VOLUME I

Draft Environmental Impact Assessment Report

SC/RFP/RA-28/2020

Feasibility Study, Preliminary Design and Detailed Design for the Upgrade to Bitumen Standard of the Access Road: Opuwo-Okongwati-Epupa-Baynes HPP

21 January 2022

Pregon Consulting Engineers (Pty) Ltd.
Innovative Solutions with Precision

WML CONSULTING ENGINEERS (PTY) LTD

DUNAMIS CONSULTING ENGINEERS & PROJECT MANAGERS (PTY) LTD

PREFACE

The EIA Report is presented in two (2) volumes, namely:

Volume 1 – Draft EIA Report (Detailed Design – Part 1) – This document

Volume 2 – Draft EIA Report (Feasibility Study – Part 2, 3 & 4)

EXECUTIVE SUMMARY

Background Information

The Roads Authority of Namibia (RA) appointed the Pregon, WML and Dunamis (PWD) Joint Venture to perform the Consultancy Services for the Feasibility Study, Preliminary Design and Detailed Design for the Upgrade to Bitumen Standard of the Access Road: Opuwo-Okangwati-Epupa-Baynes Hydro Power Project (HPP) Site.

The project route starts from Opuwo in the Kunene Region to Ominyandi, which is an existing gravel road (D3700).

Purpose of the Scoping Report

This Scoping Report document serves as the first deliverable in terms of the Environmental Impact Assessment process. It aims to fulfil the requirements of the Namibia Environmental Management Act No7 of 2007 and the Environmental Regulations of 2012 and contains the following steps:

- Registration of the project with Ministry of Environment and Tourism (MET)
- Notification and consultation of interested and affected parties
- Identification and consideration of issues and opportunities
- Consideration of mitigatory options
- Consideration of management plan options

Furthermore, the Scoping Report aims to facilitate the decision-making process in determining the most suitable route or less suitable route for upgrading to bitumen standard, based on environmental sensitivity.

Baseline Studies

A reconnaissance site visit and desktop study were undertaken to obtain data for the compilation of this report.

The environmental team worked closely together to consider any identified environmental issues from the onset of the project and to ensure that environmental best practices were incorporated during the planning phase of the detailed design. Our experienced and qualified team of specialists and environmental consultants provided input at an early stage of the project to highlight issues that may arise. A summary of environmental impacts is presented in section 8.2 of this document. A draft

Environmental Management Plan that is under section 9.7 of this report was prepared to mitigate the identified impacts and to avoid / minimise negative impacts and advance the positive impacts.

Conclusion

The environmental investigation to determine the sensitivity of the impacts associated with this project was done according to the legal requirements of the Environmental Management Act No. 7 of 2007 and associated Regulations of 2012.

This project does not pose significant environmental risks because the existing alignment will be followed. Waste management, pollution prevention and control as well as effective borrow pit rehabilitation will prevent any significant long-term negative effects associated with this project during construction.

The upgrade to bitumen standard will bring about the most positive impacts associated with the operational phase of the project. These include reducing the vehicle operating cost for the road user, improved road user safety and ensuring better access to the nodes along the project road

EMCN is of opinion that should mitigation and management measures be implemented as indicated; the project will not affect the natural environment in any detrimental sense. Therefore, we are of opinion that the project can be granted a Clearance Certificate and that the project will have greatly positive socio-economic benefits.

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ACRONYMS / ABBREVIATIONS

BID	Background Information Document
DEA	Directorate of Environmental Affairs
EMCN	Enviro Management Consultants Namibia
EMP	Environmental Management Plan
IAPs	Interested and Affected Parties
MEFT	Ministry of Environment, Forestry and Tourism

1. Introduction

Enviro Management Consultants Namibia (EMCN) is appointed by the Roads Authority to undertake the Environmental Assessment relating to the proposed project – Environmental Assessment Report for the Consultancy Services - Detailed Design and Tender Documentation for the Upgrading to Bitumen Standards: Opuwo-Ominyandi (135km), Kunene Region.

The project route starts from Opuwo in the Kunene Region to Okangwati (110 km), which is an existing gravel road (D3700). From Okangwati a shorter existing gravel road of 25km extends to the small town of Ominyandi where the upgrade to bitumen standard road will end.

The Project Area lies at the edge of Kalahari basin and covers the Opuwo and Epupa administrative constituencies. Opuwo is the only urban area within project boundaries, complemented by settlements and villages such as Okangwati and Opuwo. Communal farmland serves as home to the nomadic and semi-nomadic inhabitants, who primarily farm with cattle, but also small stock. The project area is characterised by semi-arid climate, with an annual rainfall ranging from 250-450mm increasing from the north to the south. The area is subject to periodic droughts, making the area marginal for rain-fed crop production.

There are conservancy areas within the region, on which local inhabitants depends on for survival. In addition to conservancies, the livelihood of the people in the area depends on small scale cultivation of plants and limited livestock, i.e. cattle and goats. The area is served primarily by informal businesses. Formal business is accessed from Opuwo, Khorixas and/or Oshakati amongst other urban areas. Tourism facilities in the area are primarily located close to the Kunene River, bordering Angola. The gravel road is essential for accessing social and economic services, but the current condition of the road possibly impedes optimal use of such service and economic growth.

The importance of upgrading the road to bituminous standards could be seen as follows:

- To serve the local communities and tourists.
- To reduce road user costs.
- To improive social and economic service delivery.
- To save on road maintenance costs arising from rising traffic volumes. The road currently serves 90 vehicles daily and blading the gravel road only, is no longer cost effective.
- This network connection will also provide access to schools, police station, clinics and the various government ministries (Agriculture, Fisheries and Environment and Tourism).

- Support other infrastructural development.
- Improvement movement between Namibia and Angola.

The proposed upgraded road will form an important element of the Southern African tourism infrastructure.

Figure 1: Locality of the project area

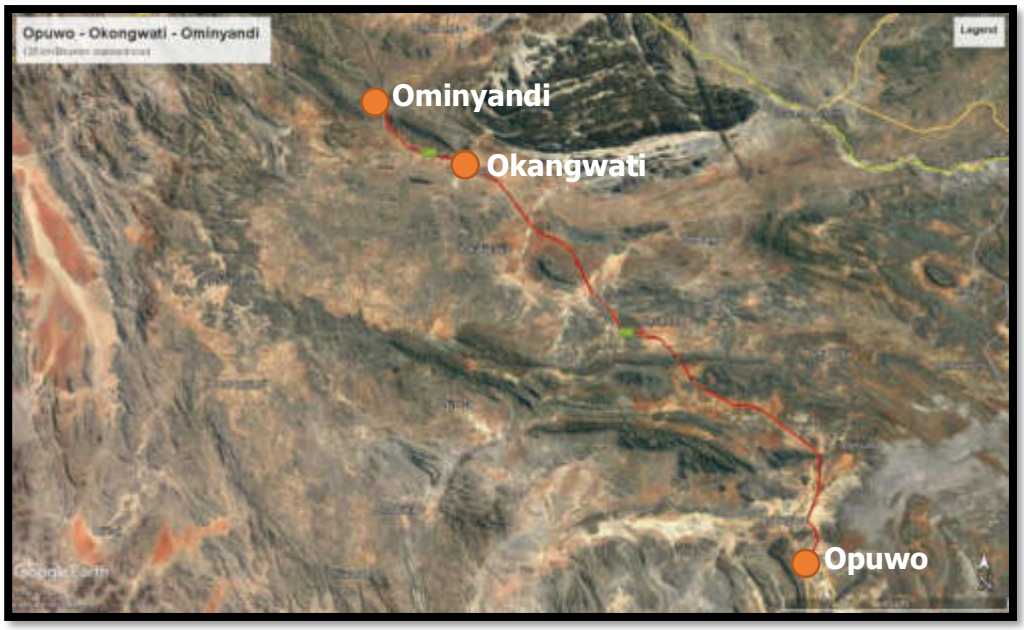

Figure 2: Google earth image of the proposed road

2. Details of the applicant and consultant

2.1. Details of the Applicant

Table 1: Details of the applicant

Applicant	Roads Authority of Namibia
Contact Person	Mr. Timotheus Hatuikulipi Project Control Officer – Roads Authority
Contact Numbers Email:	+264 81 169 4699 +264 (065) 231 560 Hatuikulipit@ra.org.na

2.2. Details of the Environmental Consultants

The environmental project team from EMCN is led by Mr. Rian du Toit, an Environmental Assessment Practitioner with more than 19 years of working experience in the field of Environmental Management. ***Table 2*** highlights the experience and qualifications of the environmental team.

Table 2: Capability Statement for the Environmental Project Team

Name	Role in the Project	Qualifications and Experience
Rian du Toit	Environmental Assessment Practitioner and Project Manager	Master's degree in the Environmental and Social fields. Mr. du Toit has more than 19 years' experience in the field of environmental management, mostly related to roads, services, transmission lines and mining right applications.

3. Road construction description

Road construction actions depend on the technically and economically viable/feasible options identified which include some degree of layer works (fill, wearing course, sub-base and base layers). Due to the low volume seal, a bitumen surface will be added on top of the layer works.

3.1. Scope of work

The scope of works involves the upgrade of a gravel road to bitumen standard of 135km of road sections, which broadly includes the following works:

- Establishment
- Clearing of site and road reserve
- Accommodation of traffic
- Rip and recompacted, reshape the existing layer as Roadbed
- Import Borrow materials for addition pavement layers such as subbase and base
- Construct drainage structures
- Construct a 19.0 mm Cape seal
- Road marking
- Road signs
- Finishing off

3.2 Typical Road Structure Cross Section of a Bitumen Road

The following picture represents the typical bitumen road cross section applicable to this project and is discussed below.

3.2.1 Subbase:

- It is layer of granular material provided above the selected layer generally natural gravel. This material is obtained from borrow pits alongside the planned route.

3.2.2 Base course

- It is the layer immediately under the surface treatment or bitumen seal / asphalt.
- As base course lies close under the pavement surface it is subjected to severe loading. The material in a base course must be of high quality and its construction must be done to strict design standards.
- This material is obtained from borrow-pits but may have to be screened, crushed and screened, modified by addition of lime material or stabilized. The material may also have to be obtained from stone quarries opened by the contractor or from commercial sources.

3.2.3. Bituminous Pavement

For good service throughout the full life of the bituminous pavement, the bituminous surface treatment must have the following qualities:

- Resistance to cracking or ravelling.
- Resistance to weather including the effect of surface water heat and cold.
- Resistance to internal moisture, particularly to water vapours.
- Tight impermeable surface.
- Smooth riding and none skidding surface.

The design aims to meet the above requirements for considerable number of years (need proper design, good construction supervision and maintenance during the life of the road).

3.3. Borrow Pits

Suitable materials are needed for the construction of the selected layer, subbase, shoulder, gravel wearing course and base course. Fill material is also required to ensure a vertical alignment appropriate for the chosen design speed.

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 complies with 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).

A total of thirteen (13) Borrow Pits were identified along the length of the Opuwo to Ominyandi road (Figure 3). Representative samples from the borrow areas were collected for Mod/CBR/Road Indicator tests (TMH1: Methods A1(a), A2, A3, A4, A5, A7 and A8) in order to determine the wearing course/subbase potential for the proposed road upgrade in terms of the Roads Authority (RA) Materials Manual, 1st Edition October 2014.

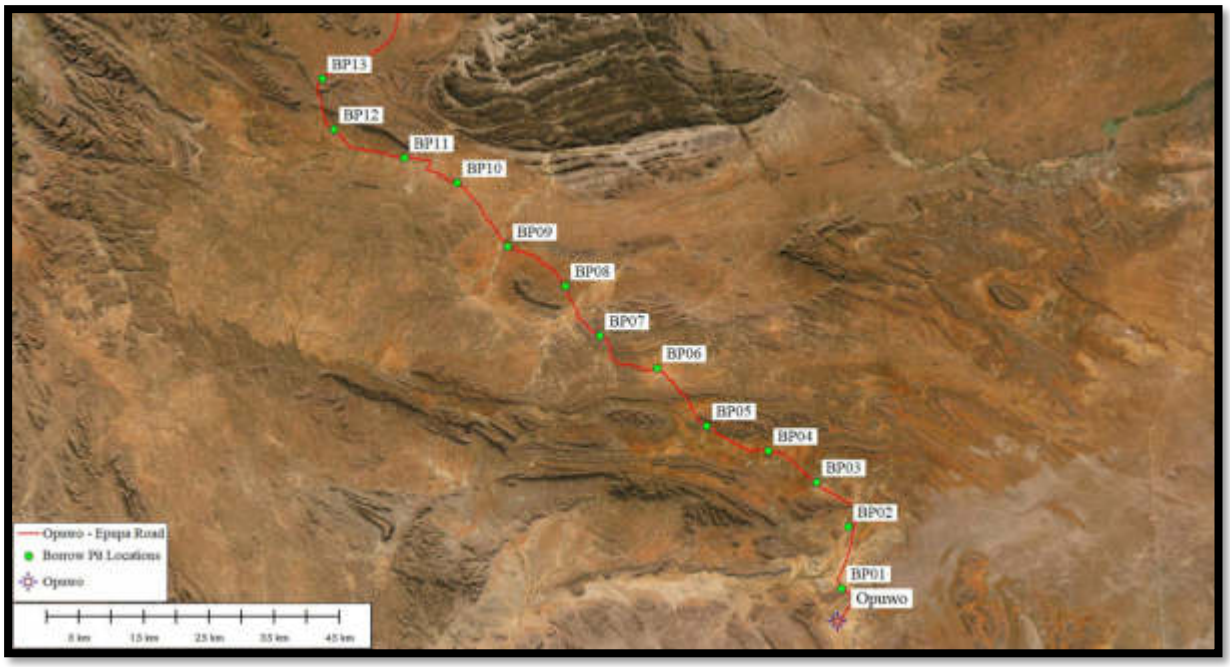

Figure 3: Borrow Pit Positions

Two additional possible quarry positions were identified during the Borrow Pit Investigation between Opuwo and Ominyandi, as seen in Figure 3 and 4. Quarry Position 01 consisted of dark grey dolomitic material, while Quarry Position 02 consisted of dark brown granitic/gneissic material.

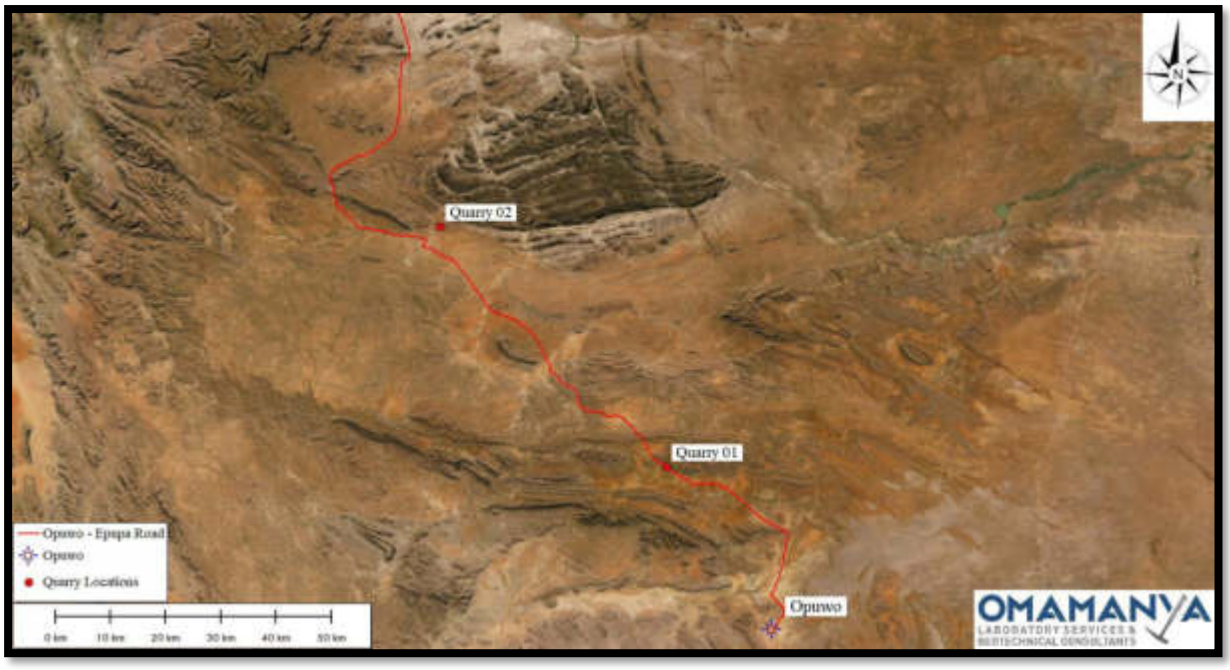

Figure 4: Possible New Quarry Locations

Figure 5: Dolomite from Quarry 01

Figure 6: Granite from Quarry 02

3.4 Construction Water Requirements

Contractors must obtain the consent of relevant landowners prior to utilizing a water source and Clause B1219 of the Project Specifications (COLTO)[1] contains requirements and standards related to the quality of water used for construction purposes. A water extraction license is required according to the Water Resources Management Act N0.11 of 2013.

3.5 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 might be used for sealing the newly constructed road (dependent on the chosen alternative to be followed). Bitumen in itself 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 close proximity to the existing towns of Opuwo and Epupa. Proper waste management principles should be enforced as stipulated by the Environmental Management Plan.

Sewage management is also 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.

4. 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.

[1] Standard Specifications for Bridge Works for State Road Authorities - COLTO

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

5. Policy, legal and administrative 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 3***, as contained in Appendix B of the Republic of Namibia's Environmental Regulations, may be applicable and will require Environmental Clearance.

Table 3: Listed Activities in Terms of the Environmental Management Act

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

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
Forest Act 12 of 2001	Provision for the protection of natural vegetation. No regulations promulgated yet.	• Permits should be obtained from Department of Forestry for the removal of protected trees.

Statute	Provisions	Project Implications
	Section 22(1): It is unlawful for any person to "*cut, destroy or remove:* • 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. • 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.	
National Heritage Act 27 of 2004	Heritage resources to be conserved in development.	All archaeological sites to be identified and protected.
Nature Conservation Ordinance 4 of 1975	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.
Preservation of Trees and Forests under the Forest Act, 2001.	Protection to tree species.	The Contractor will require a permit to remove any protected trees.
Soil Conservation Act 76 of 1969	Prevention and combating of soil erosion; conservation, improvement and manner of use of soil and vegetation, and protection of water sources. The Minister may direct owners or land occupiers in respect of *inter alia* water courses. No Regulations exist to this effect.	Removals of vegetation cover to be avoided and minimized at all costs. Soil pollution to be avoided.
Water Resources Management Act 11 of 2013	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. Section 566 states that any drilling to be conducted or enlargement of an existing	Obligation not to pollute surface water bodies. The following permits are required in terms of the Water Act: • water abstraction license that will form part of the contract obligations.

Statute	Provisions	Project Implications
	borehole can only be conducted under a permit issued under the Act. 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.	
Public Health Act 36 of 1919	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.
Government Notice No 121 of 1969 as amended as well as Government Notice No. 156 of 1 Aug 1997	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) clarify the obtainment of material required for the construction of the roads in Namibia. It states the following:

For the purpose of 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 7*** *below:*

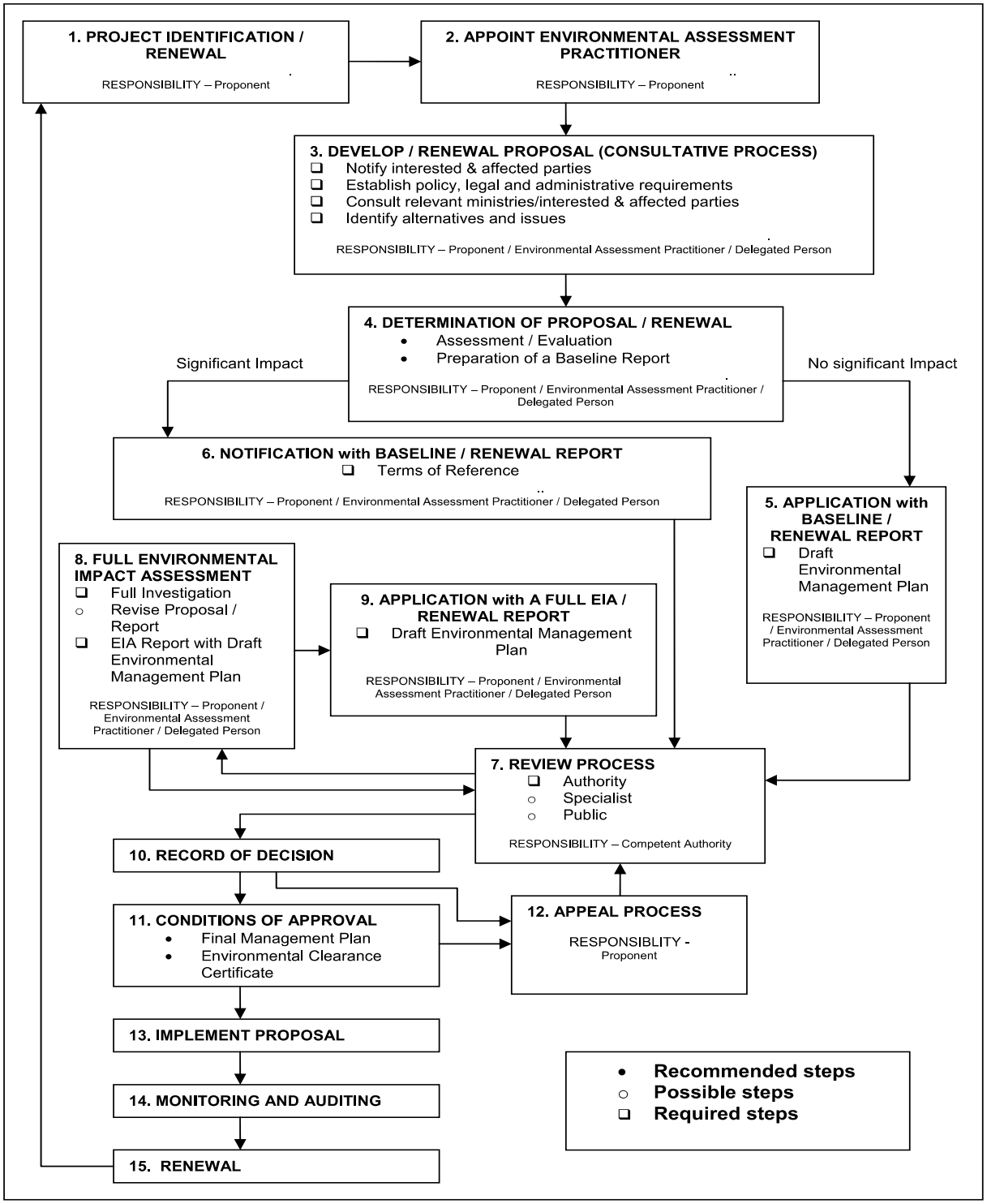

Figure 7: EIA Process

6. Description of baseline conditions

This section describes the bio-physical aspects of the study area to allow for identification of elements of environmental sensitivity and to provide the context for the assessment of significance of impacts related to the proposed project.

6.1. Rainfall and Temperature

The Opuwo area is characterized with a semi-arid highland savannah climate typified as very hot in summer and moderate dry in winter. The highest temperatures are measured in October with an average daily temperature of maximum 25.5ºC and a minimum of 17.6ºC. The coldest temperatures, conversely, are measured in July with an average daily maximum of 18.8ºC and minimum 11.8ºC (*Weather, the Climate in Namibia*, 1998 – 2018). The area therefore has fairly low frost potential.

The relative humidity between the least and most humid months varies between 10-20% and 80-90%, respectively with the average annual rainfall being between 350-400mm. Variation in annual rainfall is however quite high with between 40-50%. Rainfall in the area is typically sporadic and unpredictable however the average highest rainfall months are October to March[2].

Table 4: Rainfall and temperature - Opuwo

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature °C	23.8 °C	23.6 °C	23.3 °C	23.3 °C	21.9 °C	18.9 °C	18.8 °C	21.1 °C	24 °C	25.5 °C	25.2 °C	24.4 °C
Min. Temperature °C	17.7 °C	18 °C	18.3 °C	17.5 °C	15.2 °C	12.2 °C	11.8 °C	13.2 °C	15.3 °C	17.4 °C	17.9 °C	17.8 °C
Max. Temperature °C	30.8 °C	30.1 °C	29 °C	29.3 °C	28.6 °C	26.2 °C	26.2 °C	29.3 °C	32.8 °C	34.1 °C	33 °C	31.9 °C
Rainfall mm	93	111	107	28	0	0	0	0	2	15	42	66
Humidity(%)	47%	53%	59%	46%	30%	28%	26%	21%	19%	24%	31%	37%
Rainy days (d)	8	9	11	4	0	0	0	0	1	3	5	6
avg. Sun hours (hours)	10.6	9.8	9.1	9.8	10.1	10.0	10.0	10.4	10.8	11.2	11.3	11.2

6.2. Air quality

6.2.1 Existing Sources of Air Pollution

The proposed project site is located in rural areas where the air quality is not affected by large scale anthropogenic activities. The following sources of air contamination have been identified:

- Vehicle dust and exhaust gas emissions
- Wind-blown dust from sparsely vegetated surfaces
- Veld fires

[2] https://en.climate-data.org/africa/namibia/kunene-region/opuwo-26494/

6.2.2 Sensitive Receptors

The proposed project is located between the towns of Opuwo and Ominyandi which have a very few receptors and therefore dust reduction is not a high priority during the construction phase of the project.

6.2.3 Wind

The prevailing wind direction is expected to prevent the spread of any nuisance namely noise and smell. The predominant wind in the region is easterly with westerly winds from September to December (*Weather, the Climate in Namibia*, 1998 – 2018). Extreme winds are experienced in the months of August and September and thus significant wind erosion on disturbed areas is visible.

6.3. Topography

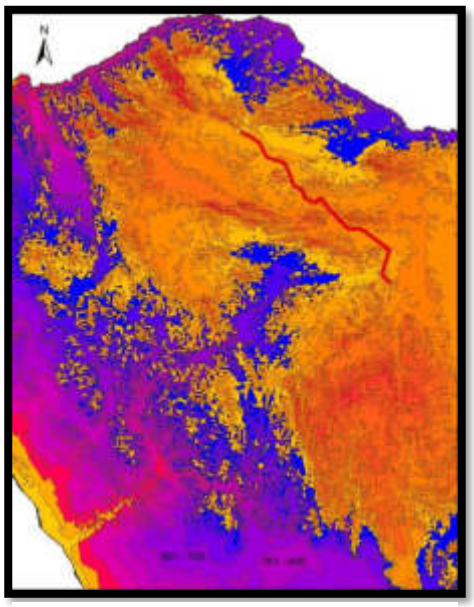

Figure 8: Topography of the project area

The proposed route is situated on the Central Plateau of Namibia with altitudes varying from 1000m to 1500m above sea-level. The general topography of the area is characterised by plains with surrounding mountainous areas.

The Steilrand Mountains is situated northwest from Opuwo with a peak hight of 1965 m. This mountain range traverse from east to west with smaller outcrops present as the road traverse northwest towards Ominyandi.

The Kunene River to the north is situated in the lowest part of the area, therefore the road slightly decreases in height to the north.

6.4. Geology

The area is generally underlain by basement rocks of the Okapuka Suite, Damaran rocks of the Nosib Group, and Alluvium sediments (Figure 5). The Mokalian (Mok) Okapuka Formation (2000 to 1200 Ma) belongs to the Khoabendus Group. Equivalents of this unit are thought to be present in the Khoabendus Inlier (Kamanjab) and Rehoboth areas (Elim Formation). Lithologically this heterogeneous unit consists of highly deformed and metamorphosed phyllite, quartzite, limestone, magnetite quartzite, gneiss, felsic and mafic volcanic, ortho-amphibolite and greenschist.

The Nosib Group is a package of (meta-) sandstones, conglomerates and siltstones that has been informally subdivided into lowermost conglomerate-sandstone, middle siltstone-dominant, and uppermost sandstone-conglomerate sequences. The total thickness ranges to more than 1000m in

some places. The Nosib Group comprises a series of prominent exposures of feldspathic quartzite to arkose, conglomerate and shale. The Nosib Group unconformably overlies the basement of the Okapuka Suite and Formation and is commonly preserved as open synclines or monoclines.

The majority of the rock outcrop along the C43 road can be classified as Dolomite, Limestone, Granite and Gneiss, with Anorthosite occurring in the area closer to Epupa[3].

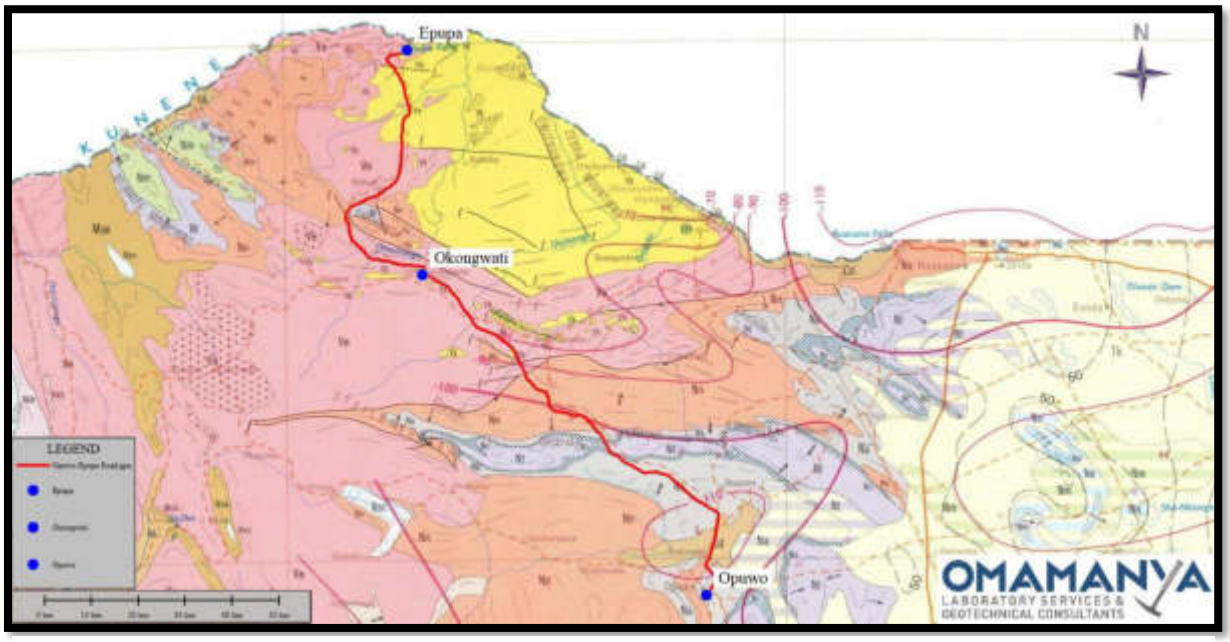

Figure 9: Geology of the project area

6.5. Soil and vegetation

The soils are variable although dominated by rock outcrops and chromatic cambisols – i.e. soils with bright colours characterised by changes in colour, structure and consistency. The soil fertility is usually moderate or high in part because of their good water holding capacity and internal drainage (Mendelsohn et al. 2002).

[3] Omamanya materials investigation report. 2021.

The general area is commonly – albeit broadly – referred to as the Mopane Savannah (Giess 1971) or Western Highlands (Mendelsohn et al. 2002) and the vegetation structure is classified as grasslands and scattered trees.

According to Maggs (1998) there are approximately 4344 higher plant species with the most species being within the grasses (422), composites (Asteraceae) (385), legumes (Fabaceae) (377) and fygies (Mesembryanthemaceae) (177), recorded from Namibia. Total species richness depends on further collecting and taxonomic revisions. High species richness is found in the Okavango, Otavi/Karstveld, Kaokoveld, southern Namib and Central Highland (Windhoek Mountains) areas. Endemic species – approximately 687 species in total – are manly associated with the Kaokoveld (north-western) and the succulent Karoo (south-western) Namibia. The major threats to the floral diversity in Namibia are:

1). Conversion of the land to agriculture (with associated problems) and,
2). poorly considered development (Maggs 1998, Mendelsohn et al. 2002).

The Mopane Savannah, as the name implies, is characterised by Colophospermum mopane in tree and shrub form while the grasses are varied and dependant on soil types (Giess 1971). Trees are mainly associated with the various drainage lines whilst shrubs dominate the plains. Grasses are dominated by Entoplocamia aristulata, Stipagrostis hirtigluma and Schmidtia kalahariensis (Giess 1971). The overall vegetation structure can be classified as “woodland and sparse shrubland” (Mendelsohn et al. 2002).

The average plant production is viewed as “medium to high” with a variation of in green vegetation biomass between 5%-15% (depending on the locality) (Mendelsohn et al. 2002). The overall plant diversity (all species - “higher” plants) in the general area is also viewed as “varied” and estimated at between 150-499 species (depending on the locality) (Mendelsohn et al. 2002). Plant endemism is viewed as “average” with between 6 to 15 species expected from the general area although the Opuwo area is higher with between 16 to 25 species including local endemics (Mendelsohn et al. 2002). Simmons (1998b) puts the plant endemism at between 1 and 20 species depending on the locality.

Bush thickening (encroachment) is not viewed as problematic in the general area with densities <2,000-3,000 plants/ha of Colophospermum mopane (mopane) expected (Bester 1996, Cunningham 1998, Mendelsohn et al. 2002).

Furthermore, Mendelsohn et al. (2002) views the grazing and browse as “low to average” in the general area (browse good in the ephemeral rivers) with the risk of farming viewed as “high” and the tourism potential of this area also viewed as “high”.

The Savannah Biome (of which the proposed route(s) form part of) is underrepresented in the protected area network in Namibia covering 37% of the land area, but only 7.5% of the biome (Barnard 1998). The lower Kunene River and entire northern Kaoko escarpment are viewed as sites of special ecological importance due to the biotic richness; large desert dwelling mammals and high value for human subsistence and tourism (Curtis and Barnard 1998). This biotic richness is mostly associated with the intersections of the rocky terrain and major ephemeral river courses in the area. Furthermore, the entire Koakoveld is also viewed as a major tourism area with high endemicity; habitat and cultural integrity threatened by tourism pressure (Curtis and Barnard 1998) [4].

[4] Cunningham, P.L. 2021. Ecological Assessment of upgrading an access route between Opuwo via Okonhwati to Baynes Hydro Power Project site to bitumen standard. Environment and Wildlife Consulting Namibia.

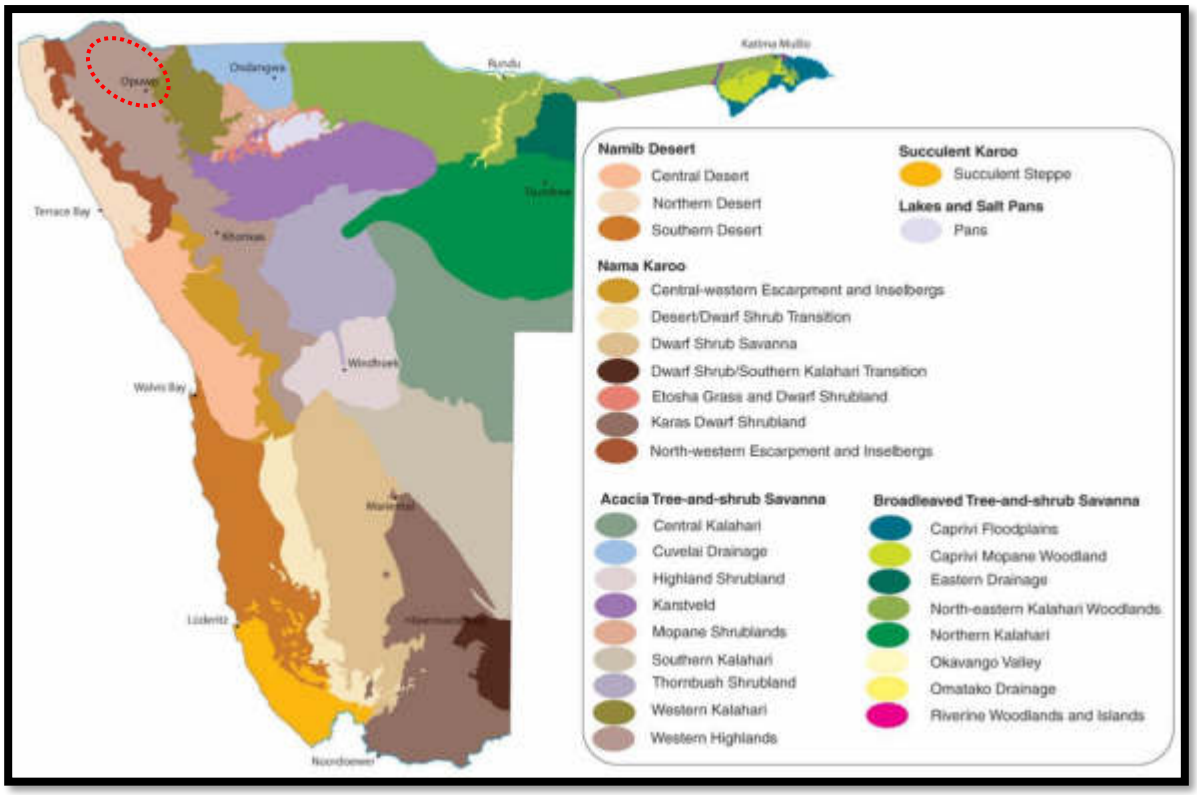

Figure 10: Biomes and vegetation types in Namibia

(Source: Mendelsohn et al. 2002).

The proposed development falls within the Mopane Savannah (Giess 1971) or Western Highlands (Mendelsohn et al. 2002). Study area shown as red dashed oblong.

6.6 Land Use

The proposed project area is located in commercial/residential and communal land. Tourism plays a secondary economic role in this area and access to these tourism destinations are important.

The route passes through (partially in cases) at least 5 communal conservancies as indicated from Opuwo to Epupa (southeast to northwest) – i.e. Ombombo, Ombazu, Kunene River, Okanguati and Epupa (MEFT/NACSO 2021). The closest formally protected areas are the Etosha National Park and the Skeleton Coast National Park (approximately 100-150km to the southeast and west, respectively)[5].

[5] Cunningham, P.L. 2021. Ecological Assessment of upgrading an access route between Opuwo via Okonhwati to Baynes Hydro Power Project site to bitumen standard. Environment and Wildlife Consulting Namibia.

6.7 Surface and Groundwater

The only perennial river draining the general area is the Kunene River while smaller ephemeral drainage lines (southeast to northwest) include the Hoarusib, Ondoto, Otjitango, Ombuka, Omuhonga and Oheuva Rivers (Mendelsohn et al. 2002).

According to the Hydrogeological Map of Namibia, from Opuwo half way to Epembe (north) lies within fractured, fissured or karstified aquifers with moderate to high groundwater potential. Further north towards Okangwati the groundwater potential is very limited and characterised by dominant rock bodies of granite, gneiss and old volcanic origin[6].

6.8. Fauna

The general Opuwo-Epupa area is regarded as “average” in overall (all terrestrial species) diversity, while the overall terrestrial endemism on the other hand is “average to high” (Mendelsohn et al. 2002). The overall diversity and abundance of large herbivorous mammals (big game) is viewed as “low” with 1-2 species while the overall diversity of large carnivorous mammals (large predators) is determined as “average” at 3 species with leopard, spotted hyena and brown hyena being the most important with “ low to medium” densities as expected in the area (Mendelsohn et al. 2002). Simmons (1998b) views the area as having high reptile (13-18 species) and mammal (9-11 species) endemism with combined vertebrate taxa of 161-200 species.

According to the literature survey an estimated (i.e. at least) 81 reptile, 16 amphibian, 109 mammal, 255 bird species (breeding residents), 188 larger trees/shrubs (>1m in height) and 58 grasses are known/expected to occur in the general area – i.e. along the proposed access route(s) – of which a high proportion are endemics (e.g. 35.8% for reptiles)[7].

[6] Van Wyk and Struckmeier. 2001. Hydrogeological Map of Namibia. NAMWATER

[7] Cunningham, P.L. 2021. Ecological Assessment of upgrading an access route between Opuwo via Okangwati. to Baynes Hydro Power Project site to bitumen standard. Environment and Wildlife Consulting Namibia.

6.9. Archaeological and Anthropological Resources

Figure 11: Grave site alongside the route

The heritage of Namibia is protected in terms of the National Heritage Act of 2004. This legislation obliges a developer to identify any heritage sites before project implementation. In Namibia, the heritage aspects are normally covered in the EA of the project.

The proposed project will be constructed in a very pristine area of Namibia. However it is important to note that the existing gravel road alignment will be followed with a few geometrical corrections.

It is anticipated that most existing borrow pits will be used for the construction of the layer works of the road.

The only significance with regards to archaeological material are the graveyards, sacred or ritual tress and places. It must be mentioned that the various grave sites found alongside the road is modern areas which have been fenced for easy identification.

Following the survey of the proposed route and consultations with the local headmen it appears that there are numerous graves alongside the road:

Grave Locations
POINT(13.81790 -17.87199)
POINT(13.59218 -17.71106)
POINT(13.52440 -17.68336)
POINT(13.32903 -17.46022)
POINT(13.31671 -17.45411)
POINT(13.23160 -17.21850)
POINT(13.85178 -17.96645)
POINT(13.47666 -17.62350)

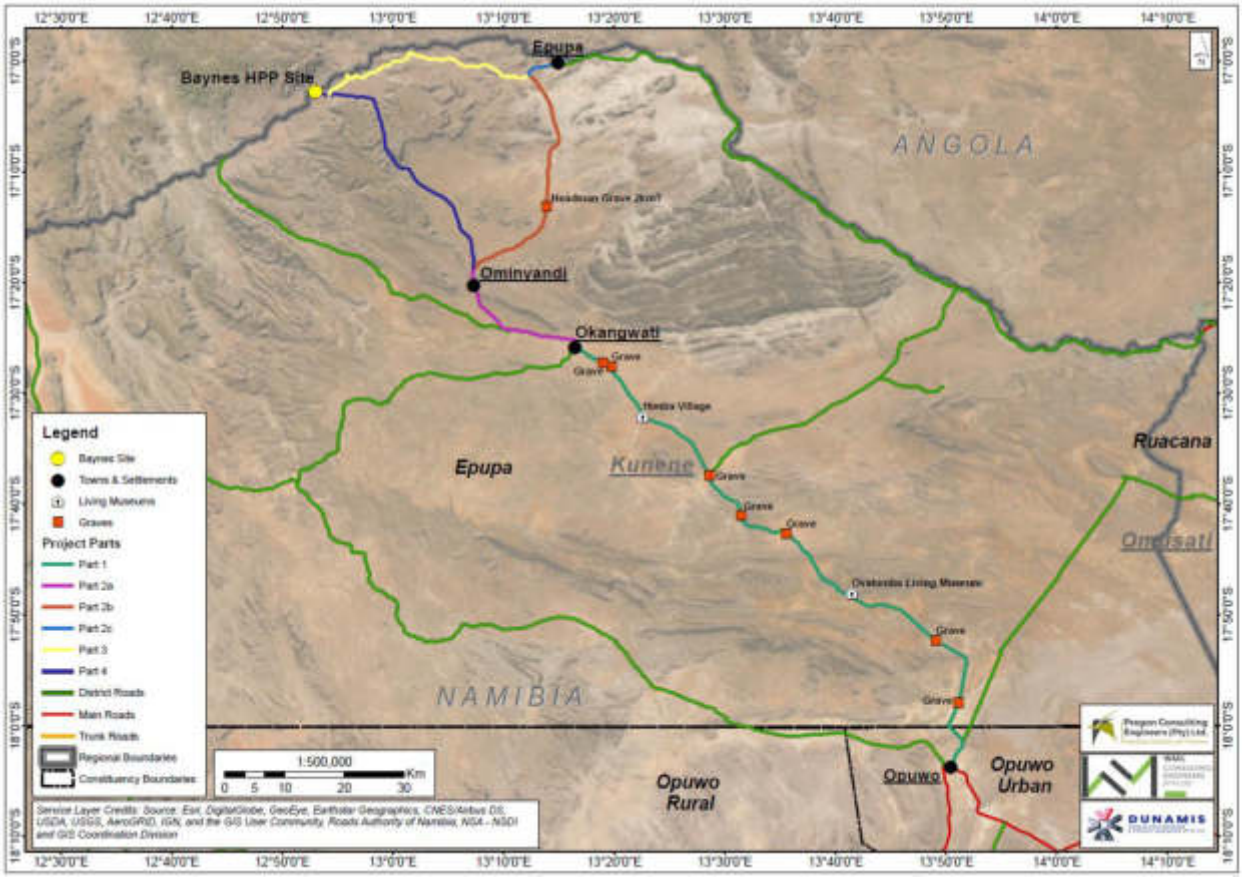

Figure 12: Grave points identified alongside the road

6.10. Noise

Even though tourism plays an important economic role in this area it is anticipated that noise will not be an important aspect to consider due to the current movement of traffic on the gravel roads. No other source of noise is anticipated.

6.11. Visual Impacts

Visual impacts associated with a bitumen road was considered during the project phase and argued during the public participation meetings. It seems that there will not be a substantial difference in visual perception from the existing gravel road and the planned bitumen road. What is of importance is the aesthetic experience from the tourist when he/she is driving through the landscape.

6.12. Socio-economic background

The Kunene Region accounts for the fifth smallest populated region, situated in the north-western part of Namibia, bordered by the Atlantic Ocean to the west, Angola to the north, Omusati, Oshana, Oshikoto regions to the east, Otjozondjupa Region to the south-east and Erongo Region to the south.

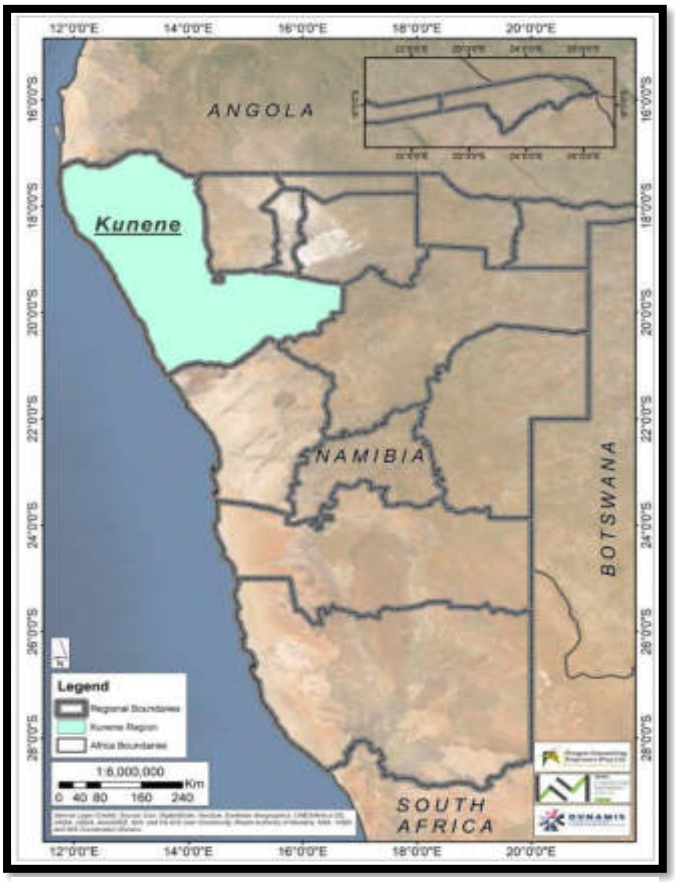

Figure 13: Map of Namibia Showing Kunene Region

Although the smallest in population, Kunene Region is the second largest region geographically with a land size of 115,291 km2 (Kunene Regional Council (KRC), 2015, p. 14). The //Kharas Region is the largest geographically.

As with most of Namibia, the Kunene Region is classified as a semi-arid, with a low rainfall, depending on the location. The western parts of the region receive very little rain, as it forms part of the Namib Desert. The northern parts normally received most rainfall, followed by the eastern and southern part. The region is therefore very dry with dust storms being a regular occurrence.

As with most of Namibia, the Kunene Region is known for its wide-open spaces, Epupa Waterfall, Skeleton Cost and the traditional lifestyles of the Ovahimba people.

The Kunene Region consists of seven political and administrative constituencies: Epupa, Opuwo Urban, Opuwo Rural, Sesfontein, Khorixas, Kamanjab and Outjo. Each of the constituencies has a constituency capital. Opuwo Town situated in the Opuwo Constituency serves as the regional administrative capital, where the Regional Council is housed. However, key regional offices, such as education amongst others are located in other urban settings, because of the geographic size of the region and long distances between places.

The Region is governed politically and administratively by the KRC headed by the Regional Governor, who is appointed by the President of the Republic of Namibia.

Figure 14: Map of Kunene Region with Urban Areas

Democratically elected Constituency Councillors are political heads of constituencies. The KRC is guided by the Namibian Constitution, Local Authorities Act and KRC Strategic Plan, 2017/18-2021/22, which is unpacked in KRC annual plans. The Strategic Plan is aligned with Namibia Vision 2030, Fifth National Development Plan (NDP5), Harambee Prosperity Plan (HPP), Performance Management System philosophy goals, Sustainable Development Goals (SDGs), and SWAPO Party 2014 Election Manifesto. The Strategic Plan is cemented by four pillars (KRC, 2017, p. 6):

- Good Governance
- Infrastructure Development
- Institutional Development
- Integrated Development

The Namibia Statistics Agency (NSA) in 2014 projected Namibia's total population to be 2.55 million (medium variant) in the year 2021. This is an increase from the 2.11 million found during the 2011 Housing and Population Census at an annual population growth rate of 1.96 percent (NSA, 2014a). The Kunene Region grew from a total population of 86,856 in the year 2011 to a projected total population of 110,000 (medium variant) in 2021 at an annual growth rate of 2.3 percent). It is envisaged that the population of the region will continue to grow to 133,000 by 2031 (NSA, 2014b, p. 4, 9, 10).

The Feasibility Study project area falls within the Epupa Constituency only, which is one of six constituencies in the Kunene Region. The Epupa Constituency makes up 20.4 percent of the total regional geographic area at 23,617 km2 of 115,616 km2. This constitute the third largest constituency

after Outjo and Opuwo constituencies. The constituency with the smallest geographic area was Kamanjab Constituency.

The Epupa Constituency housed the second largest population of 17,696 after Opuwo Constituency with 27,272 in the year 2011 (NSA, 2014c, p. ii). The annual population growth rate has been 3.0 percent until 2011. Based on the same annual growth rate, it is estimated that the population has grown to 23,782 by 2021, and will continue to grow to 31,961 by 2031. Epupa Constituency is very sparsely populated with a population density of 0.7 people per sq/km; slightly lower than the regional population density of 0.8 people per sq.km. Epupa means 'falling waters' or 'waterfall' in the Otjiherero language[8].

7. Public Participation Process

A comprehensive Public Participation process was conducted for this project which are in guidance with the requirements of the Environmental Management Act no.7 of 2007. The public participation process was regarded as an equally essential component of the overall study, as it ensured an additional opportunity for all I&APs to voice their views and opinions regarded the road upgrade.

Three Public Participation Meetings were held at the beginning of the study at the following sites, dates and times:

- Opuwo Roman Catholic Church on 17 August 2021 at 09h00 (started 10h30)
- Okangwati Community Meeting Place on 18 August 2021 at 10h00 (started at 10h30)
- Epupa Community Meeting Place on 18 August 2021 at 14h00 (started at 15h45)

In order to ensure that all I&APs were aware and invited to the above-mentioned meeting, the following avenues were used for invitations:

- Newspaper adverts in the Namibian, Republikein and New Era newspapers
- Sensitisation and invitation letters to the Kunene Regional Governor
- Public posters placed at strategic places in Opuwo, Okangwati and Epupa
- Radio announcements in local languages
- Invitations via the office of the Regional Governor and Epupa Councillor

The Office of the Regional Governor played a key role in inviting participants. The Regional Governor visited Traditional Authorities prior to the meeting with the sole purpose of sensitising them about the

[8] Sustainable Development Africa. 2021. Social Impact Assessment – Feasibility Study for the upgrade to bitumen standard of access road: Ominyandi settlement to Baynes Hydro Power Site.

road upgrade from Opuwo to Okangwati and Ominyandi. The invitation strategy seemed to have worked well, because more than 600 people attended the three meetings combined.

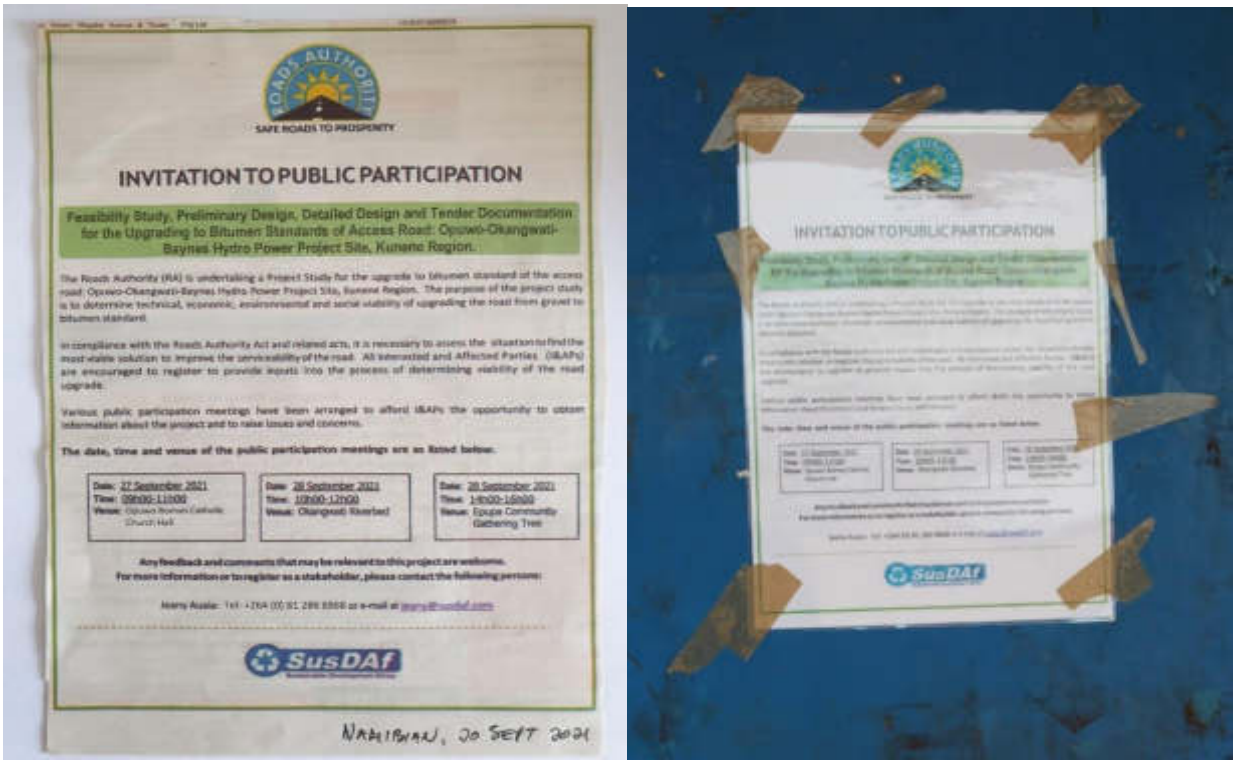

Figure 15: Public Participation Meeting Invitation Newspaper Advert and Poster Pasted on a Shop Door, Okangwati Settlement

Detailed discussions took place where I&APs could raise their expectations, queries and questions. The Feasibility Study social, environmental and engineering team members were present at the three meetings in order to respond to questions and queries. Representatives from the RA and the Angola-Namibia Permanent Joint Technical Commission (PJTC) a was also present at both meetings to respond to relevant questions and queries.

The Regional Governor, Honourable Marius Sheya attend and opened all three meetings. The meetings were exceptionally well attended by all relevant Traditional Authorities. Other regional government offices and the private sector were well represented. Please find **Appendix D** for the full Social Impact Assessment Report (2021 – Sustainable Development Africa 2021). In excess of 500 people cumulatively attended the three PP meetings.

Traditional Authorities and other attendees to the meetings were very vocal and participated well. The key issues eminating from the meetings were:

- The upgrading of the road from Ominyandi to Baynes HPP Site was a highly sensitive issue for affected Traditional Authorities and communities, because the road upgrade was directly linked to the development of the Baynes HPP, including the building of the ancillary dam.
- Traditional Authorities made it clear that they have not officially agreed to the development of the Baynes HPP Site, and that discussions were ongoing.
- An overwhelming majority of Traditioinal Authorities and affected community members were in favour of the upgrade from Ominyandi to Epupa and Orokawe.
- Serious concerns were raised about the recruitment and employment of unskilled labour by the road contractor, based on previous experience elsewhere where outside labour was sourced. The key recommendation was for the contractor to work closely with the Kunene Regional Council and affected Traditional Authorities in the recruitment of unskilled labour.

The Public Participation meetings were also used to get consent and approval by attendees for photos to be taken of them and placed in project reports where needed.

Photo: Public Participation Meetings at Opuwo, Okangwati and Epupa




8. Environmental impacts

The Scoping Report will look at the Construction and Operational Phases of the project to determine the significance of the expected environmental impacts associated with the upgrade of the existing gravel road to a bitumen standard road. 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
  - 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

8.1. 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.

Table 5: Environmental Scoping Checklist

PART 1 OF THE SCOPING CHECKLIST: QUESTIONS ON PROJECT CHARACTERISTICS				
1. Will construction, operation or decommissioning of the Project involve actions that 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 investigators 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 mostly be followed therefore there are no significant impacts anticipated.
1.6	Demolition works?	Yes	The removal of old culverts.	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	Coastal structures egg seawalls, piers?	No		
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 popular tourist route.
1.19	New road, rail, air, water borne or other transport infrastructure including new or altered routes and stations, ports, airports etc?	No	The current alignment will be followed.	The significance will be low due to the width and current alignment to be used.

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 low due to the temporary nature of the activities.
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	New culverts will be constructed.	Should proper planning and consultation with local communities be applied, negative impacts on the hydrology of the rivers and tributaries should be limited therefore reducing the significance. Construction of new culverts will have a
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 boreholes will be used and the significance will be medium due to the scarcity of available water.
1.25	Changes in water bodies or the land surface affecting drainage or run-off?	Yes	The existing road impact on the drainage patterns.	The significance will be Low positive due to improved capacity of the drainage structures
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?	?	It is uncertain what the impact might have on the migration of people in the region.	The significance is estimated to be low, but possible.
1.30	Introduction of alien species?	No		
1.31	Loss of native species or genetic diversity?	No		
1.32	Any other actions?	No		

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?				
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?	Yes	During construction, geological materials will be used for the filling and layer works. Soils will be affected and might therefore impact negatively on the agricultural / communal land.	The significance is low. The existing alignment will be followed with some small adjustments.
2.2	Water?	Yes	Water is used for domestic and construction purposes.	The available water will be used for construction. The significance will be medium due to the low volumes available.
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?	?	There is always a risk of altered quality with regards to living conditions of the adjacent people and the environment. This is with reference to HIV/AIDS.	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?	Yes	The proposed route will impact positively on the vulnerable groups due to improved mobility network and increased safety.	Positive medium significance.
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		

6. Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?

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		

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?

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)?*	No		
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?	?	In-migration of people might be a possibility.	The significance is unsure.
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		
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?				
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. Lower vehicle operating costs will contribute to the National economy.	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: • supporting infrastructure • housing development • extractive industries • supply industries • other?	Yes	Stimulating the tourism industry.	This might be a significant positive impact on the town of Opuwo and Epupa.
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?	?	Unlikely	
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.

Question - Are there features of the local environment on or around the Project location which could be affected by the Project? • The road travels through numerous conservancy areas as mentioned in this report. • There is a possibility of features of high historic or cultural importance. • Surface drainage patterns will be addressed through proper engineering design.
Question - Is the Project in a location where it is likely to be highly visible to many people? This road is not used extensively; therefore, the location is not highly visible to many people.
Question - Is the Project located in a previously undeveloped area where there will be loss of Greenfield land? No, the road will be constructed on the existing alignment.
Question - Are there existing land uses on or around the Project location which could be affected by the Project? There will be numerous borrow pits that will be opened but will affect the existing land uses significantly.
Question - Are there any plans for future land uses on or around the location which could be affected by the Project? No. The area will probably remain agricultural / communal.
Question - Are there any areas on or around the location which are densely populated or built-up, which could be affected by the Project? No.
Question - Are there any areas on or around the location which are occupied by sensitive land uses which could be affected by the Project? No.

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?

There are no scarce resources found around the project that could be influenced by the construction or operational phases of these projects, but there are some flora species (trees) that are protected by Forestry Legislation.

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?

No. The area has been subject to agricultural and urban activities.

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?

No.

Question - Is the Project likely to affect the physical condition of any environmental media?

No, the proposed project will be constructed mostly on the existing alignment.

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.
- The air quality will increase should the road be upgraded to bitumen standard.

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?

8.2. 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
Creation of new land uses.	The existing land use will change from agricultural to road (land use).	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 possible removal of old culverts and bridges.	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
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	There will be temporary bypasses constructed.	Negative	Low

leading to changes in traffic movements?			
Impoundment, damming, culverts, realignment or other changes to the hydrology of watercourses or aquifers.	Water balancing is an important aspect to be evaluated. Improving the culverts on the road will be positive.	Positive	Low
Abstraction or transfers of water from ground or surface waters?	Water will be extracted for the construction phase of the project.	Negative	Medium
Changes in water bodies or the land surface affecting drainage or run-off?	Drainage will improve due to the increased structures (culverts) and widening of the bridges.	Positive	Medium
Influx of people to an area in either temporarily or permanently	Migration of people might impact on the socio-economic structure of the area. The risk of HIV/AIDS may increase due to the influx.	Negative	Low
Loss of native species or genetic diversity?	Surface disturbances always impact on the biodiversity of an area.	Negative	Low
Resources such as land and water.	Very limited agricultural land will be affected due to the construction of the road.	Negative	Low
	Water is used for domestic and construction purposes.	Negative	Medium
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
Will the project affect the welfare of people eg by changing living conditions?	The proposed route will impact positively on the vulnerable groups due to improved mobility network.	Positive	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
	Gasses such as Nox and Sox are deposited in the air from the machines.	Negative	Low

Emissions from combustion of fossil fuels from stationary or mobile sources.	The movement from vehicles will generate noise, dust and gaseous emissions.	Negative	Low
Will the project cause noise and vibration from blasting?	Blasting might be conducted which will impact on existing water sources, houses and other receptors in the area.	Negative	Low
Emissions from burning of waste in open air (eg slash material, construction debris)?	Burning of waste will negatively affect the air quality.	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	Medium
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?	New road will be constructed which will benefit the communities by improving access to schools, clinics, tourism places and churches.	Positive	Medium
	New road will be constructed which will benefit the communities. Lower vehicle operating costs will contribute to the National economy.	Positive	Medium
Will the project lead to development	Access improvement to facilities in the region will benefit the local and regional communities.	Positive	Medium

9. Environmental and social management plan

The Minimum Requirements for the Environmental and Social Management Programme (ESMP) are attached in this document. It sets out as the minimum generic standards applicable to such a project. A detailed site specific ESMP should be drafted before commencement of the Construction phase.

The ESMP is intended to bridge the gap between the Environmental Assessment (EA) and the implementation of the project, particularly with regards to implementing the mitigation measures recommended in the Environmental Assessment (EA). 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 further ensures that environmental performance is increased through mitigation measures 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.

9.1. ESMP Administration

The ESMP must be part of the Tender and Contract documentation. 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.

9.2. 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 and Engineer's Representative (ER)

The Engineer shall delegate powers to the Engineer's Representative (ER) in respect of implementation of the ESMP. The Engineer 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 Contractor's appointment of the Environmental Control Officer (ECO).

Any on-site decisions regarding environmental management are ultimately the responsibility of the Engineer. The ER shall 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.
- Advising the Contractor and the Contractors ECO in finding environmentally responsible solutions to problems.
- Taking appropriate action if the specifications are not followed.
- Ordering the removal of person(s) and/or equipment not complying with the ESMP specifications.
- Issuing penalties for non-compliance to mitigation measures pertained in the ESMP.
- Advising on the removal of person(s) and/or equipment not complying with the specifications.
- 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 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:

- Regular site inspections of all construction areas with regard to compliance with the ESMP.
- Evaluate and verifying adherence to the ESMP.
- Advising the Contractor in finding environmentally responsible solutions to ESMP non-compliance activities.
- Organise and facilitate environmental awareness training for all new personnel coming onto site.

9.3. Environmental Awareness 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 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.
- The contractor shall keep records of all environmental training sessions, including names, dates and the information presented.

9.4. Public Participation

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

9.5. Environmental Auditing

Environmental auditing should be conducted at least once every three months during the construction phase. These environmental audits will be conducted by an environmental consultant with the required experience and sub-contracted by the Engineer.

Benefits derived from the audit process include:

- identification of environmental risks observed during a site visit;
- development or improvement of the environmental management system;
- suggested improvements to the ESMP;
- inspecting the required permits and licenses;
- increase in staff awareness with regards to the environment and the ESMP;

- inspect environmental incident reports, environmental monitoring and recording documentation. These documents will be compiled and filed by the ECO.

Commonly, the audit of a site will cover all environmental management procedures, operational activities & systems, and environmental issues.

9.6. Documentation, Record keeping and Reporting Procedures

The Contractor shall develop and implement an effective document handling and retrieval system for all ESMP documentation on site. This will ensure that there is adequate ESMP documentation control and will facilitate easy document access and evaluation. ESMP documentation should include (but are not limited to):

- ESMP implementation activity specifications;
- training records;
- site inspection reports;
- monitoring reports; and
- auditing reports.

The Environmental Control Officer is responsible for ensuring that the registration and updating of all relevant ESMP documentation is carried out. The ECO is responsible for ensuring that the latest versions of documents are used to conduct tasks which may impact the project environment.

9.7. Environmental Mitigation Measures / Environmental Management Plan

The following mitigation measures are sufficient to reduce or avoid negative impacts associated with the construction of a road. It is based on the activities mentioned in this report that will occur during the construction phase of the project:

COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	RESPONSIBILITY/ PARTNERSHIPS
9.7.1 MANAGEMENT AND MONITORING	To ensure that the provisions of the ESMP are implemented during construction.	The independent environmental consultant shall monitor that all aspects of the ESMP are implemented during the construction phase of the project. The environmental consultant shall conduct site inspections and attend meetings. The site meeting agenda shall make provision for reporting on non-compliance issues related to the ESMP.	Environmental consultant together with the ECO.
9.7.2 COMMUNICATION AND STAKEHOLDER CONSULTATION	To ensure that all stakeholders are adequately informed throughout construction and that there is effective communication with and feedback to the consultant and client.	a. The Contractor shall appoint an ECO from the construction team to take responsibility for the implementation for all provisions of this ESMP and to liaise between the contractor, community, and the Engineer. The ECO must be appointed at least 14 days after the site-handover. b. The Contractor shall at every site meeting report on the status of the implementation of all provisions of the ESMP. c. The contractor shall implement the environmental awareness training as stipulated in Section 9.3 above. d. The Contractor shall liaise with the social and environmental consultants regarding all issues related to community consultation and negotiation as soon as possible after construction commences.	Contractor/ Environmental Consultant to monitor.
9.7.3 HEALTH AND SAFETY	To ensure health and safety of workers and the public at all times during construction	a. The Contractor shall submit a strategy to ensure the least possible disruption to traffic and potential safety hazards during construction. b. The strategy should include a schedule of work indicating when and how road crossings (construction at existing intersections) will be made. The schedule should be updated and distributed to all stakeholders. c. The Contractor shall also liaise with the Traffic Authorities in this regard. d. Proper traffic and safety warning signs must be placed at the construction site as required by the Road Traffic and Transport Act, 1999 (Act 22 of 1999) and the Road Traffic and Transport Regulations promulgated in terms of the Act. e. The Contractor must adhere to the regulations pertaining to Health and Safety, with special reference to the provision of protective clothing. Failing to issue workers with the proper PPE, the Contract may be suspended until corrective actions were taken.	Contractor will ensure the mitigation measures are enforced at his own expense. The ECO will monitor.

COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	RESPONSIBILITY/ PARTNERSHIPS
		f. Dust protection masks shall be provided to task workers if they complain about dust. g. Surface dust will be contained by wetting dry surfaces periodically with a water bowser, sprinkler system or any suitable method. This applies to all individual construction areas on site and to the sections of the road affected. h. Potable water shall be available to workers to avoid dehydration. This water shall be of acceptable standards to avoid any illness. At least 3 litres of drinking water per person per day shall be made available during construction. i. The contractor shall enforce all relevant Health and Safety Regulations for the specific activities associated with this project. j. The Contractor shall implement a HIV/AIDS awareness programme as part of Health and Safety. k. Blasting may only be conducted by a qualified person and all laws and regulations will be enforced before and during blasting. Blasting shall be done in accordance with Clause 1222 of the Standard Specification of the Roads Authority and the Explosives Act 26 of 1956 (Regulations promulgated as amended by the Explosive Amendment Act, 1993).	
9.7.4 CONSERVATION OF THE NATURAL AND HISTORICAL ENVIRONMENT	To minimise damage to soil, vegetation and historical resources during the construction phase. This includes soil crusting, soil erosion and unnecessary vegetation destruction. Management of water (domestic and construction).	a. The main contractor's camp shall not be constructed closer than 500m from any river, stream of tributary from any river / stream. b. At the outset of construction (or during construction as may be applicable), the ECO and the contractor shall visit all proposed borrow-pits, haul roads, access roads, camp sites, and other areas to be disturbed outside the road reserve. Areas to be disturbed shall be clearly demarcated, and no land outside these areas shall be disturbed or used for construction activities. c. Detailed instructions and final arrangements for protection of sensitive areas, keeping of topsoil and rehabilitation of disturbed areas shall be made, in line with the guidelines in this document. The ECO shall be consulted before any new areas are disturbed which have not yet been visited. d. No off-road driving shall be allowed, except on the agreed haul and access roads. e. Vegetation shall be cleared within the road reserve as necessary for the construction of the road, while trees with a trunk diameter exceeding 500 mm (1 meter above ground) shall be left intact or as directed by the Engineer. The areas on either side of the road reserve may not be cleared of vegetation, unless permission is given to do so for detours or access roads. This measure is subject to the Roads Authority's specifications with regards to the road reserve. f. A prescribed penalty will be deducted from the Contractor's payment certificate for every mature tree removed without approval.	Contractor will ensure the mitigation measures are enforced at his own expense. The ECO will monitor.

COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	RESPONSIBILITY/ PARTNERSHIPS
		g. No trees may be felled or live wood in the project area removed by any member of the construction team, including sub-contractors. Contravention of this arrangement is liable for a prescribed penalty. h. A prescribed penalty will be deducted from the Contractor's payment certificate if it is shown that trees and/or branches have been broken down wilfully and unnecessarily, or that any plants have been collected illegally, by any of the staff or sub- contractors. i. Trees that need to be trimmed should be done so with the right equipment and aesthetical acceptable. The use of a saw fit for its purpose is obligatory and the branches of trees will not be broken off by the use of other machinery. j. Where topsoil is available, this must be stockpiled separately in 1,00 m high piles and this used to cover the damaged areas outside the road reserve such as access roads to borrow pits, and clearing and grubbing areas. k. Where compaction has taken place in disturbed areas, these areas must be ripped and covered with topsoil separately kept for this purpose. This aspect shall be provided for in the schedule of quantities – covered by the Standard Specification of the contract. l. Poaching or collecting of wild animals is prohibited. m. The killing of any animal (reptile, bird or mammal) is prohibited, unless for legal hunting purposes. n. A prescribed penalty will be deducted from the contractor's payment certificate if it is shown that any of his staff or sub-contractors are involved in trapping, hunting or any kind of collecting of wild animals in the vicinity of the work sites. Such activities shall be reported to Nampol for prosecution. o. Pipelines for the pumping of construction water shall as far possibly run within the road reserve and along existing tracks and other roads. p. Water will not be allowed to be wasted. This includes water required for construction and domestic purposes.	
9.7.5 BORROW PIT MANAGEMENT AND REHABILITATION	To ensure proper soil management (combat soil erosion and promote biological activities). Preserve and manage natural vegetation.	a. The removal of material at borrow-pit sites shall be focused where the least significant vegetation exists. If material is only available around significant mature trees (more than 500 cm circumference – 1 meter above ground), clusters of trees should be preserved while suitable material is excavated around them. A 3-meter buffer must be conserved around the cluster of mature trees. The ER shall visit all proposed borrow-pit areas and indicate where and how material may be removed, before works commence. A **cluster constitutes 5 or more trees in proximity (within 20m radius).**	Contractor will ensure the mitigation measures are enforced at his own expense. The ECO will monitor.

COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	RESPONSIBILITY/ PARTNERSHIPS
	To ensure health and safety around the borrow pits (decommissioning phase). To stimulate ecological processes after decommissioning (to stimulate vegetation and other biological activities). To establish borrow pits which is aesthetically pleasing after decommissioning.	b. The Contractor shall use safety tape to mark these tree clusters as to avoid confusion or miss-understandings. c. The Engineer shall draft a plan for each proposed borrow pit. Similarly, the Contractor shall draft such a plan for each borrow-pit proposed by him. This plan must indicate the required resources; borrow pit boundaries and sensitive areas that may not be mined (indication of the mature trees). d. The borrow pit areas will be clearly marked by using brightly painted markers. These markers will demarcate the area where materials might be removed and stored. e. All borrow-pits must be rehabilitated. f. The contractor shall liaise with the applicable local headmen OR residents regarding whether their borrow-pits shall be shaped as water reservoirs during rehabilitation. g. At those borrow-pits not to be shaped as reservoirs, topsoil (the top layer containing organic material) shall be stockpiled separately and the stockpile maintained for use at the end of the contract to rehabilitate the borrow pits. h. The topsoil shall be marked as to inform the machine operators that the material is top soil and should be left alone for rehabilitation purposes. i. The borrow pits shall be rehabilitated by trimming the sides to a slope not steeper than 20° (1:5) and evenly spreading the topsoil over the slopes to allow for the growth of new vegetation. j. All spoil material at the borrow pits shall be neatly shaped and covered with overburden (if available). k. Access to borrow pits shall be controlled (using gates or manned positions). l. The borrow pit floor shall be levelled evenly as part of rehabilitation. m. A Borrow Pit Rehabilitation Plan shall be compiled by the Contractor indicating the rehabilitation schedule (time-frames) for the various borrow pits to be rehabilitated. n. After the borrow pit has been rehabilitated, the Rehabilitation Checklist will be completed and signed by the relevant parties.	
9.7.6 WASTE AND POLLUTION MANAGEMENT	To avoid contribution to potential surface and groundwater pollution. To avoid contribution to potential soil pollution.	a. General waste generated during construction will be disposed of on a regular basis at an approved waste disposal site. A temporary waste site may be demarcated for temporary storage of waste, but this area will be identified and clearly marked. b. The temporary domestic waste site will be fenced off with access control to the area.	Contractor will ensure the mitigation measures are enforced at his own expense. The ECO will monitor.

COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	RESPONSIBILITY/ PARTNERSHIPS
	To ensure that sound waste management practices are adhered to during construction.	c. Adequate separate containers for hazardous and domestic waste will be provided on site and at the construction camp. d. The workforce will be sensitised to dispose waste in a responsible manner and not to litter. e. Waste bins will be placed in and around the construction site to facilitate proper waste management. f. No hazardous or domestic waste may remain on site after completion of the project. g. The construction of properly designed sewage facilities is required at the camp site. The sewage should either be removed on a regular basis and dumped at an approved sewage facility or where it is not possible, the sewage should be managed to such an extent that is does not cause any negative effects on the bio-physical or social environments. Proof of disposal shall be kept as record in the ECO file for environmental performance assessment purposes. No free-flowing sewage is acceptable. h. Toilet facilities will be available in the following ratio: 2 toilets for every 20 females and one toilet for every 20 males. The toilets should be such that these can be transported for various site selections and to be emptied at an approved sewage site. No person should have to walk more than 1km for the use of a toilet. i. A demarcated vehicle service area will be provided. This area will have an impermeable floor, oil trap and dedicated wash bay area. All used water will first run through the oil trap before the effluent is allowed to exit. The oil trap will be cleaned on a regular basis to ensure its efficiency. j. Servicing of vehicles is only permitted in the demarcated vehicle service area, except for large immobile vehicles which may be repaired on site, on condition that oils and lubricants are prevented from spilling through the use of drip trays or other suitable containers. k. Drip trays will be available for all vehicles that are intended to be used during construction. These trays will be placed underneath each vehicle while the vehicles are parked. The drip trays will be cleaned every morning and the spillage handled as hazardous waste. l. Machines operating during the day that show signs of excess leaking (verified by ECO or Engineer) should be withdrawn from the task and repaired by the contractor. m. Accidental spills will be cleaned immediately. The contaminated soil will be suitably disposed of in a container suitable for hazardous waste. n. Used oil / lubricants, and other hazardous materials shall be stored in separate containers (metal or plastic). These containers shall be stored in an area with an impermeable floor and bunded walls. The materials and used oils / lubricants shall be disposed of at an approved waste disposal site or for collection by an oil recycling company such as WESCO Salvage (this company collects 3significant quantities of oil from central locations throughout the country).	

COMPONENT	OBJECTIVE	MANAGEMENT MEASURES	RESPONSIBILITY/ PARTNERSHIPS
		o. Fuel tanks on site will be properly bunded. The volume of the bunded area will be enough to hold 1.5 times the capacity of the storage tanks. The floor of the bunded area will be impermeable (welded plastic sheets, concrete or clay) and the sides high enough to achieve the 1.5 times holding capacity. There will be a valve installed in the bunded area to allow rainwater drainage. p. Foam fire extinguishers will be near fuel kept on site. There will be trained personnel to handle this equipment. At least two extinguishers will be placed at every fuel storage area. q. Bitumen batching areas will make use of drip trays to prevent unnecessary spillage of any bitumen products. Cleaning of spray nozzles should be done on the bypass (if it is gravel) or any other section of the road that is in use. This serves as a dust suppressor. r. Bitumen cleaning pits shall be constructed that are effectively lined with an impermeable material. No leaks / seepage is allowed from these bitumen pits. s. Should large quantities of bitumen need to be disposed, it can be done at a borrow pit with the following mitigation measures: (i) the borrow pit shall not be closer than 100m from any river, drainage tributary or stream ; (ii) The aquifer level shall not be closer than 10 meters to the borrow pit floor; (iii) a plastic lining will be laid underneath the proposed dumping area and the spoiled bitumen shall be covered with the same plastic lining as to prevent leaching; (iv) at least three meters of material shall be placed on top of the plastic lining.	
9.7.7 REHABILITATION OF CONSTRUCTION SITE, SERVITUDES AND CLEARED AREAS (WHICH INCLUDES STOCKPILES)	To rehabilitate the site office, work sites, servitude areas, tracks and other areas disturbed during construction as close to their original state as reasonably possible.	a. All bunded areas, equipment, waste, temporary structures, stockpiles etc. must be removed from the camp and construction sites. b. All disturbed areas shall be reshaped to their original contours; as close as possible to the natural conditions before construction commenced, including the road reserve, detours, construction camps, and temporary access routes. c. All cuttings must be shaped with a slope to provide a natural appearance, without having to destroy significant vegetation on top of the slope (this applies to big trees as mentioned in the ESMP only).	Contractor will ensure the mitigation measures are enforced at his own expense. The ECO will monitor.

9.8. Non-Compliance

A) Procedures

The Contractor shall comply with the environmental specifications and requirements on an on-going basis and any failure on his part to do so will entitle the ER to impose a penalty. In the event of non-compliance, the following recommended process shall be followed:

- The Engineer shall issue a notice of non-compliance to the Contractor through the ECO, stating the nature and magnitude of the contravention.
- The Contractor shall act to correct the non-conformance within 24 hours of receipt of the notice, or within a period that may be specified within the notice.
- The Contractor, through the ECO, shall provide the ER with a written statement describing the actions to be taken to discontinue the non-conformance, the actions taken to mitigate its effects and the expected results of the actions.
- In the case of the Contractor failing to remedy the situation within the predetermined time frame, the Engineer shall impose a monetary penalty based on the conditions of contract.
- In the case of non-compliance giving rise to physical environmental damage or destruction, the Engineer shall be entitled to undertake or to cause to be undertaken such remedial works as may be required to make good such damage and to recover from the Contractor the full costs incurred in doing so.
- In the event of a dispute, difference of opinion, etc. between any parties with regard to or arising out of interpretation of the conditions of the ESMP, disagreement regarding the implementation or method of implementation of conditions of the ESMP, etc. any party shall be entitled to require that the issue be referred to specialists for determination.
- The Engineer shall at all times have the right to stop work and/or certain activities on site in the case of non-compliance or failure to implement remedial measures.

B) Offences and Penalties

Where the Contractor inflicts non-repairable damage upon the environment or fails to comply with any of the environmental Specifications, he shall be liable to pay a penalty fine over and above any other contractual consequence.

The Contractor is deemed NOT to have complied with this specification if:

- within the boundaries of the site, site extensions and haul/access roads there is evidence of contravention of these environmental Specification;

- environmental damage due to negligence;
- the Contractor fails to comply with corrective or other instructions issued by the Engineer within a specific time;

Penalties for the activities detailed below, will be imposed by the Engineer on the Contractor and/or his Subcontractors:

a.	Actions leading to erosion	A penalty equivalent in value to the cost of rehabilitation plus 20%
b.	Oil spills or hydrocarbon spillages	A penalty equivalent in value to the cost of clean-up operation plus an N$ 5000 fine.
c.	Damage to indigenous vegetation	A penalty equivalent in value to the cost of restoration plus N$ 5 000
d.	Damage to sensitive environments	A penalty equivalent in value to the cost of restoration plus N$ 5 000
e.	Damage to cultural sites	A penalty to a maximum of N$100 000 shall be paid for any damage to any cultural/ historical sites
f.	Damage to trees	A penalty to a maximum of N$15 000 shall be paid for each tree removed without prior permission, or a maximum of N$5 000 for damage to any tree, which is to be retained on site.
g.	Damage to natural fauna	A penalty to a maximum of N$5 000 for damages to any natural occurring animals.
h.	Any persons, vehicles, plant, or thing related to the Contractors operations within the designated boundaries of a “no-go” area	N$4 000
j.	Litter on site	N$5 000
k.	Deliberate lighting of illegal fires on site	N$ 5 000
l.	Any person, vehicle, item of plant, or anything related to the Contractors operations causing a public nuisance.	N$1 000
m.	Constant leakages from the sewage system.	N$ 15 000

Penalties may be issued per incident at the discretion of the Engineer. The Engineer will inform the Contractor of the contravention and the amount of the fine, and will deduct the amount from monies due under the Contract.

For each subsequent similar offence the fine may, at the discretion of the Engineer, be doubled in value to a maximum value of N$ 30, 000.

Payment of any fines in terms of the contract shall not absolve the offender from being liable from prosecution in terms of any law. In the case of a dispute in terms of this section, the Engineer shall determine as to what constitutes a transgression in terms of these Environmental Mitigation Measures and the Non-compliance section of this document.

10. Conclusion and recommendations

The environmental investigation to determine the sensitivity of the impacts associated with this project was done according the legal requirements of the Environmental Management Act No. 7 of 2007 and associated Regulations of 2012.

This project is situated in a very pristine area of Namibia and is very sensitive with regards to ecological and socio-economic aspects. Even though this is the case, the project does not pose significant environmental risks because the alignment of the existing gravel road will be followed with some small geometrical corrections.

Even though there are some negative impacts associated with upgrading to bitumen standard, the significance of these impacts is considered to be low to medium and these negative impacts could further be reduced or avoided by proper implementation of the Environmental and Social Management Plan.

Waste management, pollution prevention and control as well as effective borrow pit rehabilitation will prevent any significant long-term negative effects associated with this project during construction.

The upgrade to bitumen standard will bring about the most positive impacts associated with the operational phase of the project. These include reducing the vehicle operating cost for the road user, improved road user safety and accessibility of tourists in the region.

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APPENDIX A: BASIC RULES OF CONDUCT

The following list represents the basic Do's and Don'ts towards environmental awareness, which all participants in this project must consider whilst carrying out their tasks. These are not exhaustive and serve as a quick reference aid.

NOTE: ALL new site personnel must attend an environmental awareness presentation. Please inform your foreman or manager if you have not attended such a presentation or contact the ECO.

DO:

- Use the toilet facilities provided;
- Report dirty or full facilities;
- Clear your work areas of litter and building rubbish at the end of each day;
- Use the waste bins provided and ensure that litter will not blow away;
- Report all fuel or oil spills immediately & stop the spill continuing;
- Dispose of cigarettes and matches carefully (littering is an offence);
- Confine work and storage of equipment to within the immediate work area;
- Use all safety equipment and comply with all safety procedures;
- Prevent contamination or pollution of soil, streams and water channels;
- Ensure a working fire extinguisher is immediately at hand if any "hot work" is undertaken e.g. Welding, grinding, gas cutting etc;
- Report any injury of an animal;
- Drive on designated routes only;
- Prevent excessive dust and noise.

DO NOT:

- Remove or damage vegetation without direct instruction;
- Make any fires;
- Injure, trap, feed or harm any animals - this includes birds, frogs, snakes, lizards etc;
- Enter any fenced off or marked area.
- Allow cement or cement bags to blow around;
- Speed or drive recklessly;
- Allow waste, litter, oils or foreign materials on the ground or in any steams;
- Swim in the dam;
- Litter or leave food laying around;
- Waste water;
- Use vehicles that are leaking oil or any hydrocarbon substance.

APPENDIX B: REHABILITATION CHECKLIST FOR THE FINALIZATION OF BORROW PITS

Borrow Pit Name and Number: _____ Date: _____

It is essential that a borrow pit meet the requirements set out in the approved EMP before closure. After the requirements are met, the borrow pit can be signed off and regarded as rehabilitated. After the borrow pit has been signed off, the contractor or any other party may not be allowed to engage in any activities in or around the signed off borrow pit. This includes, but is not limited to activities such as further excavations, dumping of overburden or spoils, sloping, etc.

Criteria for rehabilitation according to the EMP:

Item Number	Description	Comments	Complied
			Yes / No
1	Gradient of the borrow pit walls are less than 18 degrees (1:3).		
2	The walls is covered with overburden/top soil with a thickness of more than150 mm.		
3	The floor of the borrow pit is level and no material is found within the pit.		
4	The compacted areas are ripped to a minimum depth of 300mm.		
5	No man made topographical high or low points are found in or around the borrow pit. These might include berm walls, excavation holes, stock piles, etc.		
6	The site is clear of any illegal dumping of foreign or other materials in and around the borrow pit.		
7	All invasive vegetation has been removed from site.		

When the answer to **all of the above** statements are “Yes" then the R.E. or authorized person can sign off the borrow pit and regard it as closed.

Signed off by: Environmentalist: _____

_____ _____

Residing Engineer / Authorized Person Land- Owner

APPENDIX C: CURRICULUM VITAE OF COMPILER

APPENDIX D: PUBLIC PARTICIPATION ATTENDANCE REGISTERS