

2023

**THE ENVIRONMENTAL MANAGEMENT PLAN FOR THE  
CONSTRUCTION AND OPERATION OF THE POWERLINES  
FROM KUDU GAS POWER STATION PLANT AT UUBVLEI  
TO ORANJEMUND AND OBIB SUBSTATION, KARAS  
REGION**

**THE DOCUMENT IS PREPARED BY NAMPOWER'S  
SHEW SECTION. MARCH 2023**

**NAMIBIA POWER CORPORATION (PTY) LTD**

**P.O. BOX 2864**

**WINDHOEK,**

**15 LUTHER STREET**

**TEL: +264 205 4111**



## Table of Contents

1	LIST OF TERMS, ACRONYMS AND ABBREVIATIONS .....	3
2	INTRODUCTION .....	4
3	OBJECTIVES AND SCOPE OF THIS ENVIRONMENTAL MANAGEMENT PLAN (EMP) .....	4
4	POLICY AND LEGISLATIVE FRAMEWORK .....	5
5	ROLES AND RESPONSIBILITIES .....	10
6	DESCRIPTION OF OPERATIONAL ACTIVITIES TO BE UNDERTAKEN AND ASSOCIATED IMPACTS .....	13
7	MANAGEMENT AND MITIGATION MEASURES .....	16
8	REPORTING, MONITORING AND AUDITING .....	41
9	NON-COMPLIANCE AND CONFLICT MANAGEMENT PROCEDURES .....	41
10	RECORD KEEPING .....	41
11	CONCLUSION .....	42
12	ANNEXURES.....	<b>Error! Bookmark not defined.</b>
	Annexure 2: Herbicide application guideline .....	<b>Error! Bookmark not defined.</b>
	Annexure 3: Monitoring checklist to ensure that line inspections and general maintenance activities were conducted in accordance with guidelines – i.e. ecological best practices.....	<b>Error! Bookmark not defined.</b>
	Annexure 4: Landowner permission form.....	<b>Error! Bookmark not defined.</b>
	<b>Activities to be undertaken on the property (completed by the contractor):</b> .....	<b>Error! Bookmark not defined.</b>
	<b>Specific conditions to be met on the property (as stipulated by the landowner):</b> .....	<b>Error!</b> <b>Bookmark not defined.</b>
	<b>Error! Bookmark not defined.</b>	
	Annexure 5: Chance find procedure.....	<b>Error! Bookmark not defined.</b>

## 1 LIST OF TERMS, ACRONYMS AND ABBREVIATIONS

EAP	Environmental Assessment Practitioner
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
EMA	Environmental Management Act no 7 of 2007
EMP	Environmental Management Plan]
GIS	Geographical Information System
HIV/AIDS syndrome	Human immunodeficiency virus/ acquired immunodeficiency
MEFT	Ministry of Environment, Forest and Tourism
NHC	National Heritage Council
SHE	Safety, Health and Environment
SHEW	Safety, Health, Environment and Wellness
kV	Kilovolt

## 2 INTRODUCTION

The purpose of the project is to provide power to Skorpion Zinc Mine (from Kokerboom Substation), transmit power from the proposed Kudu Power Project to the Namibian power grid (via Kokerboom) once this project is in operation, and provide a link to the South African Power Grid (at Oranjemond Substation).

To carry out its mandate of transmission and distribution of electricity, NamPower has transmission and distribution networks across all regions countrywide.

### 2.1 Project description

The following infrastructure is already existing and operational :

- 400kV power line from the existing Kokerboom Substation near Keetmanshoop to the Obib Substation near Skorpion Zinc Mine.
- 400kV Obib Substation approximately five kilometres south-east of Skorpion Zinc Mine;
- 2 x 66kV power lines / 132kV power line from Obib Substation to Skorpion Zinc Mine;
- 66/132kV Skorpion Substation at Skorpion Zinc Mine; and
- 66kV power line from Obib Substation to link with the existing 66kV line along the Rosh Pinah road.

Project to be constructed include:

- 400kV power line from the Obib Substation southwards to a new substation north of Oranjemond.
- 132kV transmission line from Obib to the proposed Atlantic substation.
- 400kV substation approximately 15 kilometres north of Oranjemond.
- 2 x 400kV power lines from the substation north of Oranjemond to the proposed Kudu Gas Project; and
- 220kV power line from the substation north of Oranjemond to link with the South African Power Grid at the Oranjemond Substation, just south of the Orange River in South Africa.

## 3 OBJECTIVES AND SCOPE OF THIS ENVIRONMENTAL MANAGEMENT PLAN (EMP)

The construction and operation of the transmission lines can have a negative impact on the receiving environment. However, the impacts are limited to the line servitude. It is thus important that good management measures are implemented to ensure that environmental damage is minimised. This Environmental Management Plan (EMP) seeks to manage and keep to a minimum the negative impacts and at the same time, enhance the positive impacts.

The scope of this EMP includes all activities associated with the construction and operation of the existing and proposed transmission lines and substations. It is necessary to highlight that

the EMP is a living document that should be periodically reviewed and updated. It must also be noted that the EMP should be read in conjunction with laws and regulations outlined in section 5, Table 1 and all other applicable laws.

The aim of this EMP is to detail the management actions required to implement the mitigation measures identified thereby ensuring that any operational phase activity is carried out in a manner that takes cognisance of environmental protection and is in line with legal.

This EMP has the following objectives:

- To outline mitigation measures to be implemented during the operation phase, in order to manage and minimize the extent of environmental impacts.
- Minimize negative impacts and enhance positive impacts associated with the operations.
- To ensure that the operational activities do not result in undue or reasonably avoidable adverse environmental impacts and ensure that any potential environmental benefits are enhanced.
- To identify key personnel who will be responsible for the implementation of the measures, outline functions and responsibilities.
- To propose mechanisms for monitoring compliance and preventing long term or permanent environmental degradation.
- To ensure that the concerns and complaints of Interested and Affected Parties (I&APs) with regards to the operational and maintenance activities are addressed effectively and timely.
- Ensure compliance to legislative requirements.

#### **4 POLICY AND LEGISLATIVE FRAMEWORK**

**Table 1: The legislative requirements which are applicable to the Construction and operational and maintenance activities include but not limited to:**

<b>Legislation:</b>	<b>Section (s) applicable:</b>	<b>Implications:</b>
---------------------	--------------------------------	----------------------

<p>Environmental Management Act no 7 of 2007</p>	<p>Section 3</p> <p>Section 27</p> <p>Section 33 onwards</p> <p>And all other applicable sections.</p>	<ul style="list-style-type: none"> <li>• All activities performed should be in line with the following principles: <ul style="list-style-type: none"> <li>○ Interested and affected parties should have an opportunity to participate in decision making</li> <li>○ Listed activities should be subject to an EIA</li> <li>○ Polluter should pay for rehabilitation</li> <li>○ Pollution should be minimized</li> </ul> </li> <li>• Environmental assessments should be carried out for listed activities. The proposed activity can be classified under the following range of activities: <ul style="list-style-type: none"> <li>○ Generation of electricity</li> <li>○ Transmission of electricity</li> </ul> </li> <li>• These sections details the process to be followed in order to obtain a clearance certificate.</li> <li>• All existing listed activities must obtain a clearance certificate within one year of the law coming into effect. Therefore, all existing activities which can be considered a listed activity should apply for clearance.</li> </ul>
<p>EMA Regulations GN 28-30 (GG 4878) (February 2012)</p>	<ul style="list-style-type: none"> <li>• Listed activity:</li> <li>• 5.1</li> <li>• 6 – 9; 13; 15; 21-24</li> <li>• Any other</li> </ul>	<ul style="list-style-type: none"> <li>• This activity can be considered as electricity generation and transmission.</li> <li>• These sections details the process to be followed in terms of producing an</li> </ul>

	applicable sections	Environmental Assessment and this process should be adhered to during the generation of information for this document.
No. 156 Labour Act, 1992: Regulations relating to the health and safety of employees at work .	All applicable regulations	All regulations applicable to different activities must be complied to.
Labour Act no 11 of 2007	<ul style="list-style-type: none"> <li>• Section 3</li> <li>• Section 4</li> <li>• Section 9</li> <li>• Section 39 – 42</li> <li>• All other applicable sections</li> </ul>	<ul style="list-style-type: none"> <li>• Children under the age of 16 may not be employed</li> <li>• Forced labour may not be used.</li> <li>• Basic conditions of employment as stipulated by the law must be met.</li> <li>• The employer shall ensure the health and safety of all employees and non-employees on site. Employees must fulfil their duties in order to ensure their own health and safety and that of other employees and persons. Employees may leave the work site if reasonable measures to protect their health are not taken.</li> </ul>
Electricity Act no 4 of 2007	<ul style="list-style-type: none"> <li>• Section 33</li> </ul>	<ul style="list-style-type: none"> <li>• Installations used for the provision of electricity should be operated with due compliance with the requirements of laws relating to health, safety and environmental standards. Therefore – any company involved within the Electricity Supply Industry must adhere to the laws covering the previously stated aspects or stand to lose their licenses to operate.</li> </ul>
Water Act no 54 of 1956	<ul style="list-style-type: none"> <li>• Section 21 and 132</li> <li>• Section 23</li> </ul>	<ul style="list-style-type: none"> <li>• Conditions in terms of the disposal and management of effluent are to be adhered</li> </ul>

	<ul style="list-style-type: none"> <li>• All other sections applicable to different activities.</li> </ul>	<p>to.</p> <ul style="list-style-type: none"> <li>• Any person causing pollution to a water source shall be guilty of an offence.</li> </ul>
Public and Environmental Health Act no 1 of 2015	<ul style="list-style-type: none"> <li>• Section 52</li> <li>• Section 53</li> <li>• All other sections applicable to different activities.</li> </ul>	<ul style="list-style-type: none"> <li>• A person generating waste must ensure that the waste generated is kept and stored under conditions that causes no harm to human health or damage to the environment.</li> <li>• Waste must only be disposed of at a waste disposal site, including an incinerator approved by the local authority concerned.</li> </ul>
Water Resources Management Act no 24 of 2013	<ul style="list-style-type: none"> <li>• Section 89</li> <li>• All other sections applicable to different activities.</li> </ul>	<ul style="list-style-type: none"> <li>• The owner or occupier or other person in control of land where an incident that causes or is likely to cause a water resource to be polluted must take all reasonable measures to contain and minimize the effects of the incident; and to clean up polluted areas and remedy the effects of the incident.</li> </ul>
Hazardous Substances Ordinance 14 of 1974	<ul style="list-style-type: none"> <li>• Section 27</li> <li>• All other sections applicable to different activities.</li> </ul>	<ul style="list-style-type: none"> <li>• To provide for the control of substances which may cause injury or ill-health to or death of human beings, by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure thereby in certain circumstances.</li> <li>• To provide for the division of such substances into groups in relation to the degree of danger.</li> <li>• To provide for the prohibition and control of the importation, manufacture, sale, use, operation, application, modification,</li> </ul>



		<p>disposal or dumping of such substances; and</p> <ul style="list-style-type: none"> <li>To provide for matters connected therewith.</li> </ul>
<p>Fertilizers, farm feeds, agricultural remedies and stock remedies Act no 36 of 1947</p>	<ul style="list-style-type: none"> <li>Definitions</li> <li>Section 7</li> <li>Section 10</li> <li>All other sections applicable to different activities.</li> </ul>	<ul style="list-style-type: none"> <li>Arborocide application is defined as an agricultural remedy under this Act.</li> <li>Only registered pesticide may be used.</li> <li>May only buy herbicides in a container that complies with the prescribed requirements and is sealed and labelled.</li> <li>Only allowed to use herbicides in the prescribed manner.</li> <li>Landowners must be notified about applications, and the following information must be supplied: <ul style="list-style-type: none"> <li>Purpose of administration</li> <li>Registered name and number of the product</li> </ul> </li> <li>Precautions to be taken before, during and after each administration.</li> </ul>
<p>The Nature Conservation Ordinance (1975) as amended through the Nature Conservation Amendment Act of 1996.</p>	<ul style="list-style-type: none"> <li>Chapter 11: Game Parks, Nature Reserves, Conservancies and Wildlife Councils</li> </ul>	<ul style="list-style-type: none"> <li>Permits are required to enter the National Park. Permits are also required for the removal of any protected plant or tree. It also stipulates that no damage may be done to any object of geological, ethnological, archaeological, historical or other scientific interest without the appropriate permits.</li> </ul>
<p>National Heritage Act No 27 of 2004</p>	<ul style="list-style-type: none"> <li>Section: 46, 48, 55</li> <li>All other sections</li> </ul>	<ul style="list-style-type: none"> <li>All heritage resources are to be identified and either protected or removed/mitigated</li> </ul>

	applicable to different activities.	<p>with a permit from the National Monuments Council, before any development may take place</p> <ul style="list-style-type: none"> <li>• A chance find procedure should be followed in case of discovery of a heritage resource.</li> </ul>
Soil Conservation Act no 76 of 1969	<ul style="list-style-type: none"> <li>• Section 4</li> <li>• Section 13</li> <li>• Section 21</li> <li>• And other applicable sections</li> </ul>	<ul style="list-style-type: none"> <li>• Institutions may be ordered by the relevant Minister to construct soil conservation works when and where necessary.</li> <li>• Fire protection schemes may be implemented to regulate the prohibition of veld burning as well as the prevention, control and extinguishing of veld and forest fires.</li> <li>• It is illegal to damage, destroy / fail to maintain any soil conservation works; fire belts; works constructed in terms of a fire protection scheme.</li> </ul>
Forest Act no 12 of 2001	<ul style="list-style-type: none"> <li>• Section 132</li> <li>• Section 41</li> <li>• And other applicable sections</li> </ul>	<ul style="list-style-type: none"> <li>• Vegetation may not be removed within 100 m of a river, stream or water course</li> <li>• A person shall be liable for damage caused by any fire which arises as a result of activities carried out on site without having taken reasonable measures to prevent a fire.</li> </ul>

## 5 ROLES AND RESPONSIBILITIES

It is the responsibility of NamPower and/or contractor to ensure that all the environmental management actions are carried out effectively and timeously. It is important to note that the successful implementation of the EMP is, however dependent on clearly defined roles and responsibilities by several stakeholders. Below are the key employees that are responsible for the management of environmental and social issues during the operational phase:

**Table 2: The roles and responsibilities for operational activities:**

Responsible person	Responsibilities
The Area Superintendent	<ul style="list-style-type: none"> <li>• Is responsible for the enforcement of the EMP</li> <li>• To ensure that environmental requirements are adequately covered in any external service provider contracts.</li> <li>• To ensure that SHE requirements are included in the tender documents sent to the contractors. A copy of this EMP should also form part of the tender documents.</li> <li>• To ensure that corrective actions are implemented for non-compliances.</li> <li>• To ensure that appropriate records and information regarding compliance with environmental requirements are maintained.</li> <li>• To ensure that the line and substation remain in compliance with the requirements of this EMP, through regular communication and monitoring.</li> <li>• To ensure that all incidents, accidents and complaints are reported. To also ensure that incidents and accidents are investigated to prevent re-occurrence.</li> <li>• Ensuring that the work being done does not create a nuisance to any being working, residing or living on adjacent properties or within the immediate surroundings of the site.</li> </ul>
Project Manager	<ul style="list-style-type: none"> <li>• Is responsible for the enforcement of the EMP.</li> <li>• To ensure that SHE requirements are included in the tender documents sent to the contractors.</li> <li>• Must ensure that the contractor remains in compliance with the requirements of this EMP.</li> <li>• Ensuring that the work being done does not create a nuisance to any being working, residing or living on adjacent properties or within the immediate surroundings of the site.</li> </ul>

	<ul style="list-style-type: none"> <li>• To ensure that all incidents, accidents and complaints are reported. To also ensure that incidents and accidents are investigated to prevent re-occurrence.</li> </ul>
NamPower SHEW	<ul style="list-style-type: none"> <li>• To ensure that all requirements with regards to this EMP are enforced by contractors/NamPower's employees.</li> <li>• Communicate NamPower SHEW requirement to the contractors and NamPower employees.</li> <li>• Provides SHEW inductions to NamPower and contractor employees.</li> <li>• Implement monitoring, conduct inspections and audits in consultation with the Project Manager/Area Superintendent.</li> <li>• Document and communicate monitoring, audit and inspection findings to project manager and area superintendent.</li> <li>• Communicate the final inspection report to the Project manager on contractor compliance to the EMP before the project close-off and final payment is made to the contractor.</li> </ul>
Contractor	<ul style="list-style-type: none"> <li>• Is responsible for the enforcement of the EMP.</li> <li>• To appoint a SHE officer responsible for the implementation of this EMP.</li> <li>• To ensure that all tasks undertaken under the scope of work, are in accordance both with NamPower's SHEW policies and procedures as well as to the requirements of this EMP.</li> <li>• Ensure that employees are regularly trained, and awareness built relating to environmental and social management.</li> <li>• To ensure that all incidents, accidents, and complaints are reported to the project manager. The contractor to ensure that incidents and accidents are investigated to prevent re-</li> </ul>

	<p>occurrence.</p> <ul style="list-style-type: none"> <li>• Ensuring that all employees receive a SHEW induction before the start of the project.</li> <li>• Ensuring that the work being done does not create a nuisance to any being working, residing, or living on adjacent properties or within the immediate surroundings of the site.</li> </ul>
--	---

## 6 DESCRIPTION OF OPERATIONAL ACTIVITIES TO BE UNDERTAKEN AND ASSOCIATED IMPACTS

The table below outlines the summary of the operational activities and associated socio-economic and environmental impacts.

**Table 3: The Construction and operational activities include but not limited to:**

Activity	Description	Associated potential impacts
<b>Access route and line route Bush clearing</b>  <b>Site Establishment</b>  <b>Camping</b>  <b>Transportation of materials</b>	<ul style="list-style-type: none"> <li>• Construction activities.</li> </ul>	<ul style="list-style-type: none"> <li>• Dust and noise</li> <li>• Loss of biodiversity</li> <li>• Use of resources</li> <li>• Waste</li> <li>• Off-road tracks</li> <li>• Waste</li> <li>• Increase in traffic volume on roads.</li> </ul>
<b>Construction phase</b>	<ul style="list-style-type: none"> <li>• Civil, mechanical, and electrical installations on the line and substation.</li> </ul>	<ul style="list-style-type: none"> <li>• Job and economic opportunities for locals and region at large.</li> <li>• HIV and AIDS issues due to introduction of new people in the area.</li> </ul>
<b>Excavations</b>	<ul style="list-style-type: none"> <li>• Tower foundation excavations</li> </ul>	<ul style="list-style-type: none"> <li>• Dust and noise</li> <li>• Disturbance and loss of biodiversity.</li> </ul>
<b>General functioning of the transmission line</b>	<ul style="list-style-type: none"> <li>• Physical presence and functional</li> </ul>	<ul style="list-style-type: none"> <li>• Animal (including birds) mortalities through collisions and electrocution.</li> <li>• Death of avifauna, especially protected</li> </ul>

	<p>characteristics of the line.</p>	<p>spp.</p> <ul style="list-style-type: none"> <li>• Visual impact.</li> <li>• Community impacts in a form fatalities or injuries caused by electrocution.</li> <li>• Meeting electricity demand (positive impact).</li> </ul>
<p><b>Maintenance of the line and station</b></p>	<p>The maintenance of the line entail but not limited to:</p> <ul style="list-style-type: none"> <li>• Repairing of line components.</li> <li>• Maintenance of electrical equipment/ line's components.</li> </ul>	<ul style="list-style-type: none"> <li>• Soil and water contamination.</li> <li>• Waste generation leading to filling up of landfill space.</li> <li>• Destruction of vegetation; vertebrate fauna; avifauna especially protected spp. and sensitive habitats.</li> <li>• Social issues such as introduction of new workers in the area, e.g., HIV/AIDS spreading.</li> <li>• Loss of human life (through electrocution).</li> </ul>
<p><b>Refurbishment/Construction</b></p>	<ul style="list-style-type: none"> <li>• Refurbishment of the line components.</li> <li>• Construction and/or repair of excess roads.</li> </ul>	<ul style="list-style-type: none"> <li>• Noise emissions</li> <li>• Air emissions</li> <li>• Introduction of new people in the area leading to the spread of diseases such as HIV/AIDS</li> <li>• Soil and water contamination</li> </ul>

		<ul style="list-style-type: none"> <li>• Waste generation leading to filling up of landfill space</li> <li>• Employment of casual workers</li> <li>• Loss of biodiversity reduces habitat availability and food sources for many animals.</li> <li>• Loss of sensitive plants and habitats.</li> <li>• Loss or damage of heritage resources.</li> </ul>
<b>Periodic inspections and monitoring</b>	Periodic inspections and monitoring of the line.	<ul style="list-style-type: none"> <li>• Soil and ground water contamination because of oil spills</li> <li>• Soil contamination because of improper waste handling and disposal.</li> <li>• Loss of biodiversity if existing access roads are not use.</li> </ul>
<b>Installation of Optic Fibre networks</b>	<ul style="list-style-type: none"> <li>• Design, Supply, Delivery, Installation and Commissioning of Optic Fiber networks for communication purposes.</li> </ul>	<ul style="list-style-type: none"> <li>• Loss of biodiversity</li> <li>• Soil contamination because of improper waste handling and disposal.</li> <li>• Loss of sensitive plants and habitats.</li> </ul>
<b>Vegetation Management</b>	<ul style="list-style-type: none"> <li>• Removal of trees, bushes or grass to maintain access to the line servitude.</li> </ul>	<ul style="list-style-type: none"> <li>• Destruction of vegetation; vertebrate fauna; avifauna especially protected spp. and sensitive habitats.</li> <li>• Conflict with landowners</li> <li>• Loss of topsoil</li> <li>• Soil and water contamination</li> <li>• Loss or damage of heritage resources.</li> </ul>

		<ul style="list-style-type: none"><li>• Soil erosion</li><li>• Destruction of sensitive habitats</li></ul>
--	--	--

## 7 MANAGEMENT AND MITIGATION MEASURES

In order to ensure that the potential impacts are eliminated and/or minimised, it is necessary to ensure that the various activities related to the operation of the powerline are adequately managed and monitored. Table 4 below outline mitigation measures as well as objectives to be achieved. A responsible person (s) have been assigned to each mitigation measure (s).



**Table 4: Proposed mitigation measures for the general Construction and operational activities**

ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
<p><b>Environmental Awareness Training</b></p>	<ul style="list-style-type: none"> <li>• All senior and supervisory staff members shall familiarise themselves with the full contents of the EMP. They shall know and understand the specifications of the EMP and shall be able to assist other staff members in matters relating to the EMP.</li> <li>• An environmental awareness training programme for all staff members shall be put in place. Before commencing with any work, all staff members shall be appropriately briefed about the Code of Conduct (Part B) and relevant occupational health and safety issues.</li> <li>• After being briefed about the contents of the Code of Conduct, staff members shall sign a register as proof of their training.</li> <li>• All staff members shall be provided with the correct tools, equipment, and training in order for them to undertake their activities in an environmentally responsible manner.</li> </ul>	<p>Area superintendent</p> <p>Project manager</p> <p>SHEW</p> <p>Contractor</p>

<b>ASPECT</b>	<b>MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS</b>	<b>RESPONSIBLE PERSON</b>
<b>Disputes / Claims / Litigation</b>	<ul style="list-style-type: none"> <li>• To avoid unnecessary disputes and claims, verbal agreements and arrangements shall not be allowed.</li> <li>• Keep written records of all discussions and agreements with owners and/or managing bodies of affected land.</li> <li>• Keep written record of all complaints and claims, and the measures implemented to address these complaints and claims.</li> <li>• Resolve disputes and address environmental complaints and claims in the best possible way.</li> </ul>	<p>Area superintendent</p> <p>Project manager</p> <p>SHEW</p> <p>Contractor</p>

ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
<b>Employment / Social Structures</b>	<ul style="list-style-type: none"> <li>• Maximise benefits to local labour and small / micro enterprises.</li> <li>• Avoid employment conflict.</li> <li>• Most importantly, never recruit labour off the street or at the gate.</li> </ul>	Area superintendent  Project manager  SHEW Representative  Contractor
<b>Responsibility for Implementing the EMP</b>	<ul style="list-style-type: none"> <li>• The overall responsibility for ensuring compliance with the EMP is with the Main Contractor (MCT). The Main Contractor shall ensure that all staff members, sub-contractors and suppliers understand and adhere to the EMP and its Code of Conduct.</li> <li>• The Main Contractor shall nominate a senior staff member as Environmental Control Officer (ECO) to supervise implementation of the EMP and to be accountable for issues relating to the environment. The ECO shall liase with the EC, MET, NamPower, the public, and owners or managing bodies of affected land.</li> <li>• The EMP shall be part of the terms of reference for all contractors, sub-contractors and suppliers. All contractors, sub-contractors and suppliers have to give some assurance that they understand the EMP and that they undertake</li> </ul>	Area superintendent  Project manager  SHEW Representative  Contractor

<b>ASPECT</b>	<b>MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS</b>	<b>RESPONSIBLE PERSON</b>
	to comply with the conditions therein.	
<b>Dealing with Non-Compliance with the EMP (Penalties / Incentives for Staff)</b>	<ul style="list-style-type: none"> <li>Put in place procedures to motivate staff members to comply with the EMP Code of Conduct, and to deal with acts of non-compliance, or deliberate and malicious damage to the environment by any staff member.</li> </ul>	Area superintendent Project manager SHEW Representative Contractor

ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
<b>Reporting Procedures / Environmental Register</b>	<ul style="list-style-type: none"> <li>• Put in place an Environmental Register and as soon as possible, but within 24 hours of becoming aware of environmentally related problems (such as an environmental complaint or claim; an incident of non-compliance; or other environmentally related incident), notify the EC, and document:</li> <li>• Nature of the problem.</li> <li>• Causes of the problem.</li> <li>• Party/Parties responsible for causing the problem.</li> <li>• Immediate actions taken to stop / reduce / contain the causes of the problem.</li> <li>• Additional corrective or remedial actions taken and/or to be taken to address the problem, and to prevent reoccurrence of such problems.</li> <li>• Timeframes and the party/parties responsible for implementation of corrective or remedial actions.</li> <li>• Procedures to be taken and/or penalties to apply if corrective or remedial actions are not implemented as stipulated, and</li> <li>• Copies of all correspondence relating to the problem.</li> <li>• Arrange for EMP related issues to be discussed at all customary (monthly) site</li> </ul>	<p>Area superintendent</p> <p>Project manager</p> <p>SHEW Representative</p> <p>Contractor</p>

ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
	<p>meetings. A copy of the relevant sections of the minutes of these site meetings to be forwarded to the EC, and one copy to be filed in the environmental register.</p> <ul style="list-style-type: none"> <li>•</li> </ul>	
<p><b>Project Layout and Access Plan</b></p>	<ul style="list-style-type: none"> <li>• Before commencing with construction, carefully plan the siting and use of the construction activities and all workings. Develop a Project Layout and Access Plan to show the intended use of the area. Have the plan approved by the Ministry of Environment and Tourism (MET), and Environmental Consultant (EC). The plan shall clearly indicate (on 1:50 000 topographical maps) and/or describe the location and details of:</li> <li>• The proposed power line servitude, bend points and final substation positions (details about final positioning of bend points and the substation obtainable from NamPower).</li> <li>• Areas and routes to be cleared – including the size/width of the cleared areas along the powerline and the location and size of areas to be cleared to facilitate construction of the substation.</li> </ul>	<p>Area superintendent Project manager SHEW Representative Contractor</p>

ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
	<ul style="list-style-type: none"> <li>• Construction campsites and rest areas to be used during construction of the power line and the substation.</li> <li>• On-site and off-site waste disposal sites and procedures at construction campsites, rest areas and all areas affected during construction.</li> <li>• Sources of construction materials (quarries and borrow pits).</li> <li>• Power supply during construction.</li> <li>• Existing roads and tracks to be used as transportation routes, and routes to gain access to construction areas.</li> <li>• New roads and tracks deemed necessary to provide access to powerline and substation site. Indicate if they are permanent or temporary and how temporary roads shall be removed after use. Provide details on the type and design of the roads. In the case of single-track paths and narrow roads, show points where vehicles will be allowed to overtake, pass each other, or turn around.</li> <li>• Topsoil management, i.e., indicate areas where topsoil will be removed, stockpiled and later used, especially on and around the substation site.</li> <li>• Lay down speed limits conducive to road safety on all the roads and tracks used during construction (speed limits of construction roads should generally</li> </ul>	

ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
	not exceed 40 km/h but will depend on the condition of the road or track in question).	
<b>Route and Area Clearing and Establishment of New Roads and Tracks</b>	<ul style="list-style-type: none"> <li>• Carefully plan construction activities and transportation of people and equipment with the intention to: <ul style="list-style-type: none"> <li>– Avoid clearing (blading) where it is not absolutely called for to ensure safe mechanical construction and electrical operation of the power line.</li> <li>– Minimise the establishment of new roads and tracks.</li> <li>– Minimise secondary impacts such as dust and erosion.</li> <li>– Avoid compromising the safety of the public, workers and animals in the area.</li> </ul> </li> <li>• Prohibit vehicles from leaving designated paths and existing tracks. Encourage people to walk to points of interest that are located away from existing tracks.</li> <li>• Minimise erosion and drainage problems by avoiding tracks crossing contours at right angles.</li> <li>• Implement measures to manage storm water runoff (i.e. avoid the concentration of water by putting in place mounds at suitable intervals to direct runoff.</li> <li>• Put in place measures to avoid erosion at river and stream channel crossings, and at places where existing erosion scars and dongas are encountered.</li> </ul>	Area superintendent Project manager SHEW Representative Contractor



ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
	<ul style="list-style-type: none"> <li>Encourage the use of three-point-turns rather than u-turns or large turning circles.</li> </ul>	
	<ul style="list-style-type: none"> <li>Carefully plan the movement and transportation of staff, equipment, and materials to minimise the number of trips required.</li> <li>Carefully plan the movement and transportation of staff, equipment, and materials to minimise the number of trips required.</li> <li>Make sure all drivers are properly trained and in possession of a valid licence for the specific vehicle.</li> <li>Encourage the use of headlights. Always switch on headlights on gravel public roads.</li> <li>The Main Contractor shall be responsible for rehabilitation of all unwanted tracks or unwarranted disturbed areas formed by themselves or their staff members, sub-contractors, or suppliers. The primary aim is to avoid all unnecessary tracks.</li> </ul>	<p>Area superintendent</p> <p>Project manager</p> <p>SHEW Representative</p> <p>Contractor</p>

ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
<p><b>Pollution control and handling of HAZARDOUS SUBSTANCES</b></p>	<ul style="list-style-type: none"> <li>• Minimise the risk of pollution and health impacts.</li> <li>• Prevent polluted water from entering stream channels or underground aquifers.</li> <li>• Provide adequate ablution facilities (i.e. chemical toilets, french drains, or a pit system) at construction campsites. Position these away from any river, stream channel, pan, dam or borehole and maintain in a hygienic and good working order.</li> <li>• Ensure that all staff are adequately protected and educated about the safe and proper handling and disposal of hazardous substances.</li> <li>• Keep a register of hazardous substances present on construction areas, and have information pertaining to the management of spills or ingestion available.</li> <li>• Provide and maintain adequate bunding (i.e. impervious concrete slabs or plastic linings, drip trays, traps, sumps, etc.) where hazardous materials are stored and handled (e.g. at diesel generators and refuelling depots). Bunds should be adequately sized and capable of containing ALL the substances they are intended for.</li> <li>• Used fuel, oils, hydraulic fluids, paints and solvents, and grease should be stored in drums or other suitable containers. These should be labelled, sealed and removed from the site to an appropriate disposal site or recycling facility.</li> <li>• Hazardous substances should be stored in a well-ventilated area, and behind lock and key.</li> <li>• In the event of a hazardous spill, whether accidental, deliberate or through negligence, on site or during transportation of these substances to/from the site: <ul style="list-style-type: none"> <li>- Immediately implement actions to stop or reduce and contain the spill.</li> <li>- Report the spill to the ECO and arrange implementation of the necessary clean up procedures.</li> <li>- Collect contaminated soil, water and other materials and dispose of it at an appropriate site.</li> </ul> </li> </ul>	<p>Area superintendent</p> <p>Project manager</p> <p>SHEW Representative</p> <p>Contractor</p>

ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
<b>Waste Management</b>	<ul style="list-style-type: none"> <li>• Implement all reasonable measures to prevent inappropriate disposal of waste and to prevent litter from becoming windblown or carried around by scavengers.</li> <li>• Always maintain a clean and tidy site.</li> <li>• Be aware of the classification of ‘hazardous waste’ and ‘general waste and construction rubble’ applicable to this highly sensitive environment.</li> <li>• For all hazardous or potential hazardous waste, the principle of ‘what gets taken in shall be taken out’ shall apply. No hazardous or potentially hazardous or harmful waste (including glass, metal and plastic) shall be buried or burned anywhere in the veld or at the construction campsite.</li> <li>• Provide separate waste containers (drums, bins, skips or bags) for hazardous and potentially hazardous waste, and for general waste and construction rubble. Hazardous waste containers should be easily distinguishable as such. Where relevant, containers shall be provided with lid or netting to prevent it being carried around by scavengers or the wind. Waste containers should not be over-filled.</li> <li>• Arrange for the removal of full waste containers on a regular basis. Verify the final destination and method of disposal or recycling. Keep in mind that the producer of the waste is ultimately responsible for its proper disposal.</li> <li>• Ensure that the construction campsites, all construction areas site and the surroundings are kept in a clean and neat condition at all times and that windblown litter is cleared on a daily basis.</li> </ul>	<p>Area superintendent</p> <p>Project manager</p> <p>SHEW Representative</p> <p>Contractor</p>

ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
<b>Protecting the biophysical environment</b>	<ul style="list-style-type: none"> <li>• Minimise water consumption wherever possible.</li> <li>• Avoid depletion of boreholes.</li> <li>• Minimise the damage to the fragile surface soil layer through careful planning of construction activities.</li> <li>• Implement measures to preserve topsoil in areas where disturbances do occur.</li> <li>• Implement the best practicable means to prevent dust from becoming so dispersed in the atmosphere as to be harmful or cause nuisance to people, plants and animals.</li> <li>• Avoid unnecessary damage and destruction of the vegetation cover.</li> <li>• Prevent veld fires.</li> <li>• Avoid poaching and collection of animals and plants material.</li> <li>• Install bird deflectors on those sections of the line where bird collisions are likely to be problematic.</li> <li>• Implement all reasonable measures to minimise the visual impacts and keep the area as natural looking as possible.</li> <li>• At the start and for the duration of route clearing / establishment of new roads and tracks, liaise with NamPower, the EC and NBRI to coordinate the relocation of important plants, and to identify sensitive sites to be avoided during construction.</li> <li>• Supply commercially bought firewood or alternative fuel for cooking and space heating.</li> <li>• Install bird flappers on the earth cables (top cables) along the following route sections: <ul style="list-style-type: none"> <li>- Crossing of the Fish River (1.2 km section).</li> <li>- Crossing of the Konkiep River (0.8 km section).</li> <li>- Eastern edge of the Huib-Hoch Plateau (1.5 km section).</li> </ul> </li> </ul>	<p>Area superintendent</p> <p>Project manager</p> <p>SHEW Representative</p> <p>Contractor</p>
<b>Safety Management</b>	<ul style="list-style-type: none"> <li>• Develop and implement an occupational health and safety system that comprises key elements such as risk assessment and safe working procedure.</li> </ul>	<p>Area superintendent</p> <p>Project manager</p>

ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
	<ul style="list-style-type: none"> <li>• NamPower SHEW requirements must be complied with.</li> <li>• All work activities to be done under the supervision of a competent person.</li> <li>• Appropriate warning signs must be placed on the facilities.</li> <li>• SHE file to be submitted in case of projects in accordance with NamPower SHE requirements.</li> </ul>	<p>SHEW Representative</p> <p>Contractor</p>
	<ul style="list-style-type: none"> <li>• Eliminate the presence of potential sources of ignition and provide appropriate equipment to minimize fire risk.</li> <li>•</li> </ul>	<p>Area superintendent</p> <p>Project manager</p> <p>Contractor</p>
<b>Air Quality</b>	<ul style="list-style-type: none"> <li>• Dust generation from all activities must be minimised.</li> <li>• Excavation, handling, and transportation of erodible materials shall be avoided under high wind conditions or when a visible dust plume is present.</li> <li>• Speed limit to be enforced to control dust emissions.</li> <li>• Dust suppression measures shall be implemented when necessary.</li> <li>• Vehicle, machinery, and equipment shall be maintained in good working order</li> </ul>	<p>Area superintendent</p> <p>Project manager</p> <p>Contractor</p>

ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
	<p>in order to minimise exhaust fume emissions.</p> <ul style="list-style-type: none"> <li>• Vehicle, machinery, and equipment must be serviced by competent personnel and records must be kept onsite</li> </ul>	
<b>Resources Efficiency</b>	<ul style="list-style-type: none"> <li>• Minimise water wastage and record water usage.</li> <li>• Avoid wasteful use of materials.</li> <li>• Source goods and services locally where possible</li> </ul>	<p>Area superintendent</p> <p>Project manager</p> <p>SHEW Representative</p> <p>Contractor</p>
<b>Waste Management</b>	<ul style="list-style-type: none"> <li>• Minimise the generation of waste by applying the waste hierarchy.</li> <li>• Line servitude to be kept free of waste.</li> <li>• No burning, burying or dumping of any waste materials shall be permitted onsite.</li> <li>• Labelled waste bins with lids must be provided at campsites (in case of a project) for all waste streams and ensure that waste is disposed at nearest approved waste disposal site.</li> <li>• Ensure that waste segregation is done at source.</li> </ul>	<p>Area superintendent</p> <p>Project manager</p> <p>SHEW Representative</p> <p>Contractor</p>

ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
	<ul style="list-style-type: none"> <li>• Waste must be disposed at a licensed waste facility.</li> <li>• Hazardous waste shall be disposed of at a registered hazardous waste disposal site.</li> <li>• Safe disposal certificates for hazardous waste must be kept in the SHE file.</li> <li>• Concrete waste must not be dumped on site.</li> </ul>	
<b>Wastewater management</b>	<ul style="list-style-type: none"> <li>• Water containing environmental pollutants shall be collected and removed from site.</li> <li>• No wastewater runoff or uncontrolled discharges from the site/working areas shall be permitted.</li> <li>• Mobile toilets or septic tanks should be used in remote areas.</li> </ul>	<p>Area superintendent</p> <p>Project manager</p> <p>SHEW Representative</p> <p>Contractor</p>
<b>Hazardous Substances</b>	<ul style="list-style-type: none"> <li>• The use, handling, storage and disposal of the hazardous chemical must be in accordance with the MSDS.</li> <li>• Containers must be clearly marked to indicate contents and quantities.</li> <li>• Hazardous substances storage areas must be bunded. A bund should be able to contain 110% of the volume of the largest container stored within it.</li> </ul>	<p>Area superintendent</p> <p>Project manager</p> <p>SHEW Representative</p> <p>Contractor</p>

ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
	<ul style="list-style-type: none"> <li>• Diesel and other liquid fuel must be stored in appropriate storage tanks or in bowzers with secondary containment.</li> <li>• Inspect and maintain hazardous storage areas to avoid overflows.</li> <li>• Ensure that drip trays are available, to be use in case of leaking equipment.</li> <li>• Spill kit and absorbents must be available onsite at campsite.</li> <li>• Hazardous substance storage areas must display safety symbolic signs.</li> <li>• All spills must be reported, cleaned and remediated to in compliance with SHEW requirements.</li> </ul>	
<b>Social Impact</b>	<ul style="list-style-type: none"> <li>• NamPower/ Contractor must sign land permission form and agreement with land owners 14 days prior to commencement of work onsite.</li> <li>• Employees should limit their contact with permanent residents of the area.</li> <li>• Employees should be properly educated about the impact of HIV / AIDS and pregnancies.</li> <li>• The use of intoxicating liquor or drugs of any kind by the employees is strictly prohibited.</li> <li>• Ensure that all queries and complaints are documented, investigated and dealt with.</li> </ul>	<p>Area superintendent</p> <p>Project manager</p> <p>SHEW Representative</p> <p>Contractor</p>



<b>ASPECT</b>	<b>MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS</b>	<b>RESPONSIBLE PERSON</b>
	<ul style="list-style-type: none"><li data-bbox="636 300 1691 383">• A register shall be kept of all complaints from stakeholders, this should also the actions taken to rectify the complaints.</li></ul>	

<p><b>Archaeology/ Protecting Heritage sites and artefacts.</b></p>	<ul style="list-style-type: none"> <li>• Any chance finds must be reported to NamPower environmental section.</li> <li>• No heritage objects may be moved without a permit from the National Monuments Council and any permitted removal of heritage objects must be done under the supervision of a qualified specialist.</li> <li>• Implement all reasonable measures to avoid disturbance or loss of important heritage sites and artefacts, those recorded during the archaeological survey as well as any new sites found during construction – especially to stone walls, graves and other ‘heaps of stones’ throughout.</li> <li>• Be aware of the location and adhere to the general guidelines for management of the known heritages sites.</li> <li>• Clearly mark with whitewash or demarcate with plastic tape those sites associated with stone structures, dry-stone walling or a ‘heap of stones’ to increase their visibility, thus helping to prevent accidental destruction.</li> <li>• Should there be any minor re-alignments of the power line required along the route section between the Konkiep River (Bp15) and Skorpion Zinc Mine / Obib Substation (Bp34), consult with the EC or Archaeological Specialist to verify possible impacts on known heritage sites identified.</li> <li>• When a potential heritage site or artefact are found: <ul style="list-style-type: none"> <li>- Carefully work around the site to avoid damage;</li> </ul> </li> </ul>	<p>Area superintendent</p> <p>Project manager</p> <p>SHEW Representative</p> <p>Contractor</p>
---	---	--

ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
	<ul style="list-style-type: none"> <li>- Do not remove any object from the site;</li> <li>- Document the nature and location of the site;</li> <li>- If damage to the site cannot be avoided, report the discovery to the National Monuments Council or Archaeological Specialist to obtain their advice, and do not damage or destroy the site without their permission.</li> </ul>	
<b>Fauna and Flora</b>	<ul style="list-style-type: none"> <li>• Ensure that the site is kept clean and free of waste.</li> <li>• Ensure that the line structures are maintained such that the conductors do not hang low to avoid potential human life and animal life losses.</li> <li>• No harvesting or damaging of plants is allowed.</li> <li>• Poaching or capturing of any animal (wild or domestic) is prohibited.</li> <li>• Bird nests may not be disturbed unless interfering with the normal operation of the line/station.</li> <li>• No domestic animals may be kept onsite (in case of camping) as they can introduce diseases or interbreed with the animals occurring naturally in the area.</li> </ul>	<p>Area superintendent</p> <p>Project manager</p> <p>SHEW Representative</p> <p>Contractor</p>

<b>ASPECT</b>	<b>MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS</b>	<b>RESPONSIBLE PERSON</b>
	<ul style="list-style-type: none"> <li>• Vehicles driving along the lines should engage four-wheel drive to prevent spinning and consequent impacts on soil surface.</li> <li>• Do not destroy, damage, collect any protected flora species that may be encountered servitude operations unless interfering with the normal operation of the line.</li> <li>• Avoid disturbing the rocky/mountainous areas. Rocky areas potentially have high plant and high vertebrate fauna diversity.</li> <li>• Only remove/prune flora directly affecting the transmission line;</li> <li>• Avoid disturbing the rocky, pans and ephemeral drainage lines and other sensitive areas. sections.</li> <li>• Identify potential bird collision prone areas (i.e. habitats).</li> <li>• Install bird flight diverters (BFD's) and anti-perching devices (APD's) to the identified collision potential areas.</li> <li>• Monitor all bird mortalities encountered under the transmission line.</li> <li>• All wildlife and electrical infrastructure interactions such as (animal/bird deaths) must be reported to the SHEW section.</li> </ul>	
<b>Water Resources</b>	<ul style="list-style-type: none"> <li>• Care must be taken to ensure that pollution of water does not occur.</li> </ul>	Area superintendent

ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
	<ul style="list-style-type: none"> <li>• Naturally occurring water resources may not be used for any personal hygiene.</li> <li>• Water may only be taken from a private or government property based on an agreement between the NamPower, contractor and custodian of the water source.</li> </ul>	Project manager SHEW Representative Contractor
<b>Erosion</b>	<ul style="list-style-type: none"> <li>• Implement and maintain erosion control measures along the access route in erosion prone areas.</li> <li>• Rehabilitate eroded areas</li> </ul>	Area superintendent Project manager SHEW Representative Contractor
<b>Campsite Establishment</b> <b>(should there be a need for camping, mostly during projects)</b>	<ul style="list-style-type: none"> <li>• Adequate ablution facilities must be provided onsite in relation to the number of employees.</li> <li>• Ablution facilities must not be located within 100m of any river, stream channel, pan, dam or borehole</li> <li>• Non-employees are not allowed to reside at the campsite.</li> <li>• Fire extinguishers, first aid kits, assembly point, and emergency numbers must be available onsite.</li> <li>• Waste must be managed in accordance with waste management requirements</li> </ul>	Area superintendent Project manager SHEW Representative Contractor

ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
	outlined in this EMP.	
<b>Manual and Mechanical Vegetation Removal</b>	<ul style="list-style-type: none"> <li>• Obtain a permit from the Ministry of Environment, Forestry and Tourism to remove protected trees as per the Forest Act No. 12 of 2001.</li> <li>• Measures must be put in place to avoid erosion especially at rivers, stream channel crossings, and at places where existing erosion scars and dongas are encountered to avoid any further erosion.</li> <li>• Avoid mechanical bush clearing in sensitive areas.</li> <li>• Measures must be put in place to preserve the topsoil structure</li> <li>• The disturbed soil must be levelled.</li> <li>• Do not remove wood cut on site as this would affect the recycling of nutrients locally as well as lead to a potential industry in firewood targeting the better quality tree species.</li> <li>• Where clearing is done near a river, the contractor/NamPower must ensure that no felled bushes/branches/shrubs are left behind in the riverbed.</li> <li>• No burning of bush cleared materials is allowed onsite.</li> <li>• Manual and mechanical vegetation removal should be done in accordance with NamPower Procedures.</li> </ul>	Area superintendent Project manager SHEW Representative Contractor

ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
	<ul style="list-style-type: none"> <li>Avoid the cutting down of protected tree species [Forestry Ordinance No. 37 of 1952) not directly affecting the power lines during the line clearing operation.</li> </ul>	
<b>Herbicide Use</b>	<ul style="list-style-type: none"> <li>Prevent the application of selected herbicide(s) in sensitive areas – e.g. “high” &amp; “medium” sensitivity areas (See annexure 1). Sensitive areas are known/expected to have higher biodiversity.</li> <li>Avoid the spraying of protected tree [Forestry Ordinance No. 37 of 1952) not directly affecting the power lines during the line clearing operation.</li> <li>Eradicate all invasive alien species potentially associated with the line/station. This would indicate overall environmental commitment.</li> <li>Avoid spraying herbicide during windy days/periods (See the general product requirements for herbicide used) as this could affect non-target areas and species.</li> <li>Avoid spraying, removing and/or approaching trees with vulture (and other larger raptors) nests along the route (if they are not affecting the line).</li> <li>Implement strict control over the storage, protective measures &amp; application of the selected herbicide(s) throughout.</li> <li>Always consult and adhere to the MSDS requirements for the herbicide</li> <li>Herbicide must be handled in accordance with the requirements outlined in NamPower Procedures.</li> </ul>	<p>Area superintendent Project Manager</p> <p>SHEW Contractor</p>

ASPECT	MANAGEMENT AND MITIGATION MEASURES/COMMITMENTS	RESPONSIBLE PERSON
<b>Site Rehabilitation (progressive and post rehabilitation)</b>	<ul style="list-style-type: none"> <li>• Progressive rehabilitation especially when there is project work is in progress.</li> <li>• Post projects rehabilitation must also be done.</li> <li>• All materials, equipment and waste must be removed from site.</li> <li>• A post construction audit prior to the contractor leaving site must be conducted.</li> <li>• SHEW to sign site close off or take over certificate once remedial corrective actions have been implemented.</li> </ul>	Area superintendent  Project Manager  SHEW  Contractor



## **8 REPORTING, MONITORING AND AUDITING**

The environmental monitoring, inspections and audits must be conducted in line with legislation, supporting procedures and requirements of this plan. Monitoring, inspection and audit reports detailing the monitoring, inspection and audit results shall be prepared by the SHEW section and communicated to the Area Manager, Superintendent or Project Manager.

## **9 NON-COMPLIANCE AND CONFLICT MANAGEMENT PROCEDURES**

The Area Superintendent, Project manager and Contractor shall ensure that the employees and external service providers comply with the requirements outlined in this EMP. In the event of non-compliance, the following recommended process shall be followed:

- Non – compliances will be identified during inspections or audits carried out by the SHEW Section and reported to the Area manager, Superintendent and Project Manager for corrective actions.
- Area Superintendent / Project Manager shall notify the responsible stakeholders about the non-compliance .
- Corrective and preventative actions must be implemented on an agreed timeframes.
- Area Superintendent / Project Manager to report back on how the non-conformances have been rectified.
- Follow – up inspections/audits shall be conducted to assess whether the corrective and preventative actions were implemented effectively.

The contractor/Area Superintendent / Project Manager shall notify NamPower of the following:

- Conflicts arising with any landowner / representative and other stakeholders.
- Any special conditions requested by a landowner / representative.

NamPower has the right to stop certain line activities if it is found that a gross violation of the EMP is taking place.

## **10 RECORD KEEPING**

Record keeping is important for the effective functioning and implementation of an EMP. EMP documentation must be kept in both the hard copy and electronic format for safe keeping and must be available during SHE audits.

## **11 CONCLUSION**

All management measures and legal requirements outlined in this EMP should be implemented in order to ensure environmental compliance by all parties undertaking the operational activities. This will ensure that potential negative impacts are identified, avoided or mitigated and positive impacts are enhanced.



**ENVIRONMENTAL MANAGEMENT PLAN FOR  
CONSTRUCTION AND OPERATION OF THE  
POWERLINES FROM KUDU GAS POWER STATION  
PLANT AT UUBVLEI TO ORANJEMUND AND OBIB  
SUBSTATION, KARAS REGION**

**Updated in 2023**



# ENVIRONMENTAL MANAGEMENT PLAN (EMP)

## PART A: MITIGATION MEASURES

### AIM

Part A is the core of the EMP. Potential environmental impacts, impacts sources and objectives are described, and environmental management mitigation measures during construction are specified. Except where otherwise stated, all these mitigation measures will apply throughout the construction period and, as part of the project contract, the Contractor shall always adhere to these measures.

### TABLE OF CONTENTS

A 1.	ENVIRONMENTAL AWARENESS / COMPLIANCE WITH THE EMP .....	A-1
A 2.	CONSTRUCTION INITIATION / SITE ESTABLISHMENT .....	A-3
A 3.	PUBLIC RELATIONS / COMPLAINTS AND CLAIMS .....	A-5
A 4.	EMPLOYMENT / SOCIAL STRUCTURES .....	A-7
A 5.	ROUTE CLEARING / ESTABLISHMENT AND MAINTENANCE OF ROADS AND TRACKS.....	A-7
A 6.	POLLUTION CONTROL AND HANDLING OF HAZARDOUS SUBSTANCES.....	A-10
A 7.	WASTE MANAGEMENT .....	A-12
A 8.	PROTECTING THE BIOPHYSICAL ENVIRONMENT .....	A-13
A 9.	PROTECTING HERITAGE SITES AND ARTEFACTS.....	A-17
A 10.	INFRASTRUCTURE / DEVELOPMENT.....	A-18
A 11.	HEALTH AND SAFETY .....	A-19
A 12.	CLOSURE AND REHABILITATION .....	A-19
A 14.	EMP AMENDMENTS .....	A-21

# ENVIRONMENTAL MANAGEMENT PLAN (EMP)

## PART A: MITIGATION MEASURES

### A 1. ENVIRONMENTAL AWARENESS / COMPLIANCE WITH THE EMP

#### Potential Significant Impacts

- A lack of environmental awareness and non-compliance with the EMP will result in unnecessary environmental damage. The public's negative perceptions about construction activities in sensitive environments will be enforced.

#### Sources of Potential Impacts

- Non-compliance with the EMP will transpire because of:
  - Ignorance, negligence, recklessness or a general lack of commitment towards the environment.
  - Lack of clearly defined roles and responsibilities.
  - Lack of corrective actions in the case of problems and difficulties with implementation of the EMP.

#### Objectives

- Ensure that all staff members who come to site are trained on aspects of the environment and encourage them to contribute to its preservation.
- Clarify and accept responsibilities for implementation of the EMP.
- Put in place reporting procedures and an environmental register to document all environmental complaints and claims received, incidents of non-compliance with the EMP, or any other environmental incident related to the project.

<i>Mitigation Measure</i>	<i>Responsibility</i>
<b>Environmental Awareness Training</b>	
<b>1.1.</b> All senior and supervisory staff members shall familiarise themselves with the full contents of the EMP. They shall know and understand the specifications of the EMP and shall be able to assist other staff members in matters relating to the EMP, specifically with the Code of Conduct (Part B).	Project Manager, Area Superintendent , SHEW Representative and Contractor
<b>1.2.</b> An environmental awareness training programme for all staff members shall be put in place. Before commencing with any work, all staff members shall be appropriately briefed about the Code of Conduct (Part B) and relevant occupational health and safety issues. The training programme has to be approved by the EC and NamPower.	Project Manager, Area Superintendent , SHEW Representative and Contractor
<b>1.3.</b> After being briefed about the contents of the Code of Conduct, staff members shall sign a register as proof of their training (see Part E, Addendum 2).	Project Manager, Area Superintendent , SHEW Representative and Contractor
<b>1.4.</b> All staff members shall be provided with the correct tools, equipment and training in order for them to undertake their activities in an environmentally responsible manner.	Project Manager, Area Superintendent , SHEW Representative and Contractor

<i>Mitigation Measure</i>	<i>Responsibility</i>
<b>Responsibility for Implementing the EMP</b>	
<p><b>1.5.</b> The overall responsibility for ensuring compliance with the EMP is with the Main Contractor (MCT). The Main Contractor shall ensure that all staff members, sub-contractors and suppliers understand and adhere to the EMP and its Code of Conduct.</p>	<p>Project Manager, Area Superintendent , SHEW Representative and Contractor</p>
<p><b>1.6.</b> The Main Contractor shall nominate a senior staff member as Environmental Control Officer (ECO) to supervise implementation of the EMP and to be accountable for issues relating to the environment. The ECO shall liaise with the EC, MET, NamPower, the public, and owners or managing bodies of affected land.</p>	<p>Project Manager, Area Superintendent , SHEW Representative and Contractor</p>
<p><b>1.7.</b> The EMP shall be part of the terms of reference for all contractors, sub-contractors and suppliers. All contractors, sub-contractors and suppliers have to give some assurance that they understand the EMP and that they undertake to comply with the conditions therein.</p>	<p>Project Manager, Area Superintendent , SHEW Representative and Contractor</p>
<p><b>1.8.</b> As soon as possible, but within 48 hours, report to the ECO (who will in turn report, as soon as possible, but within 48 hours, to the EC):</p> <p>1.8.1. Difficulties encountered with carrying out EMP Mitigation Measures that could result in future non-compliance.</p> <p>1.8.2. Areas of non-compliance, or amendments made to any EMP Mitigation Measures without prior approval (see Clause 1.9).</p>	<p>Project Manager, Area Superintendent , SHEW Representative and Contractor</p>
<b>EMP Amendments / EMP Instructions</b>	
<p><b>1.9.</b> No EMP amendment (relaxation or revision of any EMP Mitigation Measure) shall be allowed without approval from the MET or EC. Motivations for EMP amendments may be discussed with the MET or EC.</p>	<p>Project Manager, Area Superintendent , SHEW Representative and Contractor</p>
<p><b>1.10.</b> The MET or EC may approve EMP amendments or issue EMP instructions (for corrective actions, remediation and rehabilitation). These amendments or instructions issued by the MET or EC shall be implemented within the time frame specified.</p>	<p>Project Manager, Area Superintendent , SHEW Representative and Contractor</p>
<b>Dealing with Non-Compliance with the EMP (Penalties / Incentives for Staff)</b>	
<p><b>1.11.</b> Put in place procedures to motivate staff members to comply with the EMP Code of Conduct, and to deal with acts of non-compliance, or deliberate and malicious damage to the environment by any staff member.</p>	<p>Project Manager, Area Superintendent , SHEW Representative and Contractor</p>

<i>Mitigation Measure</i>	<i>Responsibility</i>
<b>Reporting Procedures / Environmental Register</b>	
<p><b>1.12.</b> Put in place an Environmental Register and as soon as possible, but within 24 hours of becoming aware of environmentally related problems (such as an environmental complaint or claim; an incident of non-compliance; or other environmentally related incident), notify the EC, and document:</p> <p>1.12.1. Nature of the problem.</p> <p>1.12.2. Causes of the problem.</p> <p>1.12.3. Party/Parties responsible for causing the problem.</p> <p>1.12.4. Immediate actions taken to stop / reduce / contain the causes of the problem.</p> <p>1.12.5. Additional corrective or remedial actions taken and/or to be taken to address the problem, and to prevent reoccurrence of such problems.</p> <p>1.12.6. Timeframes and the party/parties responsible for implementation of corrective or remedial actions.</p> <p>1.12.7. Procedures to be taken and/or penalties to apply if corrective or remedial actions are not implemented as stipulated, and</p> <p>1.12.8. Copies of all correspondence relating to the problem.</p>	SHEW representative
<p><b>1.13.</b> Arrange for EMP related issues to be discussed at all customary (monthly) site meetings. A copy of the relevant sections of the minutes of these site meetings to be forwarded to the EC, and one copy to be filed in the environmental register.</p>	SHEW representative

## **A 2. CONSTRUCTION INITIATION / SITE ESTABLISHMENT**

### **Potential Significant Impacts**

- Unnecessary damage to sensitive sites, potentially affecting biodiversity protection.
- Unwanted scarring of the landscape, potentially affecting the tourism potential of the area.

### **Sources of Potential Impacts**

- Indiscriminate siting and use of construction workings such as construction campsites, roads and tracks, waste dumps, quarries and borrow pits, water abstraction points, etc., especially around the substation site.

### **Objectives**

- The main aim is to minimise the need for rehabilitation by avoiding unnecessary damage to soils and vegetation, and the creation of unwanted tracks or unwarranted disturbed areas. The ideal is to, at the end of the construction period, have the least possible number of access roads and a single-track path along the length of the power line, and as few as possible tracks to/from the substation site – always keep in mind that unwanted tracks and disturbed areas would have to be rehabilitated.
- Carefully plan construction activities near the substation site and along the length of the power line to minimise the overall area of impact, keep activities (such as construction campsites and rest areas) to already disturbed sites where it will not detract from, or destroy, sensitive sites (see Glossary of Terms). Limit the number of construction campsites and new access roads and tracks and site them to, as far as possible, minimise environmental damage.



<i>Mitigation Measure</i>	<i>Responsibility</i>
<b>Project Layout and Access Plan</b>	
<p><b>2.1.</b> Before commencing with construction, carefully plan the siting and use of the construction activities and all workings. Develop a Project Layout and Access Plan to show the intended use of the area. Have the plan approved by the Ministry of Environment and Tourism (MET), and Environmental Consultant (EC). The plan shall clearly indicate (on 1:50 000 topographical maps) and/or describe the location and details of:</p> <p>2.1.1. The proposed power line servitude, bend points and final substation positions (details about final positioning of bend points and the substation obtainable from NamPower).</p> <p>2.1.2. Areas and routes to be cleared – including the size/width of the cleared areas along the powerline and the location and size of areas to be cleared to facilitate construction of the substation.</p> <p>2.1.3. Construction campsites and rest areas to be used during construction of the powerline and the substation.</p> <p>2.1.4. On-site and off-site waste disposal sites and procedures at construction campsites, rest areas and all areas affected during construction.</p> <p>2.1.5. Sources of construction materials (quarries and borrow pits).</p> <p>2.1.6. Sources and procedures for water abstraction and provision.</p> <p>2.1.7. Power supply during construction.</p> <p>2.1.8. Existing roads and tracks to be used as transportation routes, and routes to gain access to construction areas</p> <p>2.1.9. New roads and tracks deemed necessary to provide access to powerline and substation site. Indicate if they are permanent or temporary and how temporary roads shall be removed after use. Provide details on the type and design of the roads. In the case of single-track paths and narrow roads, show points where vehicles will be allowed to overtake, pass each other or turn around (see Clause 5.11.1).</p>	Project Manager, Area Superintendent , SHEW Representative and Contractor
<p>2.1.10. Topsoil management, i.e. indicate areas where topsoil will be removed, stockpiled and later used, especially on and around the substation site.</p>	
<p><b>2.2.</b> Lay down speed limits conducive to road safety on all the roads and tracks used during construction (speed limits of construction roads should generally not exceed 40 km/h but will depend on the condition of the road or track in question).</p>	MCT.

<i>Mitigation Measure</i>	<i>Responsibility</i>
<b>Construction Campsite Plan</b>	
<p><b>2.3.</b> Before establishing construction campsites at the substation or along the powerline route, carefully plan the layout and use of the sites and develop a Construction Campsite Plan for each campsite. Have the plan approved by the MET and EC. A Construction Campsite Plan shall provide a description of the site and shall show, on a reasonably scaled map, the intended use of the site. Indicate and/or describe the location, size/quantity/capacity and design of:</p> <p>2.3.1. Access routes.</p> <p>2.3.2. Ablution facilities (including details on the handling of sewage and wastewater).</p> <p>2.3.3. On-site waste management facilities (waste containers, pit, etc.).</p> <p>2.3.4. Design of bunds and other structures for containment of hazardous substances.</p> <p>2.3.5. Fencing.</p> <p>2.3.6. Water storage and supply.</p> <p>2.3.7. Power supply (for cooking, space heating, lighting, etc.).</p> <p>2.3.8. Fire extinguishers, first aid kit and any other relevant safety equipment.</p> <p>2.3.9. Accommodation facilities.</p> <p>2.3.10. Other structures and buildings (offices, storerooms, workshops, etc.).</p> <p>2.3.11. Other storage areas and stockpiles (i.e. topsoil, construction materials, equipment, etc.).</p> <p>2.3.12. Location of areas to be reinstated upon completion of the construction period, providing measures to be used for reinstatement.</p>	Project Manager, Area Superintendent , SHEW Representative and Contractor
<b>Implementation of the Approved Plans</b>	
<p><b>2.4.</b> Throughout the period of construction, restrict activities to within the designated areas as indicated on the Project Layout and Access Plan, and the Construction Campsite Plans (see Clause 5.1).</p>	Project Manager, Area Superintendent , SHEW Representative and Contractor
<p><b>2.5.</b> Have all amendments to the Project Layout and Access Plan, and the Construction Campsite Plan approved by the MET or EC. The MET and EC must respond to within ten working days (see Section <b>Error! Reference source not found.</b>).</p>	ECO.

### **A 3. PUBLIC RELATIONS / COMPLAINTS AND CLAIMS**

#### ***Potential Significant Impacts***

- Disputes over game and livestock escaping or being driven from camps due to the destruction of fence lines or due to poor management of gate operations.
- The construction activities will be watched with interest by authorities and by the owners and/or managing bodies of affected land. People could easily become discontented when:
  - they notice trespassers on, or undue damage to their land and fence lines;
  - gate operations are poorly managed;

- they are not consulted and kept informed on issues affecting them; their privacy is compromised or when they feel harassed or ‘bullied’ on their own land – the construction crew will be perceived as irresponsible or ‘just doing as they please’.

**Objectives**

- Maintain cordial relations with the owners and/or managing bodies of land affected by the construction activities.
- Minimise complaints, grievances and claims.

<i>Mitigation Measure</i>	<i>Responsibility</i>
<b>At the Start of Construction (Construction Initiation / Site Establishment)</b>	
<p><b>3.1.</b> Contact the owners and/or managing bodies of affected land. Discuss with them what they could expect during the construction period (what activities will take place on their land; when it will happen; and how it will be controlled and managed). Where applicable, negotiate with them, and keep written documentation of all decisions and agreements, related to:</p> <p>3.1.1. Programming and description of construction activities on their land.</p> <p>3.1.2. Siting of construction campsites, and leasing of the land in question.</p> <p>3.1.3. Where gates will be installed.</p> <p>3.1.4. Access control, gate operating procedures, and holding of keys.</p> <p>3.1.5. Water abstraction from boreholes located on their land, and measures to prevent depletion of the boreholes and trampling of the surrounding area.</p> <p>3.1.6. Establishment of new roads and tracks on their land.</p> <p>3.1.7. Procedures by which owners and/or managing bodies of the land can bring complaints and claims under the attention of the Contractor, NamPower, the MET and EC.</p> <p>3.1.8. Any special conditions or requirements.</p> <p>3.1.9. To avoid possible disputes and litigation, document the location and nature (include photographs where applicable) of existing, visible damage to fence lines, kraals, farm dams and buildings, trampled vegetation, erosion dongas, etc.</p>	<p>Project Manager, Area Superintendent , SHEW Representative and Contractor</p>
<p><b>3.2.</b> For all game-fenced camps (if these are affected by construction), liaise with the owner and/or managing body of the land and keep written documentation of all decisions and agreements on:</p> <p>3.2.1. The number and type of game animals in the camp. If no game counts are available, conduct a census.</p> <p>3.2.2. How access will be controlled.</p> <p>3.2.3. Measures to minimise disturbances to game animals.</p>	<p>Project Manager, Area Superintendent , SHEW Representative and Contractor</p>
<b>Throughout the Construction Period</b>	
<p><b>3.3.</b> Keep noise levels and other disturbances to a minimum, especially near homesteads.</p>	<p>Contractor</p>
<p><b>3.4.</b> Respect the rights of the landowners and people’s privacy.</p>	<p>Contractor</p>
<p><b>3.5.</b> Prevent trespassing onto private land or restricted areas.</p>	<p>Contractor</p>
<p><b>3.6.</b> Ensure regular contact with the owners and/or managing bodies of the land in order keep them informed about progress with the work.</p>	<p>Contractor</p>

<i>Mitigation Measure</i>	<i>Responsibility</i>
3.7. Strictly adhere to the gate operating procedures as agreed with individual owners / managers.	Contractor
<b>Disputes / Claims / Litigation</b>	
3.8. To avoid unnecessary disputes and claims, verbal agreements and arrangements shall not be allowed (see Clause 1.12): 3.8.1. Keep written record of all discussions and agreements with owners and/or managing bodies of affected land. 3.8.2. Keep written record of all complaints and claims, and the measures implemented to address these complaints and claims.	
3.9. Resolve disputes and address environmental complaints and claims in the best possible way.	Project Manager, Area Superintendent , SHEW Representative and Contractor

## **A 4. EMPLOYMENT / SOCIAL STRUCTURES**

### *Potential Impacts and Impact Sources*

- Recruitment of casual labour off the street could lead to a further influx of job seekers to the area.
- Employment conflict may arise if the recruitment process and employment policy is perceived as unfair, especially to local communities and small / micro enterprises.

### *Objectives*

- Avoid employment conflict and link-up with recruitment procedures established by Skorpion Zinc.
- Maximise benefits to local labour and small / micro enterprises.

<i>Mitigation Measure</i>	<i>Responsibility</i>
4.1. In conjunction with NamPower and Skorpion Zinc, put in place recruitment procedures and an employment policy that is considered fair. Always adhere to these procedures and policy and ensure that all sub-contractors and suppliers know and adhere to these procedures and policy. Most importantly, never recruit labour off the street or at the gate.	Project Manager, Area Superintendent , SHEW Representative and Contractor

## **A 5. ROUTE CLEARING / ESTABLISHMENT AND MAINTENANCE OF ROADS AND TRACKS**

### *Potential Significant Impacts*

- Potential damage to the soil structure, soil compaction and loss of soil fertility.
- Loss of the vegetation cover and increased erosion risks.
- Proliferation of unsightly tracks. Tracks in low rainfall areas will remain visible for many years because of the compaction of the sensitive soil structure and disturbance of the sparse vegetation cover.
- Dust related problems.
- Safety hazards to the public, workers and animals in the area.

### *Sources of Potential Impacts*

- Blading takes place when a grader is used to clear and flatten access paths or the service path along the length of the power line. The soil surface is skimmed and the vegetation cover, including the root systems of plants, is removed.

- Tracks are created when vehicles, heavy machinery and equipment (e.g. graders), and even pedestrians simply move over an area. Haphazard and off-road driving and people wandering of into the veld can easily result in the proliferation of numerous tracks. Most of the construction materials will be delivered on site by large utility vehicles.

**Objectives**

- Carefully plan construction activities and transportation of people and equipment with the intention to:
  - Avoid clearing (blading) where it is not absolutely called for to ensure safe mechanical construction and electrical operation of the power line.
  - Minimise the establishment of new roads and tracks.
  - Minimise secondary impacts such as dust and erosion.
  - Avoid compromising the safety of the public, workers and animals in the area.

<i>Mitigation Measure</i>	<i>Responsibility</i>
<b>Route and Area Clearing and Establishment of New Roads and Tracks</b>	
<p><b>5.1.</b> Off-road driving, blading and the creation of new tracks, other than those described in the Project Layout and Access Plan, are prohibited and will be regarded as unwanted tracks or unwarranted disturbed areas. All unwanted tracks or unwarranted disturbed areas shall be properly rehabilitated (see Section A 12).</p>	Project Manager, Area Superintendent , SHEW Representative and Contractor
<p><b>5.2.</b> Before blading or driving over any area:</p> <p>5.2.1. Rather keep to existing roads and tracks.</p> <p>5.2.2. Carefully examine the area to determine if there are any sensitive sites (see Glossary of Terms) in harms way. Clearly mark, or demarcate with plastic tape, these sites and work around them.</p> <p>5.2.3. If not possible to avoid a sensitive site, keep the area of impact as small as possible and implement other measures to minimise impacts. For example:</p> <ul style="list-style-type: none"> <li>– <i>Without delay to the project, coordinate with the timeous relocation of plants (see Clause 8.9).</i></li> <li>– <i>Implement erosion protection measures on steep sloping terrain.</i></li> <li>– <i>In the case of heritage sites being discovered, notify and obtain advice from the National Monuments Council or the Archaeological Specialist (see Clause 9.9.4).</i></li> </ul>	SHEW Representative and Contractor
<p><b>5.3.</b> When a new path is created:</p> <p>5.3.1. Carefully plan the route and have it clearly marked out so that drivers exactly know where to drive.</p> <p>5.3.2. Establish the track by simply driving over the ground if there are no obvious obstacles (i.e. large rocks, high plants or rough terrain).</p> <p>5.3.3. Keep tracks as narrow as possible and only drive on marked out routes.</p> <p>5.3.4. If obstacles are far enough apart, divert the track around obstacles. Only obstacles that could interfere with the safe construction (i.e. during stringing of conductors) and operation of the power line need to be removed.</p> <p>5.3.5. Where possible, remove obstacles by hand. Shrubs to be cut or crushed rather than being completely uprooted.</p>	SHEW Representative and Contractor

<i>Mitigation Measure</i>	<i>Responsibility</i>
5.3.6. Only blade an area if it is unavoidable, and keep the width of the bladed area as narrow as possible.	
<b>5.4.</b> When blading, keep the blade approximately five centimetres from the soil surface to minimise impacts to the soil surface and top layer, pebbles and small stones on the surface, small plants, and the root systems of larger plants.	
<b>5.5.</b> Minimise erosion and drainage problems by avoiding tracks crossing contours at right angles.	
<b>5.6.</b> Implement measures to manage storm water runoff (i.e. avoid the concentration of water by putting in place mounds at suitable intervals to direct runoff).	
<b>5.7.</b> Put in place measures to avoid erosion at river and stream channel crossings, and at places where existing erosion scars and dongas are encountered (see Clause 3.1.9) to avoid any further erosion at these points.	
<b>5.8.</b> Liaise with NamPower, the EC and NBRI to coordinate the relocation of important plant specimens (see Clause 8.9).	SHEW Representative and Contractor
<b>5.9.</b> Blading of route sections Bp18 to Bp34 will generally be unnecessary, and should not be allowed due to the highly sensitive nature of the area. Before undertaking blading in this area, notify and obtain approval from the EC to blade specific areas where required due to local conditions.	Project Manager, Area Superintendent, SHEW Representative and Contractor
<b>Use and Maintenance of Roads and Tracks</b>	
<b>5.10.</b> Prohibit vehicles from leaving designated paths and existing tracks. Encourage people to walk to points of interest that are located away from existing tracks.	Project Manager, Area Superintendent, SHEW Representative and Contractor
<b>5.11.</b> Prevent gradual widening or braiding of tracks, and prevent secondary tracks, numerous parallel tracks and clover-leaf intersections from developing:  5.11.1. Designate specific points along the path (e.g. at specific pylons or intersections) for construction vehicles to turn around, overtake and pass each other. Keep these points to a minimum. Prohibit construction vehicles from overtaking, passing each other or turning around at any other point.  5.11.2. Encourage the use of three-point-turns rather than u-turns or large turning circles.  5.11.3. Prevent vehicles from cutting corners or taking short cuts.	Project Manager, Area Superintendent, SHEW Representative and Contractor
<b>5.12.</b> Minimise damage to tracks:  5.12.1. Carefully plan the movement and transportation of staff, equipment and materials to minimise the number of trips required.  5.12.2. Prohibit recreational driving.  5.12.3. Encourage slow and responsible driving (see Clause 2.2).  5.12.4. Use 4x4 vehicles (instead of 2x4 vehicles).  5.12.5. Use large, wide tyres and low tyre pressures to minimise soil compaction. Use of balloon-type tyres in heavy sand is essential.	Project Manager, Area Superintendent, SHEW Representative and Contractor

<i>Mitigation Measure</i>	<i>Responsibility</i>
<p><b>5.13.</b> Keep all existing and new roads in an acceptable condition:</p> <p>5.13.1. Repair erosion damage and put in place measures to avoid erosion over the long-term.</p> <p>5.13.2. Repair deep ruts and inaccessible sections to avoid vehicles having to drive around bad sections (i.e. mud, deep ruts and loose sand), thereby creating new tracks.</p>	
<p><b>5.14.</b> Address road safety issues:</p> <p>5.14.1. Make sure all drivers are properly trained and in possession of a valid licence for the specific vehicle.</p> <p>5.14.2. No one shall drive when under the influence of alcohol.</p> <p>5.14.3. Encourage safe and responsible driving. Adhere to speed limits (Clause 2.2).</p> <p>5.14.4. Encourage the use of headlights. Always switch on headlights on gravel public roads.</p> <p>5.14.5. Access points off public roads should be clearly signposted.</p>	Project Manager, Area Superintendent, SHEW Representative and Contractor
<p><b>5.15.</b> The Main Contractor shall be responsible for rehabilitation of all unwanted tracks or unwarranted disturbed areas formed by themselves or their staff members, sub-contractors or suppliers. The primary aim is to avoid all unnecessary tracks (see Sections 0 and A 12).</p>	Contractor
<p><b>5.16.</b> Cordon off unwanted tracks or unwarranted disturbed areas and avoid any further access to these areas.</p>	Contractor
<b>Clearing of Areas</b>	
<p><b>5.17.</b> When an area is cleared (i.e. in the case of the construction camps and around the substation):</p> <p>5.17.1. Minimise the size of the area as far as possible and adhere to the guidelines for blading as described in Clause 5.5.</p> <p>5.17.2. Keep to already disturbed areas as far as possible.</p> <p>5.17.3. Locate the cleared area in such a way as to minimise / prevent vehicle and pedestrian traffic through or close to sensitive areas.</p>	Contractor

## **A 6. POLLUTION CONTROL AND HANDLING OF HAZARDOUS SUBSTANCES**

### **Potential Significant Impacts**

- The accidental, negligent, or deliberate spillage, or inappropriate disposal of hazardous substances could result in air, soil and water pollution and may affect the health and well being of people, plants and animals.

### **Sources of Potential Impacts**

- Substances such as sewage, fuels, lubrication oils, hydraulic and brake fluid, solvents, paints and anti-corrosives, insecticides and pesticides, as well as the by-products and waste associated with use of these products will be present on construction areas, especially at construction campsites.
- Typical problem areas at construction campsites include, but are not limited to ablution facilities and sewage pits, refuelling stations, storage areas for hazardous substances and waste pits.

**Objectives**

- Minimise the risk of pollution and health impacts.
- Prevent polluted water from entering stream channels or underground aquifers.

<b><i>Mitigation Measure</i></b>	<b><i>Responsibility</i></b>
<b>6.1.</b> Provide adequate ablution facilities (i.e. chemical toilets, french drains, or a pit system) at construction campsites. Position these away from any river, stream channel, pan, dam or borehole and maintain in a hygienic and good working order.	Contractor
<b>6.2.</b> When travelling or when working in the veld, where there are no toilets available, staff should not urinate or defecate in or near any river, stream channel, pan, dam or borehole. Excrement should always be buried or covered with soil or small rocks.	All Staff.
<b>6.3.</b> Ensure that all staff are adequately protected and educated about the safe and proper handling and disposal of hazardous substances.	Contractor
<b>6.4.</b> Keep a register of hazardous substances present on construction areas and have information pertaining to the management of spills or ingestion available.	Contractor
<b>6.5.</b> Provide and maintain adequate bunding (i.e. impervious concrete slabs or plastic linings, drip trays, traps, sumps, etc.) where hazardous materials are stored and handled (e.g. at diesel generators and refuelling depots). Bunds should be adequately sized and capable of containing ALL the substances they are intended for.	Contractor
<b>6.6.</b> Always use a bunded area when washing, refuelling or doing maintenance work on vehicles, machinery or equipment (i.e. generators) or when transferring hazardous substances from one container to another. These activities are not allowed outside the construction campsite, in the veld or along roads and tracks.	Contractor
<b>6.7.</b> Hazardous substances should be stored in a well-ventilated area, and behind lock and key.	Contractor
<b>6.8.</b> In the event of a hazardous spill, whether accidental, deliberate or through negligence, on site or during transportation of these substances to/from the site:  6.8.1. Immediately implement actions to stop or reduce and contain the spill.  6.8.2. Report the spill to the ECO and arrange implementation of the necessary clean up procedures.  6.8.3. Collect contaminated soil, water and other materials and dispose of it at an appropriate site.	Contractor
<b>6.9.</b> Used fuel, oils, hydraulic fluids, paints and solvents, and grease should be stored in drums or other suitable containers. These should be labelled, sealed and removed from the site to an appropriate disposal site or recycling facility.	Contractor
<b>6.10.</b> Use the least polluting, most rapidly biodegradable products for cleaning purposes.	Contractor



## A 7. WASTE MANAGEMENT

### Potential Significant Impacts

- Visual degradation.
- Pollution and potential harm to people and animals.

### Sources of Potential Impacts

- Litter and inappropriately disposed waste.
- Waste carried around by the wind or by scavengers.

### Objectives

- Implement all reasonable measures to prevent inappropriate disposal of waste and to prevent litter from becoming windblown or carried around by scavengers.
- Always maintain a clean and tidy site.

<i>Mitigation Measure</i>	<i>Responsibility</i>
<b>7.1.</b> Be aware of the classification of 'hazardous waste' and 'general waste and construction rubble' applicable to this highly sensitive environment (refer to the Glossary of Terms and Section E 7).	Contractor
<b>7.2.</b> For all hazardous or potential hazardous waste, the principle of 'what gets taken in shall be taken out' shall apply. No hazardous or potentially hazardous or harmful waste (including glass, metal and plastic) shall be buried or burned anywhere in the veld or at the construction campsite.	Contractor
<b>7.3.</b> Only uncontaminated, non-hazardous combustible substances (e.g. wood, cardboard, paper and food scraps) shall be burned on site. These wastes may only be burned in the waste pit or in drums / large tins when intended for space heating, etc (see Clause 8.16.1).	Contractor
<b>7.4.</b> Only uncontaminated, non-hazardous construction rubble (i.e. waste concrete) may be buried on site. These wastes may only be buried in the waste pit. All other waste (see Clause 7.2) should be taken to an appropriate dump.	Contractor
<b>7.5.</b> Minimise the production of waste as far as possible and compact waste to reduce bulk.	Contractor
<b>7.6.</b> At construction campsites, designate an area for a waste pit (see Clauses 7.3 to 7.4) and an area for temporary storage of all waste intended for removal from the site (see Clause 7.2).	Contractor
<b>7.7.</b> Systematically, on a daily basis, collect waste and separate hazardous and potentially hazardous or harmful waste from general waste and construction rubble.	Contractor
<b>7.8.</b> Provide separate waste containers (drums, bins, skips or bags) for hazardous and potentially hazardous waste, and for general waste and construction rubble. Hazardous waste containers should be easily distinguishable as such. Where relevant, containers shall be provided with lid or netting to prevent it being carried around by scavengers or the wind. Waste containers should not be over-filled.	Contractor
<b>7.9.</b> Arrange for the removal of full waste containers on a regular basis. Verify the final destination and method of disposal or recycling. Keep in mind that the producer of the waste is ultimately responsible for its proper disposal.	Contractor

<i>Mitigation Measure</i>	<i>Responsibility</i>
<p><b>7.10.</b> For purposes of burning and burying the waste described in Clause 7.3 and 7.4 prepare a waste pit at campsites:</p> <p>7.10.1. Remove topsoil and store separately for use during rehabilitation.</p> <p>7.10.2. Excavate the pit to a sufficient depth.</p> <p>7.10.3. Fence the pit with chicken wire (<math>\geq 1.2</math> meters high) to keep waste from being carried around by the wind or scavenger animals.</p> <p>7.10.4. After dumping, immediately burn or cover the waste – keeping in mind certain waste could become airborne or that the waste could attract scavengers.</p> <p>7.10.5. Compact waste and do not over-fill the pit.</p> <p>7.10.6. Rehabilitate pit after use (see Clause 12.9).</p> <p>7.10.7. Prevent any hazardous or potentially hazardous waste from being dumped in the pit.</p>	Contractor
<p><b>7.11.</b> Illegal dumping (either at the construction campsites, construction areas, on the site, along public roads or in surrounding areas) shall not be tolerated.</p>	Contractor
<p><b>7.12.</b> Ensure that the construction campsites, all construction areas site and the surroundings are kept in a clean and neat condition at all times and that windblown litter is cleared on a daily basis.</p>	Contractor

## **A 8. PROTECTING THE BIOPHYSICAL ENVIRONMENT**

### *Potential Significant Impacts and Impact Sources*

#### **Managing the Use of Water**

- Potential depletion of water resources (i.e. boreholes) due to indiscriminate water abstraction and unnecessary wastage of a scarce resource.

#### **Soil Management and Dust Control**

- Dust can be a nuisance to the construction workforce and to the public and can negatively affect the growth and recovery rate of plants. Potential sources of fugitive dust include, but are not limited to:
  - Grading / movement of soil;
  - Transportation and unloading of construction materials;
  - Vehicular movement over unsurfaced roads and tracks;
  - Wind erosion of stockpiles;
  - Drilling.

#### **Plants and Animals**

- Illegal poaching and collection of animals and plant material.
- Unnecessary trampling of vegetation and harm to animals.

#### **Landscape Quality**

- Degradation of the scenic quality due to the proliferation of tracks and the presence of litter and unsightly structures.

**Objectives****Managing the Use of Water**

- Minimise water consumption wherever possible.
- Avoid depletion of boreholes.

**Soil Management and Dust Control**

- Minimise the damage to the fragile surface soil layer through careful planning of construction activities.
- Implement measures to preserve topsoil in areas where disturbances do occur.
- Implement the best practicable means to prevent dust from becoming so dispersed in the atmosphere as to be harmful or cause nuisance to people, plants and animals.

**Plants and Animals**

- Avoid unnecessary damage and destruction of the vegetation cover.
- Prevent veld fires.
- Avoid poaching and collection of animals and plants material.
- Install bird deflectors on those sections of the line where bird collisions are likely to be problematic.

**Landscape Quality**

- Implement all reasonable measures to minimise the visual impacts and keep the area as natural looking as possible.

<i>Mitigation Measure</i>	<i>Responsibility</i>
<b>General</b>	
<b>8.1.</b> Throughout the period of construction, restrict activities to within the designated areas as indicated on the Project Layout and Access Plan, and the Construction Campsite Plan (see Section 0).	Contractor
<b>8.2.</b> Adhere to the specifications for route clearing / establishment and maintenance of roads and tracks (see Section A 5).	Contractor
<b>Managing the Use of Water</b>	
<b>8.3.</b> Discuss water abstraction for construction purposes with affected landowners and/or the relevant authorities (i.e. towns, or Department of Water Affairs). Negotiate procedures for the use of the specific resources with them and obtain the necessary permits / written approval.	Contractor
<b>8.4.</b> Avoid depletion of local water resources. Regularly monitor water quality and rest water levels of boreholes. Pumping tests should be performed in order to determine the potential safe yield and its suitability as a water supply.	Contractor
<b>8.5.</b> Minimise water consumption: 8.5.1. Create awareness and encourage all staff to use water sparingly. 8.5.2. Maintain water tanks, pipes and taps. Immediately, but within 12 hours of detection, repair all drips and leaks.	Contractor
<b>Soil Management / Topsoil / Dust Control</b>	
<b>8.6.</b> Strip the top layer of the soil to a depth of 200 mm, or to bedrock / subsoil level, whichever is less from: 8.6.1. Areas to be excavated (i.e. waste and sewage pits). 8.6.2. Beneath permanent buildings, structures, concrete slabs and paved surfaces (especially at the substations). 8.6.3. Bunded areas (i.e. refuelling stations).	Contractor

<i>Mitigation Measure</i>	<i>Responsibility</i>
<p><b>8.7.</b> Store topsoil separately for use in rehabilitation.</p> <p>8.7.1. Protect stockpiles from wind erosion.</p> <p>8.7.2. The height of stockpiles should not exceed 1.5 m and unnecessary compaction should be avoided to maintain aeration and biological activity.</p> <p>8.7.3. Keep the period of topsoil stockpiling as short as possible (maximum 12 months).</p>	Contractor
<p><b>8.8.</b> Implement measures to prevent dust from becoming problematic. These measures shall include, but are not limited to:</p> <p>8.8.1. Avoid excessive vehicular movement.</p> <p>8.8.2. Limit vehicle speeds on unsurfaced roads and tracks.</p> <p>8.8.3. Avoid dust-generating activities (i.e. grading and moving of soil) during periods of medium to high winds (<math>\geq 4.2\text{m/s}</math>).</p> <p>8.8.4. Cover and/or maintain appropriate freeboard (<math>\pm 0.3\text{m}</math>) on trucks hauling any loose material that could produce dust when travelling.</p>	Contractor
<b>Plants and Animals</b>	
<p><b>8.9.</b> At the start and for the duration of route clearing / establishment of new roads and tracks, liaise with NamPower, the EC and NBRI to coordinate the relocation of important plants, and to identify sensitive sites to be avoided during construction. This is especially applicable to the route sections between Bp18 and Bp34 where approval for blading has to be obtained (see Clause 5.9).</p>	Contractor
<p><b>8.10.</b> With regards to sensitive sites:</p> <p>8.10.1. Get to know which sites are sensitive and mark or demarcate these with plastic tape to increase their visibility, thus helping to prevent accidental destruction and avoid unnecessary damage.</p> <p>8.10.2. Prevent people from going to, or driving over, these areas.</p> <p>8.10.3. Where they cannot be avoided altogether, minimise impacts by removing as little vegetation as possible.</p> <p>8.10.4. Avoid blading of sensitive areas. Remove vegetation by hand. Feather-back the vegetation and avoid removal of large tracts of vegetation.</p>	Contractor
<p><b>8.11.</b> When positioning pylons, the official project surveyor should move pylons forwards or backwards along the line to ensure that they are positioned where they will have the least impacts on sensitive sites and important plant specimens, without compromising technical aspects of pylon positioning. This is particularly relevant near river and drainage line crossings and along the route section running up the escarpment. Movement of pylons by any other person, other than the official project surveyor, will not be allowed.</p>	Project Manager, Contractor and SHEW representative.
<p><b>8.12.</b> Put in place gate operating procedures (see Clause 3.1) based on the principle of: always close gates that were found closed; and always leave gates open that were found open upon arrival.</p>	Contractor and SHEW representative

<i>Mitigation Measure</i>	<i>Responsibility</i>
<p><b>8.13.</b> Strictly prohibit, and put in place penalties (see Clause 1.11) for:</p> <p>8.13.1. Collection, picking, removing, unearthing, cutting, chopping down, or wilful damage to any plant or dry plant material outside of the areas demarcated for clearing.</p> <p>8.13.2. Feeding, teasing, playing with, attempting to tame, catching, hunting, shooting, or setting devices to trap or kill any wild or domesticated animal.</p> <p>8.13.3. Collecting firewood from the veld, unless approved by the EC <b>and</b> landowner.</p> <p>8.13.4. Going to, driving over, or wilful damage to rock outcrops and any other area that is barricaded, cordoned off or marked as a sensitive site (see Clauses 8.9 and 8.10).</p> <p>8.13.5. Not adhering to gate operating procedures.</p>	Contractor and SHEW representative
<p><b>8.14.</b> Supply commercially bought firewood or alternative fuel for cooking and space heating.</p>	Contractor
<p><b>8.15.</b> Keep all activities away from rock outcrops. For example: install water tanks on stands and not on rock outcrops.</p>	Contractor
<p><b>8.16.</b> Implement measures to minimise the risk of veld fires.</p> <p>8.16.1. No fires will be allowed in the veld or anywhere outside the construction campsites.</p> <p>8.16.2. At the construction campsite, allocate specific areas for making fires and encourage the use of drums or large tins instead of open fires.</p> <p>8.16.3. Prohibit smoking near refuelling depots or near any flammable substance. Instruct staff members to put out cigarette butts before throwing them into a waste container.</p> <p>8.16.4. Have sufficient fire fighting equipment available at the construction campsites and at all construction areas (i.e. in all construction vehicles).</p>	Contractor
<p><b>8.17.</b> Be aware of introducing unwanted / invasive / problem plants or animals to the area. Should any introductions occur, obtain advice from the MET or EC, and treat the invasion according to their recommendations.</p>	Contractor
<p><b>8.18.</b> Avoid blading, creation of new tracks, and vehicular movement through rivers and stream channels. Use existing crossing points wherever possible.</p>	Contractor
<p><b>8.19.</b> All plants not interfering with safe construction and operation of the power lines should be left undisturbed.</p>	Contractor
<b>Bird Deflectors</b>	
<p><b>8.20.</b> Install bird flappers on the earth cables (top cables) along the following route sections:</p> <p>8.20.1. Crossing of the Fish River (1.2 km section).</p> <p>8.20.2. Crossing of the Konkiep River (0.8 km section).</p> <p>8.20.3. Eastern edge of the Huib-Hoch Plateau (1.5 km section).</p>	Contractor, Project Manager and SHEW representative .
<p><b>8.21.</b> Have the type of bird flapper approved by NamPower, the EC and MET and adhere to the manufacturer's specifications (see Addendum 1 for a example of a commercially available flapper) for installation.</p>	Contractor, Project Manager and SHEW representative .

<i>Mitigation Measure</i>	<i>Responsibility</i>
<b>Landscape Quality</b>	
<b>8.22.</b> Pay attention to the appearance of the any temporary fencing and buildings.	Contractor
<b>8.23.</b> Ensure that that any signage (i.e. at entrance gates) is visible but not visually intrusive.	Contractor
<b>8.24.</b> Adhere to waste management guidelines (see Section A 7). Ensure good ‘housekeeping’ at the campsites and rest areas and control litter and general site cleanliness.	Contractor

## **A 9. PROTECTING HERITAGE SITES AND ARTEFACTS**

### *Potential Significant Impacts*

- Damage or loss of important cultural, historical or pre-historical sites and artefacts.

### *Sources of Potential Impacts*

- Impacts to heritage sites and artefacts may occur because of:
  - Blading / creation of new roads and tracks / off-road driving;
  - Positioning of pylons;
  - Drilling;
  - People tampering with, or removal of, potential heritage sites and artefacts.

### *Principles*

- No heritage objects may be moved without a permit from the National Monuments Council and any permitted removal of heritage objects must be done under the supervision of a qualified specialist.

### *Objectives*

- Implement all reasonable measures to avoid disturbance or loss of important heritage sites and artefacts, those recorded during the archaeological survey as well as any new sites found during construction – especially to stone walls, graves and other ‘heaps of stones’ throughout the area.

<i>Mitigation Measure</i>	<i>Responsibility</i>
<b>Known Heritage Sites and Artefacts</b>	
<b>9.1.</b> Be aware of the location and adhere to the general guidelines for management of the known heritages sites as described in Section E 9.2.	Contractor
<b>9.2.</b> Clearly mark with whitewash or demarcate with plastic tape those sites associated with stone structures, dry-stone walling or a ‘heap of stones’ to increase their visibility, thus helping to prevent accidental destruction (see Section E 9.2).	Contractor
<b>9.3.</b> When positioning pylons, the official project surveyor should move pylons forwards or backwards along the line to ensure that they are positioned to avoid them being positioned on top of unique heritage features, without compromising technical aspects of pylon positioning.. Movement of pylons by any other person, other than the official project surveyor, will not be allowed.	Contractor

<i>Mitigation Measure</i>	<i>Responsibility</i>
<b>9.4.</b> Should there be any minor re-alignments of the power line required along the route section between the Konkiep River (Bp15) and Skorpion Zinc Mine / Obib Substation (Bp34), consult with the EC or Archaeological Specialist to verify possible impacts on known heritage sites identified (see Section E9.2).	Contractor, Project Manager and SHEW representative ., Archaeological Specialist.
<b>Unrecorded Heritage Sites and Artefacts</b>	
<b>9.5.</b> Be aware of the possibility that currently unrecorded heritage sites and artefacts may be found during construction.	Contractor
<b>9.6.</b> Adhere to the specifications for route clearing / establishment and maintenance of roads and tracks (see Section A 5).	Contractor
<b>9.7.</b> Know what to look out for and how to identify heritage features by studying and adhering to the guidelines provided in Section E 9.3.	Contractor
<b>9.8.</b> Treat any 'heap of stones', dry-stone walling or other suspicious stone structure as if it may be a grave or other important heritage feature – and strictly leave them alone.	Contractor
<b>9.9.</b> When a potential heritage site or artefact are found: 9.9.1. Carefully work around the site to avoid damage; 9.9.2. Do not remove any object from the site; 9.9.3. Document the nature and location of the site; 9.9.4. If damage to the site cannot be avoided, report the discovery to the National Monuments Council or Archaeological Specialist to obtain their advice, and do not damage or destroy the site without their permission.	Contractor, Project Manager and SHEW representative .  Archaeological Specialist, Monuments Council.
<b>9.10.</b> Strictly prohibit, and put in place penalties (see Clause 1.11) for: 9.10.1. Wilful damage, removal or collection of any stone structure or wall, heap of stones, grave, rock painting or engraving, stone tools, beads, ostrich eggshells, or any other heritage site or artefact.	Contractor, Project Manager and SHEW representative .

## **A 10. INFRASTRUCTURE / DEVELOPMENT**

### **Potential Significant Impacts and Impact Sources**

- Damage to existing roads and tracks, telephone lines, fence lines, etc.
- Dangerous conditions near road and railway crossings and near airfields.
- Trespassing and illegal access onto land.

### **Objectives**

- Minimise impacts on developments and infrastructure in the area.
- Implement measures to avoid safety hazards near roads, railway lines and airfields.
- Prevent trespassing onto land.

<i>Mitigation Measure</i>	<i>Responsibility</i>
<b>10.1.</b> Be aware of, and adhere to, the regulations of the Sperrgebiet (applicable for route sections within the Sperrgebiet) and prevent people from illegally entering this area.	Contractor

<i>Mitigation Measure</i>	<i>Responsibility</i>
<b>10.2.</b> Prevent people from entering private land without prior permission of the owner or managing body of the land.	Contractor
<b>10.3.</b> Consult with the relevant authorities, and adhere to safety standards near roads, railway lines, airfields and other infrastructure. The relevant authorities should approve any relaxation of safety standards.	Contractor
<b>10.4.</b> Avoid unnecessary damage to infrastructures such as roads, telephone lines, kraals, reservoirs, farm dams and fence lines. Repair damage, reinstate, relocate or replace infrastructure as required.	Contractor

## **A 11. HEALTH AND SAFETY**

### **Potential Impacts**

- Dangerous working conditions may transpire if the necessary precautions, to protect the health and safety of the all involved in the construction of the power line, are not taken.
- Dehydration of construction workers due to a lack of readily available drinking water in a harsh climate.

### **Objectives**

- Protect the health and safety of all involved in the construction of the power line, and of people, plants and animals in the area.
- Provide sufficient potable water for drinking, cooking and personal hygiene purposes.

<i>Mitigation Measure</i>	<i>Responsibility</i>
<b>11.1.</b> Provide a comprehensive first aid kit for each construction team or construction area / node. Make sure that there are staff members who are trained to use it.	Contractor
<b>11.2.</b> Provide sufficient fire-fighting equipment at all the campsites and construction areas, and make sure that there are staff members who know how to use the equipment.	Contractor
<b>11.3.</b> Make sure that the necessary safety equipment and protective clothing, required for specific construction work, are used, and inform staff about safety procedures and possible dangerous working conditions.	Contractor
<b>11.4.</b> Always provide sufficient potable water, inform staff about the dangers of dehydration, and encourage them to drink several litres of clean water daily.	Contractor
<b>11.5.</b> Provide information about HIV / AIDS to all staff.	Contractor
<b>11.6.</b> Provide sufficient ablutions facilities at the construction campsites and maintain these facilities in a good working and hygienic condition.	Contractor

## **A 12. CLOSURE AND REHABILITATION**

### **Potential Impacts and Impact Sources**

- Permanent scarring of the landscape if unwanted tracks or unwarranted disturbed areas are not repaired, and if the construction campsites are not properly reinstated.
- Inadequate rehabilitation due to insufficient budget allocations.

### **Objectives**

- Make sure there are sufficient budget allocations for environmental rehabilitation.
- Rehabilitate unwanted tracks or unwarranted disturbed areas as best as possible.



- Remove potential ‘eyesores’ and leave the construction campsites and entire construction area in a neat and safe condition (before final hand-over of the Site).

**Principle**

- Rehabilitation will be done as soon as possible after completion of construction activities in any one area.

<i>Mitigation Measure</i>	<i>Responsibility</i>
<b>Tender Process</b>	
<b>12.1.</b> Make sure there are sufficient budget allocations for environmental rehabilitation.	Contractor
<b>Throughout the Construction Phase</b>	
<b>12.2.</b> In consultation with NamPower, the EC and/or MEFT, identify all areas requiring rehabilitation, including unwanted tracks or unwarranted disturbed areas as per Clause 2.4, and develop the best practical rehabilitation measures for the specific areas in question. Measures include, but are not limited to:  12.2.1. Hand-raking the ground in sandy areas to remove tracks or scars. 12.2.2. Ripping of compacted soils and breaking up the clods to ensure proper drainage and water infiltration. 12.2.3. Tilling the top soil layer to establish a smooth surface. 12.2.4. Removing of the ‘middelmanneljje’ and levelling out tracks by dragging a tyre or piece of wood behind a light vehicle. 12.2.5. Sweeping or dragging a heavy cloth over an area. 12.2.6. Scattering pebbles and rocks over an area to make it blend in with the surroundings.	Contractor, Project Manager and SHEW representative .
<b>12.3.</b> Where topsoil is available, spread the topsoil (containing the valuable seedbed) over areas requiring rehabilitation.	Contractor
<b>12.4.</b> Monitor the success of rehabilitation measures and revise the measures if they were proved to be unsuccessful.	Contractor
<b>Before Closure / Final Hand Over</b>	
<b>12.5.</b> Remove all construction equipment, surplus materials and temporary structures, fences and works of every kind.	Contractor
<b>12.6.</b> Break up bunds and all other concrete slabs.	Contractor
<b>12.7.</b> Burn all uncontaminated, non-hazardous combustible substances (i.e. wood, cardboard, paper and food scraps) in the waste pit (see Clause 7.3).	Contractor
<b>12.8.</b> Burry all uncontaminated construction rubble (i.e. waste concrete) in the waste pit or remove to a waste dump (see Clause 7.4).	Contractor
<b>12.9.</b> Close the waste pit and make sure it blends in with the surrounding area.	Contractor
<b>12.10.</b> Clear windblown litter and other waste from surrounding areas.	Contractor
<b>12.11.</b> Remove all remaining waste to a recognised dump (see Clauses 7.2 and 7.9).	Contractor
<b>12.12.</b> Make sure all potential hazards (i.e. the sewage pit) and eyesores (i.e. waste pit) are left in a safe and neat condition.	Contractor
<b>12.13.</b> Repair damage to roads, fence lines, telephone lines, kraals, boreholes, etc. caused by construction.	Contractor

## **A 13. EMP AMENDMENTS**

### **13.1. Amendments from VERSION 1.0 to VERSION 1.1**

13.1.1. Clauses added: 1.13, 5.3, 13.3, 2.3.12

13.1.2. Clauses changed: 2.1.1, 2.1.2, 2.1.3,

# ENVIRONMENTAL MANAGEMENT PLAN (EMP)

## **PART B: ENVIRONMENTAL CODE OF CONDUCT**

### **AIM**

The environmental code of conduct is a simplified guide and tool for environmental awareness training of all staff before and during construction.

# Environmental Code of Conduct

*for people involved with construction of power lines to 'protect themselves and the environment'*

Kokerboom / Skorpion / Kudu Power Lines

EMP PART B

## What is the 'environment'?

The 'environment' means the surroundings within which people live. It is made up of the air, soil, water, plants and animals and all aspects of the air, soil, water, plant and animal life that affect people's health and safety.

People are part of the environment and their health and safety have to be considered during construction.

## Does this Code of Conduct apply to me?

YES, the rules of this Code of Conduct apply to EVERYBODY. This includes all permanent, contract, or temporary workers as well as any other person involved with the project or visiting any construction area. EVERYBODY will be required to adhere to the Code of Conduct.

EVERYBODY must study and keep to the all the rules of this Code of Conduct. Ignorance, negligence, recklessness or a general lack of commitment towards the Code of Conduct will not be tolerated.

If you do not keep to the rules, you will be reprimanded and disciplined. Repeated and continued breaking of the rules will result in a disciplinary enquiry and you may even be asked to leave the construction area on a permanent basis.

## What if I do not understand the rules?

ASK FOR HELP. If you do not understand, or if you do not know how to keep to any of the rules listed below, you must get help from your supervisor.

If your supervisor cannot help you, he should get advice from his superiors. You may also talk to the project manager or the environmental control officer.

Insist on advice and training until you are able to keep to all of the rules.

### ***The following people are there to help you:***

Your Supervisor: \_\_\_\_\_

Environmental Control Officer: \_\_\_\_\_

Project Manager: \_\_\_\_\_

## Environmental Training Register

You may only sign the environmental training register once you have shown that you understand the full content of this Code of Conduct.

# Environmental Rules

---

## Safety and Security Issues

---

1. Use safety equipment and wear the protective clothing as prescribed by your supervisor and keep to his/her safety instructions.
2. Never use equipment or machinery if you have not been properly trained how to operate the specific piece of equipment or machinery – INSIST ON HELP.
3. Never enter any restricted area or areas that is out of bounds or demarcated as 'no go' areas without permission of your supervisor.
4. Never climb over any fence or trespass on private property without permission of the landowner or your supervisor.
5. Report to your supervisor if you see a stranger or unauthorised person on the construction area.
6. Do not remove any vehicle, machinery, equipment, or any other object from the construction site without the permission of your supervisor.
7. Never drive, operate any piece of equipment or machinery, or do any work on the construction site while under the influence of alcohol.

---

## Responsible Driving

---

8. Keep to existing tracks. Off-road and haphazard driving is prohibited and will not be tolerated. Never drive across the veld and never create new tracks without permission of your supervisor, and then only drive on routes that are clearly marked or pointed out to you.
9. Never turn around, overtake, pass or make way for other vehicles along a single-track or narrow path. Do this only at designated points as indicated to you by your supervisor. When turning around at these points, use three-point turns instead of u-turns or turning circles.
10. Never cut corners or take short cuts through the veld.
11. Drive slowly to prevent dust from becoming problematic and look out for people and animals. Adhere to the prescribed speed limits.
12. Switch on your headlights at sunset, early in the mornings, under dusty or hazy conditions, and whenever visibility is doubtful. Always switch on headlights on public roads.
13. Never drive when you are not in possession of a valid licence for the specific vehicle.

---

## Dealing with Environmental Complaints

---

14. If you have a complaint about dangerous working conditions or potential pollution of the environment, talk to your supervisor, the project manager or environmental control officer.
15. If any person complains to you about noise, lights, litter, pollution, or any harmful condition, immediately report this to your supervisor, the project manager or environmental control officer.

---

## Working Hours

---

16. Stick to the working hours prescribed to you by your supervisor. You may only work on weekends and after hours with his/her consent.

---

## Fire Control

---

17. Never start a fire in the veld or alongside any road or track. Fires are only allowed at specific places at the campsite. Ask your supervisor where you are allowed to make a fire at the campsite.
18. Never make open fires – use a drum or large tin.
19. Never smoke or make fires near refuelling depots or near any flammable substance.
20. Put out cigarette butts before throwing them into a waste container – do not throw them on the ground.
21. Immediately notify your supervisor if you see an unsupervised fire at the construction campsite or near any construction area.

---

## Noise

---

22. Prevent disturbances and game from being chased away by avoiding unnecessary noise.

---

## Preventing Pollution and Dangerous Working Conditions

---

23. Littering or illegal dumping will not be tolerated. Never abandon or throw away any waste or hazardous substance on the construction area, into streams, along roads and tracks, or anywhere in the veld.
24. Never allow any hazardous substance to flow into streams or soak into the soil.
25. Immediately report to your supervisor when you notice any container, which holds hazardous substances overflow, leak or drip.
26. Immediately report to your supervisor when you spill, or notice any hazardous substance being spilled.
27. Immediately report to your supervisor any vehicle, piece of equipment or machinery that is leaking fuel, oil or other hazardous substance.
28. Always put waste in the containers that are provided at construction campsites.
29. Only paper, wood, cardboard and food scraps may be thrown into the waste pit.
30. If you are not sure how to transport, store, use, or get rid of waste or any hazardous substance, ask your supervisor for advice.
31. Always use a bunded area when washing, refuelling or doing maintenance work on vehicles, machinery or equipment (i.e. generators) or when transferring hazardous substances from one container to another. These activities are not allowed outside the construction campsite, in the veld or along roads and tracks.

### ***Did you know?***

*Certain substances used during construction of power lines could be toxic, harmful to health, or dangerous because they are flammable or likely to explode.*

*If not used correctly, these '**hazardous substances**' can pollute the air, water or soil and may even cause sicknesses in people, plants and animals.*

*Accidental, negligent or deliberate spillage or inappropriate disposal of hazardous substances should be avoided at all costs.*

*Hazardous substances are stored in special containers and specially designed bunded areas are provided at the construction campsite. These bunded areas are designed to prevent hazardous substances from leaking and being spilled onto the ground.*

Examples of hazardous substances are: human excrement, fuel, lubricating oils, solvents, acids, hydraulic and brake fluid, soaps and detergents, and the hazardous wastes that are produced when using these substances.

### ***How can waste be hazardous?***

*Used oil and lubricants, spent battery acids, old fuel and oil filters, human excrement, etc. can pollute the air, water or soil and may even cause sicknesses in people, plants and animals.*

*Scrap metal, wiring, circuit boards, broken glass, light bulbs, and other sharp objects can injure people, plants and animals.*

*Animals could get trapped in drums, tins and bottles or get entangled in plastic or metal wiring. Waste could even be ingested by animals.*

*All these '**hazardous wastes**' require careful collection and handling. Special waste containers are provided at all the construction campsites.*

---

## Saving Water

---

32. Always use as little water as possible. Never leave taps or hose pipes running. Close all taps after use.
33. Report any dripping or leaking taps and pipes to your supervisor.

---

## **Caring for Plants and Animals**

---

34. Poaching and the collection of animals or plant material are strictly prohibited. People caught in possession of plant material or animals will be handed to the authorities for prosecution.
35. Strictly leave all plant material alone – never collect, pick, remove, unearth, cut, chop down, or wilfully damage any plant, dry plant material or piece of wood outside of those areas demarcated for blading / clearing as part of construction.
36. Strictly leave all animals alone – never tease, play with, attempt to tame, catch, hunt, shoot, or set devices to trap or kill any wild or domesticated animal.
37. Never leave rubbish or food scraps and bones where it can attract scavenger animals, birds, or insects. Never feed wild animals or birds.
38. Never collect firewood from the veld. Only use commercially bought firewood supplied to you by your supervisor.
39. Keep off rock outcrops and never go to areas that are barricaded or cordoned off.
40. Do not damage, drive over or tear down fences and always leave gates behind you in the same position as found to prevent game or livestock from getting out of camps. Close gates that were closed and leave gates open that were found open.
41. Drive slowly and avoid grading or moving of soil when there are high winds. Remember that dust can be harmful to the sensitive plants growing in the area.

---

## **Protecting Cultural, Historical and Pre-Historical Sites and Artefacts**

---

42. Carefully work around, and never visit or drive over any area that is out of bounds, cordoned off or where a heap of stones or old stone walls have been whitewashed.
43. Never remove stones or destroy old stone walls or other heaps of stones. Remember that what looks like a 'heap of stones' may be an old grave – treat any heap of stones as if it is a grave.
44. Never tamper with or remove any structure, stone, plant, rock painting, engraving, piece of wood or eggshell, or any other artefact found in the area.
45. Immediately notify your supervisor if you find any object you suspect may have some cultural, historical or archaeological value.
46. Graffiti is strictly prohibited. Never draw or cut lettering, pictures or other markings on rocks, trees or pieces of wood in the area.

---

## **Health and Hygiene**

---

47. Drink lots of clean water throughout the day.
48. Use the toilets at the campsites, wash your hands and maintain a good personal hygiene routine.
49. When working in the veld, where there are no toilets available, do not urinate or defecate in or near rivers or stream channels, always bury or cover excrement with soil or small rocks, and wash your hands afterwards.
50. Please take the necessary precautions to avoid contracting or spreading HIV / AIDS.
51. Inform your supervisor when you are sick.

---

## **Environmental Training Register**

---

52. Before commencing with work on the project, you will be expected to sign the environmental training register – you may only sign the register once you have shown that you understand the full content of this Code of Conduct.

***Please remember:***

*by keeping to these rules, you will set an example for fellow workers – this will motivate them to also go along with the rules*

*assist fellow workers where you can*

# ENVIRONMENTAL MANAGEMENT PLAN (EMP)

## **PART C: QUESTIONS TO PROSPECTIVE CONTRACTORS**

### **AIM**

Part C of the EMP contains questions to be completed by all prospective contractors for the Project. The completed questionnaire shall be regarded as a commitment by the Contractor and, once agreed to by the parties concerned, the completed questionnaire shall form part of the EMP, which in turn will form part of the contract documents for the project.



# ENVIRONMENTAL MANAGEMENT PLAN (EMP)

## **PART C: QUESTIONS TO PROSPECTIVE CONTRACTORS**

### **General**

- C 1.** If considered relevant, describe additional measures and/or describe amendments required to those listed in the EMP Mitigation Measures (Part A, Sections A1 to A12) and in the EMP Environmental Code of Conduct (Part B).

### **Environmental Awareness / Compliance with the EMP**

- C 2.** In reaction to Part A 1, how will staff members be trained to ensure that they understand, and be able to abide by, the Code of Conduct?
- C 3.** In reaction to Part A 1, how will non-compliance with the EMP be prevented, and how will it be dealt with if allowed to happen?

### **Public Relations**

- C 4.** In reaction to Part A 3, how will the owners and/or managing bodies of the land be kept informed about issues affecting them?

### **Employment / Social Structures**

- C 5.** How many people will be employed?
- C 6.** How and where will labour be recruited?

### **Route Clearing / Establishment and Maintenance of Roads and Tracks**

- C 7.** Unnecessary blading, proliferation of tracks in the highly sensitive environment, and erosion are major concerns (see Section A 2 and E 2). How will this be avoided?
- C 8.** List and describe the type and number of vehicles to be used during construction, indicate how and where they will be used.

### **Pollution Control and Handling of Hazardous Substances**

- C 9.** List the activities that would involve the handling of potentially hazardous substances during construction, and describe how pollution and environmental health impacts will be prevented during the handling of these substances.

**Waste Management**

- C 10.** Provide the best possible estimation of the type and quantity of waste that will be produced (refer to the definition of ‘hazardous waste’ and ‘general waste’ in the Glossary of Terms and Part E 7).
- C 11.** How will the waste (as described in the reaction to Question C 10) be managed? Where applicable, provide details on minimisation, collection, recycling, compaction, burning, temporary storage, disposal, etc.

**Biophysical Environment**

- C 12.** How will water be supplied? If available, provide details on the sources of water abstraction for construction water and potable water for workers.
- C 13.** Provide the best possible estimation of how much water will be used (construction water and potable water for workers).
- C 14.** How will illegal collection and poaching of plant material and animals, and deliberate or malicious damage to the environment (by any staff member) be prevented, and be dealt with if allowed to happen?
- C 15.** What fuel sources will be used for cooking, space heating, construction, etc?
- C 16.** Where will the concrete aggregate (gravel and sand) be sourced?
- C 17.** Provide an indication of where construction campsites and new access roads will be required.

# ENVIRONMENTAL MANAGEMENT PLAN (EMP)

## PART D: MONITORING CHECKLIST

### AIM

Part D of the EMP is a list of criteria that will be used to monitor the implementation of the EMP and the Contractor's overall environmental performance.

### TABLE OF CONTENTS

D 1.	ENVIRONMENTAL AWARENESS / COMPLIANCE WITH THE EMP .....	D-1
D 2.	CONSTRUCTION INITIATION / SITE ESTABLISHMENT.....	D-1
D 3.	PUBLIC RELATIONS / COMPLAINTS AND CLAIMS .....	D-2
D 4.	EMPLOYMENT / SOCIAL STRUCTURES .....	D-2
D 5.	ROUTE CLEARING / ESTABLISHMENT AND MAINTENANCE OF ROADS AND TRACKS.....	D-2
D 6.	POLLUTION CONTROL AND HANDLING OF HAZARDOUS SUBSTANCES.....	D-2
D 7.	WASTE MANAGEMENT .....	D-3
D 8.	PROTECTING THE BIOPHYSICAL ENVIRONMENT .....	D-3
D 9.	PROTECTING HERITAGE SITES AND ARTEFACTS.....	D-4
D 10.	INFRASTRUCTURE / DEVELOPMENT .....	D-4
D 11.	HEALTH AND SAFETY .....	D-4
D 12.	CLOSURE AND REHABILITATION .....	D-5

---

KOKERBOOM / SKORPION / KUDU POWER LINES  
**ENVIRONMENTAL MANAGEMENT PLAN (EMP)**

<b>PART D: MONITORING CHECKLIST</b>
-------------------------------------

**D 1. ENVIRONMENTAL AWARENESS / COMPLIANCE WITH THE EMP**

- 1.1 Has an Environmental Control Officer (ECO) been appointed?
- 1.2 Has the EMP been included in the terms of reference for contractors, sub-contractors and suppliers and all tender documentation related to the project?
- 1.3 Is there evidence of a lack of environmental training, or lack of commitment towards implementation of the EMP?
- 1.4 What procedures are in place for dealing with acts of non-compliance with the EMP and with deliberate and malicious damage to the environment? Are these procedures effective?
- 1.5 Are the contractors having trouble carrying out any of the EMP specifications? Are there areas of non-compliance?
- 1.6 Are any amendments to the EMP specifications required?
- 1.7 Has the Environmental Register been kept up to date?
- 1.8 Has the Environmental Training Register been kept up to date?

**D 2. CONSTRUCTION INITIATION / SITE ESTABLISHMENT****At the Start of Construction**

- 2.1 Have the Project Layout and Access Plan and Construction Campsite Plan been submitted and have they been approved? (The MET and EC are allowed ten working days to approve or to respond with comments to the submission of the plans).

**Throughout Construction**

- 2.2 Are construction activities conducted as per the approved Project Layout and Access Plan and Construction Campsite Plan?
- 2.3 What amendments were made to the plans? Where the amendments approved by the MET and EC? (The MET and EC are allowed ten working days to approve or to respond with comments to the submission of the amended plans).
- 2.4 Is the total area of disturbance kept to a minimum? Is there room for improvement?

**D 3. PUBLIC RELATIONS / COMPLAINTS AND CLAIMS**

- 3.1 Have any environmental complaints or claims been made about the construction activities? How were these addressed?
- 3.2 Are there any disputes, grievances or claims that need to be resolved? How could these be resolved?
- 3.3 Are there written proof of all agreements and negotiations with owners and managing bodies of affected land?

**D 4. EMPLOYMENT / SOCIAL STRUCTURES**

- 4.1 Are the recruitment procedures and employment policy in place? How are they implemented?
- 4.2 Is there evidence of employment conflict?
- 4.3 Are unemployed people congregating at the construction campsites?

**D 5. ROUTE CLEARING / ESTABLISHMENT AND MAINTENANCE OF ROADS AND TRACKS**

- 5.1 What areas were bladed? Was blading in all these areas really necessary?
- 5.2 What new roads and tracks were created? Were all of these in line with the Project Layout and Access Plan?
- 5.3 Are there unwanted tracks and unwarranted disturbed areas?
- 5.4 Is there evidence of haphazard / off-road driving? Where is widening or braiding of tracks, secondary and parallel track development, large turning circles, u-turns, clover-leaf intersections, short cuts, etc. problematic?
- 5.5 Are roads and tracks well maintained? Are there sections that require repair?
- 5.6 Is there evidence of dangerous conditions (i.e. vehicles exceeding the speed limit, or unmarked access points from public roads)?

**D 6. POLLUTION CONTROL AND HANDLING OF HAZARDOUS SUBSTANCES**

- 6.1 Have the areas where hazardous substances are handled been appropriately bunded? Are these bunds of an adequate size and capable of collecting ALL substances they were intended for?
- 6.2 Are there adequate facilities for storage of hazardous substances (including hazardous waste)? Are all the containers intact and are storerooms locked?
- 6.3 Are appropriate processes in place for the containment and clean up of spills?
- 6.4 Have there been any hazardous spills on the site? Why did the spills occur? How were they cleaned up? How can similar incidents be prevented?
- 6.5 Are all staff members aware of how to store, use and dispose of hazardous substances?

## **D 7. WASTE MANAGEMENT**

- 7.1 Are all the construction areas and construction campsites kept clean and neat? Is litter / refuse (including waste concrete and surplus construction materials) a problem? What clean up procedures are required?
- 7.2 Have sufficient waste containers been provided? Are they scavenger proof?
- 7.3 Has the waste pit been properly fenced? Is there evidence of waste being carried away by wind or scavengers? Is the waste in pit burned and buried on a regular basis?
- 7.4 Is there evidence of hazardous waste been dumped, spilled burned or buried anywhere?
- 7.5 What measures have been taken to minimise waste production or to recycle waste?
- 7.6 What dump sites are used for disposal of wastes? Are these sites appropriate/

## **D 8. PROTECTING THE BIOPHYSICAL ENVIRONMENT**

### **Managing the Use of Water**

- 8.1 What water sources are being used and how much water is used from each source? Have the landowners and/or relevant authorities been consulted?
- 8.2 What measures are in place to avoid local depletion of water resources? Are the water quality and rest water levels of boreholes being measured, and how often are these measurements taken?
- 8.3 What measures are in place to minimise water consumption? Is there evidence of water being wasted?

### **Soil Management and Dust Control**

- 8.4 Has topsoil been appropriately removed and stored?
- 8.5 Is there evidence of dust being a problem? What measures should be taken to minimise problems?
- 8.6 Is there evidence of unnecessary damage to soils? Are there erosion scars?

### **Plants and Animals**

- 8.7 Has the relocation of important plant specimens been adequate? What problems were encountered? Which areas were covered by the operation and are there other areas where rescue operations are still required? How can this be achieved?
- 8.8 Have the pylons been positioned to minimise impacts?
- 8.9 Have gate operating procedures being discussed with landowners? Is there evidence of poor gate management or destruction of fence lines?
- 8.10 Have there been problems or complaints with regards to poor gate operation, poaching, game or livestock escaping from game-fenced areas, or game being driven out because of disturbances caused by construction teams.
- 8.11 Is there evidence of unnecessary damage caused to the biophysical environment (i.e. damage to river banks, stream channels, vegetation etc.)?

- 8.12** Is the making of fires at the campsites properly controlled and managed? What fuel sources are being provided for cooking, lighting and space heating? Is there evidence of wood being collected from the veld?

#### **Bird Deflectors**

- 8.13** Before installation of bird deflectors: Has the type of 'bird flapper' to be used been approved by NamPower, the EC and MET?
- 8.14** During or shortly after stringing of conductors: Have the bird flappers been installed correctly and along all the route sections described in Part A, Clause 8.20?

#### **Landscape Quality**

- 8.15** Is the area being kept clean and tidy? Is there any unnecessary scarring of the landscape?

### **D 9. PROTECTING HERITAGE SITES AND ARTEFACTS**

#### **Known Heritage Sites and Artefacts**

- 9.1** Have all known heritage sites been clearly marked or cordoned off?
- 9.2** Do all staff members know which sites are sensitive, and do they know how to prevent damage to these sites?

#### **Unrecorded Heritage Sites and Artefacts**

- 9.3** Are all staff members aware of what to look for and what to do if they encounter potential heritage objects?
- 9.4** Were any unrecorded heritage sites or objects found during construction? Were damage to these avoided? Were the proper procedures followed?

### **D 10. INFRASTRUCTURE / DEVELOPMENT**

- 10.1** Is there evidence of damage to developments and infrastructure such as roads, telephone lines, fences, farmhouses, kraals, boreholes, farm dams, etc?
- 10.2** Are the safety issues near roads, railway lines, airfields, etc. being addressed?

### **D 11. HEALTH AND SAFETY**

- 11.1** Is there a first aid kit available to all the construction teams and at all construction areas / nodes?
- 11.2** Is there sufficient fire-fighting equipment available at the construction campsite and in all construction vehicles?
- 11.3** Is there potable water available to all staff members at all times?
- 11.4** Is there evidence of overflowing problems or unhygienic conditions at the ablution facilities?

- 11.5** Are the necessary safety procedures in place? Are staff members aware of these? Are the correct safety clothing and equipment being used?
- 11.6** Have staff members been informed about the risks of working in the harsh environment and about the dangers of HIV / AIDS?

## **D 12. CLOSURE AND REHABILITATION**

### **Tender Process**

- 12.1** What budget allocations are available for environmental rehabilitation?

### **Throughout the Construction Period**

- 12.2** Which areas have been rehabilitated and how well?
- 12.3** Which areas still require rehabilitation? What rehabilitation measures are required for the different areas?
- 12.4** Have unwanted tracks and unwarranted disturbed areas been cordoned off?

### **Before Closure / Hand Over**

- 12.5** Have all unnecessary tracks and disturbed areas been sufficiently rehabilitated?
- 12.6** Has all waste been burned, buried or removed from the construction areas and campsite as per the waste EMP guidelines for waste management (see Section B7)?
- 12.7** Has the construction campsite been sufficiently reinstated (including all concrete slabs, waste pit and sewage pit)?
- 12.8** Were the available topsoil replaced to areas requiring rehabilitation?
- 12.9** Has damage to roads, fence lines, telephone lines, kraals, etc. been repaired?
- 12.10** Is the area clean and neat? Have obvious 'eyesores' and scars in the landscape (including erosion scars) been removed as best as possible?



# ENVIRONMENTAL MANAGEMENT PLAN (EMP)

## PART E: BACKGROUND INFORMATION

### AIM

An understanding of the environment and construction related issues is essential to ensure that all people involved with construction are aware of the possible implications of their actions. Part E provides a brief description of the affected environment and highlights potential construction related environmental impacts. It therefore serves as background to, and motivation for the environmental mitigation measures contained in the EMP (Part A) and the Code of Conduct (Part B).

### TABLE OF CONTENTS

E 1.	ENVIRONMENTAL AWARENESS / COMPLIANCE WITH THE EMP .....	E-1
E 2.	CONSTRUCTION INITIATION / SITE ESTABLISHMENT .....	E-1
E 3.	PUBLIC RELATIONS / COMPLAINTS AND CLAIMS .....	E-2
E 4.	EMPLOYMENT / SOCIAL STRUCTURES .....	E-2
E 5.	ROUTE CLEARING / ESTABLISHMENT AND USE OF TRACKS .....	E-2
E 6.	POLLUTION CONTROL AND HANDLING OF HAZARDOUS SUBSTANCES.....	E-3
E 7.	WASTE MANAGEMENT .....	E-4
7.1.	General Waste and Construction Rubble .....	E-4
7.2.	Hazardous Waste.....	E-4
E 8.	PROTECTING THE BIOPHYSICAL ENVIRONMENT .....	E-4
8.1.	Introduction.....	E-4
8.2.	General Description of the Biophysical Environment .....	E-5
8.2.1.	Climate.....	E-5
8.2.2.	Water Resources .....	E-5
8.2.3.	Soils .....	E-5
8.2.4.	Air Quality (Dust Control).....	E-6
8.2.5.	Plants and Animals .....	E-6
8.2.6.	Landscape Quality .....	E-6
8.3.	Description of Specific Route Sections.....	E-7
8.3.1.	Keetmanshoop (Bp1) to Huib-Hoch Plateau (Bp18).....	E-7
8.3.2.	Huib-Hoch Plateau (Bp18 to Bp19) .....	E-7
8.3.3.	Huib-Hoch Plateau to Obib Substation (and southwards to Oranjemund/Kudu Gas) ..	E-7
8.4.	Bird Deflectors .....	E-8
8.4.1.	Areas where Bird Deflectors are Required .....	E-8
8.4.2.	Areas to be Monitored .....	E-8
8.5.	Relocation of Plants .....	E-8
8.6.	Additional Guidelines for the Construction Team .....	E-8

E 9.	PROTECTING HERITAGE SITES AND ARTEFACTS.....	E-9
9.1.	Description of Heritage Resources along Specific Route Sections.....	E-9
9.1.1.	Kokerboom Substation (Bp1) to the Konkiep River (Bp15) .....	E-9
9.1.2.	Konkiep River (Bp15) to Skorpion Zinc Mine / Obib Substation (Bp34).....	E-9
9.1.3.	Power Lines from Obib Substation to the Kudu Gas Project .....	E-10
9.1.4.	Link to South African Power Grid.....	E-10
9.2.	Management of Known Heritage Sites and Artefacts.....	E-10
9.3.	Protecting Unrecorded Heritage Sites and Artefacts.....	E-15
E 10.	INFRASTRUCTURE / DEVELOPMENT.....	E-19
E 11.	HEALTH AND SAFETY .....	E-20
E 12.	CLOSURE AND REHABILITATION .....	E-20

## ADDENDA

- Addendum 1: Example of commercially available ‘bird flapper’.
- Addendum 2: Template for the Environmental Training Register.
- Addendum 3: Power Lines in Southern Namibia: Minimising the Impacts on Flora. Illustrated Guide for Project Planning, Construction and Operation. Prepared for NamPower, by EnviroScience, May 2000.
-

# ENVIRONMENTAL MANAGEMENT PLAN (EMP)

## PART E: BACKGROUND INFORMATION

### E 1. ENVIRONMENTAL AWARENESS / COMPLIANCE WITH THE EMP

All the people involved with power line construction need to be aware of the sensitivity of the area in which they operate and of the potential consequences of their actions. The EMP provides essential information on the area and on potential impacts associated with construction. All contractors and sub-contractors will be required to adhere to the EMP.

The EMP includes an Environmental Code of Conduct (EMP Part B), which everybody involved with the project will have to abide by. It is essential that all staff members are properly briefed about its contents. All senior and supervisory personnel should be able to assist their workers in matters relating to the EMP and its Code of Conduct. Ensuring compliance with the rules outlined in the EMP will protect staff members from the effects of the environment and it will protect environmental resources for future generations.

Non-compliance with the EMP will be deemed to have occurred when there is evidence of:

- Negligence or recklessness by any person resulting in infringement of EMP Mitigation Measures.
- Failure to adequately respond to environmental complaints received.
- Failure to report areas of non-compliance with the EMP Mitigation Measures, and difficulties encountered with carrying out EMP Mitigation Measures that may result in future non-compliance. Failure to have revisions or amendments made to EMP Mitigation Measures approved by the MET or EC.
- Failure to respond adequately to instructions issued by the MET or EC.

### E 2. CONSTRUCTION INITIATION / SITE ESTABLISHMENT

If not planned well, and if certain activities are not correctly sited, construction can leave ugly scars in the landscape and will have unnecessary impacts on sensitive environments. However, NamPower is committed to build this new power line in the most environmentally sensitive way possible. The EMP has been produced in to order meet NamPower's commitment to protect the environment and the people involved with construction.

Environmental impacts will largely depend on the location of new roads and tracks and construction campsites, the degree of environmental control exerted, and the level of housekeeping achieved by the Contractor.

The aim is to minimise the need for rehabilitation by avoiding the creation of unwanted tracks and unnecessary damage to soils and vegetation. The ideal is to only have a single-track path along the length of the power line (service track), and the least number of access roads possible at the end of the construction period.

---

### **E 3. PUBLIC RELATIONS / COMPLAINTS AND CLAIMS**

More often than not, people perceive construction crews as not being committed towards environmental protection, but rather 'doing as they please' and only focused on chasing financial targets, often at the expense of the environment. People are therefore generally very negative and 'suspicious' about all construction activities.

It is essential to be transparent and keep people informed, to resolve disputes and to address environmental complaints in the most efficient and effective way. This will prove to owners and managing bodies of land in the area that the construction crew can act in an environmentally responsible way, particularly in this sensitive and pristine environment.

Landowners are generally concerned that construction activities would interfere with activities on their farms and that the presence of the workforce would compromise their safety and relations with their farm workers.

NamPower has negotiated way leaves with landowners and/or managing bodies of the land, but details such as a water abstraction, leasing of land on which construction campsites are located, gate operation procedures, management of game within game-fenced areas, and construction programming will still have to be discussed.

### **E 4. EMPLOYMENT / SOCIAL STRUCTURES**

The influx and congregation of jobseekers at construction sites are always very difficult to control. Unemployment in the region is high and the influx of jobseekers into Rosh Pinah will be an important social impact of the Skorpion Zinc Mine development. The numbers of jobseekers to the village of Rosh Pinah has apparently increased in anticipation of the opening of the Skorpion Zinc Mine. The problem could be aggravated by the development of the proposed power line and substations, the water pipeline and the expansion of the Rosh Pinah infrastructure. Word of the proposed power line development and possible jobs, even only for a few days, may aggregate the influx of prospective jobseekers to nearby towns and to the construction campsites.

Disputes and employment conflict may easily arise if the recruitment process and employment policy is perceived as unfair, especially to local communities and small / micro enterprises. The use of casual labour 'recruited at the gate' may exacerbate the problem.

Skorpion Zinc has initiated a nation-wide information campaign that clearly spells out the development stages of the proposed Skorpion Zinc Project, the time frames involved, and the number and type of employment opportunities. It states that the Skorpion Zinc Project and their contractors will recruit the majority of their workforce through established labour offices in the major centres. This system has been used throughout the recent phase of exploration and drilling.

When recruiting labour for the construction of the power line, it is advisable to link up with the established structures and procedures put in place by Skorpion Zinc.

### **E 5. ROUTE CLEARING / ESTABLISHMENT AND USE OF TRACKS**

Most of the environmental impacts associated with construction will take place during clearing of the power line route and the establishment of new roads and tracks.

Without sufficient access to the power line route, and without an adequate service track along the length of the route, construction and maintenance of the line would not be possible. Route clearing and the creation of new tracks, to provide access and to facilitate transportation of people and equipment, cannot be avoided altogether, but should be planned and managed well to avoid exacerbation of impacts.

---

Route clearing for power line development involves blading (grading) of an area to create an even path for the line. The soil surface is skimmed to remove rocks, vegetation and other obstacles likely to interfere with the construction and daily operation of the power line. However, where there are no real obstacles, where vehicles can simply drive over an area, or where obstacles could easily be removed by hand, there is no need for blading.

The following is an abstract from Dr Dieter Noli's report on the route section near the Fish River:

*The terrain between Bp5 and Bp6 is heavily eroded and is traversed by both a 132kV power line and a rough track. Clearly, any archaeological material which may have been in it had either been washed away, or had been destroyed during the blading for the 132kV line. According to the owner of 'Kykop', the blading had not only been most destructive, but had also promoted erosion. **The badly eroded state of the valley should serve as a cautionary tale against unnecessary blading on ANY terrain, but especially on sloping terrain.***

Every effort should be made to avoid blading where it is not absolutely called for because blading of an area is far more destructive than when obstacles are removed by hand and when a single track is created by driving over an area. During blading, the vegetation, including the root systems of plants, is completely removed and the inherent structure of the soil surface is destroyed over a larger area.

The loss of plant cover increases the risks for erosion, especially on sloping terrain. Erosion may eventually lead to a total loss of the fertile topsoil, resulting in permanently bare areas. Near streams and dams, the transported erosion material may cause siltation and could lead to poor water quality. The bladed area will also result in visual impacts due to 'scarring' of the landscape.

Disturbances associated with blading (and subsequent skimming of the soil surface) can be significantly reduced if blade was kept approximately five centimetres from the soil surface. By doing this, larger obstacles will still be removed but the integrity of the protective top layer of the soil will be left intact. Gravel, pebbles and small stone stones on the soil surface, and small plants will be left in place, and larger plants will be 'pruned' five centimetres above ground.

Although generally less destructive than blading, the creation of new tracks, by driving over an area, should also be kept to a minimum. Tracks generally cause soil compaction, loss of soil fertility and loss of vegetation cover. It may also result in altered run-off patterns and soil erosion. Tracks have an impact on the visual quality of an area, particularly in areas that are relatively free of other human interference. In low rainfall areas, tracks can remain visible for many years.

## **E 6. POLLUTION CONTROL AND HANDLING OF HAZARDOUS SUBSTANCES**

A variety of potentially hazardous substances (see Glossary of Terms) are likely to be present during power line construction. For the purpose of this EMP, 'management' of hazardous substances refers to the transportation to/from construction sites, exposure of persons to, handling, use, storage, recycling or disposal of these substances, as well as response and clean up in the case of leaks, spills or inappropriate disposal of these items.

The accidental, negligent or deliberate spillage or inappropriate disposal of hazardous substances could result in air, soil and water pollution and may also affect the health and well being of the people, plants and animals.

---

## **E 7. WASTE MANAGEMENT**

It is generally accepted that the production of waste material at construction campsites is inevitable. As has been proven with similar developments in the region, waste management at these campsites could easily become problematic. However, this issue will only be significant if the Contractors are not bound by contractual constraints relating to correct waste disposal methods and if they are not regularly monitored.

The characteristics and classification of the waste material determines its handling and ultimate disposal method. Waste can be classified in the following waste streams:

### **7.1. General Waste and Construction Rubble**

It includes waste paper, board, cardboard, benign organic and domestic waste and uncontaminated construction debris such as used bricks, wood, waste concrete, unused subsoil and rubble from excavations or demolished structures.

### **7.2. Hazardous Waste**

Hazardous waste has the potential to affect human and/or environmental health. This would be because of the inherent chemical and physical composition that could injure, hurt or be toxic, poisonous, flammable, explosive, carcinogenic or radioactive.

Hazardous waste includes, but are not limited to: sewage sludge, the by-products and wastes associated with the use of hazardous substances (i.e. used fuel, oil, lubricants and solvents), as well as items such as spent batteries, old oil filters, light bulbs, tyres, circuit boards, etc. which requires special collection and handling.

When left abandoned, even substances such as scrap metal, wire, tins, broken glass and plastic could be harmful to people, wild and domestic animals. For example: plastic could be ingested by animals; people and animals could be injured by broken glass or metal objects; and animals could get trapped in drums, tins and bottles or get entangled in plastic or metal wiring. Even if buried, such objects may become exposed over time due to wind erosion or future human activities. Because of the sensitive nature of the area, these substances are all regarded as 'hazardous waste' for the purposes of this EMP.

*During their review of the Environmental Impact Assessment Reports, MET indicated that they would prefer a waste management strategy stipulating: burning of non-hazardous combustible waste on-site and removal of all other waste to a recognised dump site.*

## **E 8. PROTECTING THE BIOPHYSICAL ENVIRONMENT**

### **8.1. Introduction**

For the purposes of this EMP, the biophysical environment covers the air, water, soil, plants, animals (both wild and domesticated), and landscape quality. Landscape quality refers to the visual resources and scenic value of the area.

Impacts on the biophysical environment will be most noticeable:

- at river and drainage channel crossings where there are concentrations of protected and endemic plants, where banks could easily be eroded once disturbed, and where flash floods may occur to aggravate erosion problems.
  - on steep slopes.
-

- on gravel/gypsum desert plains where the crust (soil surface) is easily destroyed and where tracks will remain visible for many years.
- on mountains, inselbergs and rock outcrops where numerous animal species are dependent on specific micro-habitats and highly adapted and specialised vegetation found on these areas.
- at construction campsites where poor ‘housekeeping’ would result in visual degradation and where pollution could occur if hazardous substances are not handled correctly.
- on bladed areas (vegetation cleared by grading).

## **8.2. General Description of the Biophysical Environment**

### **8.2.1. Climate**

The entire study area may be described as arid to semi-arid, with mean rainfall and evaporation figures increasing steadily north-eastwards from the coast to Keetmanshoop (50 to 168 mm and 2600 to 3900 mm respectively). Rainfall near the west coast and over the Huib-Hoch Plateau generally falls during the winter months of May to August, whilst the areas in the east of the study area experience rain during the summer months between November and April. Flash foods could occur and measures to prevent erosion during these events will be required. Fog occurs regularly along the west coast.

### **8.2.2. Water Resources**

There is a shortage of water in the area and supplies of sufficient water for the staff members (potable water) and for construction activities (i.e. for concrete mixing), will probably have to come from nearby towns, or from boreholes at various points along the line. Borehole water in the area is not always potable, if this is the case, it will have to be treated or sourced elsewhere. Water should be used sparingly at all times.

Water abstraction will have to be discussed with landowners and/or the relevant authorities (i.e. towns or Department of Water) and their approval should be obtained where required. Care should be taken not to exhaust a resource on which landowners and wildlife in the area depend. Local depletion of ground water resources should be avoided at all cost.

### **8.2.3. Soils**

Soils in the area are considered fragile and vulnerable because they have taken so long to form in the arid to semi-arid climate and because they are easily destroyed. Recovery from structural damage by disruption to the surface micro-topography and compaction may take as long as soil formation – several thousand years! The vegetation cover stabilises the surface and protects the underlying soil from erosion. In some areas, the gravel or gypsum layer of the desert plains also affords the soil some protection. Disturbance of the organic and inorganic protective layers can lead to increased wind and water erosion, reduced infiltration rates, reduced soil moisture content and the inhibition of plant germination and growth.

Without the protective soil covering, erosion may lead to increased desertification and dust related problems. The top layer of the soil contains the very important seedbed. Topsoil is a valuable resource that needs to be protected. Without the topsoil, and the seedbed that it contains, rehabilitation would be almost impossible. People straying of roads and tracks and the collection of firewood would result in unnecessary trampling of vegetation (aggravating erosion and dust problems) and removal of important sources of soil nutrients.

#### 8.2.4. Air Quality (Dust Control)

The quality of the air in the area is generally very clear and clean, except for the high levels of dust in some areas during strong wind episodes. The area is sparsely populated, there is barely any grassland or woody vegetation for fires, and, apart from the village of Rosh Pinah, there is no industrial activity at all. The only expected problem with air quality is fugitive dust. The control of fugitive dust is one of the most sensitive issues at construction sites. It is a highly visible impact and very often a source of concern and annoyance to people living or present near construction sites. Increased dust levels would negatively affect the growth and recovery rate of plants. Water is scarce and large quantities of water will not be available for dust suppression. The aim is therefore to reduce dust by the means of limiting disturbances to the soil and vegetation cover.

The greatest dust problems are created when the fragile top layer of soil on the desert 'pavement' are disturbed. Once disturbed, it can result in the movement of large quantities of sand. Dust is also an issue on the road between Rosh Pinah and Aus and on farm roads across neighbouring farms.

Very small quantities of noxious and/or offensive gaseous air pollutants and smoke would be generated during construction. Veld fires could however prove problematic in terms of air quality.

#### 8.2.5. Plants and Animals

Because of the aridity and harsh conditions, most of the plants grow very slowly and once they are disturbed, may take years to recover. New plants will only establish and grow in good rain years. Some of the smallest shrubs and tiny succulents may be older than any living person. Their tenuous existence will be threatened by any disturbance to the environment. Changes in soil structure, exposure to increased dust levels and possible airborne or groundwater pollution will seriously disturb the plants' ability to survive. The area supports a wide variety of plant and animal species. Some of these are restricted to the area and/or are protected by law. It is an area of high conservation value and importance.

Most animals, reptiles or insects that live along the route will probably move away from the noise and activity associated with construction, and will later return once this ceases. Animals depend on the sparse vegetation cover and veld fires could drastically affect the availability of grazing for both game and livestock. This could compromise the livelihood of farmers.

Many of the landowners in the area use their farms for recreational hunting of game mammals. They generally do not have game-fenced camps but rather rely on game occurring naturally on the land. It is obvious that game would move away from construction related disturbances, but this will be temporary and no long-term impacts on the number of game mammals found in the area are expected. Besides minimising noise and other disturbances, very little could be done to control the migration of game outside game-fenced areas.

Very few game-fenced areas exist and it is unclear if any will be affected by construction. Where they do exist, measures to prevent game from escaping from the camps will have to be implemented.

The greatest threat is actually from poaching or collection of certain species of interest by the construction and maintenance teams. Illegal plant collection has proved to be a major problem in the area. Poaching and any collection of plant material will have to be strictly prohibited.

#### 8.2.6. Landscape Quality

The area is relatively untouched by human development and large parts of the area are striking as well as being of scientific interest. It is therefore prudent to preserve the landscape quality as best as possible.

---



Construction activities, especially the campsites, often affect the character and visual appearance of an area. This may be because of the heterogeneous or haphazard nature of temporary fencing and buildings, presence of loose waste and litter, unsatisfactory state of equipment, large areas denuded of vegetation and the presence of stockpiled materials.

### **8.3. Description of Specific Route Sections**

#### **8.3.1. Keetmanshoop (Bp1) to Huib-Hoch Plateau (Bp18)**

The eastern half of the study area is characterised by fairly flat topography. Between Keetmanshoop (Bp1) and the Fish River (Bp5 to Bp6), there is a step off a shallow escarpment onto undulating topography, which becomes progressively more rugged as the incised tributaries of the Fish River are encountered. To the west of the Fish River, there is a rugged  $\pm 200\text{m}$  high escarpment, which slopes gently westwards into the wide and broken Nukaneb and Konkiep River valleys (the power line crosses the Konkiep River near Bp15).

Habitats from Keetmanshoop (Bp1) to the eastern edge of the Hunsberg (Bp16) and to the Huib-Hoch Plateau (Bp18) falls within in the Nama Karoo Biome and are characterised by widely scattered low shrubs and patches of grassland. The majority of the species within this biome are widespread in distribution and are thus not vulnerable. Trees are confined mainly to the riverbeds and larger drainage lines. The protected Kokerboom / Quiver Tree is scattered throughout the area. There are dense populations of them in the form of 'kokerboom forests' near Keetmanshoop (between Bp1 and Bp3).

Most vegetation to the east of the Huib-Hoch Plateau has a wide distribution and will not be greatly impacted on. However, trees along riverbeds and drainage lines provide important habitats and food sources for animals and birds in the arid environment.

#### **8.3.2. Huib-Hoch Plateau (Bp18 to Bp19)**

The Huib-Hoch Plateau (Bp18 to B19) is a major obstacle along the route, with mountains that rise 300 to 400 meters above the surrounding areas. The western edge of the Huib-Hoch Plateau is steep and runs along the edge of the Namib Desert.

On the plateau, there is a mixture of species from both the Nama and Succulent Karoo Biomes because of the area being in the transition zone between summer and winter rainfall. There are a number of species of conservation importance.

#### **8.3.3. Huib-Hoch Plateau to Obib Substation (and southwards to Oranjemund/Kudu Gas)**

Habitats of this south-western section of the route, from the Huib-Hoch Plateau (Bp18), through the Witputs area, on to the Obib Substation near Skorpion Zinc (Bp34) and further southwards to Oranjemund (Bp39 at Kudu Gas) form part of the Succulent Karoo Biome with the most prominent type of vegetation being leaf-succulents.

Small mountain ranges and inselbergs are found near the proposed Skorpion Zinc Mine. These become smaller as one moves westwards into the gently undulating sandy plains and dune fields of the desert.

There are a number of plants with a limited distribution, which makes them more sensitive to disturbance. Of these, many are endemic to the area. Their scarcity also makes them desirable additions to plant collections. This entire section of the power line should therefore be regarded as highly sensitive.

From Witputs the route corridor heads south-westwards past Skorpion across plains covered with dwarf shrub vegetation with a number of protected species. The rocky outcrops and foothills of the inselbergs in this area are known to contain many other protected species and particularly those species treasured by plant collectors.

---

The northern fringe of the Obib dunes, where the power line will cross, is largely covered by *Othonna cylindrica*, while the featureless sandy plains that characterise the rest of the route to Oranjemund are dominated by *Brownanthus marlothii* on sandy plains and *C. arenosus* on the gravel and gypsum plains.

The section of the route from the Huib Hoch (Bp18), to Aub and Witputs, and southwards to Spitskop and across to Obib Substation and Skorpion Zinc (Bp34) is considered the most sensitive. Blading and other construction related disturbances along this section (Bp18 to Bp 34) should be avoided as best as possible.

#### **8.4. Bird Deflectors**

Certain route sections could be problematic in terms of bird collisions. However, bird populations in the area are relatively low and the impact is not expected to be significant.

##### **8.4.1. Areas where Bird Deflectors are Required**

As a pre-cautionary measure, marking of the conductors, by hanging bird deflectors on the earth cables, to reduce or prevent bird collisions are required at:

- crossings over the Fish and Konkiep River valleys.
- eastern edge of the Huib-Hoch Plateau.

Research suggests the use of ‘bird flappers’ closely spaced ( $\pm 5$ m) apart on both the earth cables. An illustration of a typical flapper is provided in Addendum 1. The flappers should be installed as per the manufacturer’s specifications and should be approved by NamPower and the MET.

##### **8.4.2. Areas to be Monitored**

Other areas, where the need for deflectors is doubtful are:

- crossings over the Kanas and Nukaneb Rivers valleys.
- near Volstruis Pan, the pan on topographical map 2717AB and pans crossed in the Huns area; and
- route sections close to the coast (i.e. between Kudu Gas project to just north of the town of Oranjemund).

NamPower and/or MET personnel working in the area should monitor these sections for a few weeks after stringing of the line, during the first rainy season, and during routine inspections of the line. If there is evidence of bird collisions, NamPower should have deflectors installed as soon as possible.

#### **8.5. Relocation of Plants**

It is not always possible to avoid all the important plants during construction of the line. Protected and other important plants directly in the path of the power line will have to be relocated to similar habitats in surrounding areas. A high degree of coordination and communication will be required between construction teams (especially the surveying and blading teams), NamPower, the EC and the NBRI who will probably coordinate the relocation process.

#### **8.6. Additional Guidelines for the Construction Team**

The onus is placed on the people involved with surveying, blading and construction of the power line to identify and to avoid damage to important plants and other sensitive sites.

---

As a general guideline, most succulents and many bulbs are of high conservation importance. Concentrations of succulents can be used as pointers to areas of high conservation value, which should be avoided. If they cannot be avoided, certain plant specimens will require relocation. Heavy penalties exist if protected species are damaged or traded. The Camelthorn, Shepard's tree, Quiver tree and 'Halfmens' are examples of protected plant species.

As a more comprehensive guide to the identification and protection of important plants and their habitats, please familiarise yourself with the supplementary document (see Addendum 3):

*Power Lines in Southern Namibia: Minimising the Impacts on Flora  
Illustrated Guide for Project Planning, Construction and Operation.  
Prepared for NamPower, by EnviroScience, May 2000.*

## **E 9. PROTECTING HERITAGE SITES AND ARTEFACTS**

### **9.1. Description of Heritage Resources along Specific Route Sections**

Key characteristics of the different route sections are described in the following sub-sections.

#### **9.1.1. Kokerboom Substation (Bp1) to the Konkiep River (Bp15)**

From the Kokerboom Substation to the Konkiep River, the power line runs through relatively open countryside with savannah vegetation. Neither the terrain, nor water availability would have been all that effective in channelling the activities of the prehistoric and historic inhabitants, leading to widely scattered and sparsely occupied sites, the localities of which are difficult to predict or to identify.

While spectacular archaeological sites are not expected, they cannot be ruled out, and will probably occur at and near those points where the route intersects the valleys of the Nukanab, Kunab, Kanas and Fish Rivers, especially the latter.

Dr Dieter Noli surveyed the Fish River area after a report of stone circles being observed from the air. Running south from Bp4, the power line enters a narrow valley at Bp5. This valley, which enters the Fish River Valley at Bp6, forms a natural constriction in the terrain and an access route to the river. It was thought to have some archaeological potential. The three 'stone circles' concerned are located on the Farm 'Neckertal' (26 40' 51.2' S, 17 51' 12.7' E) but they are in fact rectangular rather than round. They are associated with bits of glass and metal, and are clearly of a historical rather than a prehistoric nature. They are also well clear of the power line. The current landowner was not aware of any other rough stone structures on his farm, and neither were the landowners of the farms 'Slangkop' and 'Kykop'. The terrain between Bp5 and Bp6 is heavily eroded and is traversed by both a 132kV power line and a rough track. Clearly, any archaeological material which may have been in it had either been washed away, or had been destroyed during the blading for the 132kV line.

#### **9.1.2. Konkiep River (Bp15) to Skorpion Zinc Mine / Obib Substation (Bp34)**

The route between the Konkiep River and the Obib Substation near Skorpion Zinc Mine should be considered as highly sensitive and great care should be taken to avoid damage or loss of important sites and artefacts found along this section (see Section 9.2). The power line closely follows historical routes that were once used by early inhabitants of the area. In addition to various sections of the old colonial routes, there is also every indication that this area was extensively used in precolonial times by both hunter-gatherers and herders, all channelled into the area by a combination of favourable terrain and water availability.

The historical routes followed the paths of the least resistance over rugged topography, and probably linked waterhole to waterhole. The power line follows some of the routes, as it has to traverse areas such as the Huib-Hoch Plateau along paths of the easiest access. Even the escarpment itself is rich in artefacts. This can be attributed to the abundance of raw material suitable for stone tools (hornfels), as well as the ready supply of water which early man would have had access to in the rock pools of the ravines.

---

### 9.1.3. Power Lines from Obib Substation to the Kudu Gas Project

This involves the planned power lines between Obib Substation and the Kudu Gas Project (Bp34 to Bp39), as well as a new substation north of Oranjemund (Bp36). The power line route runs through relatively open terrain where concentrations of archaeological sites are unlikely to be encountered. The area around Skorpion Zinc Mine has been subjected to an archaeological survey and it is unlikely that anything additional will be found during surveying, blading and construction. The risk of damage to heritage sites and artefacts along this route is therefore low.

### 9.1.4. Link to South African Power Grid

The link involves a 220kV power line between the new substation north of Oranjemund (Bp36), and the Oranjemund Substation in South Africa. The Oranjemund area and Orange River are known for their important archaeological sites. The archaeological evidence shows that early man frequented the shores of the Orange River from about 1.5 million years ago onwards. It was used as both a linear oasis and a route to the interior during the Early Stone Age, the Middle Stone Age, and the Later Stone Age. The lower Orange River, from Hohenfels to the Orange River mouth, has yielded a total of 16 sites to date, including nine LSA sites, two MSA sites, two ESA/MSA sites, two historical sites and three graves. The nine LSA sites are all concentrated in a 6 km long part of the narrow, sandy zone bracketed by the road and the river along the proposed route between Hohenfels and Swartkop.

In 1910, the present site of the town of Oranjemund was a farm called 'Sandkraal', occupied by Giel Louw. Dr Noli reported that the site of the original homestead, is marked by a scattering of limpets, ostrich eggshell fragments, bone, metal, wood and European ceramics. The site is located adjacent to the seaward side of the present golf course. Two further archaeological sites are located between Swartkop and Oranjemund, an ESA/MSA at S28° 32.901' E 16° 28.233' and a MSA site at S 28° 33.510' E 16° 27.105'.

The known sites along the Orange River are to the south of the existing road. As the power line is to be routed north of this, they are not likely to be impacted. However, due to the lack of vegetation and the nature of the terrain, any open archaeological sites will be extremely vulnerable to being disturbed during both the construction and the operational phases of the project. The MSA site east of Oranjemund is close to the proposed route of the new power lines and should be clearly demarcated before blading or construction.

## 9.2. **Management of Known Heritage Sites and Artefacts**

Dr Dieter Noli conducted archaeological surveys of following (most sensitive) route sections:

- Near the Fish River (Bp5 to Bp6), and
- Konkiep River (Bp15) to Skorpion Zinc Mine / Obib Substation (Bp34).

No important archaeological sites were recorded between Bp5 to Bp6 (see Section 9.1.1), but several sites of archaeological interest were recorded between the Konkiep River and Skorpion Zinc area.

### **MANAGEMENT GUIDELINES FOR KNOWN HERITAGE SITES WITHIN THE PATH OF THE POWER LINE**

Descriptions of the sites within the direct path of the power line, together with specific management actions required to protect important sites, are provided below:

*224: 27 51.135 S, 16 38.873 E (state land)*

*Description: A small shelter on the southern side of a small valley, containing only ostrich eggshell fragments and one piece of charcoal. Not important.*

*Management Guidelines: No mitigation required.*

225: 27 50.902 S, 16 39.849 E (Spitzkop)

*Description: A limited open site containing quartz blades and chert flakes, glass, wire and plastic, located west of a rocky ridge jutting to the south. Interesting, but not important.*

*Management Guidelines: No mitigation required.*

**226: 27 41.646 S, 16 42.659 E (Witputs Sued)**

**Description:** *About 50 meters of dry stone walling around the mouth of a kloof, with another eight meters of it further up, all of it about one meter high. It could be part of a colonial or Nama stock enclosure. Important, and limited in extent. This walling (either Nama or Colonial) is clearly visible, and could easily be avoided during blading and the construction of the pylons.*

**Management Guidelines:** *Do not disturb! Mark wall with whitewash or demarcate and avoid damage to the site. Prevent people from going to the site and direct all traffic away from the site.*

**254: 27 40.234 S, 16 46.614 (Witputs Annex)**

**Description:** *Scattered ESA site with heavy-edged pieces on quartzite. Interesting site but not important.*

**Management Guidelines:** *Avoid unnecessary disturbance.*

**253: 27 39.013 S, 16 50.562 E (Kolke)**

**Description:** *An extensive ESA/MSA site with quartzite flakes, blades and cores, located at and around Bp24, one core being amongst the stones used to construct the beacon. The site extends all along the riverbank. Important, but extensive.*

**Management Guidelines:** *Avoid unnecessary disturbance. Minimise blading and keep service path as narrow as possible (single-track). Avoid gradual widening of the track by prohibiting vehicles to pass each other, overtake or turn around along this section.*

**227: 27 37. 077 S, 16 51.658 E (Kolke)**

**Description:** *A limited stone tool manufacturing site at the base of a hill, containing quartzite cores and flakes, some of which look very new. Could be a mixture of historic and prehistoric material. Interesting, but not important.*

**Management Guidelines:** *Avoid unnecessary disturbance.*

**228: 27 36. 103 S, 16 52.679 E (Kolke)**

**Description:** *An open MSA site in a wind-sheltered level valley: blades, points and flakes on quartzite, as well as quartz flakes. Very scattered. Interesting, but not important.*

**Management Guidelines:** *Avoid unnecessary disturbance. Minimise blading and keep service path as narrow as possible (single-track). Avoid gradual widening of the track by prohibiting vehicles to pass each other, overtake or turn around along this section.*

**229: 27 34.764 S, 16 54.165 E (Aub)**

**Description:** *A dry stone goat pen, either historic or prehistoric, of the type used by the Nama. Important site.*

**Management Guidelines:** *Do not disturb! Mark piles of stones with whitewash or demarcate and avoid damage to the site. Prevent people from going to the site. Direct traffic around the site.*

**230: 27 34.613 S, 16 54.737 E (Aub)**

**Description:** *Twin hut or cooking shelter circles of dry stone walling, of the type used by the Nama, the whole structure measuring 3 meters by 5 meters. Important site. Clearly visible.*

**Management Guidelines:** *Do not disturb! Mark piles of stones with whitewash or demarcate and avoid damage to the site. Prevent people from going to the site. Direct traffic around the site.*

**237: 27 29.716 S, 16 57.622 E (Abos)**

**Description:** *Extensive MSA open site in front of a rock 'nose'. Blades, points, scrapers, flakes, discoids on quartzite and hornfels at least 100 by 100 meters. The existing 'track' to the top of escarpment goes through this site. It is an important site, but extensive enough to make it alright to use the existing track as a service track during construction.*

**Management Guidelines:** *Use only the existing track. Widening of the track should be avoided. Vehicles should not be allowed to pass each other, overtake or turn around along this section. The track should be used exclusively for access and no other activities should be allowed near the site (i.e. construction campsite rest area where people have lunch, etc.) Prevent people and vehicles from moving across the site.*

**238: 27.30.944 S, 16 59.435 E (Abos)**

**Description:** *Extensive ESA/MSA open site on top of escarpment, next to a ravine with a spring in it. There are flakes and blades with and without patina, so a long time-period is probably covered. The entire area is one large field of hornfels, an ideal material for making stone tools.*

**Management Guidelines:** *Blading of this section is unnecessary and should not be allowed. Vehicles should not be allowed to pass each other, overtake or turn around along this section. The track should be used exclusively for access and no other activities should be allowed near the site (i.e. construction campsite rest area where people have lunch, etc.) Prevent people and vehicles from moving across the site.*

**241: 27 28.244 S, 17 07.754 E (Quaggaspoort)**

**Description:** *ESA/MSA site on deflation plain/deposit next to river. Flakes, cores, blades, etc. on quartzite and hornfels. Extends in all directions, and for nearly 6 km towards the west along the run of the river, to site 235 (27 29.566 S, 17 04.600 - Quaggaspoort), next to the same river. Important, but so extensive that some impacts are unavoidable during construction.*

**Management Guidelines:** *Avoid unnecessary disturbance. Minimise blading and keep service path as narrow as possible (single-track). Avoid gradual widening of the track by prohibiting vehicles to pass each other, overtake or turn around, along this section.*

**242: 27 27.736 S, 17 09.618 E (Quaggaspoort)**

**Description:** *ESA/MSA open site, continuation of 240. Important, but so extensive that some impacts are unavoidable during construction.*

**Management Guidelines:** *Avoid unnecessary disturbance. Minimise blading and keep service path as narrow as possible (single-track). Avoid gradual widening of the track by prohibiting vehicles to pass each other, overtake or turn around, along this section.*

243: 27 27.497 S, 17 10.179 E (Quaggaspoort)

**Description:** *Dry stone semi-circle measuring two meters by three meters, forming a hunting blind amongst game paths in the middle of a neck in the mountains, 79 meters west of Bp 17, with two more hunting blinds and the remains of a stone wall being located nearby at site 244 (27 27.482 S, 17 10.216 E - Quaggaspoort). Extremely important.*

**Management Guidelines:** *These stone structures are prehistoric, and MUST NOT be disturbed! Mark piles of stones with whitewash or demarcate and avoid damage to the site. No blading to be allowed near the site. Prevent people from going to the site. Direct traffic away and around the site.*

245: 27 24.766 S, 17 14.123 E (Huns)

**Description:** *ESA/MSA open site on the deposit next to a river, with large flakes, blades and knives, as well as two very nice hand axes. It extends all the way to site 246 (27 24.626 S, 17 14. 207 E – Huns). Important, but so extensive that some impacts will be unavoidable during construction.*

**Management Guidelines:** *Avoid unnecessary disturbance. Minimise blading and keep service path as narrow as possible (single-track). Avoid gradual widening of the track by prohibiting vehicles to pass each other, overtake or turn around, along this section.*

247: 27 24.052 S, 17 15.162 E (Huns)

**Description:** *ESA/MSA open site on deposit next to same river as sites 245 and 246, being a continuation of the same general site. Material includes hand axe sized flakes, prepared cores and a 56 millimetres by 180 millimetres blade. Important, but extensive enough to be unavoidable.*

**Management Guidelines:** *Avoid unnecessary disturbance. No specific action beyond the minimisation of blading is required. keep tracks as narrow as possible.*

248: 27 21.305 S, 17 20.135 E (Hope)

**Description:** *Abstract rock engraving near the Konkiep on a smooth, horizontal slab of rock, of a type repeated several times at the nearby site 249 (27 21.301 S, 17 20.299 – Hope). Important, but at least 100 meters south of the power line.*

**Management Guidelines:** *No evasive action is required if the service track is aligned on the existing track or directly under the line itself. There may be more of the same form of art in the general area and elsewhere near the power line (usually near river banks), so copy-cat graffiti by the construction crew should be actively discouraged.*

250: 27 22.584 S, 17 17.740 E (Huns)

**Description:** *ESA/MSA flakes, blades, cores on quartzite on deposit next to road. Important, but extensive enough to be unavoidable.*

**Management Guidelines:** *Avoid unnecessary disturbance. No specific action beyond the minimisation of blading is required. Keep tracks as narrow as possible.*



**MANAGEMENT GUIDELINES FOR KNOWN HERITAGE SITES NEAR THE PATH OF THE  
POWER LINE**

*There are a number of VERY important and sensitive heritage sites located near the path of the power line. These would generally not be affected by construction – except for when people purposefully visit these sites with the intention to collect interesting objects or because they are curious and ‘want to have a look’. The locations of these sites are therefore not disclosed.*

*It is important to prevent people from exploring surrounding areas, wandering outside predefined construction areas, and from trespassing onto restricted and private land.*

*Should there be any minor re-alignments of the power line required along the route section between the Konkiep River (Bp15) and Skorpion Zinc Mine / Obib Substation (Bp34), impacts on important heritage sites should be verified against Dr Dieter Noli’s information on heritage sites in the area.*

### **9.3. Protecting Unrecorded Heritage Sites and Artefacts**

The entire power line route has NOT been subjected to an archaeological survey. It is therefore possible that currently unrecorded heritage sites and artefacts may still be discovered. Such objects could easily be damaged or destroyed altogether if not managed correctly.

The discovery of a heritage object could cause a disruption and delay in the progress of work and could result in people being reluctant to disclose such a discovery. However, it should be stressed that this type of discovery also has positive consequences because of its educational value and added knowledge of local heritage resources. Deliberate destruction, removal or tampering with heritage sites is punishable by law.

The onus is placed on the people involved with surveying, blading and construction of the power line to identify and to avoid damage to currently unrecorded heritage objects. Guidelines to identify potential heritage sites and artefacts are provided below:

**DR DIETER NOLI’S GUIDELINES FOR IDENTIFICATION OF HERITAGE  
SITES AND ARTEFACTS**

**WHAT TO LOOK FOR IN GENERAL**

*Archaeological sites are not scattered at random all over the countryside. They are located at sites that have distinct economic, strategic or practical advantages. From an economic point of view, sites will be located in close proximity to sources of water, food, raw materials or shelter.*

*From a strategic point of view, sites will be located along access routes, at locations that have military advantages, at places where game can be ambushed, and at places where a good view provides ready information on the activities of both men and beasts in the surrounding area.*

*From a practical point of view, for instance, rock engravings will only be found on rocks with a suitable surface area. From this it follows that an area the size of a tennis court, chosen at random from the middle of a gravel plain, is unlikely to be an archaeological site. A cave the size of a tennis court with a sandy, level floor, facing away from the prevailing wind, located next to a permanent spring in an otherwise waterless pass leading through an otherwise impenetrable mountain range, on the other hand, will most certainly be an archaeological site.*

*It must be remembered that the Namib Nomads, the Nama herders who displaced them and the colonial travellers who followed, all lived by means of camping, the only differences being that Nomads travelled unencumbered, the herders with stock and the colonials with wagons. It follows that, in order to locate an archaeological site in any given terrain, the novice archaeologist only has to imagine that he is backpacking through an area, and that he is about to stop for the night. This puts him into hunter-gatherer mode, because of which he will choose the same site that other hunter-gatherers have been choosing for thousands of years.*

*Construction campsites and rest areas should be clearly specified and kept away from areas that look inviting as early man may also have used these sites!*

### **WHAT TO LOOK FOR AT A DISTANCE**

*Once an area has been identified as promising due to the overall nature of the terrain, it should be inspected from a distance, in order to identify possible site locations. Caves can usually be readily identified because their dark openings form a stark contrast to the general washed-out glare of the Namib. Not all caves, however, contain archaeological sites.*

*In addition to offering shelter from the prevailing elements and to being comfortable, they must also be accessible, and preferably in the vicinity of the most precious of desert resources, water.*

*The fact that a cave is not in the way of the route does not mean that its existence can be ignored. The most extensively occupied caves often have a flat living area in front of them, which the prehistoric inhabitants used as a porch, and which can be covered with a very dense selection of artefacts.*

*There is a tendency for the archaeological material to gradually move out of the cave and down such a slope as may be in front of it. This is due to a combination of erosion and the human habit of throwing things 'out of the window' if they are no longer needed. If the slope is steep enough, artefacts can still be found several hundred meters away from a cave in some cases. To find artefacts 50 meters from a cave is not unusual.*

*Potential permanent water holes can often be identified at a distance by the comparatively dense vegetation that tends to surround them. Temporary water holes, on the other hand, can be located in natural rock tanks, where there is no soil to support any vegetation, but where the lie of the land can lead one to suspect the existence of such tanks.*

*Water running over a cliff, for instance, will often gouge out a 'bath' at the bottom of the drop, which will for a short time form a natural pool after it has rained. Once one is near a suspected waterhole, one should sit down quietly somewhere and watch the flight paths of birds and bees. If enough birds and bees are seen to be flying to and from the same location, it may well contain open water. Similarly, several game trails converge at the same point are normally an indication of water, which the game will readily dig for if it is located in a sandy area, such as a river bed. Dry pans will invariably contain water when it rains, but those without a natural overflow will eventually become salty due to their inability to flush out the salt remaining from repeated evaporation cycles.*

*Potential fortifications are difficult to identify at a distance because they are normally made from dry-stone walling in rocky areas, using the local rocks as raw materials, and because they were usually built to blend in with their surroundings. Even so, any grouping of rocks looking even slightly unnatural should be inspected. Fortifications can range from chest-high walling with loopholes to low rows of packed stone, which will barely conceal a prone man.*

*Precolonial graves are normally just a heap of stones of one to two meters in diameter. Colonial graves are oblong heaps of stone, either with or without a headstone. Anything looking even vaguely like a grave should be treated as one.*

*Stone circles and stone semi-circles, approximately one to two meters in diameter and thirty centimetres high, can be either the bases of huts, wind shelters, or hunting blinds. Huts and wind shelters tend to be located at good camping sites, whereas hunting hides tend to be located at good ambush sites, either near water or where the terrain forces the game to stick to a certain route. Hunting hides can also be combined with stone game fences designed to channel the game in a certain direction.*

*The ruins of colonial structures made of mud bricks have often deteriorated to the point where all that remains is a low mound of clay. Such mounds should be inspected.*

*Any feature or grouping of stones, which looks even slightly out of place, should be inspected, as it could easily be a collection of hearth stones and one or two upper and lower grindstones, indicating the location of a campsite, game fence, hunting hide, pitfall or house. They date either from the colonial period or from the period immediately preceding it, and are probably the work of the Nama, which makes it inadvisable to disturb.*

*It is also to be considered that any man-made heap of stones could be a grave, which is best left alone as a matter of principle.*

#### **WHAT TO LOOK FOR AT ONE'S FEET**

*Once a potential archaeological site has been located at a distance, it has to be inspected at close quarters. This does not mean driving past it at 50 meters, but walking until one is standing on top of it, and then looking straight down. The reason for this is that, because all precolonial artefacts are made from natural materials, they blend in very well with their surroundings, while the colonial artefacts have largely been broken, trampled, rusted and sandblasted beyond rapid recognition.*

*It is extremely important to realise that NOTHING which one sees should be picked up, let alone removed. Archaeology is the reconstruction of the past, based on the physical remains of the past. This means that the mechanics of archaeology are very similar to detective work. The only difference is that, unlike Sherlock Holmes, who inspects the room the morning after the murder, the archaeologist inspects the cave thousands of years after the event, when a lot of the evidence has already been destroyed by the ravages of time. Any further tampering with the evidence may therefore render an already difficult task impossible – and is punishable by law with a jail sentence of one year.*

*The most obvious artefacts to look out for are stone tools. These, however, are not very easily recognised by a novice. Even the ubiquitous hand axe, the classical scalloped, teardrop-shaped, brick-sized tool from the Early Stone Age, will often pass unnoticed if it is lying nestled amongst other rocks. The same applies to the fist-sized upper grindstones and the telephone directory-sized lower grindstones of the Later Stone Age, regardless of the fact that they all have at least one extremely smooth surface, which can readily be felt, but not very easily seen.*

*Not all stones are suitable for making stone tools, in that not all stones have a tendency to break like glass, giving a sharp edge, which can be used for cutting. Quartz, which can be white, semi-clear or completely clear, does have this tendency, as does crypto-crystalline silica, which is often red, dark, brown, or light brown, and chert, which can be translucent and the colour of honey, with a matt white cortex. It follows that one has to identify the raw materials, rather than the tool themselves. This is easier said than done, but if any collection of rock fragments, which seems to be out of place from a geological point of view, is treated as a potential collection of tools, one is on the right track. A useful hint here is that rocks which do not belong in the area and which were therefore brought in as a raw material for making tools tend to have a different colour to whatever else is lying around.*

*Fragments of ostrich eggshell, on the other hand, are very easy to recognise, and, as ostrich eggs were eaten and the shells were used both as water containers and as a source of raw materials for making beads, the shell fragments are plentiful at most archaeological sites. The fact, however, that ostrich eggshell is found at a site, or even in a cave inaccessible to ostriches, does not necessarily mean that one is dealing with an archaeological site.*

*Ostriches, after all, tend to use the eggs as well, and hyenas using the cave as a den could have carried in stolen ostrich eggs. The trick here lies in going down on one's hands and knees and looking for intact, broken and partially manufactured ostrich eggshell beads amongst the ostrich eggshell fragments. As the Namib Nomads were also in the habit of decorating the ostrich eggshell water containers with engravings, some of the fragments will have engravings on them. Sometimes an intact ostrich eggshell water container is found, consisting of an empty ostrich eggshell with one small hole drilled into it.*

*Other food remains, such as bone splinters, are not very significant, as they could easily have been brought onto the site by jackals, hyenas or porcupines. Accumulations of seashell, however, be they from limpets or black mussels, are highly significant, as shellfish was a very important part of the diet of the Namib Nomads. Close to the sea, all archaeological sites are marked by an abundance of seashells, which at times can be seen from several hundred meters. At Elizabeth Bay, some 30 kilometres south of Lüderitz, there once was a massive midden the size of a tennis court and about two meters high. Further inland, sites may only contain one or two limpet fragments, but these are clear indicators of human activity, and have been found as far inland as Witputs by Dr Noli, and even along the Konkiep River by Wendt (1980).*

*Pottery, though normally highly fragmented and largely dating from the last 500 years, can be found at many sites. It usually takes the shape of grey-black, grainy concave fragments with white grit inclusions, and can easily be mistaken as being natural by the novice. The larger pieces, however, are more obvious, especially if the outside of the pot was smoothed off and given a red hue with ochre. Finding intact pots is extremely rare, but it does happen.*

*The most common historical artefact is glass, usually in the form of black or dark green fragments of gin and brandy bottles, with later sites also containing the remains of beer and wine bottles. These containers penetrated into the most isolated corners of the south-western Namib.*

*Pale blue glass trade beads do occur, but not very extensively, and one is more likely to find the empty cartridge cases from firearms, normally from either the British .577 Snider rifle or the 8 x 75 mm German Mauser.*

*Sites of European occupation, as opposed to European influence, in addition to stone walling and glass, also tend to contain large amounts of charcoal mixed with rusty nails, the latter having resulted from the burning of packing crates with nails in them. Such sites, especially those of military origin, also usually have substantial quantities of rusted tin cans, wire and other bits of metal, as well as fragments of European crockery. Due to the rather chronic lack of rainfall, metal lasts much longer in the south-western Namib than would normally be expected.*

### **ROCK ART**

*The rock art of the south-western Namib is either painted on smooth surfaces in protected areas such as rock overhangs or caves, or engraved on smooth surfaces out in the open near water sources. Whereas the paintings, which are largely done in ochre hues, normally depict naturalistic representations, the engravings are usually of an abstract nature. Both of these art forms are easily and permanently defaced by even light 'pecking' with a rock, and repeated wetting of paintings to make them more visible eventually destroys them. It is quite distressing to see to what extent some of the art of the area has already been vandalised by graffiti artists.*

*While rock paintings are as a rule tucked away to such an extent that they should not come in the way of the power line, rock engravings, especially those on smooth blue dolomite slabs, could be a very real problem, as they generally occur in completely exposed areas. As rock art is difficult to identify at a distance, all suitable surfaces should be inspected.*

## **E 10. INFRASTRUCTURE / DEVELOPMENT**

As a result of the semi-arid to arid climate, poor vegetation cover, wind-blown sands and thin soil layer, farms tend to be large, and there are many that are uninhabited or used only for recreational hunting.

The Sperrgebiet (Diamond Area No 1) is to west and southwest of the Obib Substation near Skorpion Zinc. Power lines running from the Obib Substation southwards to Kudu Gas and Oranjemund will therefore have to run through the Sperrgebiet. The area has been off limits to all but the diamond mining companies that have held the prospecting rights for this land for over 80 years. Most mining activities are on the coastline and along the Orange River and the remainder of the area has been left untouched by man. Access to the Sperrgebiet is restricted and permits are required for all people entering the area.

Tourism in the region is not well developed, but areas with high tourist potential abound. With the opening up of the Orange River road from Noordoewer to Rosh Pinah, and the future de-proclamation of the Sperrgebiet, tourism could become a major source of revenue for the region. Areas such as the Schakalberg Mountains, Obib Dunes, Gomtawibberg, Rooilepel fossil deposits and known sites of historical and archaeological interest could well be developed for future tourism.

The tarred B4 national road parallels the rail link between Keetmanshoop and Lüderitz, and the relatively good calcrete C13 district road connects Rosh Pinah and Aus. The rest of the roads through the area are secondary gravel roads. Both the villages of Oranjemund and Rosh Pinah belong to mining companies, and access to Oranjemund is restricted.

Although infrastructure is not well developed throughout the area, the power line will cross, or run in close proximity to a number of roads and will be close to the airfield near Skorpion Zinc. Ministry of Works, Communication and Transport (Department of Roads) and Civil Aviation Authority regulations and guidelines will apply in these areas.

The power line will cross numerous fence lines. Gates will have to be installed at all these points and gate operation procedures, access control and holding of keys will have to be discussed with the owners and/or managing bodies of the land. Destruction of fences could result in game or livestock escaping from camps. This issue proved to be very problematic during similar developments in the region when disputes on the actual number of game found in the area arose and construction teams were blamed for chasing game out of the area.

## **E 11. HEALTH AND SAFETY**

The desert environment often has intense heat and there is a shortage of water. This combination could be life threatening if people are unaware of the harshness of the environment in which they are working. The health of the construction workforce could be compromised if sufficient potable water and hygienic ablution facilities are not supplied at all times.

Any standing water will attract bees, and at certain times of the year, numerous black flies that swarm inland from the Orange River may be a nuisance.

HIV / AIDS is on the increase in Namibia. HIV / AIDS and related illnesses in Rosh Pinah have increased in recent years. According to the senior nursing sister in Rosh Pinah, this increase is apparently amongst the mine workforce, and not necessarily from immigrants hoping to secure work. Apparently, those who develop full-blown AIDS leave Rosh Pinah, to return to families able to care for them or who live closer to better medical facilities. Prostitution, already a problem in the mining town, will probably increase due to the influx of workers. There is very little that can realistically be done to curtail prostitution, but there must be a concerted effort to educate everyone, especially prostitutes and their prospective clients about HIV / AIDS. Apparently, condoms are freely available at several points in the village, the Sand Hotel, including the clinic and recreational clubs.

Construction work can be risky if the correct protective clothing and equipment are not used or if workers are not properly trained to do potentially dangerous tasks. There will be flammable and hazardous substances (i.e. fuel) on the site. Sufficient fire fighting equipment should be available and procedures for handling of hazardous substances should be put in place.

## **E 12. CLOSURE AND REHABILITATION**

As stated in Section E 2, the need for rehabilitation can be drastically minimised if unnecessary damage to soils and vegetation, and the creation of unwanted tracks are avoided right from the start and as best as possible. The ideal is to only have a single-track path along the length of the power line and the least number of access roads possible at the end of the construction period. However, it is very likely that unexpected damage will occur. Unwanted tracks and disturbed areas will require rehabilitation and construction campsites will require proper reinstatement to avoid permanent scarring of the landscape. It essential that adequate budget allocations are available for rehabilitation.

---