, February 2005. Environmental Best Practice Specifications: Construction Integrated Environmental Management Sub-Series No. IEMS 1.6. Third Edition. Pretoria.

3. Areas with a high soil erodability potential

The following areas are generally associated with high soil erodibility potential:

» Any areas without vegetation cover
» Excavated areas
» Steep areas
» Areas where the soil has been degraded already
» Dispersive, duplexed soil areas
» Areas with fine grained soil material with a low porosity
» Areas which undergo overland flow of water.
» Areas close to water
» Irrigated areas
» Compacted areas
» Rivers
» Drainage lines
» And any areas where developments cause water flow to accelerate on a soil surface.
» Coarsely gravelly covered surfaces

4. Precautionary management activities to avoid erosion

In the assessment process the ECO and the contractor must assess all:

- Infrastructure and equipment placements and function to ensure that the infrastructure or equipment is not causing accelerating soil erosion on the site.
- Construction activities to ensure that no erosion indicators are forming as a result of the construction activities.

5. Monitoring

7.1. General Erosion

The ECO must assess the site for erosion indicators in the monitoring process, which include:

- Bare soil
- Desiccation cracks
- Terracettes
- Sheet erosion
- Rill erosion (small erosion features with the same properties and characteristics as gullies)
- Hammocking (Soil build-up)
- Pedestalling (Exposing plant roots)
- Erosion pavements
- Gullies
- Evidence of Dispersive soils

In the assessment process, the ECO and the contractor must assess all:

- Infrastructure and equipment placements and function to ensure that the infrastructure or equipment is not causing accelerated soil erosion on the site.
- Construction activities to ensure that no erosion indicators are forming as a result of the construction activities.

If any activities or placement of equipment cause pooling on the site, degrade the vegetation, result in removal of the surface or subsurface soil horizons, create compacted surfaces with steep gradients, or minimise runoff areas, the erosion potential on the site will increase.

If any erosion features are begin forming or are present as a result of the activities mentioned above the ECO must:

- Assess the situation.
- Take photographs of the soil degradation.
- Determine the cause of the soil erosion.

» Inform and show the relevant contractors the soil degradation.
» Inform the contractor that rehabilitation must take place and that the contractor is to implement a rehabilitation method statement and management plan.
» Monitor that the contractor is taking action to stop the erosion and assist them where needed.
» Report and monitor the progress of the rehabilitation weekly and recorded all the findings in a site diary.
» All actions with regards to the incidents must be reported on a monthly compliance report which will be submitted to the department.

The contractor/ developer (with the ECO's consultation) must:

» Select a system to treat the erosion
» Design the treatment system
» Implement the system
» Monitor the area to see if the system functions like it should, if the system fails, the method must be adapt or adjust to ensure the accelerated erosion is controlled.
» Monitoring must continue until the area has been stabilised

7.2. Stormwater Management

The ECO is responsible to monitor the site and the activities to ensure that no unnatural soil degradation is taking place.

The ECO must assess the site for erosion indicators such as:

» Bare soil
» Exposed plant roots, pedestalling
» Sheet erosion
» Rill erosion
» Hammocking
» Erosion pavements
» Terracettes
» Gullies

In the assessment process the ECO and the contractor must assess all:

» Disturbed watercourse areas by the development: roads, bridges, river crossings, cabling, permanent laydown areas, crane pads and any other remaining hard surfaces.
» Construction activity limited to specified areas. Stockpiles of aggregate and material will be positioned at least 50m away from drainage lines and wetlands.

If any erosion features are present as a result of the activities mentioned above the ECO must:

» Assess the situation
» Take photographs of the soil degradation.
» Determine the cause of the erosion.
» Inform and show the relevant contractors the soil degradation.
» Inform the contractor that rehabilitation must take place and that the contractor is to implement a rehabilitation method statement and management plan.
» Monitor that the contractor is taking action to stop the erosion and assist them where needed.
» Monitor the rehabilitation weekly and record the findings in a site diary.
» All actions with regards to the incidents must be reported on in the monthly compliance monitoring report.

The contractor/ developer must (with the ECO's consultation):

» Select a system to treat the erosion
» Design the treatment system
» Implement the system
» Monitor the area to ensure that the erosion has been addressed adequately.
» Monitor the erosion until the area has been stabilised.

6. Rehabilitation

The following erosion control measures and rehabilitation specifications must be implemented to ensure that good environmental practice is conducted and environmental compliance is achieved.

6.1. General Erosion Management

In this section the equipment needed to remediate erosion, the precautionary measures which must be taken to avoid erosion and mitigation requirements for already degraded areas.

6.1.1. Equipment

The civil works contractor may use the following instruments to combat erosion when necessary:
» Reno mattresses
» Slope attenuation
» Hessian material
» Shade catch nets
» Gabion baskets

- Mulching Run-off control (increase the amounts of runoff areas to disperse the water)
- Silt fences
- Storm water channels and catch pits
- Shade / catch nets
- Soil bindings
- Geofabrics
- Hydroseeding and/or re-vegetating
- Mulching over cleared areas
- Stone packing
- Tilling (roughing the surface)

6.1.2. Methods to prevent accelerated erosion

The following practises should be considered and adhered to:

- Ensure steep slopes are stabilised.
- Ensure that steep slopes are not stripped of vegetation and left to dry out and become water repellent (which will case increased runoff and a decreased infiltration rate) increasing the erosion potential.
- Ensure that all water on site (rain water or water wastage from the construction process) does not result in any surface flow (increase velocity and capacity of water) as a result of the poor drainage systems.
- Ensure that pooling of water on site is avoided, as the site and the general area consists of dispersive soils, pooling will cause an increase of infiltration on one area, causing the subsurface to begin eroding.
- Ensure that heavy machinery does not compact those areas which are not intended to be compacted (i.e. areas intended to be managed), as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area. where compaction does occur, the areas should be ripped.
- Ensure that compacted areas have adequate drainage systems to avoid pooling and surface flow.
- Prevent the concentration or flow of surface water or stormwater down cut or fill slopes, or along pipeline routes or roads, and ensure measures to prevent erosion are in place prior to construction.
- Ensure that stormwater and any runoff generated by hard surfaces should be discharged into retention swales or areas with rock rip-rap. These areas should be grassed with indigenous vegetation. These energy dissipation structures should be placed in a manner that surface flows are managed prior to being discharged back into a natural watercourse to support the maintenance of natural base flows within the ecological systems and prevent erosion, i.e. hydrological regime (water quantity and quality) is maintained.
- Ensure siltation and sedimentation through the use of the erosion equipment mentioned structures.

» Ensure that all stormwater control features have soft engineered areas that attenuate flows, allowing for water to percolate into the local ground watertable in low quantities (to reduce runoff but prevent subsurface erosion).
» Minimise and restrict site clearing to areas required for construction purposes only and restrict disturbance to adjacent undisturbed natural vegetation.
» Ensure that vegetation clearing is conducted in parallel with the construction progress across the site to minimise erosion and/or run-off.
» Ensure that large tracts of bare soil which would cause dust pollution in high winds, or have high erosion susceptibility and increase sedimentation in the lower portions of the catchment are controlled through temporary surface covering.
» Ensure no diversion of water flows in catchment occurs.
» Ensure that dust control measures are implemented, but prevent over-wetting/ saturating the area (to cause pooling) and run-off (that may cause erosion and sedimentation).
» Watercourse (stream) crossings should not trap any run-off, thereby creating inundated areas, but allow for free flowing watercourses.

6.1.3. Mitigation for previously degraded areas

Previously degraded areas could pose a threat to construction activities in the area and must therefore be stabilised, then remediated and rehabilitated through:

» Protecting, stabilise and isolate the degraded areas to ensure no further damage is caused by erosion due to construction activities.
» Increase the drainage in the area but avoid pooling.
» Prevent increasing sedimentation in areas that have been chocked by soils from degraded areas.
» Once construction has been completed, a method statement must be drafted for the rehabilitation of the previously degraded areas, using equipment mentioned above and implemented.
» Stabilisation of steep slopes must be undertaken.
» Ensure that bare soil is covered and hydro seeded to reduce topsoil loss.

6.2. Methodologies

The following erosion control measures and rehabilitation specifications may be required to be implemented to ensure that good environmental practice is conducted and environmental compliance is achieved.

» Topsoil covered with a geotextile or hessian material and a grass seed mixture (see Rehabilitation Specifications).
» Logging or stepping following the contours of the slope, to reduce surface runoff.
» Earth or rock-pack cut-off berms.
» Packed branches to roughen the surface and promote infiltration.
» Benches (sand bags).

» Stabilisation of near vertical slopes (1:1 – 1:2), if created during construction, will be required to utilise hard structures that have a natural look. The following methods may be considered:
  - Gabions (preferred method with geotextile material).
  - Retaining walls.
  - Stone pitching.
» The slopes of all stream diversions must be protected. The following methods may be considered:
  - Reno mattresses (preferred method), ensure that the reno mattresses are buried deep into the subsurface, to avoid undercutting from the water.
  - Coarse rock (undersize rip-rap)
  - Sandbags.
  - Stone packing with geotextile
» Where feasible use rubber dams as stream diversions when establishing water course crossings. Although (and considering that these are non-perennial watercourses) the recommendation is to construct watercourse crossings during dry periods (or no flow periods), where possible.
» Any concentration of natural water flow caused by road works or hardstands areas will be treated as follows:
  - if water flow is sub-critical, nothing is required
  - if water flow is supercritical, the outlets will be provided with protection (either gabions or stone pitching – depending on the flows) to release water subcritical back into the watercourse at a low velocity.

6.3. Engineering Specifications

A detailed Stormwater Management Plan describing and illustrating the proposed stormwater control measures must be prepared by the Civil Engineers and this includes erosion control.

Requirements for project design:

» Erosion control measures to be implemented before and during the construction period, including the final stormwater control measures (post construction).
» The location, area/extent (m^2/ha) and specifications of all temporary and permanent water management structures or stabilisation methods.
» A resident Engineer to be responsible for ensuring implementation of the erosion control measures on site during the construction period.
» The Developer holds ultimate responsibility for remedial action in the event that the approved stormwater plan is not correctly or appropriately implemented and damage to the environment is caused.
» Concrete lined drains placed adjacent to road to transfer the water to the existing water courses.
» Frequent gravel drains hydroseeded placed on permanent roadway edges.

» At the point where stormwater is discharged, energy dissipaters to be constructed to reduce the flow rate of run-off.
» All cut and fill banks will be seeded with an approved seed mix (as per the rehabilitation specifications) to ensure bank stabilisation and the elimination of potential erosion. Reno mattresses may be used to ensure that the area remains stable.

6.4. Rehabilitation Specifications

» Employ a Horticultural Landscape Contractor to fulfil the rehabilitation of disturbed areas post-construction.
» A detailed Rehabilitation Plan describing and illustrating the proposed rehabilitation activities on site must be prepared i.e. areas of top soiling, seeding and replanting of vegetation; species mix; requirements for fertilisation; seed sowing rates; watering etc. (i.e. bill of quantities).
» The following document should be consulted for further support with respect to information regarding rehabilitation, namely: The Department of Water Affairs and Forestry, February 2005. Environmental Best Practice Specifications: Construction Integrated Environmental Management Sub-Series No. IEMS 1.6. Third Edition. Pretoria.
» These specifications may be modified by the Horticultural Landscape Contractor on consideration of site conditions.

6.5. Post- and during construction rehabilitation activities

» Correct and appropriate stockpile management of topsoil will be required during the construction phase.
» Rehabilitation of disturbed areas will be implemented as these areas become available for rehabilitation.
» Disturbed areas will include, for example: construction camp site, areas where underground cabling has been layed/buried, roadsides of new access roads.

7. Rehabilitation steps to mitigate the eroded area

» Stockpiled topsoil must be spread over disturbed areas (150 – 200mm thick) just prior to planting/seeding.
» Rip and scarify along the contours of the newly spread topsoil prior to watering and seeding.
» Organic fertilizers or compost shall be used if site conditions require it and can be applied as part of hydro-seeding applications.
» Seed should be sown into weed-free topsoil that has been stockpiled (i.e. original topsoil from the site).
» Indigenous plants (e.g. grass species such as *Cynodon dactylon*, *Eragrostis curvula*) shall be used to rehabilitate disturbed areas.

» Applying the seed through hydromulching (hydro-seeding) is advantageous (or organic mulching after seeding).
» Watering is essential and rehabilitation should ideally occur during the wet season.
» The topsoil in the area is vulnerable to erosion therefore the hydro-seeded surfaces must be covered with a shade cloth material or natural fibre (hessian material) to reduce the loss of soil while the plants establish.

7.1. 'Watering' to avoid erosion

» Movement of livestock in newly rehabilitated areas must be restricted (using fences (which can later be removed), where possible, while taking into consideration drinking areas/paths.
» Watering the rehabilitated areas should be undertaken in the wet/rainy season essential but if this is not possible, an initial watering period (supplemental irrigation) will be required to ensure plant establishment (germination and established growth).
» Generous watering during the first two weeks, or until the seeds have germinated, is required (unless adequate rainfall occurs) i.e. seed beds will need to be kept moist for germination to occur.
» For grass to establish (once germination has occurred), rainfall or irrigation is needed at regular intervals, ideally every few days and possibly every day if weather conditions require it.
» During dry periods, with no rainfall, 100 litres per m² (or 100mm of rain) over a month or more, may be necessary to establish plants capable of surviving dry weather (or otherwise specified by the Horticultural Landscape Contractor).

7.2. Seeding

The developer should make use of an appropriate mix of grass species for rehabilitation 9to be determined in consultation with a suitably qualified ecologist) and they must be mixed for sowing either in summer or in winter. Grass species application (Mucina and Rutherford, 2006) is at the rate secified as kg/ha.

7.3. Steep slopes

» Areas that have a steep gradient and require seeding for rehabilitation purposes should be adequately protected against potential run-off erosion e.g. with coir geotextile netting or other appropriate methodology.
» Provision for wind should also be made on these slopes to ensure the fine grained soil is not removed.

7.4. Maintenance and duration

» Rehabilitation will occur during construction, as areas for plant rehabilitation become available.
» The rehabilitation period post construction is estimated to be over a period of 6 (minimum) to 12 months (maximum), or a time period specified by the Horticultural Landscape Contractor, particularly if planting of trees and shrubs occurs.
» The rehabilitation phase (including post seeding maintenance) should be at least 6 months (depending on time of seeding and rainfall) to ensure establishment of plants with a minimum 80% cover achieved (excluding alien plant species).
» If the plants have not established and the 80% is not achieved within the specified maintenance period, maintenance of these areas shall continue until at least 80% cover is achieved (excluding alien plant species).
» Additional seeding may be necessary to achieve 80% cover.
» Any plants that die during the maintenance period must be replaced.
» Succession of natural plant species should be encouraged.

8. Conclusion

The Erosion Management Plan is a document to assist the contractor, the Developer and the ECO with guidelines on how to manage erosion. The implementation of management measures is not only good practice to ensure minimisation of degradation, but also necessary to ensure comply with legislative requirements. This document forms part of the EMP, and is required to be considered and adhered to during the design, construction, operation and decommissioning phases of the project.

9. References

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APPENDIX D:
PRINCIPLES FOR PLANT SEARCH & RESCUE, RE-VEGETATION AND REHABILITATION

METHODS FOR PLANT RESCUE AND HABITAT REHABILITATION

List of Abbreviations

CARA: Conservation of Agricultural Resources Act 43 of 1983
DEA: Department of Environmental Affairs
EA: Environmental Authorisation
ECO: Environmental Control Officer
EMPr: Environmental Management Programme
NEMA: National Environmental Management Act 107 of 1998
LFA: Landscape Functional Analysis (Tongway and Hindley 2004)
IAP: Invasive Alien Plant

List of Definitions:

Accelerated soil erosion: Soil erosion induced by human activities.

Acceptable cover: An acceptable cover shall mean that not less than 75% (in an area with rainfall above 400 mm per annum), or 40% (in regions receiving less than 400 mm rain per annum), of the area planted or hydroseeded shall be covered with grass and that there shall be no bare patches of more than 500 mm in maximum dimension.

Alien: originating from another country or continent and originally different environment, commonly used to describe plants that are not indigenous to South Africa and have become problematic (spreading rapidly, threatening existing biodiversity).

Allelopathic components: one or more biochemical compound produced by a plant and released through leaf litter or roots that suppresses the growth, survival, and reproduction of other surrounding vegetation.

Bare soil: Un-vegetated soil surface, unaltered by humans.

Compacted soil surface: A soil surface that has been hardened by an outside source, causing the soil to be more compacted than the surrounding area.

Container plants: Container plants include all vegetation which are bought or supplied in acceptable containers from nurseries or vegetation lifted out of their natural position and placed in containers.

Desirable end state: the future condition or target on which the rehabilitation is designed and that will serve later as a basis for rehabilitation success evaluation. This can be based on a reference site or modelled according to available information on historic vegetation.

Ecological rehabilitation: The process of assisting the recovery of a degraded or damaged ecosystem in a trajectory that renders the ecosystem fully functional, stable, and able to develop further, but not necessarily returning to the original historic state.

Ecological restoration: The process of assisting the recovery of an ecosystem that has been degraded damaged or destroyed, in a trajectory that ultimately returns the ecosystem to its natural successional stage.

Ecosystem: The combination of biota within a given area, together with a suitable environment that sustains the biota and the interactions between biota. It can have a spatial unit of any size, but shows some degree homogeneity as far as structure, function and species composition is concerned. Small-scale ecosystems typically link up to larger scale ecosystems and all contribute to the ecosystem function and services at the landscape-scale.

Environmental Management Plan: an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction and operation, and decommissioning of a project are prevented; and that the positive benefits of the projects are enhanced.

Establishment of grass: All procedures necessary to produce an acceptable cover of grass on an area.

Establishment Period: The Establishment Period is defined as the period beginning from the actual planting or placing of vegetation until three months thereafter, unless otherwise specified or unless grass cover is unacceptable or unless plants have not taken.

Extinction debt: is a concept that describes the future extinction of species due to events in the past. Extinction debt occurs because of time delays between impacts on a species, such as destruction of habitat or reduction of population size, and the species' ultimate disappearance.

Geophytic: resprouting during the growing season from an underground storage organ such as bulbs, corms, tubers or rhizomes, and dying back completely during unfavourable seasons.

Hydroseeding: To apply seed in a slurry with water (plus other materials to enhance growth) by means of a spraying device.

Indigenous: refers to a plant or animal that occurs naturally in the place in which it is currently found.

Invasive plant: a kind of plant which has under section 2 (3) of CARA been declared an invader plant, and includes the seed of such plant and any vegetative part of such plant which reproduces itself asexually.

Landscape: Consists of a mosaic of two or more ecosystems that exchange organisms, energy, water, and nutrients.

Nursery conditions: These are the necessary conditions to maintain healthy growth of rescued and/or container plants. This includes protection of such plants against wind, frost, direct sunlight, pests, rodents, diseases, and drought. It also includes the provision of suitable water, fertilizer and any other measures required to maintain the container plants.

Period of Maintaining: The Period of Maintaining is defined as the period following directly after the Establishment Period until the end of the Period

of Maintenance for the whole Contract as defined in the General Conditions of Contract, unless otherwise specified.

Revegetation: The process of establishing a vegetative cover on exposed soils, regardless of species composition or structure, as long as the species are non-invasive and their presence will not impede the gradual process of ecological rehabilitation or –restoration.

Soil Erosion: is a natural process whereby the ground level is lowered by wind or water action and may occur as a result of inter alia chemical processes and or physical transport on the land surface**.**

Scarifying: To roughen the surface of soil as a preparation for seeding or topsoil addition.

Trimming: To neatly round off the levels of existing or previously shaped earthworks to blend in with the levels of other earthworks, constructed works, or natural landforms.

Transformation: The conversion of an ecosystem to a different ecosystem or land use type.

Topsoil: uppermost layer of soil, in natural vegetation maximally 30 cm, in cultivated landscapes the total depth of cultivation, containing the layer with humus, seeds and nutrients. Topsoils that are applied to landscapes to be rehabilitated must be free of refuse, large roots and branches, stones, alien weeds and/or any other agents that would adversely affect the topsoils suitability for re-vegetation.

Weed: a plant that grows where it is not wanted, and can therefore be an indigenous or alien species. An unwanted plant growing in a garden is just called a weed, but the 198 listed IAPs are called "declared weeds and invaders".

1. Purpose

The Plant Rescue and Revegetation Management Plan addresses the need to mitigate all impacts leading to disturbed vegetation, loss of species and/or agricultural potential, disturbed soil surfaces, and generally bare soils prone to erosion and further degradation on the proposed development site. The plan overlaps to some degree with the Storm Water and Erosion Management Plan, and for successful rehabilitation, it is imperative that this plan is at all times used in conjunction with other EMPrs mentioned.

The objective of the plan is therefore to provide:

» Protocols for the removal, temporary storage and replanting of plant species of conservation concern
» Protocols for the rehabilitation of vegetative cover across the project area
» Tools for planning the rehabilitation work and responding to unforeseen events
» Guidelines on implementation and post-implementation tasks
» Criteria for evaluating rehabilitation success
» A summary of items to be included in the rehabilitation budget to ensure that there is sufficient allocation of resources on the project budget so that the scale of EMP-related activities is consistent with the significance of project impacts

2. Scope

This document is a plant rescue, rehabilitation, and revegetation plan that provides a guideline to be applied by all contractors on the development site. This plan, as part of the project EMPr, is a legally binding document that must be implemented to fullfil the requirements of relevant legislation. However, the management plan is an evolving guideline that needs to be updated or adapted as progress is made with the rehabilitation and revegetation of the project area, and successes and failures of procedures identified.

The objective of rescuing plants, rehabilitation and revegetation on the project area is:

» Preventing the loss of species either directly or through future extinction and minimising impacts of development on population dynamics of species of conservation concern.
» Preserving the natural configuration of habitats as part of ecosystems, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist.
» Preserving or re-creating the structural integrity of natural plant communities.
» Actively aid the improvement of indigenous biodiversity according to a desirable end state according to a previously recorded reference state. This reference

state, if healthy, will be dynamic and able to recover after occasional disturbances without returning to a degraded state.

» Improving the ecosystem function of natural landscapes and their associated vegetation.

3. Legislation and Standards

Relevant legislation:

» Conservation of Agricultural Resources Act 43 of 1983
» Environmental Conservation Act 73 of 1989
» National Forestry Act 84 of 1998
» National Environmental Management Act 107 of 1998
» Northern Cape Nature Conservation Act (Act No. 9 of 2009)

4. Effect of clearing alien vegetation

Invasive and Alien Plants (IAPs) gradually displace and suppress indigenous and/or herbaceous vegetation as their stands become bigger and denser. In addition, they use more water, hence desiccate the soil more, and may alter chemical properties of the soil – partially through secondary compounds released from their litter, partially from compounds released from roots. These altered soils suppress the germination and establishment of herbaceous species, leading to bare soil underneath dense IAP canopies.

After clearing dense stands of invasive shrubs, soil surfaces are thus generally bare with topsoil exposed to erosion and often already somewhat capped and eroded.

5. Effect of removing individuals of species of conservation concern

Species of conservation concern are declining either due to overexploitation or because their range of occupancy is limited and further infringed on by development. Most plant populations require a certain minimum number of individuals within a population or metapopulation to allow for sufficient genetic transfer between individuals. This prevents genetic erosion and hence weakening of the ability of individuals to persist in their environments. Similarly, where the distance between metapopulations is significantly increased due to fragmentation and the resultant loss of some populations, populations may suffer genetic decline due to restricted movement of pollen. Pollinators or other species that depend on a particular plant species for a specific microhabitat or food source may be equally affected because of the reduction of available resources. Therefore the aim of plant rescue actions are always to maintain as many individuals of a plant population in as close proximity to the original habitat as possible to minimise loss of individuals and fragmentation of populations to prevent the creation of future extinction debts of the development.

6. General: Plant rescue and protection

Successful plant rescue can only be achieved if:

» Species can be removed from their original habitat with minimal damage to the plant, especially the roots.
» All plants removed are safely stored and treated according to their specific requirements prior to being transplanted again.
» They are relocated into a suitable habitat and protected from further damage and all disturbances to aid their re-establishment.
» Timing of planting activities is planned with the onset of the growing season.
» Steps are taken where necessary to aid the initial establishment of vegetation, including occasional watering.

6.1. Time of planting

» All planting shall be carried out as far as is practicable during the period most likely to produce beneficial results (i.e. during the peak growing season), but as soon as possible after completion of a section of earthworks.
» Drainage line rehabilitation preparation must be done during autumn, and planting of appropriate species in these areas should commence during early spring after the first rains.

7. General: IAP removal

Removal of invasive plants should at all time follow the specifications and guidelines of the Working for Water Programme (refer also to invasive plant management plan).

Information can be obtained from the relevant website:
http://www.dwaf.gov.za/wfw

Detailed information on clearing methods is available on the above websites "Alien Invasive Plants" menu (clearing methods, operational standards and species-specific treatment methods).

8. General: Rehabilitation and re-vegetation

Successful rehabilitation can only be achieved with:
» A long-term commitment
» Practical, adaptive management
» Viable goals of desired outcomes

Prior to vegetation rehabilitation, all stakeholders involved should be consulted to determine:

» What the rehabilitation is ultimately aiming for– rehabilitation of cropping/grazing lands or rehabilitation of indigenous vegetation, after soil erosion and storm water management is in place and IAPs have been cleared?
» A clear definition of incompatible and compatible vegetation on and in the immediate surroundings of the development must be defined and maintained as such. No tree or shrubs shall be allowed to grow to a height in excess of the horizontal distance of that tree or shrub from the nearest newly developed structure or to grow in such a manner as to endanger the development or its operation
» Who will take long-term ownership and hence responsibility for the rehabilitation and its subsequent monitoring and management? Continued monitoring of vegetation establishment and composition, as well as erosion detection will have to be coupled with continued follow-up maintenance of rehabilitation and erosion control from commencement of activity up to the decommissioning phase.

The ultimate objective for rehabilitation should focus on the stabilisation of soil erosion, retaining agricultural potential of transformed areas and /or the establishment of a dense and protective plant cover and the maintenance of habitats to enable vegetation to persist and flourish on rehabilitated areas indefinitely, ultimately relying only on environmental resources.

8.1. Map and create management areas

The entire project area must be mapped and divided into management areas indicating:

» Current land cover
  - Roads and residential
  - Areas with IAPs, subdivided further in sparse or dense infestations where applicable
  - Transformed areas
  - Untransformed indigenous vegetation

For every one of the management areas, the project proponent, in consultation with the land users, will have to decide what intervention will be necessary, desirable, and feasible to enable the development of the project and long-term sustainable maintenance of infrastructure. Thus for every management area there must be an operational outline on:

» what will happen there
» what needs to be mitigated – including storm water- and erosion management
» which management units need priority intervention/mitigation
» how will this mitigation / intervention be done (method statements) including schedule of work
» realistic and desirable end states including list of species that should be established to initiate rehabilitation after initial revegetation

» approximate timeframes
» monitoring protocol to evaluate success or failures of interventions
  - establish permanently marked transects and monitor with fixed-point photography
» who will be responsible for doing what
» how will different actions be integrated to achieve and maintain or improve the desirable end state of the environment of that management unit

Special attention will have to be given to drainage zones, as these not only have very active morphodynamics, but are also distributers of seeds – both indigenous and of IAPs. Thus clearing a downstream invasion of aliens to enable maintenance of the development will be futile if the upstream IAPs are not cleared or at least aggressively controlled.

8.2. Setting realistic rehabilitation goals

Rehabilitation efforts typically aim at improving ecosystem function that consists of a series of processes, which can in the end be evaluated against a desired outcome or reference state of the vegetation and environment.

Attainable goals of rehabilitation on the project area should be possible and viable for at least the following:

» Stabilisation of soils
» Stabilisation of riparian areas
» Storm water reduction through management and wetland integrity
» Clearing of IAPs
  - The degree to which IAPs can be cleared from the project area needs to be determined according to desirability, available project funding, personnel and project requirements
» Restoring and/or rehabilitating vegetative cover on non-transformed areas to obtain an acceptable vegetation cover that can be maintained or persists on its own indefinitely

8.3. Remove or ameliorate the cause of degradation

This will include:

» Physical rehabilitation of topsoil where it has been removed.
» Topsoil on areas that have not been cultivated are considered as the upper 20 - 30 cm only. These contain the most important nutrients, micro flora and –fauna essential for nutrient cycling processes. Topsoils are also an important source of seeds.
» Subsoils and overburden substrata lack the above elements and will first have to be used for physical rehabilitation of landscapes as and where necessary, and then overlain with topsoils

» Stabilisation of topsoils and prevention of erosion – refer to the Erosion management pan
» Removal of all invasive vegetation – refer to the Invasive Management Plan
    - Where it is desirable to use brush or logs of the cleared vegetation for soil stabilisation, such material must be free of regenerative material – e.g. seeds or root suckers

8.4. Initial revegetation

Immediately after clearing of vegetation, the soil surface must be inspected for signs of erosion and stabilised as soon as possible. After completion of construction, such erosion stabilisation should preferably be with a cover of vegetation. A dense initial grass or other perennial cover will be desirable. The appropriate seed mix should be determined in consultation with an ecologist familiar with the area. The aim of the first vegetation cover is to form a protective, relatively dense indigenous layer to slow runoff, increase moisture infiltration into the soil, and gradually change the soil nutrient status in order for it to be more favourable for other desirable indigenous vegetation to become established.

8.5. Plant Search and Rescue

Prior to construction, once all the areas where topsoil will be removed or areas will be transformed have been demarcated, the ECO and contractor will be responsible to remove all bulbous species from the topsoil, as well as succulents and small indigenous shrubs that can be transplanted. These are to be kept in a raised, protected position in a designated area until they can be replanted again as part of the rehabilitation process. Further details are listed in the operation standards.

8.6. Natural seed banks and improvement of plant structural and compositional diversity

It is expected that soil seed banks of indigenous vegetation will be present to initiate initial vegetation cover, but may not be sufficient to establish an acceptable cover of desirable species. After deciding which indigenous species should be re-introduced, seed should be ideally collected from site or an environmentally-matched site nearby.

Seed collection may be done throughout the year as seed ripens, but can also be restricted to summer, when a large amount of the perennial seed should have ripened. Seeds should be stored in paper or canvas bags dusted with insecticide, and sown at the onset of the rainy season.

Alternatively, slower-growing perennials may be raised from seed or cuttings in a nursery and then transplanted once established. It will be beneficial to investigate if community members would be able to create and maintain such a nursery, or if there are nurseries in the area, that raise indigenous flora from the area.

The final vegetation cover should resemble the original (non-encroached) vegetation composition and structure as far as practicable possible or permissible within each management unit.

For drainage areas:

» First restore drainage line morphology following the guidelines of the Erosion management plan – without that ecological recovery cannot be initiated
» Determine if natural seed sources may be present further upstream
» If such upstream seed sources are still present, rehabilitation of riparian vegetation after soil erosion management will most likely occur naturally, PROVIDED that follow-up monitoring of the establishment of vegetation is carried out, and all invasive species eradicated as they emerge. This can only be achieved with a long-term commitment (> 5 years minimum)
» Should no upstream seed resources be available, suitable species (as determined in consultation with an ecologist) should be sown or planted.

8.7. Monitoring and follow-up action

Throughout the lifecycle of the development, regular monitoring and adaptive management must be in place to detect any new degradation of ecosystems affected by the development, and remedy these as soon as detected.

During the construction phase, the ECO and contractor will be responsible for initiating and maintaining a suitable monitoring system. Once the development is operational, the project proponent will have to identify a suitable entity that will be able to take over and maintain the monitoring cycle and initiate adaptive management as soon as it is required. Monitoring personnel must be adequately trained.

The following are the minimum criteria that should be monitored:
» Composition and density of replanted vegetation, distinguishing between species introduced for initial revegetation only and species that are part of the pre-determined desirable end state
» Associated nature and stability of surface soils
  - It is recommended that permanent transects are marked and surveyed annually according to the LFA technique (Tongway and Hindley 2004), adapted to integrate both surface soil characteristics and the vegetation to be monitored
» Re-emergence of IAPs
  - If noted, remedial action must be taken immediately according to Working for Water specifications
» Nature and dynamics of riparian zones
  - Stability of riparian vegetation
  - Any form of bank erosion, slumping or undercutting

- Stability of channel form and width of streams – if this increases, it shows that vegetation on plains and/or riparian areas and upper drainage lines are not yet in a stable enough state to be fully functional in reducing excess runoff and the ecosystem overall is losing valuable resources

8.8. Timeframes and duration

» Rehabilitation will occur during construction, as areas for the re-application of topsoil and revegetation become available or where revegetation can be initiated after clearing of invasives or to stabilise erosion.
» The initial revegetation period post construction is estimated to be over a period of 6 (minimum) to 12 months (maximum), or a time period specified by the Horticultural Landscape Contractor, particularly if planting of trees and shrubs occurs.
» The rehabilitation phase (including post seeding maintenance) should be at least 12 months (depending on time of seeding and rainfall) to ensure establishment of an acceptable plant cover is achieved (excluding invasive plant species or weeds).
» If the plants have not established and the acceptable plant cover is not achieved within the specified maintenance period, maintenance of these areas shall continue until at acceptable plant cover is achieved (excluding alien plant species or weeds).
» Additional seeding or planting may be necessary to achieve acceptable plant cover. Hydroseeding may have to be considered as an option in this case.
» Any plants that die, during the maintenance period, shall be replaced by the Horticultural Landscape Contractor (at the Horticultural Landscape Contractor's cost if it was due to insufficient maintenance).
» Succession of natural plant species should be encouraged
» Monitoring of rehabilitation success and follow-up adaptive management, together with clearing of emerging invasives shall be carried on until the decommissioning phase has been completed.

9. Conclusion

The Plant Rescue and Revegetation Management Plan is a document to assist the contractor, the developer, and the ECO with guidelines on how to plan and implement the required work, and understand the concepts behind successful rehabilitation. This plan will have to be implemented in conjunction with erosion-, storm water- and IAP management plans. The exact details of the rehabilitation plan will depend on the determined extent of rehabilitation that will have to be undertaken, available funding, and desirable end state of the vegetation after rehabilitation.

10. References and further reading

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A. APPENDIX: RECOMMENDED OPERATIONAL STANDARDS

OBJECTIVE: Revegetate and Rehabilitate disturbed areas

The Contractor must take all reasonable measures to ensure that plant species of conservation concern are rescued and survive indefinitely. Landscaped topsoils as well as areas cleared of IAPs must be adequately rehabilitated and /or revegetated to ensure that the ecosystems affected by the development regain and/or retain their functionality indefinitely.

Throughout the lifecycle of the development, regular monitoring and adaptive management must be in place to detect any new degradation of ecosystems affected by the development and remedy these as soon as detected.

Mitigation measures relating to the vegetative cover as part of a healthy ecosystem must be implemented in order to effectively limit and gradually reverse the impact on the environment. The focus of the mitigation measures laid out below relate to project-related disturbances. Where such disturbances are exacerbated by farming-related disturbances or vice versa, mitigation measures must be carried out in consultation with the land-user responsible.

Project component/s	Project components affecting the objective: » Access roads » Power line » Substation » All other infrastructure
Potential Impact	» Loss of suitable substrate for a stable vegetation cover » De-stabilisation and/or alteration of substrate and hence degradation of vegetation cover, significant change in species composition or loss of agricultural potential » Loss of suitable habitat for flora and fauna » Leaky ecosystem due to loss of nutrients and moisture from the system, leading to a less resilient vegetation cover and loss of ecosystem function and -services » Degradation and/or loss of riparian areas and wetlands on and beyond the project boundaries » A loss of indigenous vegetation cover and possibly endangered species » Disturbance of fauna species
Activities/risk sources	» Rainfall and wind erosion of disturbed areas » Excavation, stockpiling and compaction of soil » Existing IAPs as well as clearing thereof » Concentrated discharge of water from construction activity or new infrastructure » Storm water run-off from sealed, altered or bare surfaces » Mobile construction equipment movement on site

	» Cabling and access roads construction activities » Power line construction activities » River/stream/drainage line road crossings » Roadside drainage ditches » Project related infrastructure » Premature abandonment of follow-up monitoring and adaptive management of rehabilitation
Mitigation: Target/ Objective	» To minimise loss of plant species of conservation concern » To minimise unfavourable runoff conditions and loss of resources from the ecosystems » To minimise erosion of soil from site during and after construction » To minimise and mitigate unfavourable alteration to drainage lines, especially incision » To minimise damage to indigenous vegetation during and after construction » No accelerated overland flow related surface erosion as a result of project infrastructure » No reduction in the surface area or general nature and functionality of wetlands (drainage lines and other wetland areas) as a result of the establishment of infrastructure on the project areas and beyond its boundaries » A clear reduction of IAPs on the project area and replacement thereof by indigenous vegetation according to a pre-determined desirable end state

Mitigation: Action/control	**Responsibility**	**Timeframe**
Planning		
Classify the entire project area into management units according to current land cover and state of the environment and map accordingly	Developer / Contractor	Prior to construction
For each management unit » establish what interventions will be necessary relating to IAPs, soil erosion management, topsoil handling, landscape rehabilitation and revegetation » where rehabilitation and revegetation will be necessary, decide on the desired end state of vegetation for that management unit and create a list of species to be established on specific sites » outline the management of construction activities, including topsoils, excavated materials and felled biomass in a manner that will optimise the rehabilitation goals as fast and as effective as possible for that management unit	Developer / Contractor in collaboration with ECO and land-users	Prior to construction
Plant Rescue and indigenous plant materials		
All harvested plant materials shall be labelled with » Genus as minimum, species if known » Habitat from which materials were collected	ECO	Prior to construction
Indigenous plant materials for re-vegetation: » All plant material shall be obtained from the search-	Contractor in collaboration	Before, during and

Mitigation: Action/control	Responsibility	Timeframe
and-rescue operation on the site prior to clearing or from local nurseries or reputable seed providers. The nurseries must be registed with the Eastern Cape Department of Economic Development, Environmental Affairs and Tourism. » Indigenous materials shall only be removed from their habitat with the necessary permits whenever applicable » Each plant removed shall be handled, packed and stored in a manner suitable for that species » Removed plants shall be protected from windburn or other damage during transportation » No plants or plants with exposed roots shall be subjected to excessive exposure to drying winds and sun, or subjected to water logging » All plants shall be kept free from plant diseases and pests and protected from rodents or other damaging agents » All indigenous plants that have been removed prior to clearing shall be returned to conditions resembling their original habitat as close as practically possible	with ECO	after construction
Seed stocks for rehabilitation » Seed can be used for cultivation of desirable species for revegetation » Seed shall be utilised for direct sowing or hydroseeding » Seed collected from the site must be dried and stored in a suitable facility under cool (7-10°C), dry, insect free conditions until required for cultivation or seeding. Only viable, ripe seed shall be used » Seed harvested shall be insect- and pathogen free » Seed harvested shall not contain materials of any invasive species » Prior to clearing, seed should be collected from the site on a regular basis as species start to seed to maximise the amount of fully developed seed secured » From sites that will be cleared, 100% of all seeds available may be collected » From sites adjacent to the development, 25% of seeds can be collected for rehabilitation	Contractor and ECO	Before, during and after construction
Site-specific nursery » On-site nursery facilities shall be erected for the holding of rescued plant material and the propagation of appropriate species for re-vegetation » Where nursery facilities can only cater for rescued plants, a suitable (local) nursery shall be identified that will be willing to receive seeds collected and propagate the necessary species for later revegetation » Soil or other propagation media, were used, shall be weed- and pathogen free » Argentine ants shall be controlled at all times	Contractor, ECO to control	Prior to construction

Mitigation: Action/control	Responsibility	Timeframe
» The area where plants are stored shall be kept free of weeds » Plants stored in the designated area shall be protected from rodents, excessive sun and wind, and inspected regularly until being planted for pathogens and pests, and then treated accordingly » The nursery shall be adequately secured to prevent loss or theft of species		
Protected flora » Ensure that no indigenous protected flora is removed from its original habitat in the project area without legal documents from the relevant authorities	ECO	Before, during and after construction
Topsoil		
Avoid » Management units that will not be developed or selected elements – trees, rocky outcrops on site shall be maintained in situ and demarcated clearly to prevent any disturbance during construction » These units will be considered as NO-GO areas during construction	Contractor and ECO	Before, during and immediately after construction
Invasives » Remove all invasive shrubs as per the Working for Water specifications	Contractor, ECO to control	Before, during and after construction
Mulch » all trees felled shall be debranched and the logs used in controlling erosion from re-landscaped topsoils and/or adding surface roughness and organic matter to topsoils to be rehabilitated » all cut branches from trees, as well as all shrubs cleared from the construction site shall be shredded to mulch, either by a chipper or by hand to sticks no longer than 10 cm » preparation of mulch shall be done at source » mulched material shall be free of seed-bearing invasive plant material » the mulch shall be suitably stored – bagged if necessary - and will be used in rehabilitation and soil erosion management on the site » should additional mulch be used for rehabilitation, this should be obtained from invasive shrubs of areas not cleared. The shrubs should not have seeds. » mulch shall be stored for as short a period as possible	Contractor, ECO to control	Before, during and immediately after construction
Storage of topsoil and subsoil: » topsoils constitute the upper 20 – 30 cm of soil only, lower layers of soil are regarded as subsoil » stockpiling of topsoils and subsoils shall only be done on previously transformed areas, and be kept at least 50 m from any remaining natural vegetation	Contractor, ECO to control	During and immediately after construction

Mitigation: Action/control	Responsibility	Timeframe
» care shall be taken during stockpiling to prevent the mixing of topsoil with subsoil and/or any other material » topsoils shall be stored in heaps no higher than 2m, and shall be re-applied as soon as possible » care shall be exercised during stockpiling of topsoils to prevent compaction thereof » topsoils shall be adequately protected from erosion by preventing concentration of surface water and scouring of slopes » erosion of topsoils has to be contained and repaired as soon as it occurs, before large scale erosion and loss of topsoil develops » any logs obtained during clearing operations can be used in continuous rows to curtail erosion where necessary. Geojute (geotextile) shall be used additionally if the logs are not sufficient to remedy any erosion – for details refer to the erosion management plan » Top soil should be used within 6 months to ensure that seeds are viable.		
Boulders and rocks » where removed during clearing, should be stored separately and used in the rehabilitation program » boulders and rocks must be partially buried within the topsoil layer wherever practical to provide greater soil-holding stability and reduce water erosion » placement of rocks and boulders shall mimic the natural occurrence of rocks and boulders in the area	Contractor, ECO to control	During and after construction
Rehabilitation of surface		
Prior to the application of topsoil » subsoil shall be shaped and trimmed to blend in with the surrounding landscape or used for erosion mitigation measures » ground surface or shaped subsoil shall be ripped or scarified with a mechanical ripper or by hand to a depth of 15 – 20 cm, » compacted soil shall be ripped to a depth greater than 25 cm and the trimmed by hand to prevent re-compacting the soil » any rubbish, concrete remnants, steel remnants or other objects introduced to the site during the construction process shall be cleared before ripping, or shaping and trimming of any landscapes to be rehabilitated takes place » shaping will be to roughly round off cuts and fills and any other earthworks to stable forms, sympathetic to the natural surrounding landscapes	Contractor, ECO to control	During and after construction
Application of topsoil	Contractor, ECO	During and

Mitigation: Action/control	Responsibility	Timeframe
» topsoils shall be spread evenly over the ripped or trimmed surface, if possible not deeper than the topsoil originally removed » the final prepared surface shall not be smooth but furrowed to follow the natural contours of the land » the final prepared surface shall be free of any pollution or any kind of contamination » care shall be taken to prevent the compaction of topsoil » where applicable, the final prepared surface will also contain scattered rocks and/or logs to mimic the natural condition of the original habitat or area and to aid in soil stabilisation and erosion control	to control	after construction
Soil stabilisation » mulch from brush shall be applied by hand to achieve a layer of uniform thickness » mulch shall be rotovated into the upper 10 cm layer of soil o this operation shall not be attempted if the wind strength is such as to remove the mulch before it can be incorporated into the topsoil » in very rocky areas a layer of mulch shall be applied prior to adding the topsoil » measures shall be taken to protect all areas susceptible to erosion by installing temporary and permanent drainage work as soon as possible o where natural water flow-paths can be identified, subsurface drains or suitable surface drains and chutes need to be installed » additional measures shall be taken to prevent surface water from being concentrated in streams and from scouring slopes, banks or other areas o if mulch is limited, available mulch, together with harvested seeds, should be concentrated in these hollows to promote rapid re-vegetation in them » runnels or erosion channels developing shall be back-filled and restored to a proper condition o such measures shall be effected immediately before erosion develops at a large scale » where erosion cannot be remedied with available mulch, logs or rocks, geojute shall be used to curtail erosion	Contractor, ECO to control	During and after construction
Borrow-pits » shall be shaped to have undulating, low-gradient slopes and surfaces that are rough and irregular, suitable for trapping sediments and facilitation of plant growth. Borrow pits may only be operated with a licence from DMR. » upon completion of rehabilitation these reshaped and	Contractor, ECO to control	After construction

Mitigation: Action/control	Responsibility	Timeframe
revegetated areas shall blend into the natural terrain		
Revegetation		
Recreate a non-invasive, acceptable vegetation cover that will facilitate the establishment of desirable and/or indigenous species » revegetation of the final prepared area is expected to occur spontaneously to some degree where topsoils could be re-applied within 6 months » revegetation will be done according to an approved planting/landscaping plan according to the management units initially delineated and their respective desirable end states and permissible vegetation	Contractor, ECO to control	Successively during construction, as construction of individual components is completed, then followed up until desired end state is reached
Re-seeding » revegetation can be increased where necessary by hand- seeding indigenous species o previously collected and stored seeds shall be sown evenly over the designated areas, and be covered by means of rakes or other hand tools » re-seeding shall occur at the recommended time to take advantage of the growing season » in the absence of sufficient follow-up rains after seeds started germinating, watering of the new vegetation cover until it is established shall become necessary to avoid loss of this vegetative cover and the associated seedbank » where, after initial re-seeding, the no acceptable vegetation cover has established within 12 months, hydroseeding should be considered as an option for follow-up revegetation work » sowing rates of seeds used during hydro-seeding should be obtained from the relevant supplier and in accordance with the existing environment	Contractor, ECO to control	Successively during construction, as construction of individual components is completed, then followed up until desired end state is reached
Planting of species » species to be planted include all rescued species » the size of planting holes shall be sufficiently large to ensure that the entire root system is well covered with topsoil » soil around the roots of container plants shall not be disturbed » bulbous plants shall be planted in groups or as features in selected areas » before placement of larger plant specimens into prepared holes, the holes shall be watered if not sufficiently moist	Contractor, ECO to control	Successively during construction, as construction of individual components is completed, then followed up until desired

Mitigation: Action/control	Responsibility	Timeframe
» during transplanting care shall be taken to limit or prevent damage to roots » plants should be watered immediately after transplanting to help bind soil particles to the roots (or soil-ball around rooted plants) and so facilitate the new growth and functioning of roots		end state is reached
Traffic on revegetated areas » designated tracks shall be created for pedestrian of vehicle traffic where necessary » Disturbance of vegetation and topsoil must be kept to a practical minimum, no unauthorised off road driving will be allowed » All livestock shall be excluded from revegetated areas	Contractor	Before, during and after construction
Establishment » The establishment and new growth of revegetated and replanted species shall be closely monitored » Where necessary, reseeding or replanting will have to be done if no acceptable plant cover has been created	Contractor	Successively during construction, as construction of individual components is completed, then followed up until desired end state is reached
Monitoring and follow-up treatments		
Monitor success of rehabilitation and revegetation and take remedial actions as needed according to the respective plan » Erosion shall be monitored at all times and measures taken as soon as detected » Where necessary, reseeding or replanting will have to be done if no acceptable plant cover has been created	ECO during construction, suitable designated person/institution after that	During and after construction, during operational and decommis-sioning phase
Weeding » It can be anticipated that invasive species and weeds will germinate on rehabilitated soils o These need to be hand-pulled before they are fully established and/or reaching a mature stage where they can regenerate. No chemical clearing should be uses. This is to be done using mechanical methods. o Where invasive shrubs re-grow, they will have to be eradicated according to the Working for Water specifications		

Performance Indicator	» No activity in identified no-go areas » Acceptable level of activity within disturbance areas, as determined by ECO » Natural configuration of habitats as part of ecosystems or cultivated land is retained or recreated, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist » The structural integrity and diversity of natural plant communities is recreated or maintained » Indigenous biodiversity continually improves according to the pre-determined desirable end state o This end state, if healthy, will be dynamic and able to recover by itself after occasional natural disturbances without returning to a degraded state » Ecosystem function of natural landscapes and their associated vegetation is improved or maintained
Monitoring	» Fortnightly inspections of the site by ECO during construction » An incident reporting system must record non-conformances to the EMPr. » Quarterly inspections and monitoring of the site by the ECO or personnel designated to the rehabilitation process until 80% of the desired plant species have become established o These inspections should be according to the monitoring protocol set out in the rehabilitation plan » Thereafter annual inspections according to the minimal monitoring protocol

B. APPENDIX: CHECKLIST OF ACTIONS FOR REHABILITATION PLANNING

Conceptual Planning	» Identify rehabilitation site locations and its boundaries » Identify ownership of rehabilitation program » Describe improvements that are anticipated following rehabilitation » Identify the kind of ecosystem to be rehabilitated at each site » Identify rehabilitation goals and desirable end state » Identify physical site conditions in need of repair » Identify stressors in need of regulation or re-initiation to maintain the integrity of the ecosystem, such as aliens, erosion, fire-regime » Identify the list and kinds of interventions of abiotic and biotic interventions that are and will be needed » Identify landscape restrictions and whether or not its integrity is dependent on a functioning ecosystem outside the project area » Determine project funding and sources » Identify labour sources and equipment needs » Identify biotic resource needs and sources, e.g. suitable topsoil, seeds » Identify any permit requirements or other legal issues » Determine project duration » Outline adaptable strategies for long-term protection and management
Preliminary Tasks	» Appoint a rehabilitation practitioner who is in charge of all the technical aspects of rehabilitation » Appoint a restoration team and train where necessary to ensure effective implementation » Prepare a budget to accommodate the completion of preliminary tasks » Document existing site conditions, also describing biota » Conduct pre-project monitoring as needed, including soil chemistry, that may affect the success of the rehabilitation program » Establish a reference site or past reference that represents the desired end state of the site » Gather information on key species to be re-introduced » Conduct investigations as needed to assess the effectiveness of restoration methods and strategies used in similar habitats up to date » Decide if rehabilitation goals are realistic or need modification » Prepare a list of objectives that need to be reached to achieve restoration goals » Ensure liaison with affected stakeholders, especially as far as rehabilitation goals are concerned » Investigate available accedes and infrastructure needed to facilitate implementation of rehabilitation
Implementation phase	» Describe the interventions that will be implemented to attain each set objective » Acknowledge potential for passive restoration where viable » Prepare performance standards and monitoring protocols to measure the attainment of each objective » Schedule tasks needed to fulfil each objective

	» Obtain equipment, supplies and biotic resources as needed » Prepare an appropriate budget
Implementation tasks	» Mark boundaries and work areas » Install permanent monitoring fixtures » Implement restoration tasks
Post-implementation tasks	» Protect the rehabilitation site against initial disturbance, including herbivores » Perform post-implementation maintenance, especially continued monitoring and eradication of emerging IAPs » Monitor site at least once per year, using the LFA technique, and identify needs for adaptive management
Evaluation	» Assess monitoring data to determine whether performance standards are met and rehabilitation objectives reached and maintained » Conduct an ecological evaluation of the newly completed rehabilitation

C. APPENDIX: TRANSPLANTING GUIDELINES FOR PLANTS WITH UNDERGROUND STORAGE ORGANS

Many of the plants in harsh environments have underground storage organs from which they resprout every year after sufficient rains, flower and then die back soon after fruiting and remain dormant, out of sight until the next growing season. All species of the families Amaryllidaceae, Iridaceae, Orchidaceae are protected provincially, nationally and/or internationally, as are many species of other monocot species.

Root system: underground storage organs are variable in size, but usually between 15 and 40 cm deep in the soil

Transplanting: success of transplanting is usually very high IF handled correctly

Rescue 101: Plants should be lifted and transplanted after flowering and fruiting, preferably as the leaves start to die back. For lifting, loosen the soil or wedge apart rocks working from a circle of about 20 cm away from the base of the plant, working inwards but not closer than about 5 cm of the plant with a sharp narrow object such as a koevoet. Once the soil is loosened, gently feel by hand where the bulb, corm, or other storage organ is, and wedge out by hand, taking care not to damage it. Remove loose soil, gently cleanse off most of remaining soil, or rinse off the storage organ. Group these according to species and label clearly, keep records of labels to include name if that is known, or a brief description or photo, also the average depth of the organs when they were removed, and the habitat they were removed from. Spread these plants so that the storage organ can dry completely, and then loosely pack into newspaper or paper bag and then store in a shaded, dry position for maximally 3 months. Transplant into soil that is as similar as possible to the original habitat, TAKING CARE that the growing point of the organ points to the top, else the plant will die. Make sure the storage organs are positioned according to the records kept about original depth of the storage organ.

Aftercare: Firm down soil around the base of the plant once it is in a new position. Allow plant to resprout naturally after sufficient rains, do not water. As these plants may not be visible for a while, clearly demarcate the area where these have been planted to avoid disturbing and potentially destroying them later on.