MULILO
RENEWABLE PROJECT DEVELOPMENTS

Basic Assessment for the Proposed Development of the Supporting Electrical Infrastructure to the Kuruman Wind Energy Facilities, Kuruman, Northern Cape Province

Draft Basic Assessment Report

APPENDIX D:

Environmental Management Programme (EMPr)

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1 Introduction

Mulilo Renewable Project Developments (Pty) Ltd (hereafter, "Mulilo"), the Project Applicant, is proposing to construct two Wind Energy Facilities (WEFs), namely Kuruman Phase 1 WEF and Kuruman Phase 2 WEF and supporting infrastructure, in the Ga-Segonyana Local Municipality and the John Taolo Gaetsewe District Municipality, 8 km and 37 km south west from Kuruman and from Kathu, respectively, in the Northern Cape Province. The proposed WEF projects are being developed to generate electricity via wind energy which will feed into and supplement the national electricity grid.

This Environmental Management Programme (EMPr) has been developed as an outcome of the Basic Assessment (BA) undertaken for the development of **the supporting electrical infrastructure to the two WEFs, namely the "Kuruman Transmission Line" project**. The proposed project occurs within the Ga-Segonyana Local Municipality and the Gamagara Local Municipality and within the John Taolo Gaetsewe District Municipality.

The Basic Assessment process undertaken for this project provided an assessment of three connectivity options that will enable the WEFs to evacuate the electricity generated into the National Grid. The project components that form part of the project is presented in Table 1 below. The connection options either entail the development of a 132 kV line to the existing Ferrum substation (located in Kathu) (Alternative 1) (the preferred alternative) or to the Moffat substation (located in Kuruman) (Alternative 2 and 3) and two Eskom Switching (Metering) Stations. The two WEFs were considered as part of two separate Scoping and Environmental Impact Assessment (EIA) processes.

Table 1. Kuruman Transmission Line project components

Project components	Dimensions
Two Eskom Switching Stations	Footprint: 2 ha Height: 15 m A new Eskom switching station will be constructed adjacent to each of the IPP Collector Substations (assessed as part of a separate EIA process). The Eskom switching stations serve as the point of supply and metering point for the wind facility to connect to the Eskom Grid.
Transmissions line	Height: 15m ▪ Alternative 1 (54 km): runs from the Kuruman Phase 1 substation to the Kuruman Phase 2 substation to the Ferrum substation (located in Kathu) (Preferred). ▪ Alternative 2 (14 km): runs from Kuruman Phase 1 substation to Moffat substation (located in Kuruman). ▪ Alternative 3 (21 km): runs from Kuruman Phase 2 substation to Kuruman Phase 1 substation to the Moffat substation (located in Kuruman). Steel monopole double circuit twin tern Width of service road below line(s): jeep track (up to 6 m wide)

The coordinates of the corner points of the preferred alternative (Alternative 1) are detailed in Table 2 below.

Table 2: Co-ordinates of the Corner Points of the project site

Point	Latitude	Longitude	Point	Latitude	Longitude
A	27°34'10.62"S	23°23'5.63"E	J	27°42'51.14"S	23°17'40.65"E
B	27°34'10.57"S	23°23'11.35"E	K	27°43'46.69"S	23° 9'37.74"E
C	27°35'9.62"S	23°23'52.66"E	L	27°47'47.88"S	23° 6'33.85"E
D	27°37'25.99"S	23°24'1.64"E	M	27°47'7.84"S	23° 4'25.25"E
E	27°38'4.78"S	23°24'19.39"E	N	27°46'47.19"S	23° 3'58.73"E
F	27°38'18.30"S	23°24'17.97"E	O	27°44'28.25"S	23° 4'2.76"E
G	27°39'5.41"S	23°24'42.65"E	P	27°43'53.16"S	23° 3'39.22"E
H	27°40'4.08"S	23°24'19.66"E	Q	27°43'53.40"S	23° 3'28.81"E
I	27°41'31.07"S	23°20'12.81"E			

This draft Environmental Management Programme (EMPr) has been prepared for the **Kuruman Transmission Line project** as part of the requirements of the 2014 EIA Regulations promulgated under the National Environmental Management Act (NEMA, Act 107 of 1998).

1.1 Environmental Impact Assessment Team

The EIA team involved in preparing this EMPr is listed in Table 3 below.

Table 3: The BA team

NAME	ORGANISATION	ROLE/SPECIALIST STUDY
Environmental Management Services (CSIR)		
Paul Lochner	CSIR	Technical Advisor and Quality Assurance (EAPSA) Certified
Surina Laurie	CSIR	EAP (*Pr. Sci. Nat.)*
Specialists		
Simon Todd	3foxes Biodiversity Solutions	Ecology Impact Assessment (Terrestrial Ecology including fauna and flora)
Chris van Rooyen	Chris van Rooyen Consulting	Bird Impact Assessment
Kate MacEwan	Inkululeko Wild Services (Pty) Ltd	Bat Impact Assessment
Natasha van der Haar	Enviroswift (Pty) Ltd	Freshwater Impact Assessment
Julian Conrad	Geohydrological and Spatial Solutions International (Pty) Ltd	Geohydrological Impact Assessment
Stephan Jacobs	SiVEST SA (Pty) Ltd	Visual Impact Assessment
Nicholas Wiltshire	Cedar Tower Services (Pty) Ltd	Heritage Impact Assessment
Dr John Almond	Private, sub-contracted by Cedar Tower Services (Pty) Ltd	Palaeontological Impact Assessment

NAME	ORGANISATION	ROLE/SPECIALIST STUDY
Johann Lanz	Private	Soils and Agricultural Potential Assessment
Elena Broughton	Urban-Econ Development Economists	Socio-Economic Impact Assessment
Adrian Johnson	JG Afrika	Transportation Impact Assessment

1.2 Expertise of the persons who compiled the EMPr

Surina Laurie (Pri, Sci. Nat. registered, 400033/15):

Surina has more than 7 years of experience in environmental assessment and management and is a Senior EAP in the EMS group of the CSIR with a Masters degree in Environmental Management from the University of Stellenbosch and a Certificate in Environmental Economics from the University of London. She is a Registered Professional Natural Scientist (Registration Number: 400033/15) with the South African Council for Natural Scientific Professions (SACNASP). Surina has experience in the management and integration of various types of environmental assessments in South Africa for various sectors, including renewable energy, industry and tourism. She has also been part of advisory teams advising on financing, real estate, corporate, construction, environmental and regulatory aspects for various sponsors, developers and lenders during the DOE's first and second bidding windows in 2012 and 2013. Surina has undertaken several Solar Photovoltaic (PV) and Wind Energy Environmental Assessments (i.e. EIAs, BAs, and Amendment and Appeal Processes) in the Northern Cape, Western Cape and Free State.

2 Approach to preparing the EMPr

2.1 Compliance of this EMPr with the NEMA and EIA Regulations

This EMPr satisfies the requirements of Section 24N of the National Environmental Management Act (NEMA) (Act 107 of 1998) as well as Appendix 4 of the 2014 NEMA Environmental Impact Assessment (EIA) Regulations (GN R362). An overview of where these requirements are met in this EMPr is presented in Table 4.

Table 4: Requirements of an EMPr as defined in terms of NEMA (Act 107 of 1998) and Appendix 4 of the 2014 EIA Regulations (GN R362).

Section 24N of the NEMA	Requirements for a EMPr in terms of Section 24N of the NEMA (Act 107 of 1998)	Location in this EMPr
(2) (a)	information on any proposed management, mitigation, protection or remedial measures that will be undertaken to address the environmental impacts that have been identified in a report contemplated in subsection 24(1A), including environmental impacts or objectives in respect of- *(i)* planning and design; *(ii)* pre-construction and construction activities; *(iii)* the operation or undertaking of the activity in question; *(iv)* the rehabilitation of the environment; and *(v)* closure, if applicable;	Section 5
(2) (b)	details of- (i) the person who prepared the environmental management	Section 1.2

	programme; and (ii) the expertise of that person to prepare an environmental management programme;	
(2) (c)	a detailed description of the aspects of the activity that are covered by the environmental management programme;	Section 4
(2) (d)	information identifying the persons who will be responsible for the implementation of the measures contemplated in paragraph (a);	Section 3
(2) (e)	information in respect of the mechanisms proposed for monitoring compliance with the environmental management programme and for reporting on the compliance;	Section 5
(2) (f)	as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and	Section 5 Section 8 Section 9
(2) (g)	a description of the manner in which it intends to- (i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) remedy the cause of pollution or degradation and migration of pollutants; and (iii) comply with any prescribed environmental management standards or practices.	Section 5 Section 14 Section 15
(3) (a)	set out time periods within which the measures contemplated in the environmental management programme must be implemented;	Section 5
(3) (b)	contain measures regulating responsibilities for any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of prospecting or mining operations or related mining activities which may occur inside and outside the boundaries of the prospecting area or mining area in question; and	N/A
(3) (c)	develop an environmental awareness plan describing the manner in which- (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment.	Section 5
Appendix 4 of the EIA Regulations	**Requirements for a EMPr in terms of Appendix 4 of the 2014 NEMA EIA Regulations (GN R982)**	**Location in this EMPr**
(1) (a)	Details of - (i) the EAP who prepared the EMPr; and (ii) the expertise of the EAP to prepare an EMPr, including a curriculum vitae;	Section 1.2 Appendix A
(1) (b)	a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description	Section 4
(1) (c)	a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers;	Section 4
(1) (d)	a description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including- (i) planning and design; (ii) pre-construction activities; (iii) construction activities;	Section 5

	(iv) rehabilitation of the environment after construction and where applicable post closure; and (v) where relevant, operation activities;	
(1) (e)	a description and identification of impact management outcomes required for the aspects contemplated in paragraph (d);	Section 5
(1) (f)	a description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) and (e) will be achieved, and must, where applicable, include actions to – (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) comply with any prescribed environmental management standards or practices; (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and (iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;	Section 5
(1) (g)	the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 5
(1) (h)	the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 5
(1) (i)	an indication of the persons who will be responsible for the implementation of the impact management actions;	Section 3 Section 5
(1) (j)	the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Section 5
(1) (k)	the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Section 5
(1) (l)	a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	Section 5
(1) (m)	an environmental awareness plan describing the manner in which- (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and	Section 5
(1) (n)	any specific information that may be required by the competent authority.	N/A

2.2 Contents of the EMPr

Where applicable, this EMPr addresses the four phases of the project cycle: (1) Project Design phase; (2) Construction phase; (3) Operational phase; and (4) Decommissioning phase.

The draft EMPr follows an approach of identifying an over-arching goal and objectives, accompanied by management actions that are aimed at achieving these objectives. The management actions are presented in a table format in order to show the links between the goal and associated objectives, actions, responsibilities, monitoring requirements and targets. The management plans for the design, construction, operational and decommissioning phases consist of the following components:

- **Impact**: The potential positive or negative impact of the development that needs to be enhanced, mitigated or eliminated;
- **Mitigation/Management action**: The actions needed to achieve the objectives of enhancing, mitigating or eliminating impacts;
- **Monitoring**: The key monitoring actions required to check whether the objectives are being achieved, taking into consideration methodology, frequency and responsibility.

3 Roles and responsibilities

To achieve the goals set out in this EMPr there are responsibilities that need to be defined for the following key roles (Table 5):

- Project Developer;
- Environmental Control Officer (ECO); and
- Lead Contractor.

Table 5: Roles and responsibilities associated with the construction, operation and decommissioning of the proposed development of the supporting infrastructure in line with this EMPr.

Role	Responsibilities
Project Developer	The Project Developer is the 'owner' of the project and, as such, has the following responsibilities: ➢ Be familiar with the recommendations and mitigation measures of this EMPr; ➢ Ensure that the conditions of the Environmental Authorisation issued in terms of NEMA are fully adhered to; ➢ Ensure that other necessary permits or licenses are obtained and complied with; ➢ Appoint the ECO and the Lead Contractor.
ECO	Responsibilities of the ECO are to ➢ Oversee the implementation of the EMPr during the construction and operational phases, monitoring environmental impacts; ➢ Record-keeping and monitoring of compliance with conditions of the Environmental Authorisation; ➢ Ensure compliance to the plans included in the EMPr following approval of the Final EMPr. ➢ The lead contractor and sub-contractors may have their own ECOs, or designate ECO functions to certain personnel.
Lead Contractor	The Contractor and its sub-constructors are responsible for overall execution of the activities envisioned in the construction phase, including implementation and compliance with the recommendations and conditions specified in this EMPr. Furthermore the Contractor's responsibilities are to: ➢ Ensure that all appointed contractors and sub-contractors are aware of this EMPr and their responsibilities in relation to the plan; ➢ Meet on-site with the Project Developer's ECO prior to the commencement of construction activities to confirm the construction procedure and designated activity zones; ➢ Ensure that each subcontractor employ an ECO (or have a designated ECO function) to monitor and report on the daily activities on-site during the

Role	Responsibilities
	construction period; ➢ Implement the overall construction programme, project delivery and quality control for the construction of the solar project; ➢ Oversee compliance with the Health, Safety and Environmental Responsibilities specific to the project management related to project construction; ➢ Promote total job safety and environmental awareness by employees, contractors and sub-contractors and stress to all employees and contractors and sub-contractors the importance that the project proponent attaches to safety and the environment; ➢ Ensure that safe, environmentally acceptable working methods and practices are implemented and that sufficient plant and equipment is made available properly operated and maintained, to facilitate proper access and enable any operational to be carried out safely; ➢ Ensure that all appointed contractors and sub-contractors repair, at their own cost, any environmental damage as a result of a contravention of the specifications contained in the EMPr, to the satisfaction of the Project Developer's ECO. ➢ Implement the Traffic, Transportation and Road Maintenance Management Plan set out in this EMPr; ➢ Implement the Storm Water Management Plan set out in this EMPr.

4 Project phases

The project life-cycle activities can generally be divided into four phases (see below) and can be outlined as follows:

- Pre-construction (Design);
- Construction;
- Operation (including maintenance and repair); and
- Decommissioning.

A description of each phase and the associated activities is provided below.

4.1 Pre-construction (Design) Phase

The finalisation of the project layout, which includes the detailed routing of the line through the various environmental features identified on site, will be undertaken during this phase. The routing of the line was informed by the findings of the specialist studies, which included the identification of sensitive biophysical areas that need to be avoided.

4.2 Construction Phase

The construction phase will take place subsequent to the issuing of an EA from the DEA and a successful bid of one or both of the Kuruman WEFs in terms of the Renewable Energy Independent Power Producer Procurement Programme (REI4P) (i.e. the issuing of a Power Purchase Agreement (PPA) from the Department of Energy (DoE)). The construction phase for the proposed project is expected to extend 12 to 14 months.

The main activities that will form part of the construction phase are:

- Removal of vegetation for the proposed infrastructure;
- Excavations for infrastructure and associated infrastructure;
- Stockpiling of topsoil and cleared vegetation;
- Creation of employment opportunities;
- Transportation of material and equipment to site, and personnel to and from site; and
- Construction of the 132 kV transmission line and additional infrastructure.

4.3 Operational Phase

The following activities will occur during the operational phase:

- The transmission of electricity generated from the WEF to an Eskom substation; and
- Maintenance of the transmission line.

During the life span of the WEF (approximately 20 years), on-going maintenance to the line will be required on a scheduled basis.

4.4 Decommissioning Phase

The main aim of decommissioning is to return the land to its original, pre-construction condition. Should the unlikely need for decommissioning arise, the decommissioning procedures will be undertaken in line with the EMPr and the site will be rehabilitated and returned to its pre-construction state.

4.5 Environmental sensitivities and preferred routing

Based on the specialist studies undertaken and the results of the field studies, all features identified on site are shown in Figure 1. The respective features identified vary in sensitivity to the proposed development. The overall environmental sensitivity map overlain with the preferred line routing of Alternative 1 of the Kuruman Transmission Line is shown in Figure 2.

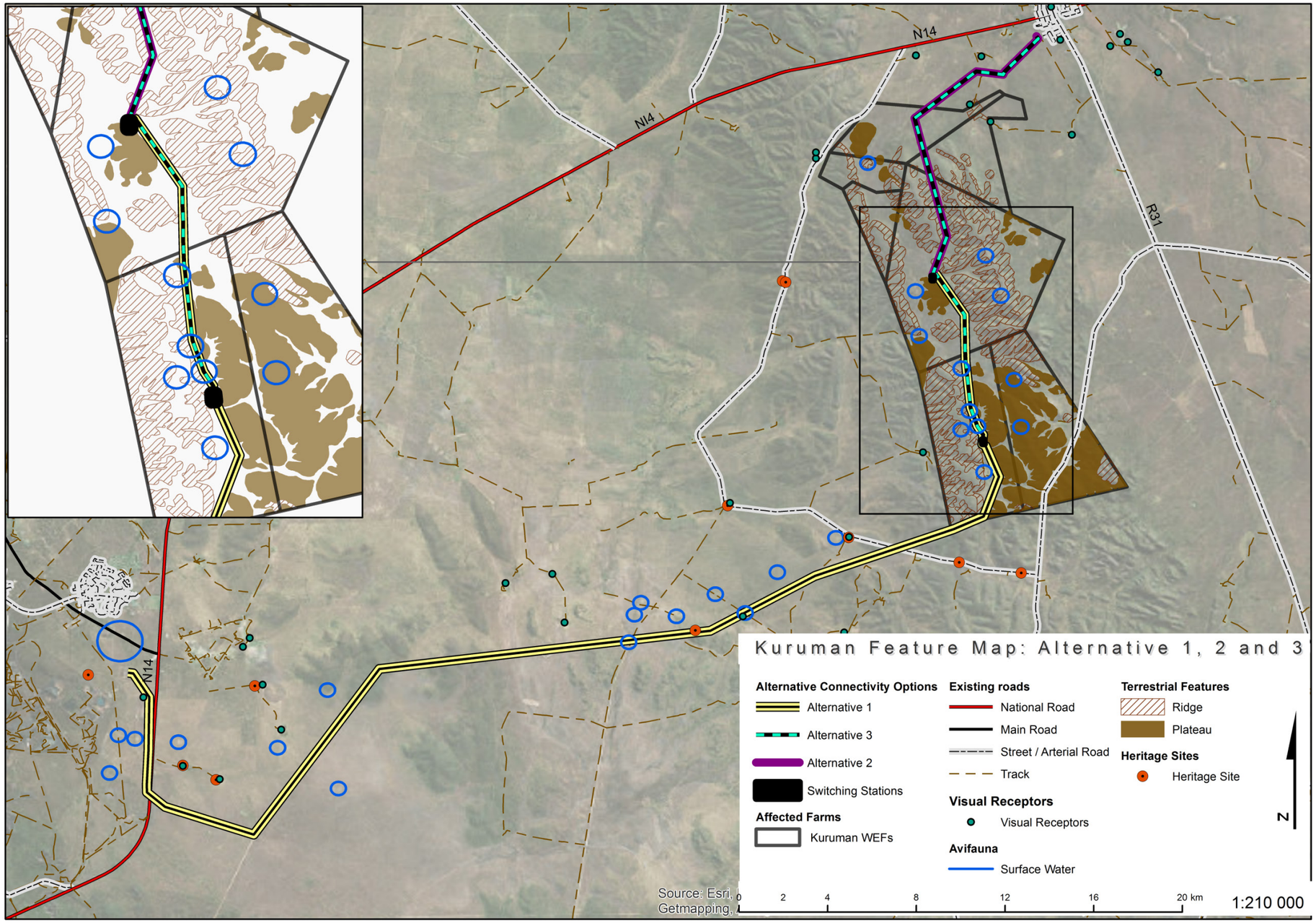

Figure 1: Environmental features that were identified by the various specialist studies

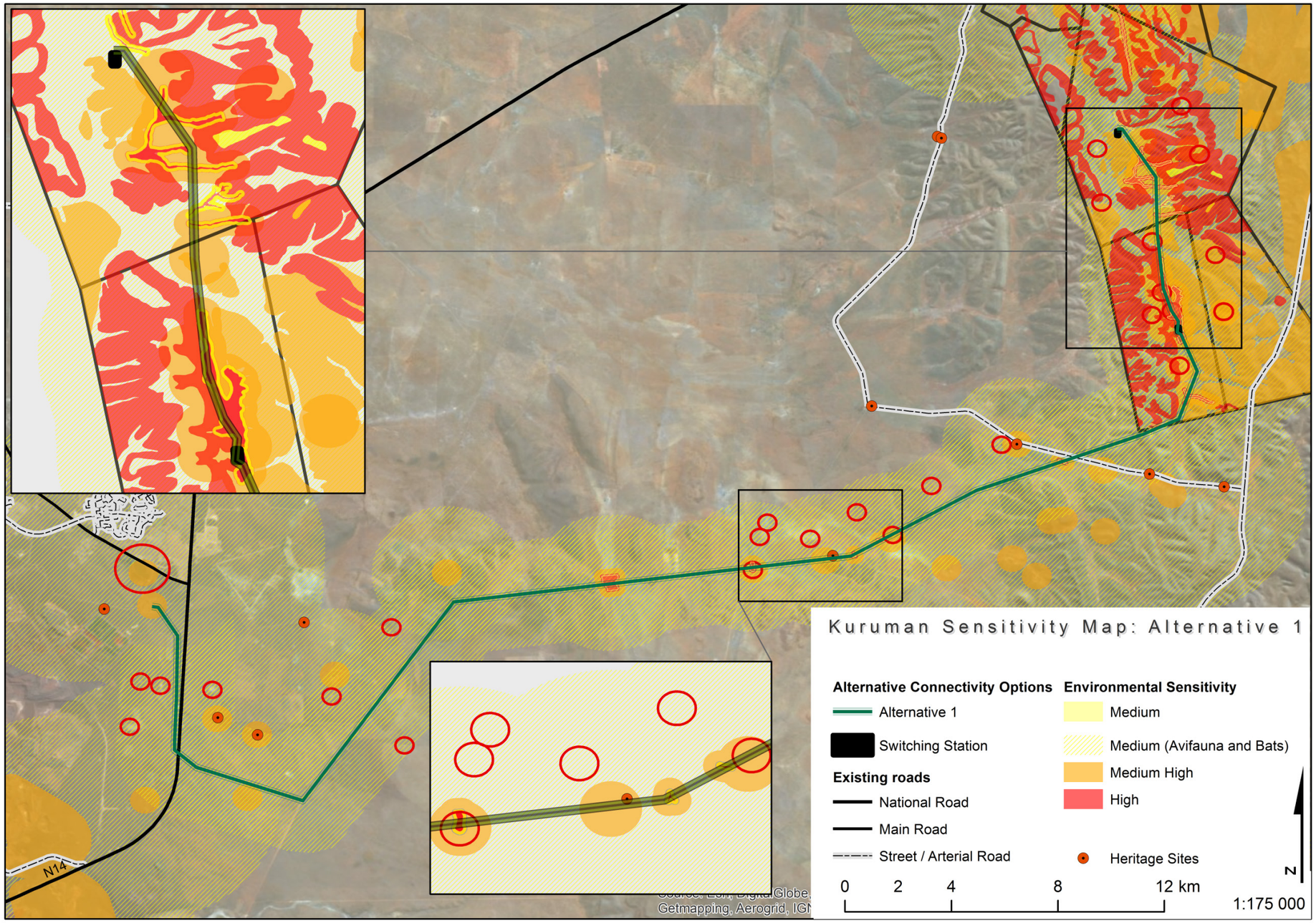

Figure 2: Environmental sensitivity map overlain with the preferred layout of the WEF

5 EMPr for the Kuruman Transmission Line

5.1 Design Phase

Aspect	Objective	Action	Frequency	Responsible Party
5.1.1 General requirements				
General site management to preserve the integrity of the site	Maintain ecological integrity of the site	▪ Existing roads and farm tracks should be used where possible. ▪ The minimum footprint areas of infrastructure should be used wherever possible, including road widths and lengths. ▪ No off-road driving. ▪ ECO to hold regular inspections ensure that the EMPr is implemented and enforced.	Weekly	❖ ECO
5.1.2 Freshwater ecology				
Potential impact on ephemeral drainage lines as a result of the proposed transmission line and associated infrastructure	Avoid or minimize impacts on ephemeral drainage lines.	▪ Ensure that the design of the proposed transmission line takes the sensitivity mapping of the freshwater specialist into account to avoid and reduce impacts on ephemeral drainage lines. ▪ Laydown areas must be place outside of ephemeral drainage lines and outside of 32m buffer areas. ▪ Where possible, transmission line support structures must be placed outside of ephemeral drainage lines and outside of 32 m buffer areas. ▪ Where avoidance of ephemeral drainage lines is not possible due to the extended distances they traverse through the landscape, the following measures are recommended: o Make use of existing access roads to support structure localities where possible. The indiscriminate movement of vehicles	During design cycle and before construction commences	❖ Project developer and appointed freshwater specialist

Aspect	Objective	Action	Frequency	Responsible Party
		through ephemeral drainage lines in order to reach support structures must be strictly prohibited; o Support structures should be placed at least 300 m apart, where possible, and should preferably be placed within the buffer areas of the ephemeral drainage lines or within previously disturbed areas; o Support structures should only be placed within areas with a low risk of erosion; o Site specific erosion measures must be implemented where support structures will be placed within the ephemeral drainage lines or within 10m of the delineated boundaries of ephemeral drainage lines; o Engineer disturbed areas associated with transmission line support structures to coincide as closely as possible to original contours. Ensure that excavated vegetation and soil mounds are not left unattended (recreate original contours); o The appointed ECO must monitor each of the support structures located within ephemeral drainage lines or their buffer areas on a weekly basis for signs of erosion. Should erosion or sedimentation be noted immediate corrective measures must be undertaken. Rehabilitation measures may include filling of erosion gullies and rills and the stabilization of gullies with silt fences. Care must be taken to prevent additional disturbance to the ephemeral drainage lines during the implementation of these measures. Additional erosion control measures must then be applied in order to avoid any further disturbance. Erosion measures will need to be adapted according to each concern and, where possible, only soft engineering techniques should be implemented. ▪ Make use of existing access roads/service roads where possible.		

Aspect	Objective	Action	Frequency	Responsible Party
		▪ Where the crossing of ephemeral drainage lines is unavoidable, designate a single crossing area for new service roads. Strictly prohibit any activity outside of the designated crossing area. ▪ If possible, new service road crossing areas should be developed at 90 degree angles to ephemeral drainage lines in order to limit the area of disturbance.		
5.1.3 Agriculture and soil potential				
Agricultural land	Minimise disruption to agricultural activities and loss of agricultural land.	▪ Implement an effective system of storm water run-off control, where it is required. It would only be required where land disturbance could potentially lead to run-off accumulation that might then lead to down slope erosion. The system should control water movement by means of bunds and ditches, so that it safely disperses and disseminates any run-off accumulation into the veld.	On-going	❖ Project Developer
5.1.4 Bats				
Disturbance to and/or loss of bats	Least disturbance to bats and their foraging and roosting habitats and no bat fatalities.	▪ High sensitivity areas were considered to have high roosting and/ or foraging potential. These areas are potentially unsuited to development owing to the High bat importance. Where possible, transmission lines to avoid areas of high and medium-high bat sensitivity. All other areas of High bat sensitivity, especially trees and old and new buildings and their associated buffers should be avoided, where possible. ▪ Overhead transmission lines may cross overhead of linear wetlands and rivers, as long as no ground infrastructure such as pylons, lay-down areas, sub-stations or construction camps are in these areas, where possible.. ▪ Make sure that new sub-stations are bat-friendly. i.e. there should be no opportunity for roosting – no small gaps between electrical infrastructure and buildings and into roofs. No hanging spaces.	Once-off and with any future amendments	❖ Project Developer (with input from bat specialist, if needed)

Aspect	Objective	Action	Frequency	Responsible Party
		High fencing to avoid fly throughs. Consult with a bat specialist		
5.1.5 Avifauna				
Electrocution of Red Data avifauna on the 132kV powerline	Avoid mortality of Red Data avifauna	▪ It is strongly recommended that the DT 7649 vulture-friendly structure is employed or an alternative vulture friendly structure (should a double circuit line be required).	Incorporate into the design of the powerline	❖ Project Developer
5.1.6 Socio-Economic				
Employment creation for construction, operation and decommissioning activities	To reduce the unemployment rate in local municipalities	▪ Create a skills requirement profile for both construction and operations ▪ Set-up skills desk at a central an accessible location. ▪ Create awareness of skills desk through posters and media announcements. ▪ Skills desk should serve to record local job seeker skills. ▪ Identify potential candidates and fill vacancies	Once-off	❖ Human resources
5.1.7 Terrestrial ecology				
Development of the transmission line and service road	Minimize impact to sensitive habitats	▪ Pre-construction walk-through of the development footprint must be undertaken to further refine the pylon positions and further reduce impacts on sensitive habitats and protected species through micro-siting of the pylons and service roads ▪ No electrical fencing within 30 cm of the ground as tortoises become stuck against such fences and are electrocuted to death	Once-off	❖ Terrestrial specialist

5.2 Construction phase

Aspect	Objective	Action	Frequency	Responsible Party
5.2.1 General requirements				
General site management to preserve the integrity of the site	Maintain ecological integrity of the site	▪ No off-road driving. ▪ ECO to hold regular inspections to ensure that the EMPr is implemented and enforced. ▪ Unless there are water shortages, ensure that dust suppression techniques are implemented on all soil stockpiles and access roads. ▪ Unless there are water shortages, ensure that dust suppression techniques are implemented where vegetation clearance has taken place. ▪ Maintain a neat construction site by removing rubble and waste materials	Weekly	❖ ECO
5.2.2 Heritage Resources				
Destruction of heritage resources	Prevent destruction of heritage resources including archaeology palaeontology and cultural landscape resources and burial grounds and graves, and sacred spaces	▪ Should any unmarked human burials/remains or ostrich eggshell water flask caches be uncovered, or exposed during preparation of the lands for cultivation, these must immediately be reported to the South African Heritage Resources Agency (Ms Natasha Higgit 021 462 4502), or the McGregor Museum (Att Dr David Morris 053 8392707 / 082 2224777). Burials, etc. must not be removed or disturbed until inspected by the archaeologist. ▪ Should substantial fossil remains be encountered at surface or exposed during construction, the ECO should safeguard these, preferably in situ. They should then alert the South African Heritage Resources Agency as soon as possible	When encountered	❖ ECO

Aspect	Objective	Action	Frequency	Responsible Party
		(Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). This is to ensure that appropriate action (i.e. recording, sampling or collection of fossils, recording of relevant geological data) can be taken by a professional palaeontologist at the proponent's expense. A procedure for Chance Fossil Finds is included in Appendix B of this EMPr. The provisions within the Chance Fossil Finds Protocol must be adhered to.		
5.2.3 Avifauna				
Displacement of Red Data avifauna due to disturbance	Avoid displacement of Red Data avifauna	▪ No off-road driving; ▪ Maximum use of existing roads; ▪ Measures to control noise ▪ Restricted access to the rest of the property; ▪ The appointed ECO must be trained by an avifaunal specialist to identify the potential priority species as well as the signs that indicate possible breeding by these species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of Red Data species, and such efforts may include the training of construction staff to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the Red Data species are confirmed to be breeding (e.g. if a nest site is found), construction activities within 500m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed.	On-going Prior to construction	❖ ECO and Avifaunal specialist

Aspect	Objective	Action	Frequency	Responsible Party
		▪ Prior to construction, an avifaunal specialist should conduct a site walkthrough, covering the final road and power line routes, to identify any nests/breeding/roosting activity of Red Data species. The results of which may inform the final construction schedule in close proximity to that specific area, including abbreviating construction time, scheduling activities around avian breeding and/or movement schedules, and lowering levels of associated noise.		
Displacement of priority species due to habitat transformation	Avoid impact to priority species	▪ The recommendations of the ecological specialist studies must be strictly implemented, especially as far as limitation of the construction footprint, retention of natural vegetation and rehabilitation of transformed areas is concerned. ▪ Large trees should be retained as much as possible as they serve as potential roosting and breeding habitat for a variety of birds, including raptors. ▪ Audits must be performed by an external rehabilitation specialist to assess the success of the rehabilitation programme and recommend changes or additions to the programme if need be.	Prior to construction Once a year	❖ ECO ❖ Avifaunal specialist ❖ Rehabilitation specialist
Mortality of Red Data avifauna due to collisions with the earthwire of the proposed 132kV line.	Avoid mortality of Red Data avifauna	▪ High risk sections of power line must be identified by a qualified avifaunal specialist during the walk-through phase of the project, once the alignment has been finalized. ▪ Where power line marking is required, bird flight diverters must be installed on the full span length on each of the conductors according to the Eskom Guidelines (see Appendix 5). ▪ Light and dark colour devices must be alternated so as to provide contrast against both dark and light backgrounds respectively. These devices must be installed as soon as the conductors are strung. In specific instances, i.e. high-risk	Once before construction starts when the pole positions have been finalised. Marking to happen before the line becomes operational, as soon as the conductors have been strung.	❖ Avifaunal specialist

Aspect	Objective	Action	Frequency	Responsible Party
		waterbodies (to be identified during the walk-through phase), the new experimental PLP LED (light emitting diode) BFD is recommended to increase the efficacy of the device during low light conditions for waterbirds.		
5.2.4 Geohydrology				
Groundwater abstraction	Utilising groundwater in a sustainable way	▪ The production boreholes that are put into use should be yield tested prior to use (according to SANS10299) so that the correct pump sizes and installation depths can be determined. ▪ The planned production boreholes should also be sampled and chemically and microbiologically analysed by a SANAS accredited laboratory. Samples should also be analysed for asbestos content. ▪ Once the boreholes are in use they should be equipped with: o Observation pipes - so that the water levels can be measured (either manually or by data loggers). o Flow meters – to assess how much water is used and thereby all authorisations in place for use of the water are adhered to. o Sampling tap – to enable annual sampling to ensure the groundwater is safe for continued use – especially if it to be used as drinking water at the security buildings.	Prior to borehole abstraction	❖ Contractor
5.2.5 Freshwater ecology				
Disturbance of drainage lines	Avoid or minimize disturbance of ephemeral drainage lines	▪ Appoint an ECO to inspect ephemeral drainage line crossings take measures to address unforeseen disturbances to the ephemeral drainage lines	On a weekly basis (at least) during the construction phase.	❖ ECO

Aspect	Objective	Action	Frequency	Responsible Party
Alteration of flow patterns	Prevent the alteration of flow patterns through ephemeral drainage lines	▪ Strategically divert stormwater away from the construction footprint area of transmission line support structures and laydown areas. Stormwater must not be discharged into ephemeral drainage lines and their associated buffer areas. Stormwater should rather be discharged as diffuse flow at multiple discharge points into well vegetated areas outside of the buffer, and energy dissipaters (such as areas of rock riprap grassed with indigenous vegetation or similar structures) must be constructed where stormwater is released in order to reduce the runoff velocity and therefore erosion; ▪ Implement erosion control measures where required (e.g. covering steep/unstable/erosion prone areas with geotextiles; stabilising areas susceptible to erosion with sandbags; covering areas prone to erosion with brush packing, straw bales, mulch; diverting stormwater away from areas susceptible to erosion etc). This is of particular importance where the transmission line is located on steep hillsides which are prone to erosion; and ▪ The ECO must check ephemeral drainage lines and laydown areas associated with transmission line support structures for erosion damage after every heavy rainfall event. Should erosion or sedimentation be noted immediate corrective measures must be undertaken. Rehabilitation measures may include filling of erosion gullies and rills and the stabilization of gullies with silt fences. Care must be taken to prevent additional disturbance to the ephemeral drainage lines during the implementation of these measures. Additional erosion control measures must then be applied in order to avoid any further disturbance. Erosion measures will need to be adapted according to each concern.	On-going	❖ ECO

Aspect	Objective	Action	Frequency	Responsible Party
Impairment of water quality	Prevent the impairment of water quality within ephemeral drainage lines	▪ If required, dispose of concrete and cement-related mortars utilised during the construction of support structure foundations in an environmental sensitive manner (can be toxic to aquatic life). Washout should not be discharged into drainage lines; and ▪ Prohibit the mixing of concrete on exposed soils. Concrete must be mixed on an impermeable surface in an area of low environmental sensitivity identified by the ECO outside of the buffer area. ▪ Minimise the area of disturbance and the amount of earthworks; ▪ Place silt fences / traps strategically on the periphery of the construction footprint area including soil stockpile areas and laydown areas. Ensure runoff is not channeled directly into the drainage lines; ▪ Appoint an ECO to check all sediment trapping devices weekly and to ensure devices are cleared and repaired when needed.	On-going	❖ ECO
5.2.6 Visual Resources				
Potential impact on the visual environment as a result of the construction of the proposed electrical infrastructure .	Avoid or minimize impacts on visual environment and visual receptor locations in surrounding area during construction.	▪ Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. ▪ Vegetation clearing should take place in a phased manner. ▪ Ensure that all soil stockpiles are covered in order to reduce dust. ▪ Dust suppression techniques must be implemented on gravel access roads utilised during construction, where possible (unless there are water shortages). ▪ Dust suppression must be implemented in all areas where	On-going	❖ Lead Contractor

Aspect	Objective	Action	Frequency	Responsible Party
		vegetation clearing has taken place (unless there are water shortages).		
5.2.7 Socio-economic				
Socio-economic upliftment	To maximize economic benefit to the local municipality	▪ Run a supplier day in Kuruman and identify prospective companies to engage with during construction ▪ Keep record of companies and businesses supplying goods and services ▪ Calculate split percentage of local and national/international companies	On-going	❖ Project Developer
Increase in theft related crime	To prohibit theft of stock and valuables on directly and adjacent farm portions	▪ Each employed personnel ought to have an access card/ apparel for identification purposes ▪ Security should be located at the entrance to only permit authorised personnel ▪ A pick-up point ought to be established wherein, employees will be transported to and from the site ▪ Develop a local community safety forum to establish monitoring methods for surrounding community	On-going	❖ Contractor
Potential health risks for employees due to asbestos prevalence	To prohibit any illness emerging from asbestos exposure.	▪ To be developed by air and health specialist	To be developed by air and health specialist	❖ Health specialist
5.2.8 Transportation				
Dust and noise pollution	Avoid or minimize impacts on road network.	▪ Maintenance of gravel roads by Contractor as required.	On-going	❖ Haulage company and Contractor
5.2.9 Bats				
Disturbance to and/or loss of bats	Least disturbance to bats and their foraging and roosting habitats and no bat fatalities.	▪ If any trees or buildings are demolished along the route, these should be thoroughly inspected for bat presence. If bats are	On-going	❖ ECO or bat specialist

Aspect	Objective	Action	Frequency	Responsible Party
		present, they should be chased away before demolition. Each tree and/or building should be replaced with a bat box in an area near water and not intended for future development (contact: http://ecosolutions.co.za/products-services/bat-boxes) ▪ Make sure that new sub-stations are bat-friendly. i.e. there should be no opportunity for roosting – no small gaps between electrical infrastructure and buildings and into roofs. No hanging spaces. High fencing to avoid fly throughs. Consult with a bat specialist during the design and construction phases. ▪ Awareness and education of contractors. ▪ Any routine inspections of the route for bird monitoring programmes to also look out for dead bats and to report these.	Once per season Prior to construction On -going	
5.2.10 Terrestrial ecology				
Vegetation clearance for transmission line and/or switching substation construction	Minimise impacts to reptiles and other vulnerable species	▪ Undertake a search and rescue for reptiles and other vulnerable species during construction, before areas are cleared	On-going	❖ ECO

5.3 Operational phase

Aspect	Objective	Action	Frequency	Responsible Party
5.3.1 Avifauna				
Mortality of Red Data avifauna due to collisions with the earthwire of the proposed 132kV line.	Avoid mortality of Red Data avifauna	▪ Where power line marking is required, bird flight diverters must be installed on the full span length on each of the conductors according to the Eskom Guidelines (see Appendix 5 of the Avifaunal Impact Assessment Report)	Once a quarter	❖ Project developer, Eskom Management and avifaunal specialist
5.3.2 Bats				
Disturbance to and/or loss of bats	Least disturbance to bats and their foraging and roosting habitats and no bat fatalities.	▪ Any routine inspections of the route for bird monitoring programmes to also look out for dead bats and to report these.	On-going	❖ ECO/ avifaunal specialist
5.3.3 Agriculture and soil potential				
Agricultural land	Minimise disruption to agricultural activities and loss of agricultural land.	▪ Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the storm water run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.	Every six months	❖ ECO
5.3.4 Visual				
Potential impact on the visual environment as a result of the operation of the	Avoid or minimize impacts on visual environment and visual receptor locations in surrounding area during operation.	▪ Where possible, limit the amount of security and operational lighting present at the substations.	On-going	❖ Project Developer

Aspect	Objective	Action	Frequency	Responsible Party
proposed electrical.				
5.3.5 Socio-economic				
Socio-economic upliftment	Enhancement of socio-economic benefits to the community	▪ Run a supplier day in Kuruman and identify prospective companies to engage with ▪ Keep record of companies and businesses supplying goods and services. ▪ Calculate split percentage of local and national/international companies. ▪ Create a skills requirement for the operational phase. ▪ Identify potential candidates and their gaps in skills required. ▪ Develop necessary training programmes. ▪ Engage in training. ▪ Assess quality of work of trained individuals before and after training. ▪ Implement the health and safety plan.	On-going	❖ Project Developer
5.3.6 Freshwater				
Degradation of drainage lines	Avoid or minimize degradation of ephemeral drainage lines.	▪ Eradicate alien and weed vegetation at each crossing as well as any areas accidentally disturbed: ○ Remove alien species manually, by hand as far as possible. The use of herbicides should be avoided. Should the use of herbicides be required, only herbicides which have been certified safe for use in aquatic environments by an independent testing authority may be considered; ○ Dispose of removed alien plant material at a	Bi-monthly during the operational phase (for alien vegetation).	❖ ECO

Aspect	Objective	Action	Frequency	Responsible Party
		registered waste disposal site or burn on a bunded surface where no stormwater runoff is expected; ○ Remove vegetation before seed is set and released; and ○ Cover removed alien plant material properly when transported, to prevent it from being blown from vehicles. ▪ Crossings should be inspected twice a year as well as after heavy rainfall events for the duration of the operational phase in order to determine whether any additional erosion control measures are required. Should erosion or sedimentation be noted immediate corrective measures must be undertaken. Rehabilitation measures may include filling of erosion gullies and rills and the stabilization of gullies with silt fences. Care must be taken to prevent additional disturbance to the ephemeral drainage lines during the implementation of these measures. Additional erosion control measures must then be applied in order to avoid any further disturbance. Erosion measures will need to be adapted according to each concern.	Twice a year as well as after heavy rainfall events during the operational phase (for erosion and sedimentation).	
5.3.7 Heritage				
Destruction of heritage resources including archaeology palaeontology and cultural landscape resources and burial grounds and graves, and sacred spaces	Prevent destruction of heritage resources including archaeology palaeontology and cultural landscape resources and burial grounds and graves, and sacred spaces	▪ Allow access to burial grounds for relatives and friends of deceased	On-going	❖ Project Developer

5.4 Decommissioning phase

Aspect	Objective	Action	Frequency	Responsible Party
5.4.1 Avifauna				
Displacement of Red Data avifauna due to disturbance	Avoid displacement of Red Data avifauna	▪ No off-road driving. ▪ Maximum use of existing roads. ▪ Measures to control noise. ▪ Restricted access to the rest of the property. ▪ The appointed ECO must be trained by an avifaunal specialist to identify the potential priority species as well as the signs that indicate possible breeding by these species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of Red Data species, and such efforts may include the training of staff to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the Red Data species are confirmed to be breeding (e.g. if a nest site is found), de-commissioning activities within 500m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed. ▪ Prior to de-commissioning, an avifaunal specialist should conduct a site walkthrough, covering the power line, to identify any nests/breeding/roosting activity of Red Data species, the results of which may inform the final de-commissioning schedule in close proximity to that specific area, including scheduling activities around avian breeding and/or movement schedules, and lowering levels of associated noise.	Decommissioning	❖ ECO and Rehabilitation specialist

Aspect	Objective	Action	Frequency	Responsible Party
5.4.2 Freshwater				
Degradation of drainage lines	Avoid or minimize degradation of ephemeral drainage lines	▪ Rehabilitate all areas disturbed during decommissioning activities; ▪ Eradicate alien and weed vegetation within the drainage lines as well as within any additionally disturbed areas; ▪ Check each area where decommissioning has taken place within an ephemeral drainage line or associated buffer zone for alien vegetation proliferation and erosion damage once a year and after every heavy rainfall event, until an indigenous vegetation cover of at least 50% has been reached within disturbed areas. Any alien species noted must be removed immediately by hand. Should erosion or sedimentation be noted immediate corrective measures must be undertaken. Rehabilitation measures may include filling of erosion gullies and rills and the stabilization of gullies with silt fences. Care must be taken to prevent additional disturbance to the ephemeral drainage lines during the implementation of these measures. Additional erosion control measures must then be applied in order to avoid any further disturbance. Erosion measures will need to be adapted according to each concern and, where possible, only soft engineering techniques should be implemented	On-going	❖ ECO
Impairment of water quality	Prevent the impairment of water quality within ephemeral drainage lines	▪ Minimise the area of disturbance and the amount of earthworks during decommissioning activities; ▪ Decommissioning of service roads traversing ephemeral drainage lines must be undertaken during the dry season; ▪ Decommissioning of transmission line support structures should also be undertaken during the dry season, However,	On-going	❖ ECO

Aspect	Objective	Action	Frequency	Responsible Party
		if this is not possible the following mitigation measures are recommended: ○ Divert stormwater runoff from disturbed areas into sediment trapping devices. Ensure stormwater is not channeled directly into a drainage line; ○ Construct silt fences and earthen dikes / diversions at areas where sheet flow is expected, to retain and divert sediment-laden runoff; ○ Construct silt fences / traps in areas prone to erosion, to retain sediment-laden runoff; ○ Check all sediment trapping devices weekly to ensure devices are cleared and repaired when needed; ▪ Rehabilitate all areas disturbed during decommissioning activities		
5.4.3 Socio-economic				
Socio-economic upliftment	Procure goods and services, as far as practically possible, from the local municipality	▪ Run a supplier day in Kuruman and identify prospective companies to engage with. ▪ Keep record of companies and businesses supplying goods and services. ▪ Calculate split percentage of local and national/international companies.	On-going	❖ Project Developer
5.4.4 Visual				
Potential impact on the visual environment as a result of the decommissioning of	Avoid or minimize impacts on visual environment and visual receptor locations in surrounding area during decommissioning.	▪ Rehabilitate areas where vegetation was cleared as soon as possible. ▪ Dust suppression techniques must be implemented on gravel access roads utilised during decommissioning phase,	On-going	❖ Project Developer

Aspect	Objective	Action	Frequency	Responsible Party
the proposed electrical		where possible (unless there are water shortages). ▪ Ensure that all structures associated with the proposed development are removed.		
5.4.5 Heritage				
Destruction of heritage resources including archaeology palaeontology and cultural landscape resources and burial grounds and graves, and sacred spaces	Prevent destruction of heritage resources including archaeology palaeontology and cultural landscape resources and burial grounds and graves, and sacred spaces	▪ Proactive management ▪ strategies to prevent impacts	On-going	❖ Project Developer
5.4.6 Transportation				
Dust and noise pollution	Avoid or minimize impacts on road network.	▪ Maintenance of gravel roads by Contractor as required.	On-going	❖ Haulage company and Contractor

6 Alien Invasive Management Plan

OBJECTIVE: Avoid the establishment and spread of alien invasive species during all phases of the development

- Check the construction footprint of transmission line support structures, service road crossing areas as well as immediately adjacent areas for alien and invasive species weekly during the construction phase and alien species noted must be removed.
- Remove alien species manually, by hand as far as possible. The use of herbicides should be avoided. Should the use of herbicides be required, only herbicides which have been certified safe for use in aquatic environments by an independent testing authority may be considered.
- Dispose of removed alien plant material at a registered waste disposal site or burn on a bunded surface where no stormwater runoff is expected.
- Remove vegetation before seed is set and released.
- Cover removed alien plant material properly when transported, to prevent it from being blown from vehicles.
- Removal of the alien and weed species encountered on the property must take place in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 and Section 28 of the National Environmental Management Act, 1998). Removal of species should take place throughout the construction, operational, closure/decommissioning and rehabilitation/ maintenance phases.
- Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems.

7 Plant Rescue and Protection Plan

OBJECTIVE: Avoid and mitigate potential impacts to listed and protected plant species and their habitats

- A pre-construction walk-through by a botanist of the development footprint must be undertaken to further refine the routing of the line.
- Removal of vegetation must be followed closely by rehabilitation by specialists qualified in this vegetation type's remediation.
- Prevent and manage the establishment of alien vegetation (as per Alien Invasive Management Plan, Section 6 of this EMPr).
- Minimise removal of vegetation during construction and operation to reduce the risk of excessive open areas occurring.
- All disturbed sites must be rehabilitated.

8 Re-vegetation and Habitat Rehabilitation Plan

OBJECTIVE: Re-vegetate open areas and rehabilitate disturbed areas

- Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize the soil against erosion.
- Store topsoil and vegetation removed from the construction footprint at designated stockpile areas for use in rehabilitation activities. Designated stockpile areas must be located outside of

the buffer areas of ephemeral drainage lines, preferably within already disturbed areas. Vegetation should be cut rather than uprooted in order to make way for stockpile areas. This will prevent further disturbance of soils.

- Rehabilitate any areas surrounding transmission line support structures which have been disturbed as a result of construction related activities in order to prevent alien vegetation proliferation.
- Reshape and reprofile the banks of the drainage line to either side of each crossing so that they tie in with the surrounding channel banks both longitudinally and perpendicularly (height, slope and structure).
- Rip and loosen compacted soils associated with the bank to a depth of 300mm in order to aid in the establishment of vegetation.
- Redistribute stockpiled topsoil across the banks.
- Prevent erosion of the channel banks by covering and stabilizing any steep or unstable reshaped channel banks with a geotextile such as Geojute or BioJute, or with the use of sandbags or silt fences at the break in slope.
- Revegetate disturbed areas with vegetation assemblages reflecting the general species composition of the area as soon as possible after the application of topsoil and stabilizing of soils. A botanical specialist should advise on appropriate species to be utilized during revegetation.
- Strictly prohibit the use of alien vegetation during rehabilitation activities.
- The bed and the banks of the ephemeral drainage lines must be rehabilitated to as close to their original condition as possible. Ensure that the beds of the features are restored to their natural base level in order to prevent erosion or upstream ponding (i.e. the base of roads/culverts must tie in with the natural base level of the ephemeral drainage lines).

9 Open Space Management Plan

OBJECTIVE: Prevent occurrence of excessive open areas

- Minimise removal of vegetation during construction and operation to reduce the risk of excessive open areas occurring
- Removal of vegetation must be followed closely by rehabilitation by specialists qualified in this vegetation type's remediation.

10 Storm Water Management Plan

OBJECTIVE: Manage storm water runoff to prevent adverse impacts to terrestrial and aquatic ecosystems.

- Implement an effective system of storm water run-off control using bunds and ditches, where it is required - that is at points where water accumulation might occur. The system must effectively collect and safely disseminate any run-off water from all hardened surfaces and it must prevent any potential down slope erosion.
- Stormwater from the hardened road surfaces traversing the ephemeral drainage lines must be directed to the outer edges of the roads and must be passed through filter strips/energy dissipaters (e.g. areas of rock riprap grassed with indigenous vegetation) before being released into the ephemeral drainage lines.
- All surfaces draining towards the stormwater system should be inspected on a regular basis for any materials that could contaminate groundwater. This includes solvents, paints, oils and fuel products.

11 Fire Management Plan

OBJECTIVE: Reduce the risk of fire in the grassland environment

- Construct fire-breaks around the site/footprint area before any other construction begins.
- Prohibit smoking on-site or alternatively indicate designated smoking areas for staff.
- Designate cooking areas for staff where fire hazard will be insignificant.
- Educate staff of the dangers of open and unattended fires.
- Educate staff as to proper fire safety.
- Enforce proper waste management including disposal of flammable material (e.g. cigarette butts and packaging).
- Place firefighting equipment at appropriate locations on site and ensure staff are aware of such equipment and associated procedure.
- No fires are allowed around the construction area.
- Welding, gas cutting or cutting of metal will only be permitted in an area designated as safe by the subcontractor.

12 Erosion Management Plan

OBJECTIVE: Prevent soil erosion and rehabilitate eroded areas.

- If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface. Any subsurface spoils from excavations must be disposed of where they will not bury the topsoil of agricultural land.
- Compact subsoil and spread the topsoil as evenly as possible over the subsoil. The creation of permanent depressions or mounds above distribution lines must be avoided.
- Revegetate disturbed areas above distribution lines with vegetation assemblages reflecting the general species composition of the area as soon as possible after the application of topsoil. A botanical specialist should advise on appropriate species to be utilized during revegetation.
- Implement erosion control measures where required (e.g. covering steep/unstable/erosion prone areas with geotextiles; stabilising areas susceptible to erosion with sandbags; covering areas prone to erosion with brush packing, straw bales, mulch; diverting stormwater away from areas susceptible to erosion etc). This is of particular importance where roads and crossings are located on steep hillsides which are prone to erosion.
- Use gabion baskets / reno mattresses strategically for erosion protection, as required.
- Use excavators instead of bulldozers where ephemeral drainage line crossings are constructed / upgraded to reduce sedimentation and consolidate the entry and exit points to reduce scouring.
- Place silt fences / traps strategically on the periphery of the construction footprint area including the construction camp, cleared areas, storage areas, soil stockpile areas and laydown areas. Ensure runoff is not channeled directly into the drainage lines.

13 Leakage / Spillage Monitoring System

OBJECTIVE: Prevent and monitor accidental leakages and spillages

- All vehicles and other equipment (generators etc.) must be regularly serviced to ensure they do not spill oil. Vehicles should be refuelled on paved (impervious) areas, optimally off-site. If liquid product is being transported it must be ensured this does not spill during transit.
- Emergency measures and plans must be put in place and rehearsed in order to prepare for accidental spillage.
- Diesel fuel storage tanks must be above ground on a concrete surface in a bunded area.
- Engines that stand in one place for an excessive length of time (1-2 months) must have drip trays.
- When servicing equipment on site, drip trays shall be used to collect the waste oil and other lubricants. Drip trays shall also be provided in construction areas for stationary plant (such as generators, pumps and compressors) and for Transport and Earthmoving Equipment (such as scrapers, diggers, loaders, trucks, cranes, etc.). Drip trays shall be inspected and emptied daily. Drip trays shall be closely monitored during rain events to ensure that they do not overflow. Where practical, the Contractor shall ensure that equipment is covered so that rainwater is excluded from the drip trays.
- Vehicle and washing areas must also be on paved surfaces and the by-products removed to an evaporative storage area or a hazardous waste disposal site (if the material is hazardous).
- If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material, and reported. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes.

14 Protection of Hydrological Features Measures

OBJECTIVE: Prevent groundwater contamination and freshwater features

- If possible, crossing areas should be developed at 90 degree angles to ephemeral drainage lines in order to limit the area of disturbance.
- A maximum construction working servitude of 3m should be allowed to either side of ephemeral drainage line crossing areas.
- Avoid the use of infill material or construction material with pollution / leaching potential when constructing or widening roads across drainage lines.
- Dispose of concrete and cement-related mortars in an environmental sensitive manner (can be toxic to aquatic life). Washout should not be discharged into drainage lines. A washout area should be designated at least 30m from any buffer zone, and wash water should be treated on-site.
- Prohibit the mixing of concrete on exposed soils. Concrete must be mixed on an impermeable surface in an area of low environmental sensitivity identified by the ECO outside of the buffer area.
- Construct temporary bunds around areas within drainage lines where cement is to be cast in-situ.

15 Waste Management Plan

OBJECTIVE: Promote proper waste disposal, waste reduction, re-use, and recycling opportunities

- Prohibit the dumping of excavated material within the channel.
- All excavated material shall be used for road works.
- Cut material shall be used, where possible, in construction or on site (e.g. in grading gravel roads), or removed from site. A suitable area for the storage of waste must be selected (away from water courses) and included in the site layout plan.
- Ensuring that an adequate number of rubbish and "spill" bins are provided will also prevent litter and ensure the proper disposal of waste and spills
- Implement effective waste management in order to prevent construction related waste from entering the freshwater environments.
- Ensure an adequate and sustainable use of resources.
- Waste separation is encouraged and therefore receptacles should be labelled to reflect the different waste types.
- All operational waste (concrete, steel, rubbles etc.) to be removed from the site and waste hierarchy of prevention, as the preferred option, followed by reuse, recycling, recovery must be implemented, where possible.
- Other non-hazardous solid waste (e.g. packaging material) to be disposed of at a licensed landfill.
- All liquid waste (used oil, paints, lubricating compounds and grease) to be packaged and disposed of by appropriate means.
- Adequate containers for the cleaning of equipment and materials (paint, solvent) must be provided as to avoid spillages.
- Waste water from construction and painting activities must be collected in a designated container and disposed of at a suitable disposal point off site.
- Control and implement waste management plans provided by contractors. Ensure that relevant legislative requirements are respected.
- Vegetative material will be kept on site and mulched after construction to be spread over the disturbed areas to enhance rehabilitation of the natural vegetation.
- The subcontractor shall not dispose of any waste and/or construction debris by burning or burying.
- Off-cuts (steel, wood etc) will be re-used or recycled, as far as possible.

16 A transportation plan

OBJECTIVE: Manage the transportation of transmission line components and switching substation

- A permit for a vehicle carrying an abnormal load must be obtained from the relevant Provincial Authority.
- A minimum required road width of 4 meters needs to be kept and all turning radii must conform with the specifications needed for the abnormal load vehicles and haulage vehicles.
- It needs to be ensured that the gravel sections of the haulage routes remain in good condition and will hence need to be maintained during the additional loading of the construction phase and then reinstated after construction is completed.
- The gravel roads will require grading with a road grader to obtain a flat even surface and the geometric design of these gravel roads needs to be confirmed at detailed design stage.

17 A traffic management plan

OBJECTIVE: Manage the traffic generation of the project

- Adhere to existing roads and road rules associated with them (for instance speed limits).
- Strictly regulate speed limit of construction vehicles.
- Demarcate and strictly control parking areas so that vehicles are limited to specific areas only;
- Ensure that roadworthy and safety standards are implemented for construction vehicles.
- Avoid construction vehicles movement on public roads during peak traffic times (06-00 – 09:00 and 16:00 – 19:00).
- Staff and general trips should occur outside of peak traffic periods.
- Implement clear and visible signalling to indicate the movement of vehicles and when turning onto or off access roads to ensure safe access to and from the site.

Appendix A. CV of EAP

Name of firm	CSIR
Name of staff	Surina Laurie
Profession	Environmental Assessment Practitioner
Position in firm	Senior Environmental Assessment Practitioner
Years' experience	More than 7 years
Nationality	South African

Biographical sketch

Surina has more than 7 years of experience as an Environmental Assessment Practitioner (EAP). She completed both her BSc in Conservation Ecology and MPhil in Environmental Management (part-time) at the University of Stellenbosch. With her honours project, she worked closely with the Endangered Wildlife Trust Riverine Rabbit Working Group and was responsible for determining the conservation opportunity for the Riverine Rabbit in the Karoo. With this project, she gained valuable experience in how to interact and manage stakeholders in such a way that a project's objectives and conservation goals are met without the stakeholders not being included in the decision-making process. The management of stakeholders and the ability to incorporate their needs into the objectives of a project is seen as an essential component of an Environmental Impact Assessment (EIA) process. With her Masters' thesis she researched and addressed why there is a need to undertake a Cost Benefit Analysis (CBA) as part of any EIA. The need for a CBA stems from the fact that losing environmental services will have an economic impact on a regional/national level in the long term but this is usually not considered during an EIA process. A CBA will look at both the economic benefits (profit) from a project and the economic losses because of loss of ecosystem services or rehabilitation costs. By including a CBA in an EIA, both the economic and environmental financial implications (not just the environmental significance of an impact) of a project will be considered by the decision making authority prior to the issuing of Environmental Authorisations or permits. She has experience in undertaking Basic Assessments and Scoping and Environmental Impact Assessments for various sectors, including renewable energy, industry and tourism. She also has experience in undertaking environmental audits, due diligence assessments and the compilation of Environmental Management Programmes.

Registered Professional Natural Scientist (Pr. Sci. Nat.) in Environmental Science (Reg. No: 400033/15) with the South African Council of Natural Scientific Professions.

Education

2015	Certificate in Environmental Economics, University of London (SOAS)
2013	Project Management Course, University of Cape Town Graduate School of Business
2011-2012 (Part-time)	MPhil Environmental Management, University of Stellenbosch
2007-2010	BSc Conservation Ecology, University of Stellenbosch

Employment Record

Feb 2014 to present	CSIR, Project Manager, EAP
Sept 2011 to Jan 2014	WSP Environmental (Pty) Ltd, Environmental Consultant
Nov 2010 to Aug 201	EnviroAfrica, Junior Environmental Consultant

Appendix B. Fossil Finds Protocol

<table>
<tr><td>Province & region:</td><td colspan="2">KURUMAN DISTRICT, NORTHERN CAPE</td></tr>
<tr><td>Responsible Heritage Management Authority</td><td colspan="2">South African Heritage Resources Agency. Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Phone : +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web : www.sahra.org.za</td></tr>
<tr><td>Rock unit(s)</td><td colspan="2">Asbestos Hills Subgroup, Caenozoic alluvium, calcretes, breccias & calctufa</td></tr>
<tr><td>Potential fossils</td><td colspan="2">Mammalian and other vertebrate bones, teeth in older alluvium, calc tufa, breccias, calcretes.</td></tr>
<tr><td rowspan="5">ECO protocol</td><td colspan="2">1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (N.B. safety first!), safeguard site with security tape / fence / sand bags if necessary.</td></tr>
<tr><td colspan="2">2. Record key data while fossil remains are still in situ:
• Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo
• Context – describe position of fossils within stratigraphy (rock layering), depth below surface
• Photograph fossil(s) in situ with scale, from different angles, including images showing context (e.g. rock layering)</td></tr>
<tr><td>3. If feasible to leave fossils in situ:
• Alert Heritage Management Authority and project palaeontologist (if any) who will advise on any necessary mitigation
• Ensure fossil site remains safeguarded until clearance is given by the Heritage Management Authority for work to resume</td><td>3. If not feasible to leave fossils in situ (emergency procedure only):
• Carefully remove fossils, as far as possible still enclosed within the original sedimentary matrix (e.g. entire block of fossiliferous rock)
• Photograph fossils against a plain, level background, with scale
• Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags
• Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist
• Alert Heritage Management Authority and project palaeontologist (if any) who will advise on any necessary mitigation</td></tr>
<tr><td colspan="2">4. If required by Heritage Management Authority, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.</td></tr>
<tr><td colspan="2">5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Management Authority</td></tr>
<tr><td>Specialist palaeontologist</td><td colspan="2">Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (e.g. museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Resources Authority. Adhere to best international practice for palaeontological fieldwork and Heritage Management Authority minimum standards.</td></tr>
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