

ENVIRONMENTAL IMPACT ASSESSMENT REPORT  
AND ENVIRONMENTAL MANAGEMENT PLAN FOR

2023

THE RECONSTRUCTION OF FAILING SECTION ON  
MR118, BETWEEN ROSH PINAH AND ORANJEMUND.



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# 1. Table of Contents

2.	Table of Figures .....	2
1.	INTRODUCTION .....	3
1.1	BACKGROUND OF THE PROJECT .....	3
1.2	GENERAL DESCRIPTION OF THE PROJECT .....	5
1.3	RESOURCES REQUIRED FOR THE PROJECT .....	8
1.3.1	Borrow Pits.....	8
1.3.2	Construction Water Requirements .....	11
1.3.3	Residues and Emissions During Construction.....	12
3.	ASSUMPTIONS AND LIMITATIONS .....	12
4.	DETAILS OF THE APPLICANT AND CONSULTANT .....	13
4.1	DETAILS OF THE APPLICANT.....	13
4.2	DETAILS OF THE ENVIRONMENTAL CONSULTANT .....	13
5.	LEGAL FRAMEWORK.....	13
6.	METHODOLOGY FOR THE INVESTIGATION .....	18
5.1	DATA COLLECTION AND VERIFICATION .....	18
7.	AFFECTED ENVIRONMENT.....	19
7.1	CLIMATE .....	19
7.2	GEOLOGY AND SOILS .....	19
7.3	TOPOGRAPHY .....	20
7.4	SURFACE AND GROUNDWATER.....	20
7.5	LAND USE.....	20
7.6	SPECIALIST FLORA INVESTIGATION .....	20
7.6.1	Introduction .....	20
7.6.2	Results: Vegetation Sensitivities along the Route of the Proposed Road Upgrade.....	21
7.7	FAUNA .....	28
7.8	ARCHAEOLOGICAL AND ANTHROPOLOGICAL RESOURCES .....	30
7.9	NOISE.....	31
7.10	VISUAL IMPACTS.....	31
7.11	SOCIO-ECONOMIC ENVIRONMENT .....	31
8.	PUBLIC PARTICIPATION PROCESS .....	33
9.	ENVIRONMENTAL IMPACT ASSESSMENT .....	37
9.1	ENVIRONMENTAL IMPACT ASSESSMENT PROCESS METHODOLOGY .....	38
9.2	ENVIRONMENTAL IMPACT ASSESSMENT SUMMARY .....	50
10.	ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN.....	53
10.1	ESMP ADMINISTRATION.....	53
10.2	ROLES AND RESPONSIBILITIES.....	53
10.3	ENVIRONMENTAL AWARENESS AND TRAINING .....	55
10.4	PUBLIC PARTICIPATION.....	55
10.5	SPECIFIC ENVIRONMENTAL MITIGATION MEASURES - FLORA .....	56
10.6	NON-COMPLIANCE PROCEDURES .....	76

10.7	OFFENCES AND PENALTIES .....	76
10.8	ENVIRONMENTAL MONITORING AND AUDITING .....	78
10.9	DOCUMENTATION, RECORD KEEPING AND REPORTING PROCEDURES.....	79
10.	CONCLUSION AND RECOMMENDATIONS.....	80
11.	REFERENCES .....	81
	ANNEXURE A.....	82
	ANNEXURE B.....	83

## 2. Table of Figures

Figure 1:	Recent pictures of the destabilised road shoulder and road surface. ....	4
Figure 2:	Locality plan of sections requiring repairs. ....	5
Figure 3:	Finite element analysis on the mode of failure of the road embankment.....	6
Figure 4:	Blasting activities.....	6
Figure 5:	Rock showers – Dislodged boulder.....	7
Figure 6:	EIA Process.....	17
Figure 7:	Demarcated grave sites.....	31

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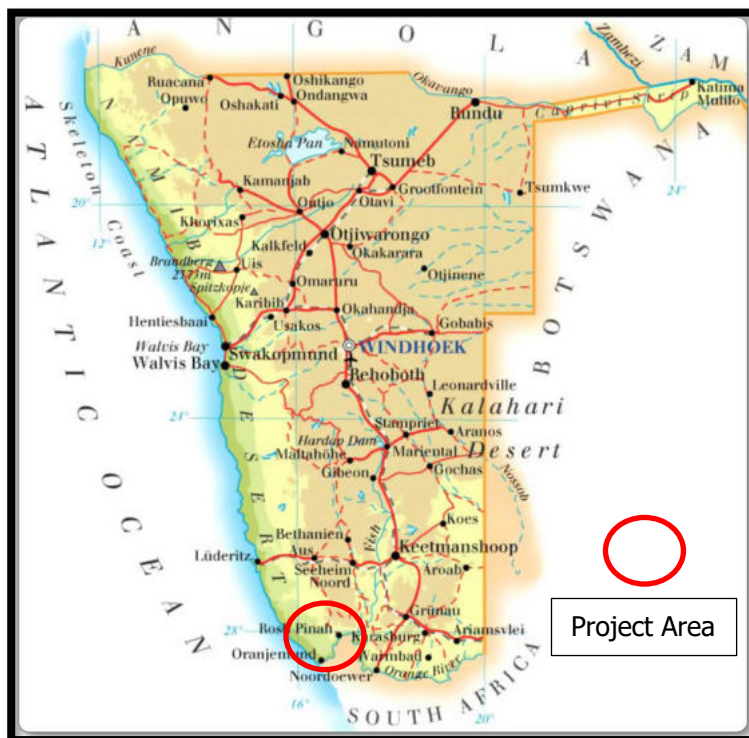
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# 1. INTRODUCTION

## 1.1 BACKGROUND OF THE PROJECT

Upgrading of a route from Rosh Pinah to Oranjemund has been considered since the early nineties and a pre-feasibility study was conducted in 1994. In 1998, the MOWTC supported by the Arab Bank for Economic Development in Africa (BADEA) appointed Loraus Consortium to conduct a feasibility study and preliminary engineering design on the link road from Aus through to Oranjemund. The consortium consisted of VKE (Namibia) Consulting Engineers and Bührmann and Partners Consulting Engineers as well as external experts.

The objective of the feasibility study was two-fold; firstly, to provide the MOWTC with engineering, socio-economic and environmental information of sufficient extent and accuracy to allow a confident decision to be made regarding the feasibility of linking Oranjemund to the national trunk road network. Secondly, to determine which of the two routes, coastal or inland would be most advantageous to upgrade.



The feasibility study which eventually covered 1400 km of road links for the economic analysis concluded that the inland route was the preferred route to be upgraded. At least the Aus – Rosh Pinah section of this the inland option was necessary for imports and exports of mine produce to Aus and Lüderitz for the then existing Rosh Pinah Mine and the new Skorpion Zinc Mine, while improving the overall road link to Oranjemund. It was found during the study that the alternative upgrading of the coastal route would still require an upgrade of the inland route, or alternatively the extension of railway network from Aus to Rosh Pinah. The latter was not economically viable mainly since it would have allowed

primarily for heavy goods transport by rail, while normal transport by road would still continue for which the road would still have required upgrading. The inland route in addition would have more advantages from an environmental point of view as well as access to better distributed good quality road works materials and water for construction.

The Rosh Pinah-Oranjemund portion of the preliminary design study could unfortunately not be finalised due to the security demands by Namdeb regarding the sections of the road that traversed mining areas. That included permanent helicopter-supported security and a very high standard of tamper-proof security fencing along both sides of the road which proofed neither technically feasible, nor economically viable. The difference of opinion between the MOWTC and Namdeb regarding payment responsibilities for the additional security measures once the road was opened to

traffic could also not be resolved, and no support from Namdeb could be obtained at the time for the proclamation of the road along the river. These unresolved matters prohibited further involvement by the Ministry since the private road belonged to Namdeb and was located on the soil of the legal concessionaire, Namdeb, who at the time by implication opposed further development of the Rosh Pinah – Oranjemund road link.

Another problem experienced was that the road alignment through the mining areas could not be fixed. Namdeb was regularly moving the position of the road as a result of space problems between the river and the mountains where the road was crossing the diamond deposits. A more direct alignment between Rosh Pinah and Oranjemund away from the river subsequently was investigated and found not acceptable. This was mainly due to environmental concerns, but also for technical reasons related inter alia to problems with windblown sand dunes.

Construction of the preferred alignment road started in 2015 and was completed in 2017. Since then the road has been in use by both NAMDEB and commercial / private road users and formed a very important transport link between Oranjemund and the rest of Namibia.

During the rainy season of 2022/2023 the Orange River flooded partial sections of the newly constructed road. Furthermore, the river also destabilised portions of the embankment/shoulder of the newly constructed road. Please refer to the pictures below:



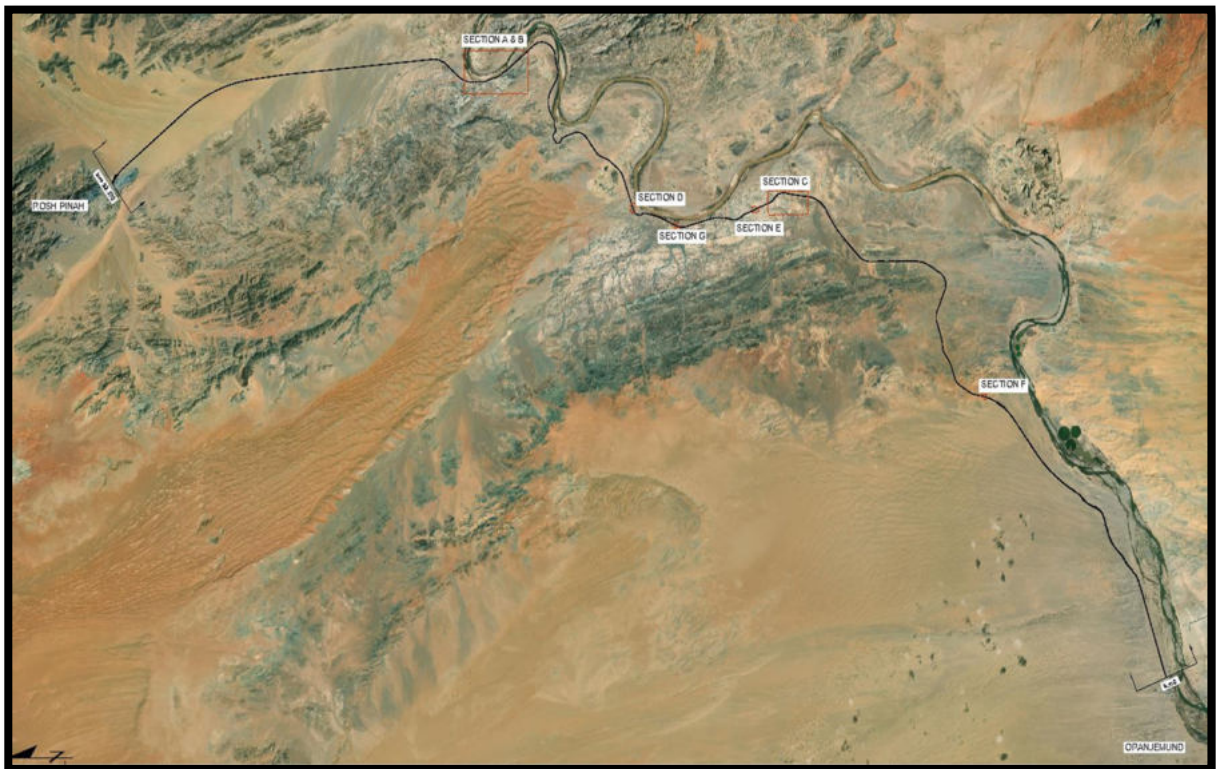
**Figure 1: Recent pictures of the destabilised road shoulder and road surface.**



The Roads Authority identified these areas need to be repaired immediately for the sake of safety related to the road user. Therefore, the reason for the application for environmental permission to the Ministry of Environment, Forestry and Tourism.

## 1.2 GENERAL DESCRIPTION OF THE PROJECT

The road was proclaimed by the Roads Authority as a public road and then upgraded to bitumen standards which was completed in August 2017. The main sections that show defects are located close to Sendelingsdrift mine which is next to the Orange river with the following approximate project co-ordinates: S28.18546°, E16.83163° and S28.175667°, E16.826944°.



**Figure 2: Locality plan of sections requiring repairs.**

Figure 2 indicate all the sections that require works. Sections A and B have severely been affected, due to the occasional flooding of the Orange River which resulted in the failure of the road fill embankment between km 192 and km 194.5 (only 2.5 Km) coupled with the rock face instability within the road cuttings.

Continuous rock falls were experienced to date over these sections in the cuttings. Even though they were rock bolted with the initial project, continuous weathering took place with ad hoc rock falls. The kilometre points, identify the main section of road, experiencing major instabilities within the road prism and are visible by, propagating cracks and differential settlement (Figure 1).

The instabilities are caused by fluctuating water levels in the Orange River, which saturate the substrate materials and cause settlement of the road pavement layers. When the water levels rise, the flow velocity increase and erodes the constructed rockfill toe of the existing embankment. This cause slipping and toppling failures to occur within the embankment as demonstrated by figure 3:







**Figure 5: Rock showers – Dislodged boulder.**

The current state of the road poses a hazard to road users due to the high risk of the road collapsing along the unstable sections (Figure 2) and the continuous rock falls (Figure 5).

The contract aims to implementing the proposed remedial measures to stabilize the road fill embankment and the rock face as well reconstructing the road pavement layers to acceptable standards, whilst ensuring and supporting the national safety endeavours. A sequential list is provided for the proposed remedial works:

- Comply with all environmental obligations.
- The establishment on Site of the Contractor's construction camp and the moving of plant, materials, and personnel to the Site; and removal of all these items on completion of the Contract, and removal on completion of the Contract of the Engineer's offices,
- Clearing of stockpile area and widening of embankment.
- Accommodation of traffic.
- Benching of existing embankment along section A and B and widening of embankment 1:1.5 to 1:2 with rock fill material. Additional erosion protection measures in the form of packed rip rap to be constructed on the widened embankment.
- Scalping and barring the rock face along section A & B, removal of hazards from rock face, stabilise the rock face.



- Installation of Rock anchors, rock bolting and meshing with shotcrete.
- Opening and reinstatement of borrow areas and the provision of certain haul roads, as well as the reinstatement of old borrow areas and old haul roads where so instructed by the Engineer.
- Excavation and stockpiling of pavement layers, fill and rockfill layers until specified depth, for each section.
- Remove and stack existing drainage structures.
- Reconstruct and stabilise alluvium substrate materials by constructing jet grouted columns in road formation along section A, B, reconstruct and stabilise road formation along section C.
- Construct a pioneering layer with rock fill material over jet grouted columns.
- Increase the vertical alignment of part of Section A by 500mm to ensure accessibility.
- Reconstruction of drainage structures and erosion protection with grouted stone pitching at outlets.
- Reconstruction of the selected subgrade layers, construction of subbase layers, shoulders and base layers.
- Application of prime coat and construction of a bituminous surfacing consisting of a 20,0 mm stone and slurry in two layers, with penetration grade bitumen.
- Construct stone catch in form of a ditch and rock catch fences along section A and B.
- Protection and relocation of Telecommunication services on section A & B.
- Trimming and cleaning of Site to high standards, with emphasis on strict environmental requirements.

## **1.3 RESOURCES REQUIRED FOR THE PROJECT**




### **1.3.1 Borrow Pits**




Suitable material is needed for the Subbase and Base layers during the construction of the road. Filling material is also required to ensure vertical alignment of the road is according to engineering standards required in Namibia.

To achieve the abovementioned, suitable material is required from borrow pits. These pits are opened using various heavy-duty machines and the material is hauled from the pit to the required sections of the road where the material is needed. It is imperative that the material excavated fits the engineering standards required for the construction of the road and is therefore tested on a regular basis.


Another important issue is hauling distance. The borrow pits cannot be situated too far from the section of the road where the material is needed, therefore borrow pits cannot be located too far apart (incurring costs due to hauling).

The following table depicts the identified borrow pits that might be used for this project. All of the pits are old borrow pits that will be re-opened and enlarged where required:

Coordinate				Photo
BP	Position	Southing	Easting	
20.7	R	28°26'59.63"S	16°39'49.45"E	
25.5	R	28°26'42.71"S	16°42'23.92"E	
37	L	28°21'47.33"S	16°45'15.62"E	

37.4	R	28°21'21.18"S	16°45'39.77"E	
42.5	L	28°19'16.63"S	16°44'54.76"E	
50.5	L	28°15'12.92"S	16°46'2.09"E	
62	L	28°12'31.18"S	16°50'10.31"E	<p>This BP was not accessible due to mining activities.</p>



68.3	L	28° 9'53.00"S	16°49'47.62"E	
68.4	L	28° 9'49.00"S	16°50'15.58"E	
OLD G3 stockpiles		28° 8'33.48"S	16°50'31.05"E	

### 1.3.2 Construction Water Requirements

Water for construction purposes may be obtained from the Orange River, unchlorinated water from the NamWater Pump Scheme at Sendelingsdrif or Rosh Pinah Mines, or from runoff water collected in old borrow pits, but the main source will be water extracted from the Orange River.

Any temporary pipelines supplied and laid by the Contractor shall be removed before or at the end of the construction period.

The Contractor shall plan with relevant authorities for procuring, transporting, storing, distributing, and applying water as may be needed for construction and other purposes. The Contractor remains responsible in terms of Clause A 2.2.7 and Clause A 2.2.8 of the Standard Specifications for the supply of water.

The early establishment of water sources will be crucial to maximise time for construction of the road.

### **1.3.3 Residues and Emissions During Construction**

Due to the type of activities that are associated with the construction of roads it is very unlikely that any toxic materials will be present on site. The only risk might be hazardous hydrocarbon substances such as fuels (diesel and petrol) and oils used by the construction machines.

Bitumen will be used for sealing the newly constructed road. Bitumen is a stable hydrocarbon substance, but the "prime" medium is very volatile and should be considered as a hazardous liquid. The cleaning of bitumen tanker nozzles and cleaning of the bitumen trucks always poses a challenge when it comes to environmental management.

Domestic and camp construction wastes generated at the contractor camps can very easily be managed due to the proximity to the existing towns of Oranjemund and Rosh Pinah. Proper waste management principles should be enforced as stipulated by the Environmental and Social Management Plan (ESMP).

Sewage management is a great concern at any construction camp. Proper planning of the sewage facilities should be done at the start of such a project to prevent sewage overflow and the contamination of soils and water. The number of workers should be determined, and the sewage facilities planned accordingly.

The contractors camp will most likely be constructed at Rosh Pinah town.

## **3. ASSUMPTIONS AND LIMITATIONS**

It is assumed that the information provided by Consulting Team and the information in the Inception Report and other relevant documentation used for the compilation of this Environmental Report is accurate and relevant to this date. It is also assumed that the secondary data collected for the bio-physical and socio-economic environments are true and correct. These include data sources associated with printed books, data available on the internet and other studies as indicated in this report.

The Contract determined the available time and funds available to complete this project. Communication between the various team members was assured through regular meetings.

## 4. DETAILS OF THE APPLICANT AND CONSULTANT

### 4.1 Details of the Applicant

<b>Applicant</b>	Roads Authority of Namibia
<b>Contact Person</b>	Mr. Johan Blaauw
Contact Numbers	
Telephone	+264 63 221 564
Email:	blaauwj@ra.org.na

### 4.2 Details of the Environmental Consultant

The environmental project team from EMCN is led by Rian du Toit. He is an Environmental Assessment Practitioner with more than twenty years' working experience in the field of Environmental Management. **Error! Reference source not found.** highlights the experience and qualifications of the environmental team.

<b>Name</b>	<b>Role in the Project</b>	<b>Qualifications and Experience</b>
Rian du Toit	Environmental Assessment Practitioner	M.A. Environment and Society (University of Pretoria) with more than 20 years' experience in the field of environmental management, mostly related to roads, services, transmission lines and mining right applications.

## 5. LEGAL FRAMEWORK

This section deals with the regulatory requirements that are applicable to this project.

### ***THE NAMIBIAN LEGISLATIVE FRAMEWORK***

During the preparation of the Scoping Report, the following legislation and policies were considered:

- Environmental Management Act 7 of 2007 ;
- Environmental Regulations of 2012;
- Roads Authority Environmental Manual of 2014
- Road Ordinance 17 of 1972

The activities listed in Table 2, as contained in Appendix B of the Republic of Namibia's Environmental Regulations, may be applicable and will require Environmental Clearance.



**Table 1: Listed Activities in Terms of the Environmental Management Act**

Activity No.	Activity Description
10.2	<p>The route determination of roads and design of associated physical infrastructure where -</p> <p>(a) it is a public road.</p> <p>(b) the road reserve is wider than 30 meters; or</p> <p>(c) the road caters for more than one lane of traffic in both directions.</p>

Currently, Environmental Impact Assessments are guided and reviewed by the Directorate of Environmental Affairs (DEA) in the Ministry of Environment, Forestry and Tourism. Guidelines for various projects have been compiled to help improve EIA practice in Namibia. There are a number of sector laws in Namibia that have relevance to Scoping and EIAs. The following table provides a summary of the relevant sector legislation.

Statute	Provisions	Project Implications
<b>Forest Act 12 of 2001</b>	<p>Provision for the protection of natural vegetation.</p> <p>No regulations promulgated yet.</p> <p>Section 22(1): It is unlawful for any person to “cut, destroy or remove:</p> <ul style="list-style-type: none"> <li>• any living tree, bush or shrub growing within 100 meters from a river, stream or watercourse on land that is not part of a surveyed erf or a local authority area without a license.</li> <li>• Vegetation which is on a sand dune or drifting sand or on a gully unless the cutting, destruction or removal is done for the purpose of stabilizing the sand or gully.</li> </ul>	<ul style="list-style-type: none"> <li>• Permits should be obtained from Department of Forestry for the removal of protected trees.</li> </ul>
<b>National Heritage Act 27 of 2004</b>	Heritage resources to be conserved in development.	All archaeological sites to be identified and protected.
<b>Nature Conservation Ordinance 4 of 1975</b>	Requires a permit for picking (the definition of “picking” includes damage or destroy) protected plants without a permit.	In case there is an intention to remove protected species, then permits will be required.
<b>Preservation of Trees and Forests under the Forest Act, 2001.</b>	Protection to tree species.	The Contractor will require a permit to remove any protected trees.

Statute	Provisions	Project Implications
<b>Soil Conservation Act 76 of 1969</b>	<p>Prevention and combating of soil erosion; conservation, improvement and manner of use of soil and vegetation, and protection of water sources.</p> <p>The Minister may direct owners or land occupiers in respect of <i>inter alia</i> water courses. No Regulations exist to this effect.</p>	<p>Removals of vegetation cover to be avoided and minimized at all costs.</p> <p>Soil pollution to be avoided.</p>
<b>Water Resources Management Act 11 of 2013</b>	<p>Section 44 states that no person may abstract or use water, except in accordance with a license issued under this Act. Abstraction of water including open waters, aquifer, brackish or marine water.</p> <p>Section 566 states that any drilling to be conducted or enlargement of an existing borehole can only be conducted under a permit issued under the Act.</p> <p>Section 66 states that a person may not discharge any effluent directly or indirectly to any water resource on or under the ground or construct any effluent treatment facility or disposal site unless in compliance with a permit issued under Section 70 of the Act. Where “effluent” means any liquid discharge as a result of domestic, commercial, industrial or agricultural activities.</p>	<p>Obligation not to pollute surface water bodies.</p> <p>The following permits are required in terms of the Water Act:</p> <ul style="list-style-type: none"> <li>• water abstraction license that will form part of the contract obligations.</li> </ul>
<b>Public Health Act 36 of 1919</b>	Provides for the prevention of pollution of public water supplies.	A general obligation for the Contractor not to pollute the water bodies in the area.
<b>Government Notice No 121 of 1969 as amended as well as Government Notice No. 156 of 1 Aug 1997</b>	This is the general health regulations applicable to this project.	The Contractor will enforce the conditions required to ensure the health and safety of the workers.

**An important section 30 from the Road Ordinance 17 (1972) clarifies the obtainment of material required for the construction of the roads in Namibia. It states the following:**

For the construction, maintenance or repair of a proclaimed road the President of Namibia may through his representatives, officers or contractors enter upon any land with any vehicle, tool, material or animal and after the expiry of a period of fourteen days after a written notice of his intention to do so –

- (i) has been handed to the owner, lessee, or occupier of such land; or
- (ii) has been sent to the last known address of such owner, lessee, or occupier by registered post; or
- (iii) has been left at a conspicuous place on such land

he may without any compensation to the owner, lessee, or occupier of the land, remove any material which may be necessary for such construction, maintenance or repair from such land or process it on such land and thereafter remove it there from and for this purpose he may build and maintain any access roads which he may consider necessary: Provided that –

(a) nothing shall be removed from any garden or other land usually cultivated, nor within two hundred and fifty metres of any house nor within fifty metres of any kraal.

(b) every excavation, including an excavation for a sample and an experimental pit, shall as soon as possible be filled up or fenced off or shall otherwise be made safe for human beings and animals again to the satisfaction of the owner, lessee, or occupier of such land or as the President of Namibia directs.

(c) any road provided for this purpose shall be ripped up in such a way that it cannot be washed away should the owner, lessee, or occupier so desire.

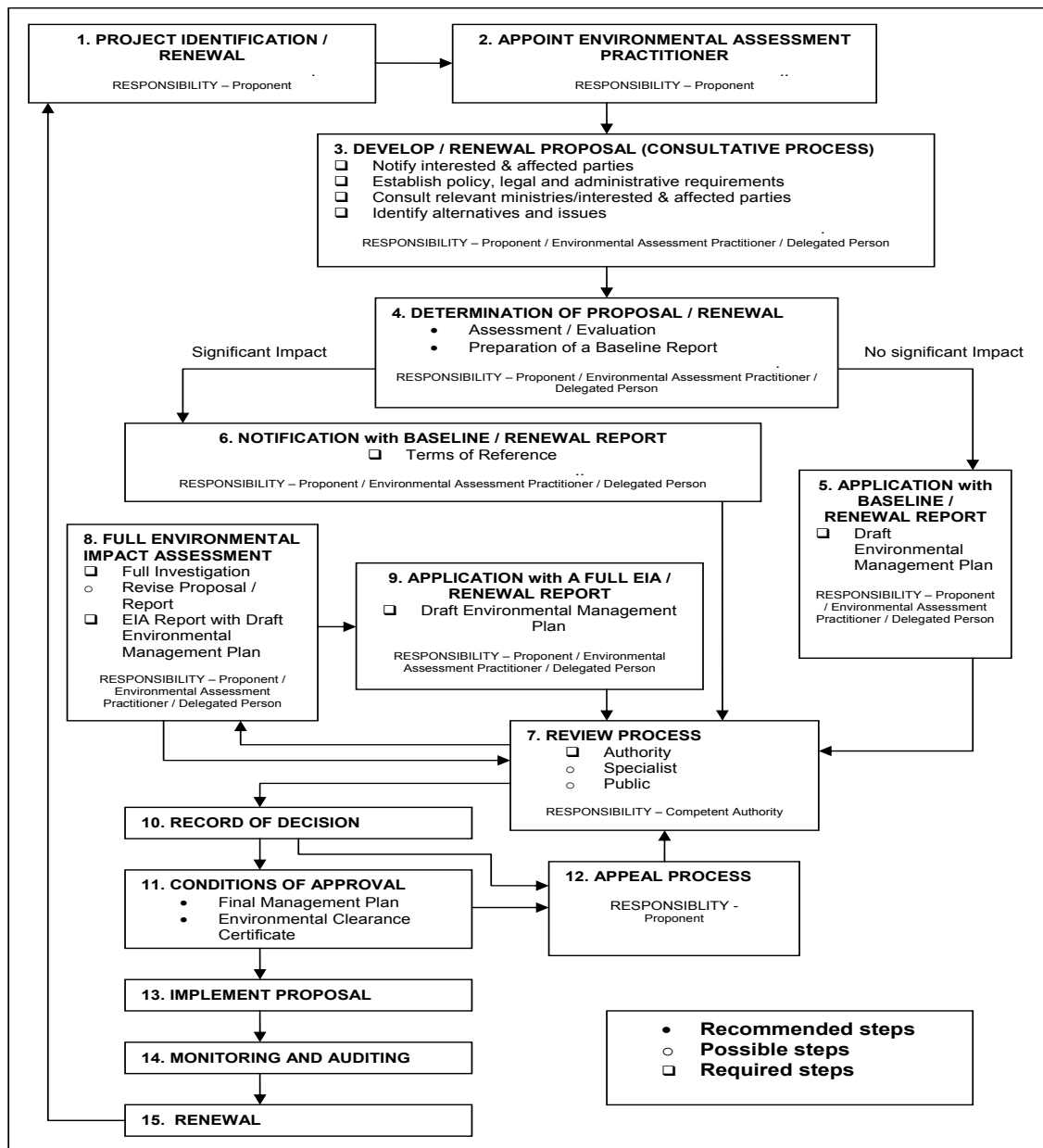
(d) the President of Namibia, his representatives, officers, or contractors shall, in exercising these powers take every care to prevent damage, injury, loss or inconvenience to the owner, lessee or occupier concerned:

Provided further that the powers granted to the President of Namibia in terms of this section shall only be exercised within the area of a local authority in consultation with the local authority.

A flowchart indicating the entire Scoping/EIA process is shown in *Figure 6 below*:



Figure 6: EIA Process



## 6. METHODOLOGY FOR THE INVESTIGATION

The following methodology was followed for the environmental investigation process as to compile the environmental assessment report:

### 5.1 Data Collection and Verification

- **Site visit and stakeholder consultation.** A site visit was conducted at the site to determine the bio-physical conditions of the project area. During the site visit focused attention was given to any environmental aspect that might be significantly affected by the construction and operational phases of the proposed project.

During the stakeholder consultation questions were posed to the meeting surrounding any environmental aspect they consider to be sensitive with regards to the project. These comments (if any) are then taken into consideration during the impact identification and evaluation process.

- **Literature review.** As mentioned earlier, a thorough Environmental Impact Assessment was done during 1998 – 2000. These documents that were used as baseline information are as follows:
  - Environmental Impact Assessment Report for the construction of MR118 from Oranjemund to Rosh Pinah – 2014.
- **Obtaining information from team members.** Various inputs were received from team members involved in the project. This includes the technical, design and social team members as well as NAMDEB. Liaising with these teams enhances the understanding of the project and therefore focuses the environmental assessment to make it site and project specific.
- **Verification of existing information.** The existing documentation and specialist studies were evaluated to determine the relevance of the information that was obtained by the specialists during the 1998 – 2000 periods.
- **Specialist Investigation - Flora.** Colleen Mannheimer conducted an updated specialist flora investigation on the project during 2014. This specialist investigation was done to determine the sensitivity of the area and identify any “red flag” issues in this regard. This investigation also updated the specialist flora report submitted in the Feasibility Study Report Volume 2. This specialist report was also used for the compilation of this environmental report.

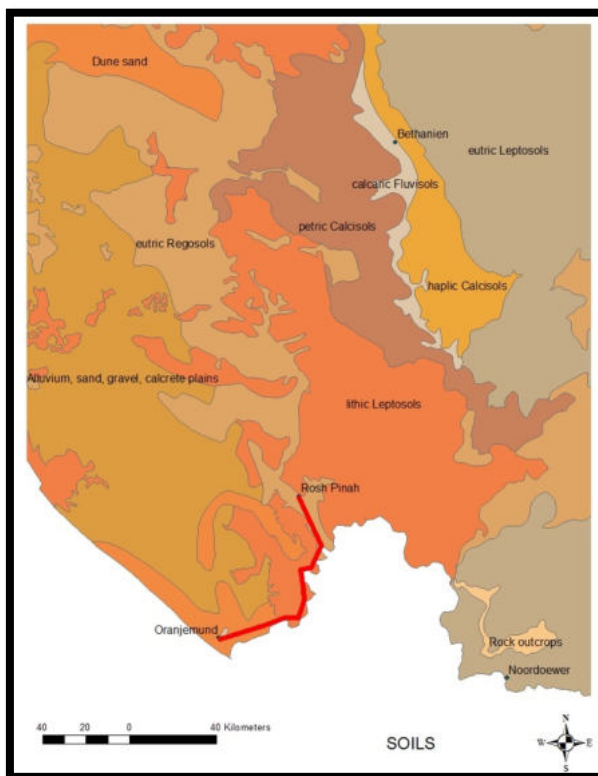
## 7. AFFECTED ENVIRONMENT

Roads are linear in nature and therefore the study area will also follow the same baseline conditions pattern. The study area will start at Posh Pinah and traverse westwards towards Oranjemund. The lateral scope of work will depend on the environmental consideration. Climatic conditions have a large lateral scope, whereas archaeological considerations are very limited to small areas.

### 7.1 Climate

Winter and summer rains are possible, with an average annual rainfall of less than 100 mm, even less towards the coast, and coastal fog moving up the Orange River valley playing an important role in the moisture regime of many organisms. Due to oceanic influences temperatures are moderate compared with much of Namibia, with average annual temperature around 17°C, although temperatures may reach as high as 30°C or more in summer, particularly in the river valley. Winds, which are often strong, occur throughout the year, mainly from the south, although warm north-easterly winds occur sporadically during winter (Mendelsohn et al 2002, pers. obs.).

### 7.2 Geology and Soils



Nearly all the mountains along the northern side of the road are formed by the Gariiep Complex of the Nama Group, which according to Brink (1981) comprise of a sequence of sediments and volcanics, which accumulate in a basin. The basin formed the rocks of the Namaqua Mobile belt, the Orange river group, the Violsdrif Suite and the Richtersveld intrusive complex, containing Miogeosynclinal deposits such as quartzite, conglomerates, dolomites, shale, together with volcanic tuffs and felsite.

The road traverse over two dominant soil types namely eutric Leptosols and eutric Regosols.

**Leptosols** soil types are found in actively eroding landscapes, especially in the hilly or undulating areas that cover much of the southern and north-western Namibia. These coarse textured soils are characterised by their limited depth caused by the presence of continuous hard rock, highly calcareous or cemented layer within 30cm of the surface. The Leptosols are, therefore, the shallowest soils to be found in Namibia and they contain much gravel. As a result, their water-holding capacity is low, and vegetation in areas which they occur is often subject to drought. Rates of water run-off and water erosion can be high when heavy rains fall.

**Regosols** are medium or fine-textured soils of actively eroding landscapes, the thin layers lying directly above the rock surface from which they are formed. Although not as shallow as the Leptosols, these soils never reach depths of more than 50cm. These soils are especially susceptible

to erosion where there is any degree of slope. Vegetation cover on these soils is very scarce due to a lack of nutrient and water holding capability (Mendelsohn 2009).

### **7.3 Topography**

The topographical area for section A and B is characterized by rolling to mountainous terrain amongst the Gomsawibberg mountain range, varying in altitude between 22 to 140 metres, mean sea level (MSL), with distinctive surface water drainage patterns towards the orange river.

Section C, is mainly characterised by a rolling to hilly terrain, varying between 22 to 100m MSL.

### **7.4 Surface and Groundwater**

There are no dams in the area. During the rainy season surface runoff will occur in ephemeral riverbeds mainly leading into the Orange river. The whole study area is situated in the Orange River Surface Drainage Area. The Orange River is perennial with water available for road construction.

There will not be any water extraction from boreholes required for this project.

### **7.5 Land Use**

The project area is exclusively situated in the mining area registered to NAMDEB. There are no other activities found in the project area but that of mining. The project also resides in the Tsau//Khaeb National Park which is managed by the Ministry of Environment, Forestry and Tourism.

### **7.6 Specialist Flora Investigation**

#### **7.6.1 Introduction**

The whole road from Rosh Pinah to Oranjemund falls into the northern section of the Succulent Karoo Biome, which is regarded as a global biodiversity hotspot (Myers et al 2000) and is thus important in global as well as regional and national terms. This makes only unavoidable damage acceptable. It is extremely sensitive in terms of near-endemic, endemic, and protected plant and animal species. Approximately 16% of the Namibian flora is thought to consist of endemic species (Craven & Vorster 2006), and over 30% of plants that occur in the Namibian section of the Desert Biome are believed to be endemic to that area. This is a remarkably high figure, with the areas of highest plant endemism in the Namib being the Kaokoveld and the southern Namib, both regarded as major centres of endemism in Namibia (Maggs et al. 1998).

Furthermore, relatively recent assessment by Burke and Mannheimer (2004) indicated that the Sperrgebiet (which excludes Aus) carries nearly 25% of the plant species known to occur in Namibia. Many of these have a highly restricted distribution. Elevated areas such as mountains and koppies are known to harbour many species of conservation concern, making them sensitive to environmental disturbance, some more than others. Many tend to congregate in small patches of suitable habitat, such as moisture-gathering south-west-facing slopes that are in shade for part of the day.

Illegal access and plant removal by criminal collectors is of particular concern as it perpetuates and aggravates existing damage ad infinitum. An additional concern of great importance is the negative visual impact of roads and infrastructure. This factor is of particular importance in an area such as

the southern Namib, where open and relatively unspoilt vistas may be regarded as a major tourist attraction that will provide long-term income to the country.

Williamson (1997) included this area in his Lower Orange River Zone, which he regarded as a zone that receives regular moisture from fog moving up the river, particularly in winter. It falls within the Desert and Succulent Steppe as defined by Giess (1971). Winter rainfall predominates, although summer rains are possible, with rainfall averaging 51 mm per annum, and coastal fog playing an important role in the moisture regime of many organisms. As a result, it harbours a flora and fauna substantially different from the rest of the country.

Due to oceanic influences temperatures are moderate compared with much of Namibia, with average annual temperature approximately 18°C, although temperatures up to 40°C may be experienced in the Orange River valley in summer. Winds, which are often very strong, occur throughout the year, mainly from the south-west, although warm north-easterly winds occur sporadically during winter. Furthermore, in common with most westward-flowing rivers in Namibia, the Orange River forms a linear oasis in an arid environment, with its well-developed riparian vegetation providing a favourable habitat for plants and animals. It also acts as a 'conduit' that carries fog deeper inland more regularly than might otherwise be the case. Moisture deposition by fog against mountain slopes and gullies is thought to be an important ecosystem driver in the area, providing a relatively reliable source of moisture in contrast to rainfall, which is temporally and spatially extremely variable and unpredictable.

The mountainous area along the Orange River harbours many endemics, rare and notoriously little-known plant species. Many are poorly collected and under-recorded. Protected and range-restricted species of the succulent family Aizoaceae/Mesembryanthemaceae, including *Lithops herrei*, *Cheiridopsis verrucosa*, *C. brownii*, *Juttadinteria albata*, *Dracophilus dealbatus*, *Conophytum* spp. and many others, including numerous protected members of the family Crassulaceae, occur in the area. Many of these have highly restricted known distributions, sometimes due to highly specific habitat requirements (e.g. *Lithops herrei*), some have already been heavily impacted by mining activities (e.g. *Juttadinteria albata*) and many are targets of illegal collectors.

### **7.6.2 Results: Vegetation Sensitivities along the Route of the Proposed Road Upgrade**

For this report and ease of application the route has been divided into several zones ranging from west to east as follows:

- Zone A: Oranjemund to Skilpad
- Zone B: Skilpad to Auchas
- Zone C: Auchas to Obib
- Zone D: Obib to Sendelingsdrif
- Zone E: Sendelingsdrif to Rosh Pinah



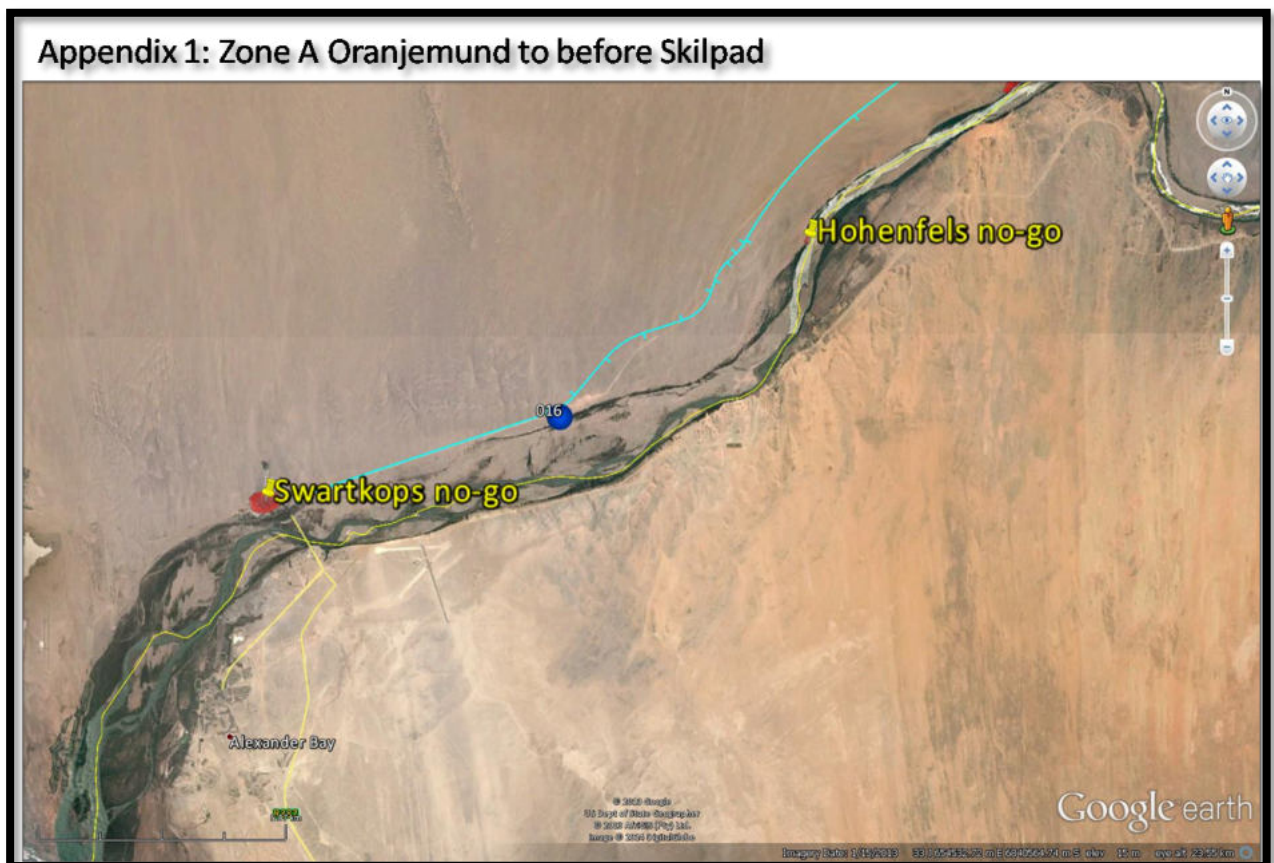
### **Zone A: Oranjemund to Skilpad**

Zone A, the westernmost section of the route, runs from Oranjemund past Swartkop gate to just before the Skilpad mountains and koppies. Except for the koppies at Swartkop and some ridges down near the river at Hohenfels, which are well away from the route this section crosses an area composed of dune sands with small hummocks. The vegetation consists of a low diversity of grasses and succulent herbs and shrubs for most of the year, but diversity climbs dramatically after rains when annuals and geophytes grow and bloom. Although several restricted range species may occur in this zone, with the exception of several that are confined to Swartkops and the rocky area near Hohenfels, none are of high conservation concern. Providing the two areas mentioned are avoided, no species is thus likely to be compromised in any meaningful way by the project because the general dune sand habitat is reasonably extensive.

The road reserve along this part of the route has already been heavily impacted by human activity, including grading, along most sections but many of the existing gravel pits have already been extensively rehabilitated by Namdeb.

### **Recommendations for Zone A:**

The Swartkop Nature Reserve and the ridges near Hohenfels should not be disturbed under any circumstance.



## **Zone B: Skilpad to Auchas (Appendix 2)**

The section of the route from just before Skilpad to just before Auchas consists of mountains and koppies with some intervening low rocky ridges and sandy plains. The plains are of low concern, but the rocky areas carry a high plant diversity and density that includes many protected, endemic, and restricted range species, including several of high conservation concern, such as *Euphorbia angrae*, *Aloe ramosissima*, *Cheiridopsis verrucosa*, *Antimima* spp., *Crassula* spp. and others. A rare lily, *Namaquanula bruce-bayeri* was found in Damage restriction area 1. All individuals found within the road reserve were rescued and submitted to the National Botanic Garden in Windhoek.

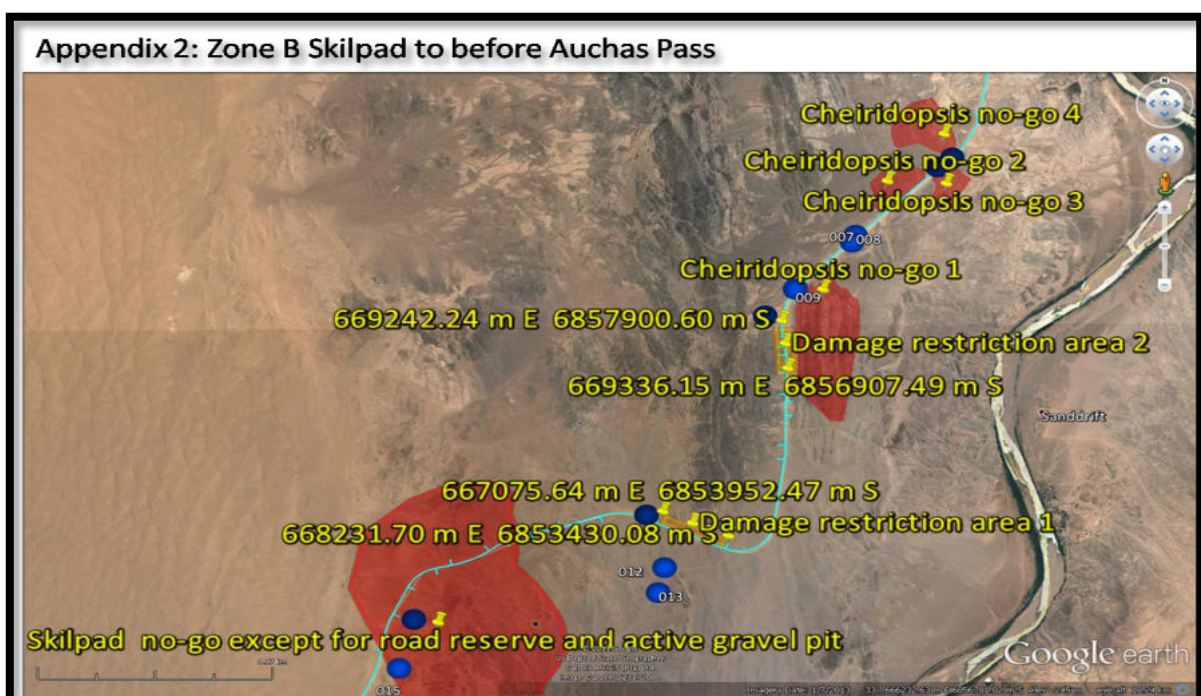
The Skilpad area is additionally of high concern because it is very likely to be an important tourist attraction when the Sperrgebiet National Park is developed. It is highly scenic and overlooks the Orange River from a very aesthetically pleasing vantage point. Historic damage has been extensively rehabilitated by Namdeb, although one active gravel pit remains.

Closer to Auchas there is Damage restriction area 2, and four no-go areas (*Cheiridopsis* no-goes 1 to 4) due to a highly restricted range protected species (*Cheiridopsis verrucosa*) occurring there, as well as other protected species. These four no-go areas only impinge very slightly on the road reserve in two places and should be easy to accommodate by delimiting them at the road edge before construction and not allowing staff to wander around on them during construction.

### **Recommendations for Zone B:**

Damage in the Skilpad area must be restricted to the road reserve and the direct vicinity of the existing active gravel pit. The extension of the gravel pit should be kept to a minimum and away from the koppies.

In the two damage restriction areas impacts outside the road reserve must be held to a minimum, and the four *Cheiridopsis* no-go areas should be avoided. Staff should not be permitted any access whatsoever to any no-go areas.



### **Zone C: Auchas to Obib (appendix 3 and 4)**

Zone C starts near the base of the Auchas pass and runs through three mountainous passes – from west to east, the Auchas, Daberas and Niklaas passes. Two of these passes are of concern, with the Auchas Pass being the area of highest concern along the entire route. Plant diversity in this zone is high, with many protected and restricted range species, including *Hartmanthus pergamentaceus* (the most extensive known population), *Astridia citrina*, *Tylecodon* spp., *Ruschia* spp. and many others.

The section of road passing through the Auchas Pass has been designated Damage restriction area 3, and GPS locs at the beginning and end are indicated on the kmz file. The seemingly unvegetated sloping ridges in this area carry a very high density and diversity of protected species on their quartz-strewn western slopes, which are largely invisible from the existing road, and must be impacted as little as possible. In the south-eastern section of this Damage restriction area 3 there is a white koppie designated Lithops no-go, home to the only known Namibian population of *Lithops herrei*, which is a Red Data species regionally assessed as Vulnerable (VU D1+2, IUCN 2001 vers. 10.1 criteria).



Figure left: Typical ridge in Auchas pass, with vegetation on the western face only.

Vegetation sensitivity is low along the route through the Daberas Pass, but increases substantially at Niklaas Pass, also on the western faces mainly. This pass is also likely to be a tourism hot spot in future. Thus, through Niklaas Pass damage must also be restricted as much as possible, although the proposed blasting at the

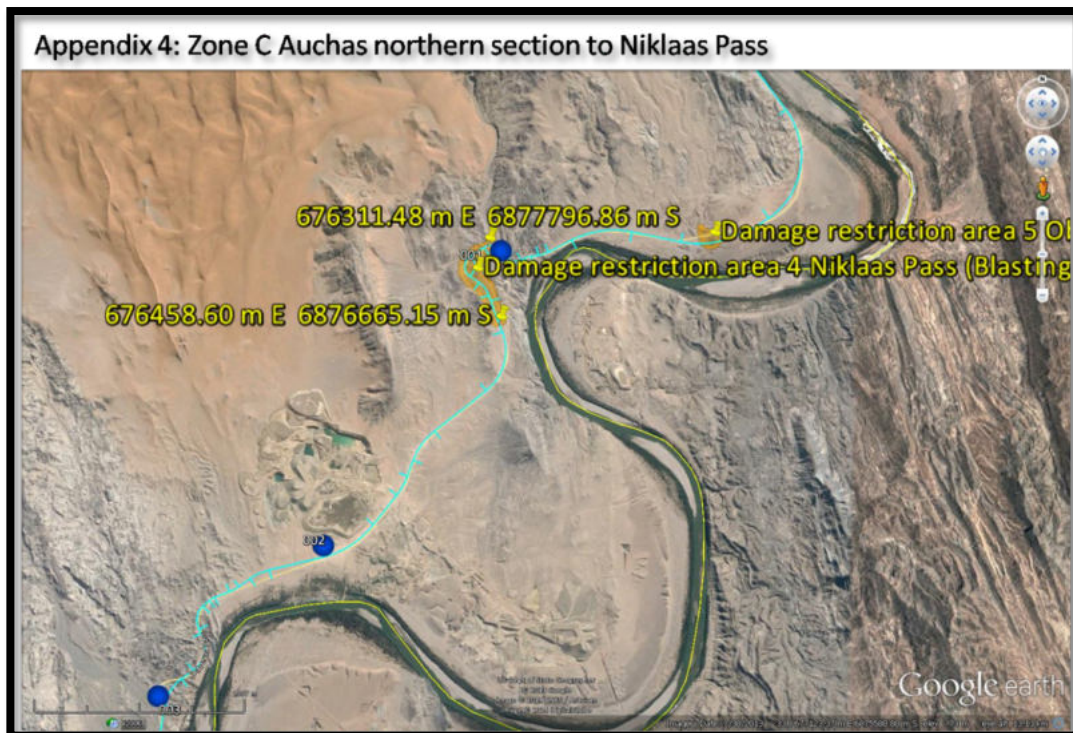
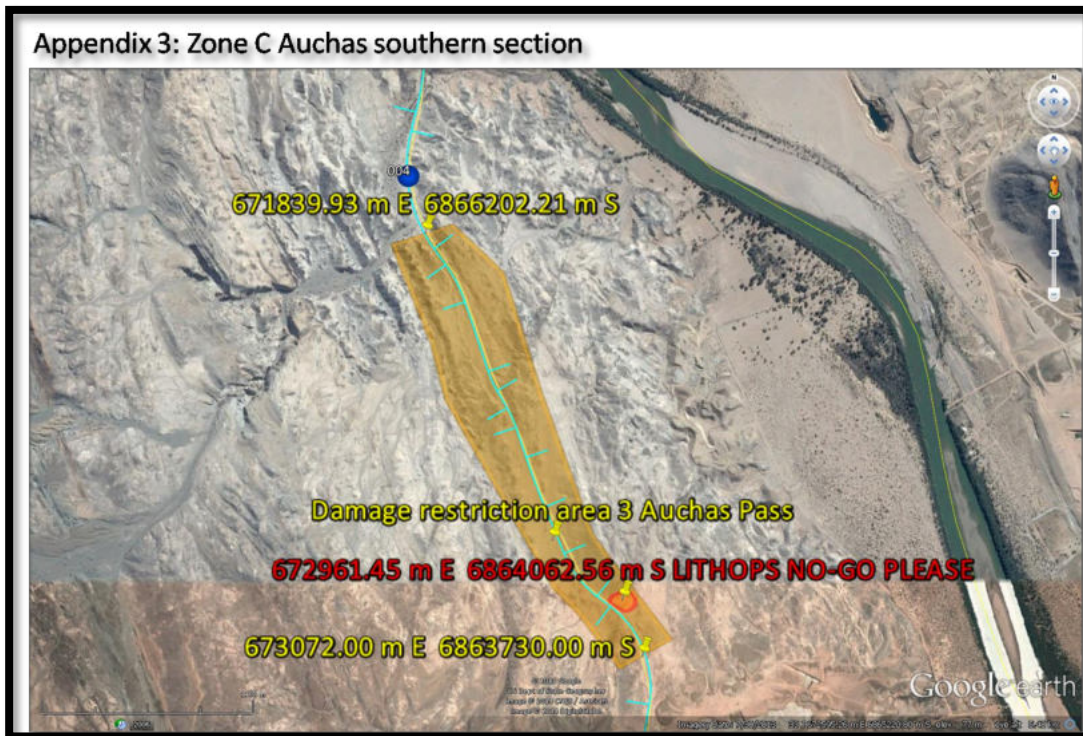
sharp turn can go ahead.

### **Recommendations for Zone C:**

Damage restriction area 3 should be observed, and staff must be disallowed access to the ridges in the area for relaxation or any other use, such as informal latrine use. The substrate is very fragile on the western slopes and will be damaged by human traffic as well as construction activity. Once the route is fixed and the midline marked the National Botanic Garden should be given the opportunity to do, or to request, plant rescue on the western faces that will be destroyed.



Although considerable damage will be done by blasting in Damage restriction area 4 (Niklaas Pass) other collateral damage should be kept to a minimum. As with Auchas, the National Botanic Garden should be given the opportunity to rescue plants well before construction begins.



### **Zone D: Obib to Sendelingsdrif (appendix 5)**

This section of the route travels up an incline of rocky ridges to the diamondiferous terraces of the Obib Mine before closely following high mountains ridges close to the riverbank and then approaching the Sendelingsdrif mine area.

The areas of highest vegetation sensitivity in this zone are the ridges in the vicinity of the road where it climbs from the sandy plain after Niklaas Pass up to Obib and white quartz areas scattered behind the ridges along the section that runs directly next to the river. The ridges near Obib carry very dense populations of protected species such as *Conophytum* spp. and *Crassula* spp., amongst others. The quartz areas further along the river also carry many species of concern, but these lie further away from the proposed route and are unlikely to be substantially damaged during this project. They will be at risk in future from visitors that stop at the proposed picnic spot.

Engineering construction along the river section will almost certainly cause the loss of many individuals belonging to protected tree species, including *Searsia lancea*, *Ziziphus mucronata* and *Salix mucronata*. These are common species whose overall survival will not be affected by the project. Their importance in this area lies, to a certain extent, on their ability to retain riverbanks and prevent erosion.

The river section is heavily infested by alien invasive species, in particular the castor oil bush (*Ricinus communis*), wild tobacco (*Nicotiana glauca*) and gifappel (*Datura* spp.).

### **Recommendations for Zone D:**

Unnecessary damage to the riverine fringe should be minimised. Legally one should apply for a permit to destroy protected tree species along the riverbank.

If possible, alien vegetation along the river section should be cleared.





### **Zone E: Sendelingsdrif to Rosh Pinah (appendix 6)**

This section passes over the Sendelingsdrif meso-terraces east of the existing road, passing the Sendelingsdrif mine and travelling over a broad, sandy-rocky drainage terrace before joining the C13 and following that road north-west to Rosh Pinah.

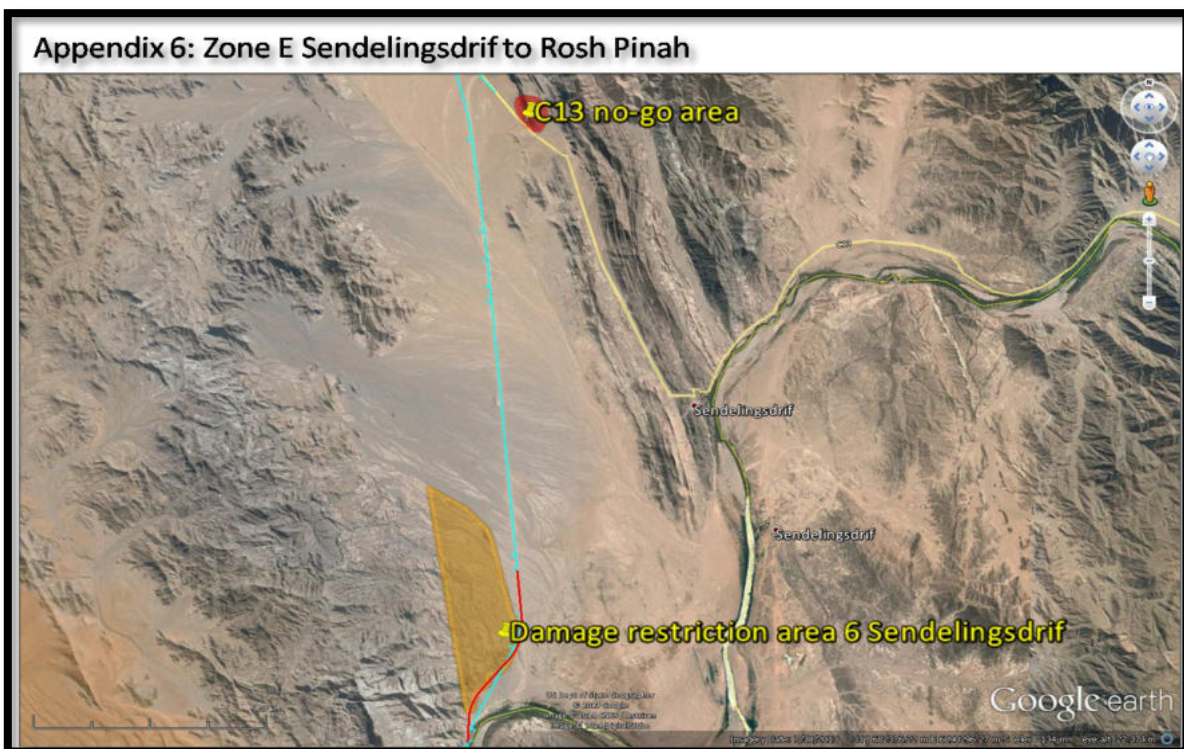
The area west of the road in the vicinity of the Sendelingsdrif mine carries plant species of very high conservation concern, including *Juttadinteria albata*, a Red Data species regionally assessed as Vulnerable (status VU A3c+4c+D2, IUCN 2001 vers. 10.1 criteria) that has already experienced very high impacts from mining. Other species of concern here include, *inter alia*, *Crassula sladenii*, *Hartmanthus pergamentaceus*, *Aloe gariopensis* and *Antimima* sp. A yet unidentified species that is very likely to be of high concern was also found here.

The drainage plain does not carry any species of high concern along the route.

To the east of the junction between the proposed route and the C13 there is a quartz area (C13 no-go area) that also carries important protected species, including, *inter alia*, *Juttadinteria albata*, *Hartmanthus pergamentaceus* and *Antimima modesta*.

### **Recommendations for Zone E:**

Once the route is finalised and the midline is marked on the meso-terraces west of Sendelingsdrif mine, **plant rescue will be essential**, and will have to be done well before construction begins, preferably in collaboration with the National Botanic Garden and Namdeb environmental staff. Damage restriction area 6 will need to be strictly observed. The C13 no-go area should not be disturbed in any way.



## 7.7 Fauna

The Oranjemund – Rosh Pinah area is home to at least 56 species of large mammals, including leopard, hyena, Hartmann’s Mountain zebra, springbok, gemsbok, red hartebeest, kudu, klipspringer, gemsbok and smaller mammals. The following list depicts more detail:

Chacma Baboon	<i>Papio ursinus</i>
Damara Ground Squirrel	<i>Xerus princeps</i>
Springhare	<i>Pedetes capensis</i>
Southern African Porcupine	<i>Hystrix africaeaustralis</i>
Cape Hare	<i>Lepus capensis</i>
Smith's Red Rock Rabbit	<i>Pronolagus rupestris</i>
African Wild Cat	<i>Felis lybica/sylvestris</i>
Caracal	<i>Caracal caracal</i>
Leopard	<i>Panthera pardus</i>
Cheetah	<i>Acinonyx jubatus</i>
Small-spotted Genet	<i>Genetta genetta</i>
Slender Mongoose	<i>Galerella sanguinea</i>
Brown Hyaena	<i>Hyaena brunnea</i>
Spotted Hyaena	<i>Crocuta crocuta</i>
Aardwolf	<i>Proteles cristatus</i>
Cape Fox	<i>Vulpes chama</i>
Bat-eared Fox	<i>Otocyon megalotis</i>
Black-backed Jackal	<i>Canis mesomelas</i>
Ratel / Honey Badger	<i>Mellivora capensis</i>
Steenbok	<i>Raphicerus campestris</i>
Common Duiker	<i>Sylvicapra grimmia</i>
Springbok	<i>Antidorcas marsupialis</i>
Gemsbok	<i>Oryx gazella</i>
Kudu	<i>Tragelaphus strepsiceros</i>
Hartmann's Mountain Zebra	<i>Equus zebra hartmannae</i>
Burchell's Zebra	<i>Equus burchelli</i>
Red Hartebeest	<i>Alcelaphus buselaphus caama</i>
Klipspringer	<i>Oreotragus oreotragus</i>
Antbear / Aardvark	<i>Orycteropus afer</i>
Rock Dassie	<i>Procavia capensis</i>

The landscape further supports a rich reptile diversity with a total of 35 lizard and gecko species with 16 snake species. A list of snakes that are common in the study area:

Namib Sand Snake	<i>Psammophis namibensis</i>
Cross-Marked Sand Snake	<i>Psammophis crucifer</i>
Dwarf-Beaked Snake	<i>Dipsina multimaculata</i>
Rhombic Egg-Eater	<i>Dasypeltis scabra</i>
Spotted Bush Snake	<i>Philothamnus semivariegatus</i>
Namaqua Tiger Snake	<i>Telescopus beetzi</i>
Southern Tiger Snake	<i>Telescopus semiannulatus</i>
Twin-Striped Shovel-Snout	<i>Prosymna bivittata</i>
Southwestern Shovel-Snout	<i>Prosymna frontalis</i>
Cape Cobra	<i>Naja nivea</i>
Horned Adder	<i>Bitis caudalis</i>
Desert Mountain Adder	<i>Bitis xeropaga</i>
Many-Horned Adder	<i>Bitis cornuta</i>
Puff Adder	<i>Bitis arietans</i>

Frog species are also common (Marbled Rubber Frog, Tandy's Sand Frog and Cape River Frog) and various tortoises (Leopard and Bowsprit).

Over 240 bird species have been recorded in these landscape areas of the project with some protected species identified<sup>1</sup>. The following table depicts some bird species commonly found in the area:

Common Ostrich	<i>Struthio camelus</i>
Little Grebe	<i>Tachybaptus ruficollis</i>
Great White Pelican	<i>Pelecanus onocrotalus</i>
Pinkbacked Pelican	<i>Pelecanus rufescens</i>
Whitebreasted Cormorant	<i>Phalacrocorax lucidus</i>
Bank Cormorant	<i>Phalacrocorax neglectus</i>
Reed Cormorant	<i>Phalacrocorax africanus</i>
Verreaux's Eagle	<i>Aquila verreauxii</i>
Tawny Eagle	<i>Aquila rapax</i>
Booted Eagle	<i>Aquila pennatus</i>
Martial Eagle	<i>Polemaetus bellicosus</i>
Brown Snake-Eagle	<i>Circaetus cinereus</i>

<sup>1</sup> <https://www.landscapesnamibia.org/fish-river-canyon/species-list-mammals>

Black-chested Snake-Eagle	<i>Circaetus pectoralis</i>
African Fish Eagle	<i>Haliaeetus vocifer</i>
Steppe Buzzard	<i>Buteo vulpinus</i>
Red-necked Falcon	<i>Falco chicquera</i>
Red-footed Falcon	<i>Falco vespertinus</i>
Rock Kestrel	<i>Falco rupicolus</i>
Greater Kestrel	<i>Falco rupicoloides</i>
Lesser Kestrel	<i>Falco naumanni</i>
Helmeted Guineafowl	<i>Numida meleagris</i>
African Jacana	<i>Actophilornis africanus</i>
Common Sandpiper	<i>Actitis hypoleucos</i>
Freckled Nightjar	<i>Caprimulgus tristigma</i>
Common Swift	<i>Apus apus</i>
Bradfield's Swift	<i>Apus bradfieldi</i>
Whiterumped Swift	<i>Apus caffer</i>
Little Swift	<i>Apus affinis</i>
Layard's Titbabbler	<i>Parisoma layardi</i>
Great Reed-Warbler	<i>Acrocephalus arundinaceus</i>
African Reed-Warbler	<i>Acrocephalus baeticatus</i>
Lesser Swamp-Warbler	<i>Acrocephalus gracilirostris</i>
Willow Warbler	<i>Phylloscopus trochilus</i>

## 7.8 Archaeological and Anthropological Resources

Some archaeological and anthropological evidence are found in the project area. However, these areas have been demarcated and identified. Should the team discover any other evidence of archaeological and anthropological deposits, NAMDEB shall be informed immediately.

The Sperrgebiet has a particularly impressive fossil record, dating from the Cretaceous period, about 58 million years ago. Some extremely rich fossil sites have been found along the Orange River and in paeleo-channels (old meander channels).

Related archaeological and historical information suggest that materials from Early Stone Age, Middle Stone Age and Late Stone Age, covering the period from about one million years ago to the present, can readily be found in the entire Sperrgebiet. The following photo was taken during the site visit where graves are protected by demarcation (fences).



**Figure 7: Demarcated grave sites.**

## **7.9 Noise**

Even though mining plays an important economic role in this area it is anticipated that noise will not be an important aspect to consider due to the very sparse population in the area.

## **7.10 Visual Impacts**

Visual impacts associated with a bitumen road is considered during the feasibility phase and argued during the public participation meetings. It seems that there will not be a substantial difference in visual perception from the existing road and the planned action to repair the cracked road.

## **7.11 Socio-economic Environment**

Oranjemund and Rosh Pinah falls within the //Karas Region – Oranjemund Constituency, with the regional government located in Keetmanshoop. The harsh climate limits agricultural potential, so that mining is the region’s biggest employer. This region has a total population size of only 77 421 people with around 9 837 people in both towns of Rosh Pinah and Oranjemund. The region has an annual growth of only 1.1%. There are only 0.5 people per sq. km. which is extremely low.<sup>2</sup> Unemployment rate for this region is calculated to be 25.9%.

The mining industry is a major pillar of Namibia’s national economy. The //Karas Region is the single most important mining region in Namibia, contributing a significant portion to the Gross Domestic Product (GDP) (Karas Regional Development Plan 2001/2002 – 2005/2006: 39).

The development of the //Karas Region is, both historically and economically, closely tied to its rich mineral deposits that provide a significant number of employment opportunities. Minerals mined in

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<sup>2</sup> Namibia 2011. Population & Housing Census Main Report.



the //Karas Region include diamonds, zinc, copper, tin, lead, silver, marble and gemstone. Gem quality diamonds are mined in Oranjemund. The mining sector generated N\$ 6,5 billion during 2007, contributing 12,4% towards Namibia's GDP, according to the Preliminary National Accounts 2007 (2008).

Despite the gains of development in the past ten years, a sizeable rural population still faces many of the developmental pressures of many nations on the African continent: Food Security, HIV & Aids, and unemployment. According to the 2011 Census data, 67.8 percent of the economically active population aged 15 years and above was employed, while 32.2 percent was unemployed (//Karas Region). There were only slight differences between urban and rural areas whereby 67.4 percent of the population in urban areas was employed compared to 68.2 percent in rural areas. At constituency level (Oranjemund Constituency), labor force participation rates were high in Oranjemund (87.7%). The labour force participation rate for females was lower in all the constituencies.

For the Oranjemund Constituency expenditure on education now ensures that over 92% of all children aged 7-13 years attend school and the region has a literacy rate of 99.5% for all persons aged 15 years and over, according to 2011 Population and Housing Census. Social services are well resourced, and health care is provided by urban hospitals and district clinics.

Life expectancy in the Karas region is at 51 years, slightly below the national norm of 52 years. According to the //Karas Regional Development Plan (2001/2002 – 2005/2006), other diagnostic health indicators such as the infant mortality rate (70 per 1000 births) and under five mortality rates (91 per 1000 births) are above the national averages of 67 and 87 respectively.

More than 60 percent of all households in the //Karas region have access to communication by means of a telephone or radio, and over 50 percent have access to television and occasional newspapers.

The most common source of energy for lighting in the region is electricity from the mains with 67.2% and Oranjemund constituency top of the list with 95.3%. More than 98.4 percent of urban household have access to safe piped water. About 75% percent of households in the Oranjemund constituency use flush toilets while only 0.5% percent have no toilet facilities (2011 Population and Housing Census - //Karas Region).

The statistical averages for the Oranjemund constituency are slightly higher in comparison with the overall averages for the //Karas region, indicating that an enhanced social environment is offered in Oranjemund and Rosh Pinah.<sup>3</sup>

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3 Helmuth. A. Economic Diversification of a Mining Town: A Case Study of Oranjemund.

## **8. PUBLIC PARTICIPATION PROCESS**

It should be mentioned that the MR118 was constructed only few years ago and the construction period was approximately three years. Both NAMDEB and the Ministry of Environment, Forestry and Tourism in Oranjemund are very aware of all the activities that took place during the construction period. Furthermore, the project team and contractor that were involved in the construction of the road were in constant communication with these entities and NAMDEB as well as MEFT were very pleased with the construction activities as well as the rehabilitation efforts made for the borrow pits.

Since there are mainly two parties involved in this project it was decided to place a press notice as required by the environmental regulations and have a consultative meeting with NAMDEB as part of the public participation process.

Before commencement of the public participation process, numerous communications were conducted between the engineering team from VKE Consulting Engineers - SMEC (the project engineers), NAMDEB, MEFT and a few other role players. All the stakeholders were already informed about this proposed project before the environmental investigation or public participation commenced.

Nether less, the proposed project was advertised in the Market Watch sections of the Republikein Allgemeine Zeitung and the Namibian Sun on two separate occasions:

- Monday 13<sup>th</sup> February 2023 in both the Republikein, Allgemeine Zeitung and the Namibian Sun;
- Monday 20<sup>th</sup> February 2023 in both the Republikein, Allgemeine Zeitung and the Namibian Sun.

Please find attached the Notices that were placed in the various newspapers:

## NOTICE OF AN ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

**Enviro Management Consultants Namibia** has been appointed by VKE Namibia on behalf of the Roads Authority to conduct an Environmental Impact Assessment and develop an Environmental Management Plan as required by the Environmental Management Act No 7 (2007) and the associated Environmental Regulations for the following project:

### **THE RECONSTRUCTION OF FAILING SECTIONS ON MR118, BETWEEN ROSH PINAH AND ORANJEMUND.**

The project consists of three (3) sections A to C. The existing bitumen surface is to be removed, stockpiled, and reconstructed. Section A and B are located on the failed section of road in between the Orange River and part of the Magalies mountain range, and after Sendelingsdrift mine. Section C is a short section along the Auchas pass.

An Environmental Clearance Certificate needs to be obtained from the Ministry of Environment, Forestry and Tourism (Environmental Commissioner) before repair construction activities may start.

Take note that Interested and Affected Parties (I&AP's) are hereby invited to register as to receive further information on this emergency repair construction activities.

Closing dates for registration is 28<sup>th</sup> February 2023.

**Enviro Management Consultants Namibia**

Attention: Mr. Rian du Toit

Fax: 088 626968

Email: [enviromc@iway.na](mailto:enviromc@iway.na)





During the Public Participation Process the following people registered as Interested and affected Parties:

Name	Contact	Comments	Action taken
Ronel Farmer	ronel@cargocarriers.co.za	The M118 is the primary route used for supply of dangerous goods (Diesel) by road daily to the mine in Oranjemund. Closure of the road during construction will impact negatively on the service delivery KPI's of our transportation contract.	Acknowledgement of the registration was sent to the I&AP and the company was ensured that traffic accommodation during the construction period is a priority.
Dene Kisting	Dene.Kisting@namdeb.com	Me. Kisting is an employee of NAMDEB, and she acknowledged the newspaper notices and help facilitating a virtual meeting between NAMDEB, SMEC and EMCN.  She also commented the following: This is an important route for the transportation of diamondiferous gravel from Sendelingsdrif to the sort house in Oranjemund. Delays due to delivery of Diesel fuel and other equipment requirements because of river floods and closing of MR118 will be avoided. Success of this project will complement Namdeb's implementation of its long-term plan.	Various communications took place between the engineers (SMEC), the environmental consultant (EMCN) and NAMDEB.
Ockert Sales	osales@coleman-transport.com	Road Closure will affect our Business and personal requirements to and from OMD.	Acknowledgement of the registration was sent to the I&AP and the company was ensured that traffic accommodation during the construction period is a priority.

A virtual meeting was held on the 22<sup>nd</sup> of March 2023 with the environmental team from NAMDEB, the project engineer (Mr. M Slabber from SMEC) and the environmentalist Mr. R du Toit (EMCN). The engineer

The project was explained by the engineer and the NAMDEB team was fully informed on the construction activities planned, construction timeframes, traffic accommodation measures during construction and some technical information on the project.

Comments from the NAMDEB team (Mr. Nandeshasho Nickanor) were that there are no objections to this proposed emergency repairs to the road. He reiterated the importance of the road to Oranjemund and Namibia in large. He also acknowledged that the environment is very important in this part of the country, but that the previous environmental management efforts implemented during the construction of MR118 were acceptable and is expected to be the same during the repair works planned.

The meeting was perceived in a very positive manner from all parties involved.

There were no more comments or concerns received or raised during the Public Participation Process.



## 9. ENVIRONMENTAL IMPACT ASSESSMENT

The Environmental Report will look at the Construction and Operational Phases of the project to determine the significance of the expected environmental impacts associated with the reconstruction of the failing sections of MR118. The following activities are generally associated with the construction of a road. These activities are kept in mind during the environmental impact assessment process.

- **Camp site establishment**
  - Demarcation of the camp site
  - Protection of vegetation and natural features
  - Protection of fauna
  - Protection of cultural historical aspects
  - Topsoil conservation
  - De-bushing and de-stumping
  - Structures construction: bulk water, sewage, electricity and accommodation
  - Parking and other required demarcated areas
- **Site infrastructure**
  - Batching plants
  - Crusher plants
  - Sand washing plants
  - Construction of service, haul and access roads
  - Gates and fences
- **Site management**
  - Rubble and waste rock
  - Solid waste
  - Liquid waste
  - Hazardous waste
  - Pollution control
  - Implements and equipment.
  - Blasting
  - Air quality
  - Noise control
  - Fire control
  - Health and Safety
- **Earthworks**
  - Prospecting boreholes and test pits
  - Excavations and trenches
  - Cut and fill
  - Shaping and trimming
  - Construction of pavement layers
- **Stockpiles, storage and handling**
  - Topsoil
  - Spoil
  - Vehicles and equipment
  - Fuel
  - Hazardous substances

## 9.1 Environmental Impact Assessment Process Methodology

One of the objectives of this study is to identify and quantify the potential positive and negative impacts which the proposed road will have on the receiving biophysical and socio-economic environment. A checklist is designed to help users identify the likely significant environmental effects of proposed projects during scoping. It is to be used in conjunction with the Checklist of Criteria for Evaluating the Significance of Impacts. There are two stages:

- **First**, identifying the potential impacts of projects.
- **Second** selecting those which are likely to be significant and therefore require most attention in the assessment.

A useful way of identifying the potential impacts of a project is to identify all the activities or sources of impact that could arise from construction, operation or decommissioning of the project, and to consider these alongside the characteristics of the project environment that could be affected, to identify where there could be interactions between them. The two parts of the Scoping Checklist have been developed to assist in this process.

Start with the checklist of questions set out below. Complete Column 2 by answering:

- yes - if the activity is likely to occur during implementation of the project;
- no - if it is not expected to occur;
- ? - if it is uncertain at this stage whether it will occur or not.

For each activity for which the answer in Column 2 is “Yes” or “?”, refer to the second part of the Scoping Checklist which lists characteristics of the project environment which could be affected, and identify any which could be affected by that activity. Information will be used about the surrounding environment in order to complete this stage. Note the characteristics of the project environment that could be affected, and the nature of the potential effects in Column 4.

Finally, use Checklist of Criteria for Evaluating the Significance of Impacts to help complete Column 5. This will identify those impacts which are expected to be significant. The questions are designed so that a “yes” answer will point towards a significant impact. It is often difficult to decide what is or is not significant but a useful simple check is to ask whether the effect is one that is of sufficient importance that it ought to be considered and have an influence on the development consent decision.

**PART 1 OF THE SCOPING CHECKLIST: QUESTIONS ON PROJECT**

**CHARACTERISTICS**

**1. Will construction, operation or decommissioning of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in water bodies, etc)?**

No.	Questions to be considered in the Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
1.1	Permanent or temporary change in land use, land cover or topography including increases in intensity of land use?	Yes	The borrow pit operations will temporarily alter the land use, land cover and, for the borrow pits - topography of the area.	Low significance because of possible mitigation measures that can be implemented. Rehabilitation of borrow pits normally return the land use to its original state.
1.2	Clearance of existing land, vegetation and buildings?	Yes	Clearing of vegetation for construction operations influencing the vegetation, soils and topography. It is very unlikely that any buildings will be cleared.	Clearing of vegetation is always regarded as significant when it comes to road construction. However, mitigation measures can reduce the significance of the impact.
1.3	Creation of new land uses?	No	The new road will be built mostly on the existing alignment.	Low significance.
1.4	Pre-construction investigations eg boreholes, soil testing?	Yes	Materials testing are required to obtain construction materials which will affect the topography and vegetation cover.	The areas of disturbance are very small. Holes are dug to excavate samples and closed after sampling. Low significance.
1.5	Construction works?	Yes	During construction aspects such as social, soil, surface water, vegetation and geology can be affected.	The existing alignment will be used therefore there are no significant impacts anticipated.
1.6	Demolition works?	Yes	The removal of old culverts, road pavement and road surface.	Very low or significance due to the low pollution risk and can be successfully mitigated.
1.7	Temporary sites used for construction works or housing of construction workers?	Yes	A temporary construction camp will probably be constructed where water and waste management are the most important activities that need to be mitigated.	Should these activities not be managed, it might have a negative impact on the soils, water and health and safety of the contractor workers. No permanent changes to the area are predicted.
1.8	Above ground buildings, structures or earthworks including linear structures cut and fill or excavations?	Yes	The above ground earthworks will be regarded as primarily for the road construction.	It is anticipated that the impact will not be significant due to the flat topography of the existing road.
1.9	Underground works including mining or tunnelling?	No		

1.10	Reclamation works?	No		
1.11	Dredging?	No		
1.12	River structures egg seawalls, piers?	Yes	Vegetation removal on the Orange Riverbank.	The vegetation is very common alongside the Orange River and the road construction areas are very short.
1.13	Offshore structures?	No		
1.14	Production and manufacturing processes?	No		
1.15	Facilities for storage of goods or materials?	Yes	The storage of machines, gravel, crushed stone, sand, cement, bitumen and bulk fuel.	The storage of goods or materials can be mitigated therefore limiting the significance.
1.16	Facilities for treatment or disposal of solid wastes or liquid effluents?	Yes	Sewage effluent from the camp sites need to be treated or disposed.	This might have a significant negative impact on Health / Safety as well as soils and water if not managed effectively.
1.17	Facilities for long term housing of operational workers?	No		
1.18	New road, rail or sea traffic during construction or operation?	Yes	Construction of a bypass and traffic increase due to movement of construction vehicles.	Medium significance due to the movement of mining vehicles and supplies of goods to Oranjemund.
1.19	New road, rail, air, water borne or other transport infrastructure including new or altered routes and stations, ports, airports etc?	Yes	The current alignment will be followed with some small deviations at the construction areas.	The significance will be low due to short distances of the proposed emergency repairs.
1.20	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	Yes	There will be temporary bypasses constructed.	The significance is likely to be medium due to the importance of the road to Oranjemund.
1.21	New or diverted transmission lines or pipelines?	No		
1.22	Impoundment, damming, culverts, realignment or other changes to the hydrology of watercourses or aquifers?	Yes	Some infringements will take place into the Orange River.	The placement of pillars and stabilization of the river bank will infringe approximately 5 meters into the Orange River. However, this is for very short distances and the river is very wide at these points.

1.23	Stream crossings?	No		
1.24	Abstraction or transfers of water from ground or surface waters?	Yes	Water will be extracted for the construction phase of the project.	Water from the Orange River will take place with very low impact.
1.25	Changes in water bodies or the land surface affecting drainage or run-off?	No		
1.26	Transport of personnel or materials for construction, operation or commissioning?	Yes	Surface characteristics.	No significance.
1.27	Long term dismantling or decommissioning or restoration works?	No		
1.28	Ongoing activity during decommissioning which could have an impact on the environment?	No		
1.29	Influx of people to an area is either temporarily or permanently?	No		
1.30	Introduction of alien species?	No		
1.31	Loss of native species or genetic diversity?	No		
1.32	Any other actions?	No		
<b>2. Will construction or operation of the Project use natural resources such as land, water, materials or energy, especially any resources which are non-renewable or in short supply?</b>				
No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
2.1	Land especially undeveloped or agricultural land?	No	Existing borrow pit areas will be used.	



2.2	Water?	Yes	Water is used for domestic and construction purposes.	The available water will be used for construction. The significance will be low due to the availability of water in the Orange River.
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**3. Will the Project involve use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health?**

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
3.1	Will the project involve use of substances or materials which are hazardous or toxic to human health or the environment (flora, fauna, and water supplies)?	Yes	Hydrocarbons always pose a risk to the environment.	Water and soils are normally affected by spillages of hydrocarbons. The significance might be medium without mitigation measures.
3.2	Will the project result in changes in occurrence of disease or affect disease vectors (eg insect or water borne diseases)?	No		
3.3	Will the project affect the welfare of people eg by changing living conditions?	Yes	This road is vital for access of goods to Oranjemund.	The significance of such risks can be mitigated, ensuring low impact significance.
3.4	Are there especially vulnerable groups of people who could be affected by the project eg hospital patients, the elderly?	No		
3.5	Any other causes?	No		

**4. Will the Project produce solid wastes during construction or operation or decommissioning?**

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
4.1	Spoil, overburden or mine wastes?	Yes	Spoils will be generated during construction affecting the aesthetics appeal of the area.	No. This activity can be mitigated very successfully. Low significance.
4.2	Municipal waste (household and or commercial wastes)?	Yes	Domestic waste will be generated.	Medium significance should it not be properly managed.
4.3	Hazardous or toxic wastes (including radioactive wastes)?	Yes	Used oils and old batteries.	Mitigation measures are important to manage the handling and disposal of used oils and old batteries.

4.4	Other industrial process wastes?	No		
4.5	Surplus product?	No		
4.6	Sewage sludge or other sludge from effluent treatment?	Yes	Sewage is produced at the construction camp.	Sewage is always a very important impact that might have a negative impact on soils, water and health and safety.
4.7	Construction or demolition wastes?	No		
4.8	Redundant machinery or equipment?	No		
4.9	Contaminated soils or other material?	Yes	There is always a possibility that contamination of soils can occur during operation due to spillage of oils / diesel.	No. The scale of contamination is very limited and can be mitigated.
4.10	Agricultural wastes?	No		
4.11	Any other solid wastes?	No		

**5. Will the Project release pollutants or any hazardous, toxic or noxious substances to air?**

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources?	Yes	Gasses such as Nox and Sox are deposited in the air from the machines.	The quantity of these gasses will not impact significant negatively on the environment.
5.2	Emissions from production processes?	No		
5.3	Emissions from materials handling including storage or transport?	No		
5.4	Emissions from construction activities including plant and equipment?	Yes	Construction vehicles, power plants and the crusher plant will generate gaseous emissions.	The impacts might be low significant and can mitigated.
5.5	Dust or odours from handling of materials including construction materials, sewage and waste?	Yes	Dust from material handling and transport.	Yes. Dust might be a nuisance to receptors.
5.6	Emissions from incineration of waste?	No		
5.7	Emissions from burning of waste in open air (eg slash material, construction debris)?	Yes	Burning of waste will negatively affect the air quality.	The significance will be low negative.

5.8	Emissions from any other sources?	No		
<b>6. Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?</b>				
No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
6.1	From operation of equipment eg engines, ventilation plant, crushers?	Yes	The mining of borrow pits and production equipment produces noise and vibrations	No. The ambient receptors are minimal. The Health and Safety within close distance must be noted.
6.2	From industrial or similar processes?	No		
6.3	From construction or demolition?	Yes	Construction will produce noise.	Low significance due to low receptor density.
6.4	From blasting or piling?	No		
6.5	From construction or operational traffic?	Yes	The hauling trucks will produce noise and vibration.	No. The impact is very local and is not significant.
6.6	From lighting or cooling systems?	No		
6.7	From sources of electromagnetic radiation (consider effects on nearby sensitive equipment as well as people)?	No		
6.8	From any other sources?	No		
<b>7. Will the Project lead to risks of contamination of land or water from releases of pollutants on the ground water into sewers, surface water, groundwater, coastal waters, or the sea?</b>				
No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
7.1	From handling, storage, use or spillage of hazardous or toxic materials?	Yes	Spillage of oils and other hydrocarbon may affect the water and soil.	With no mitigation the significance might be medium.

7.2	From discharge of sewage or other effluents (whether treated or untreated) to water or the land?	Yes	Effluent at the construction site might impact negatively on the surface water, soils and health and safety of the workforce.	Should the sewage not be properly managed the negative impact might be significant.
7.3	By deposition of pollutants emitted to air, onto the land or into water?	Yes	Gasses from the machines.	No. The volumes of emissions are limited.
7.4	From any other sources?	No		
7.5	Is there a risk of long-term build-up of pollutants in the environment from these sources?	No		

**8. Will there be any risk of accidents during construction or operation of the Project which could affect human health or the environment?**

No.	Questions to be considered in Scoping	Yes/No /?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous or toxic substances?	No		
8.2	From events beyond the limits of normal environmental protection eg failure of pollution controls systems?	No		
8.3	From any other causes?	Yes	The health and safety of road users might be affected by construction vehicles.	Might be significant if proper road traffic management is not conducted during the construction phase.
8.4	Could the project be affected by natural disasters causing environmental damage (eg floods, earthquakes, landslip, etc)?	Yes	Flooding of the Orange River is a possibility.	Low significance due to the construction that will take place during the winter months not characterised by precipitation.

**9. Will the Project result in social changes, for example, in demography, traditional lifestyles, employment?**

No.	Questions to be considered in Scoping	Yes/No /?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
9.1	Changes in population size, age, structure, social groups etc?	No		

9.2	By resettlement of people or demolition of homes or communities or community facilities eg schools, hospitals, social facilities?	No		
9.3	Through in-migration of new residents or creation of new communities?	No		
9.4	By placing increased demands on local facilities or services eg housing, education, health?	No		
9.5	By creating jobs during construction or operation or causing the loss of jobs with effects on unemployment and the economy?	Yes	The local and larger community will benefit from the construction phase.	The significance might be positive medium due job creation and increased mobility.
9.6	Any other causes?	No		
<b>10. Are there any other factors which should be considered such as consequential development which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality?</b>				
No.	Questions to be considered in Scoping	Yes/No /?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
10.1	Will the project lead to pressure for consequential development which could have significant impact on the environment eg more housing, new roads, new supporting industries or utilities, etc?	Yes	New road will be constructed which will benefit the communities of Oranjemund and Rosh Pinah.	The significance will be positive but the extent uncertain.
10.2	Will the project lead to development of supporting facilities, ancillary development or development stimulated by the project which could have impact on the environment eg: <ul style="list-style-type: none"> <li>• supporting infrastructure</li> <li>• housing development</li> <li>• extractive industries</li> <li>• supply industries</li> <li>• other?</li> </ul>	Yes	Stimulating the tourism industry and goods delivery companies.	This might be a significant positive impact on the towns of Oranjemund and good supply companies.
10.3	Will the project lead to after-use of the site which could have an impact on the environment?	No		
10.4	Will the project set a precedent for later developments?	No		
10.5	Will the project have cumulative effects due to proximity to other existing or planned projects with similar effects?	No		



## PART TWO OF THE SCOPING CHECKLIST: CHARACTERISTICS OF THE PROJECT ENVIRONMENT

For each project characteristic identified in Part 1 consider whether any of the following environmental components could be affected.

<p><b>Question - Are there features of the local environment on or around the Project location which could be affected by the Project?</b></p> <ul style="list-style-type: none"> <li>• The road travels through conservation areas.</li> <li>• There is a low possibility of features of high historic or cultural importance – existing alignment.</li> <li>• Surface drainage patterns will be addressed through proper engineering design.</li> </ul>
<p><b>Question - Is the Project in a location where it is likely to be highly visible to many people?</b></p> <p>This road is mainly used for good transport purposes between Oranjemund and the rest of Namibia. There are some tourists that enter Namibia at Oranjemund and travel further into Namibia.</p>
<p><b>Question - Is the Project located in a previously undeveloped area where there will be loss of Greenfield land?</b></p> <p>No, the repairs will be constructed mostly on the existing alignment.</p>
<p><b>Question - Are there existing land uses on or around the Project location which could be affected by the Project?</b></p> <p>The material required for the repair work will be obtained from old borrow pits (with some enlargement of the BP's).</p>
<p><b>Question - Are there any plans for future land uses on or around the location which could be affected by the Project?</b></p> <p>No. The area will probably remain mining / conservation.</p>
<p><b>Question - Are there any areas on or around the location which are densely populated or built-up, which could be affected by the Project?</b></p> <p>There are no densely populated areas around the project, only mining activities.</p>
<p><b>Question - Are there any areas on or around the location which are occupied by sensitive land uses which could be affected by the Project?</b></p> <p>Yes, the Tsau//Khaeb National Park is situated around the proposed route.</p>
<p><b>Question - Are there any areas on or around the location which contain important, high quality or scarce resources which could be affected by the Project?</b></p> <p>There are no scarce resources found around the project that could be influenced by the construction or operational phases of this project, but there are some flora species that are protected by Forestry Legislation. There are also some protected animal species that will be encountered during construction and operational phases.</p>
<p><b>Question - Are there any areas on or around the location of the Project which are already subject to pollution or environmental damage e.g. where existing legal environmental standards are exceeded, which could be affected by the project?</b></p> <p>No.</p>
<p><b>Question - Is the Project location susceptible to earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions e.g. temperature inversions, fogs, severe winds, which could cause the project to present environmental problems?</b></p> <p>Yes, the areas are subject to occasional flooding by the Orange River.</p>
<p><b>Question - Is the Project likely to affect the physical condition of any environmental media?</b></p> <p>No, the proposed project will be constructed mostly on the existing alignment.</p>

**Question - Are releases from the Project likely to have effects on the quality of any environmental media?**

- The air quality might deteriorate due to dust generation during construction but will improve during operation.
- The quality of soil might deteriorate without proper management.
- Acidification of soils or waters will probably not occur.
- There will be some noise generated during the construction and operational phase of the road but will be limited to the site. Noise levels will decrease during the operation phase of the project.
- Erosion prevention of the Orange River bank will be achieved by the construction activities.

**Question - Is the Project likely to affect the availability or scarcity of any resources either locally or globally?**

- The project will use fossil fuels in liquid (diesel).
- Water will be used for dust suppression, construction and domestic use.
- The quarrying activity extracts geological materials on a non-renewable basis.

**Question - Is the Project likely to affect human or community health or welfare?**

- The quality of air will be affected due to construction activities and hauling. Even though this is the case, human health might not be problematic.
- No mortality or morbidity might be experienced by human receptors.
- The project will have a positive impact on the social economic welfare of the region.

In the Scoping checklist, the significance must be indicated. To facilitate this procedure, the following questions were considered during the rating:

Questions that were considered to determine significance:

1. Will there be a large change in environmental conditions?
2. Will new features be out-of-scale with the existing environment?
3. Will the effect be unusual in the area or particularly complex?
4. Will the effect extend over a large area?
5. Will there be any potential for trans frontier impact?
6. Will many people be affected?
7. Will many receptors of other types (fauna and flora, businesses, facilities) be affected?
8. Will valuable or scarce features or resources be affected?
9. Is there a risk that environmental standards will be breached?
10. Is there a risk that protected sites, areas, features will be affected?
11. Is there a high probability of the effect occurring?
12. Will the effect continue for a long time?
13. Will the effect be permanent rather than temporary?
14. Will the impact be continuous rather than intermittent?
15. If it is intermittent, will it be frequent rather than rare?
16. Will the impact be irreversible?
17. Will it be difficult to avoid, or reduce or repair or compensate for the effect?

## 9.2 Environmental Impact Assessment Summary

The following environmental impacts were identified during the assessment procedure as described above. The impacts are classified as either positive or negative and the significance ratings as low, medium, and high.

Activity	Aspect / Impact	Positive / Negative	Significance
Land use / topography, and land use cover.	The quarry operations will permanently alter the land use, land cover and, for the borrow pits - topography of the area.	Negative	Low
	Areas zoned as undetermined or agricultural will change to transport (land use).	Negative	Low
Clearance of existing land, vegetation and buildings.	Clearing of vegetation for construction operations influencing the vegetation, soils and topography.	Negative	Low
Pre-construction investigators egg boreholes, soil testing?	Materials testing are required to obtain construction materials which will affect the topography and vegetation cover.	Negative	Low
Construction activities.	During construction aspects such as social, soil, surface water, vegetation and geology can be affected.	Negative	Low
Demolition works?	The removal of old culverts , road pavement and road surface.	Negative	Low
Temporary sites used for construction works or housing of construction workers?	A temporary construction camp will probably be constructed where water and waste management are the most important activities that need to be mitigated.	Negative	Low
Above ground buildings, structures or earthworks including linear structures cut and fill or excavations.	The above ground earthworks will be regarded as primarily for the road construction. Permanent changes will take place (land use).	Negative	Low
River structures egg seawalls, piers?	Vegetation removal on the Orange Riverbank.	Negative	Low
Facilities for storage of goods or materials.	Pollution of soils and water.	Negative	Medium
Facilities for treatment or disposal of solid wastes or liquid effluents?	Sewage effluent from the camp sites need to be treated or disposed.	Negative	Medium
New road, rail or sea traffic during construction or operation?	Limited traffic increases due to movement of construction vehicles.	Negative	Low

Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	There will be temporary bypasses constructed.	Negative	Low
Abstraction or transfers of water from ground or surface waters?	Water will be extracted for the construction phase of the project.	Negative	Medium
Resources such as land and water.	Very limited protected land will be affected due to the construction of the road.	Negative	Low
	Water is used for domestic and construction purposes.	Negative	Low
Will the project involve use of substances or materials which are hazardous or toxic to human health or the environment (flora, fauna, and water supplies)?	Hydrocarbons always pose a risk to the environment.	Negative	Medium
Spoil, overburden or mine wastes?	Spoils will be generated during construction affecting the aesthetics appeal of the area.	Negative	Low
Pollution on site (domestic and construction waste).	Pollution of the natural environment (soil and water).	Negative	Medium
Sewage sludge or other sludge from effluent treatment?	Sewage is produced at the construction camp.	Negative	Medium
Contaminated soils or other material.	There is always a possibility that contamination of soils can occur during operation due to spillage of oils / diesel.	Negative	Low
Emissions from combustion of fossil fuels from stationary or mobile sources.	Gasses such as Nox and Sox are deposited in the air from the machines.	Negative	Low
	The movement from vehicles will generate noise, dust and gaseous emissions.	Negative	Low
By creating jobs during construction or operation or causing the loss of jobs with effects on unemployment and the economy?	The local community will benefit from the construction phase through additional employment opportunities.	Positive	Low
Will the project lead to pressure for consequential development which could have significant impact on the environment eg more housing, new roads, new supporting	Stimulating the tourism industry and goods delivery companies.	Positive	Medium



industries or utilities, etc?			
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## **10. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN**

This Environmental and Social Management Program (ESMP) will be implemented during construction phase of the project. It includes mitigation measures mentioned in the Feasibility Study Report of 1998 – 2000, the Flora Specialist Report done by C. Mannheimer, and a generic ESMP applicable to the construction of roads. The ESMP will form part of the contractual agreement between the Roads Authority and the Contractor responsible for the construction of the road.

The ESMP is intended to bridge the gap between the Environmental Impact Assessment (EIA) and the implementation of the project, particularly regarding implementing the mitigation measures recommended in the Environmental Impact Assessment (EIA). Monitoring, auditing, and taking corrective actions during implementation are crucial interventions to successfully implement the ESMP.

The ESMP detail actions to ensure compliance with regulatory bodies and that environmental performance is verified through information on impacts as they occur.

ESMP implementation is a cyclical process that converts mitigation measures into actions and through cyclical monitoring, auditing, review, and corrective action, ensures conformance with stated ESMP aims and objectives. Through monitoring and auditing, feedback for continual improvement in environmental performance must be provided and corrective action taken to ensure that the ESMP remains effective.

### **10.1 ESMP Administration**

Copies of the ESMP shall be kept at the site office and will be distributed to all senior contract personnel. All senior personnel shall be required to familiarize themselves with the contents of this document.

### **10.2 Roles and Responsibilities**

The implementation of the ESMP requires the involvement of several stakeholders, each fulfilling a different but vital role to ensure sound environmental management during each phase.

#### **Engineer's Representative (ER)**

The Engineer will delegate powers to the Engineer's Representative (ER) on site who would act as the Employer's implementing agent and has the responsibility to ensure that the Employer's responsibilities are executed in compliance with relevant legislation and the ESMP. The Engineer also has the responsibility to approve the appointment of the Environmental Control Officer (ECO).

Any on-site decisions regarding environmental management are ultimately the responsibility of the ER. The ER will have the following responsibilities in terms of the implementation of this ESMP:

- Controlling that the necessary environmental authorizations and permits have been obtained by the Contractor.
- Assisting the Contractor in finding environmentally responsible solutions to problems with input from the ECO (Environmental Control Officer) where necessary.
- Taking appropriate action if the specifications are not followed.

- Ordering the removal of person(s) and/or equipment not complying with the EMP specifications.
- Recommending and issuing fines for transgressions of site rules and penalties for contravention of the ESMP.
- Advising on the removal of person(s) and/or equipment not complying with the specifications.
- Receive and record any complaints (concerning environmental matters) from landowners or the public.
- Auditing the implementation of the ESMP and compliance with authorization on a monthly basis.
- Undertaking a continual review of the ESMP and recommending additions and/or changes to the document after completion of the contract.

### **Environmental Control Officer (ECO)**

The Environmental Control Officer (ECO) will be a competent person from the staff of the Contractor to implement the on-site environmental management of this ESMP by the Contractor. The ECO shall be on site daily and the ECO's duties will include the following:

- Assisting the ER in ensuring that the necessary environmental authorizations and permits have been obtained.
- Maintaining open and direct lines of communication between the ER, Contractor and interested and effected parties (I&APs) regarding environmental matters.
- Convening and facilitating public meetings.
- Regular site inspections of all construction areas with regard to compliance with the ESMP.
- Monitoring and verifying adherence to the ESMP, monitoring and verifying that environmental impacts are kept to a minimum.
- Assisting the Contractor in finding environmentally responsible solutions to problems.
- Monitoring the undertaking by the Contractor of environmental awareness training for all new personnel coming onto site.

### **The Contractor**

The duties of the Contractor are as follows:

- The Contractor shall be familiar with the contents of the ESMP to understand the mitigation measures and the reasons for the measures.
- The Contractor's site agent and his Safety Health and Environmental Offices shall always be in possession of this ESMP.
- Attend lectures / training that deals with environmental issues and the content of the ESMP.
- The Contractor shall ensure that he complies fully with the Environmental Specifications. This includes all plant operators, transport vehicles, and sub-contractors.
- The Contractor should also notify the ER of any activity that could or did impact negatively on the environment.
- The Contractor is responsible for any rectification measures needed to rectify, mitigate, or avoid environmental degradation or impact during the construction phase of the project.

### **10.3 Environmental Awareness and Training**

Before any work is commenced on the Site, the Contractor shall ensure that adequate environmental awareness training of senior site personnel takes place and that all construction workers receive an induction presentation on the importance and implications of the ESMP. The Contractor shall liaise with the Engineer during the establishment phase to fix a date and venue for the training and to agree on the training content.

The Contractor shall provide a suitable venue and ensure that the specified employees attend the course. The Contractor shall ensure that all attendees sign an attendance register and shall provide the ER with a copy of the attendance register. The presentation shall be conducted, as far as is possible, in the employees' language of choice.

As a minimum, training should include:

- Explanation of the importance of complying with the ESMP.
- Discussion of the potential environmental impacts of construction activities.
- The benefits of improved personal performance.
- Employees' roles and responsibilities, including emergency preparedness.
- Explanation of the mitigation measures that must be implemented when carrying out their activities.
- Explanation of the specifics of this ESMP and its specification (no-go areas, etc.)
- Explanation of the management structure of individuals responsible for matters pertaining to the ESMP.
- A HIV/AIDS awareness programme as part of Health and Safety issues.
- The contractor shall keep records of all environmental training sessions, including names, dates and the information presented.

### **10.4 Public Participation**

An on-going process of public participation and consultation shall be maintained during construction to ensure the continued involvement of interested and affected parties (I&APs) in a meaningful way (especially NAMDEB). Public meetings to discuss progress and any construction issues that may arise shall be held at least every three months and more regularly if deemed necessary by the ER. These meetings shall be arranged by the ECO but shall be facilitated by the ER. The Contractor shall present a progress report at each meeting. All I&APs that participated in or were informed during the EIA shall be invited to each of the public meetings.

## **10.5 Specific Environmental Mitigation Measures - Flora**

The following mitigation measures are required by the Specialist Flora Assessment done by Coleen Mannheimer and include the following:

### **Recommendations for Zone A:**

The Swartkop Nature Reserve and the ridges near Hohenfels should not be disturbed under any circumstance.

### **Recommendations for Zone B:**

Damage in the Skilpad area must be restricted to the road reserve and the direct vicinity of the existing active gravel pit. The extension of the gravel pit should be kept to a minimum and away from the koppies.

In the two damage restriction areas impacts outside the road reserve must be held to a minimum, and the four *Cheiridopsis* no-go areas should be avoided. Staff should not be permitted any access whatsoever to any no-go areas.

### **Recommendations for Zone C:**

The proposed route past the Lithops no-go area must be assessed and reconsidered to ensure that the site is not damaged. It must be an absolutely no access area and be protected from careless incursion by workers and heavy machinery during construction.

Damage restriction area 3 should be observed, and staff must be disallowed access to the ridges in the area for relaxation or any other use, such as informal latrine use. The substrate is very fragile on the western slopes and will be damaged by human traffic as well as construction activity. Once the route is fixed and the midline marked the National Botanic Garden should be given the opportunity to do, or to request, plant rescue on the western faces that will be destroyed.

Although considerable damage will be done by blasting in Damage restriction area 4 (Niklaas Pass) other collateral damage should be kept to a minimum. As with Auchas, the National Botanic Garden should be given the opportunity to rescue plants well before construction begins.

### **Recommendations for Zone D:**

If possible, the construction activities should impinge as little as possible on the ridges on the incline near Obib (Damage restriction area 5).

Unnecessary damage to the riverine fringe should be minimised. Legally one should apply for a permit to destroy protected tree species along the riverbank.

If possible, alien vegetation along the river section should be cleared.