Tortoise Environmental Consultants(TEC)
One Step @ a time

VAT Number: 5728293015
Company Reg: cc/2012/2523

ENVIRONMENTAL AND SOCIAL IMPACT ASESSMENT (ESIA)

(Source: Wana Engineering Consulting, 2025)

FOR THE PROPOSED CONSTRUCTION OF DR 3604 (OSHAANGO – EPEMBE) ACCESS GRAVEL ROADS TO OKAMBUMBU SCHOOL, OKANAYIMBULA SCHOOL AND OMISHE SCHOOL, OHANGWENA REGION

Prepared for:

Ministry of Works and Transport

WANA ENGINEERING CONSULTING
Turning Dreams Into Reality

June 2025

+264 61 225 776 / +264 811 220 114
info@tec.com.na / www.tec.com.na
P.O.Box 35473, Kleine Kuppe, Windhoek
Unit 17, No. 40, Berg Street, Klein Windhoek, Windhoek, Namibia

DOCUMENT INFORMATION		
Title	Environmental and Social Impact Assessment (ESIA) report for the Construction of DR3604 (Oshaango – Epembe) Access Gravel Roads to Okambumbu School, Okanayimbula School and Omishe School (20km)	
ECC Application Reference number	**APP- 005723**	
Listed Activity	**Activity 10: Infrastructure:** 10.1 The Construction of (b) Public roads **Activity 3: Mining and Quarrying Activities:** 3.2 The Other forms of mining or extraction of any natural resources whether regulated by law or not **Activity 8: Water Resource Development** 8.1 The abstraction of ground or surface water for industrial or commercial purposes	
Location	DR3604 (Oshaango – Epembe), Ohangwena Region	
Proponent	Ministry of Works and Transport Private Bag 13341, Windhoek Contact person: Helena N. Imwalwa Tel: 061 2088759 / 0811427288 Email: helena.imalwa@mwt.gov.na Website: www.mwt.gov.na	
	Signature	**Date**
		02/07/2025
Author:	**Signature**	**Date**
Ms. Laina Alexander (EAP)[1]		2/07/2025
Reviewer: Mr. Jonas Heita (EAP)		2/07/2025
Copy Right: *"This document is the intellectual property of TEC and may only be used for the intended purpose. Unauthorized use, duplication, plagiarism or copying without referencing is prohibited"*		

[1] *EAP – Environmental Assessment Practitioner*

TABLE OF CONTENTS

1. INTRODUCTION 1
1.1 Project Background 1
1.2 Terms of Reference 1
1.3 Project rationale 1
1.4 EIA Regulation 2
1.5 Environment versus Economic Development 2
1.6 EIA Process 2
2. PROJECT INFORMATION 3
2.1 Project location 3
2.2 Route description 3
2.3 Technical Approach to Road Construction 7
3. INPUT MATERIALS FOR ROAD CONSTRUCTION 9
3.1 Supporting infrastructure – input materials 9
4. COMPLIANCE AND LEGAL FRAMEWORK 14
4.1 Compliance to the EMP 14
4.2 Environmental Management Act (No.7 of 2007) 14
4.3 EMP Requirements 14
4.4 Listed Activities 15
4.5 Legal Framework Relevant to the EMP 15
5. RECEIVING ENVIRONMENT 17
5.1 Socio – Economic Profile 17
5.1.1 Regional Profile 17
5.1.2 Population and Demography 17
5.1.3 Land uses and land tenure systems 18
5.1.4 Employment 18
5.2 Physical Environment 18
5.2.1 Climatic Conditions and Rainfall 18
5.2.2 Topography 18
5.2.3 Soils and Geology 19
5.2.4 Hydrogeology 19
5.3 Biological environment 19
5.3.1 Vegetation 19
5.3.2 Fauna 20
6. IMPACT ASSESSMENT METHODOLOGY 21

6.1 EIA Methodology 21
6.1.1 Screening 21
6.1.2 Alternatives Considered 21
6.1.3 Scope of Assessment 21
6.1.4 Detailed Impact Assessment 22
6.1.5 Impact Significance 22
6.1.6 Impact Assessment Criteria 22
6.1.7 Impact Severity 24
6.1.8 Impact Significance 24
6.2 Assessment of Cumulative Impacts 25
6.3 Mitigation Measures 25
6.3.1 Mitigation Hierarchy 26
7. ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT 27
7.1 Socio-Economic Impacts 27
7.1.1 Improved access to essential services 28
7.1.2 Short employment opportunities 29
7.1.3 Rural development and Local economic growth 30
7.2 Construction related impacts 31
7.2.1 Vegetation clearance 31
7.2.2 Water abstraction 32
7.2.3 Sand and Gravel mining 33
7.2.4 Dust 34
7.2.5 Noise from Earthmoving Equipment 35
7.2.6 Contractors camp 36
8. CONCLUSION 37
References 38

LIST OF TABLES

Table 3-1: Identified Borrow Pits 11
Table 3-2:Water sources for the road 13
Table 4-1: EMP Requirements as outlined in Section 8 of the EIA Regulations 14
Table 4-2: Listed Activities triggered by the proposed project 15
Table 4-3: Policies, Plans and Strategies 15
Table 5-1: Population of Ohangwena by age 17
Table 6-1: Assessment criteria for the evaluation of impacts 22

LIST OF FIGURES

Figure 2-1: DR3604 start point on MR121 (Source: Wana Engineering Consulting, 2025).....3
Figure 2-2: Route from Okambumbu to Omishe (Source: Wana Engineering Consulting, 2025).3
Figure 2-3: Veiko Nekundi Primary School (Source: Wana Engineering Consulting, 2025).....4
Figure 2-4: Okambumbu Combined School (Source: Wana Engineering Consulting, 2025) 4
Figure 2-5: Okanaimbula Primary School (Source: Wana Engineering Consulting, 2025).....5
Figure 2-6: Omishe Combined School (Source: Wana Engineering Consulting, 2025).....5
Figure 2-7: DR3604 showing the constituencies through which it will run 6
Figure 3-1: Selected borrow pits 12
Figure 5-1: Main biomass is Mopane trees (Source: Wana Engineering Consulting, 2025).....20
Figure 6-1: Impact Assessment Scale (Source: TEC, 2025).....24
Figure 6-2 - Mitigation Hierarchy 26

ABBREVIATIONS

DEA	Department of Environmental Affairs
DSR	Draft Scoping Report
EA	Environmental Assessment
EAP	Environmental Assessment Practitioner
ECC	Environmental Clearance Certificate
ECO	Environmental Compliance Officer
EIA	Environmental Impact Assessment
EIF	Environmental Investment Fund
EMA	Environmental Management Act (No. 7 of 2007)
EMP	Environmental Management Plan
ESR	Environmental Scoping Report
GRM	Grievance Redress Mechanism
I&APs	Interested and Affected Parties
MAFWLR	Ministry of Agriculture, Fisheries, Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism
SM	Site Manager
TEC	Tortoise Environmental Consultant

1. INTRODUCTION

1.1 Project Background

The Ministry of Works and Transport recognizes the importance of maintaining a good road network across rural areas throughout the country. Road construction projects are generally intended to improve the economic and social welfare of people. Travelling times can then be reduced with increased road capacity which also lowers the costs of vehicle use, while further increasing access to markets, jobs, education, and health services.

The project entails the upgrading of the DR3604 to gravel standard. This will include the installation of appropriate drifts and small culvert structures to manage runoff during periods of heavy water flow. Additionally, sections of the road with sharp bends will be realigned to enhance the horizontal curve radii for improved safety and drivability.

1.2 Terms of Reference

This document is prepared as part of the Environmental Impact Assessment (EIA) and scoping exercise, aimed at obtaining an Environmental Clearance Certificate (ECC) for the proposed construction of DR3604 (Oshaango – Epembe) access gravel roads to Okambumbu School, Okanayimbula School and Omishe School (20km)

Tortoise Environmental Consultants (TEC) is appointed to carry out the requisite scoping assessment and develop an Environmental Management Plan (EMP). The scoping process investigated the potential significant positive and negative biophysical and socio-economic impacts associated with construction activities for the proposed road upgrade. In addition to reporting on the potential impacts, the scoping process also serves to provide an opportunity for Interested and Affected Parties (I&APs) to provide comments and participate in the process.

1.3 Project rationale

The development of an access road from MR121 to Okambumbu Combined School, Okanaimbula Primary School and Omishe Combined School in the Ohangwena Region is motivated by the need to address key challenges faced by the local community and to promote sustainable development. The main reasons for initiating this project include (Wana Engineering Consulting, 2025):

- Okambumbu village currently lacks adequate road infrastructure, which severely limits its connectivity to surrounding areas, including important economic centers, healthcare services, schools, and administrative facilities.

- Improved road access will also create new opportunities for economic growth.

- The construction of this access road will establish a crucial link, allowing for the easy movement of people, goods, and essential services.

1.4 EIA Regulation

The EIA is regulated by the Environmental Management Act, 2007 and the EIA Regulations No. 30 of 2012, which is administered by the Ministry of Environment Forestry and Tourism (MEFT), through the Department of Environmental Affairs (DEA), which is headed by the Environmental Commissioner (EC).

1.5 Environment versus Economic Development

Namibia's economy is highly dependent on a healthy environment and striking a balance in meeting demands for economic development and maintaining biological diversity remains a priority. Therefore, it is of utmost importance that the environment and development sectors should work together and identify synergies to ensure that natural resources are utilized acceptably and sustainably.

The aim of undertaking environmental assessments is to mitigate negative impacts that would otherwise compromise socio-economic development.

1.6 EIA Process

An Environmental Impact Assessment (EIA) is a process of identifying, predicting, evaluating and mitigating the effects (negative impacts) of a proposed project on the natural and human environment.

The EIA process aims to apply the principles of environmental management, reduce negative impacts and provide an opportunity for the public to comment on the proposed activity.

The EIA Process entails the assessment and description of the study area, recommended site or affected environment. The EIA further investigates and identifies potential impacts that may arise from the proposed activity.

For every impact that is deemed significant, mitigation measures will be developed and will be outlined in the Environmental and Social Management Plan (ESMP).

2. PROJECT INFORMATION

2.1 Project location

The proposed road traverses the Epembe and Eenhana Constituencies in Ohangwena region. It is situated on the western side of gravel road MR121.

GPS coordinates: Latitude -17.749053 S and Longitude 16.364787 E

2.2 Route description

The proposed road is approximately 20 km long and it passes through a rural area frequently used by local farmers and residents from nearby villages. The area has schools, clinic, church, and several cuca shops. As a result, the road experiences very low traffic volumes, with minimal heavy vehicle usage.

DR3604 begins at Oshaango, where it intersects with MR121, and extends to Epembe, covering a total distance of 25 km.

Figure 2-1: DR3604 start point on MR121 (Source: Wana Engineering Consulting, 2025)

Figure 2-2: Route from Okambumbu to Omishe (Source: Wana Engineering Consulting, 2025)

The road will link Okambumbu, Okanaimbula, and Omishe Combined Schools to the existing road network. DR3604 is a proclaimed road. The Okambumbu settlement is located in the Ohangwena Region, approximately 30 km south of Eenhana and 30 km northeast of Ondangwa.

Figure 2-3: Veiko Nekundi Primary School (Source: Wana Engineering Consulting, 2025)

Figure 2-4: Okambumbu Combined School (Source: Wana Engineering Consulting, 2025)

Figure 2-5: Okanaimbula Primary School (Source: Wana Engineering Consulting, 2025)

Figure 2-6: Omishe Combined School (Source: Wana Engineering Consulting, 2025)

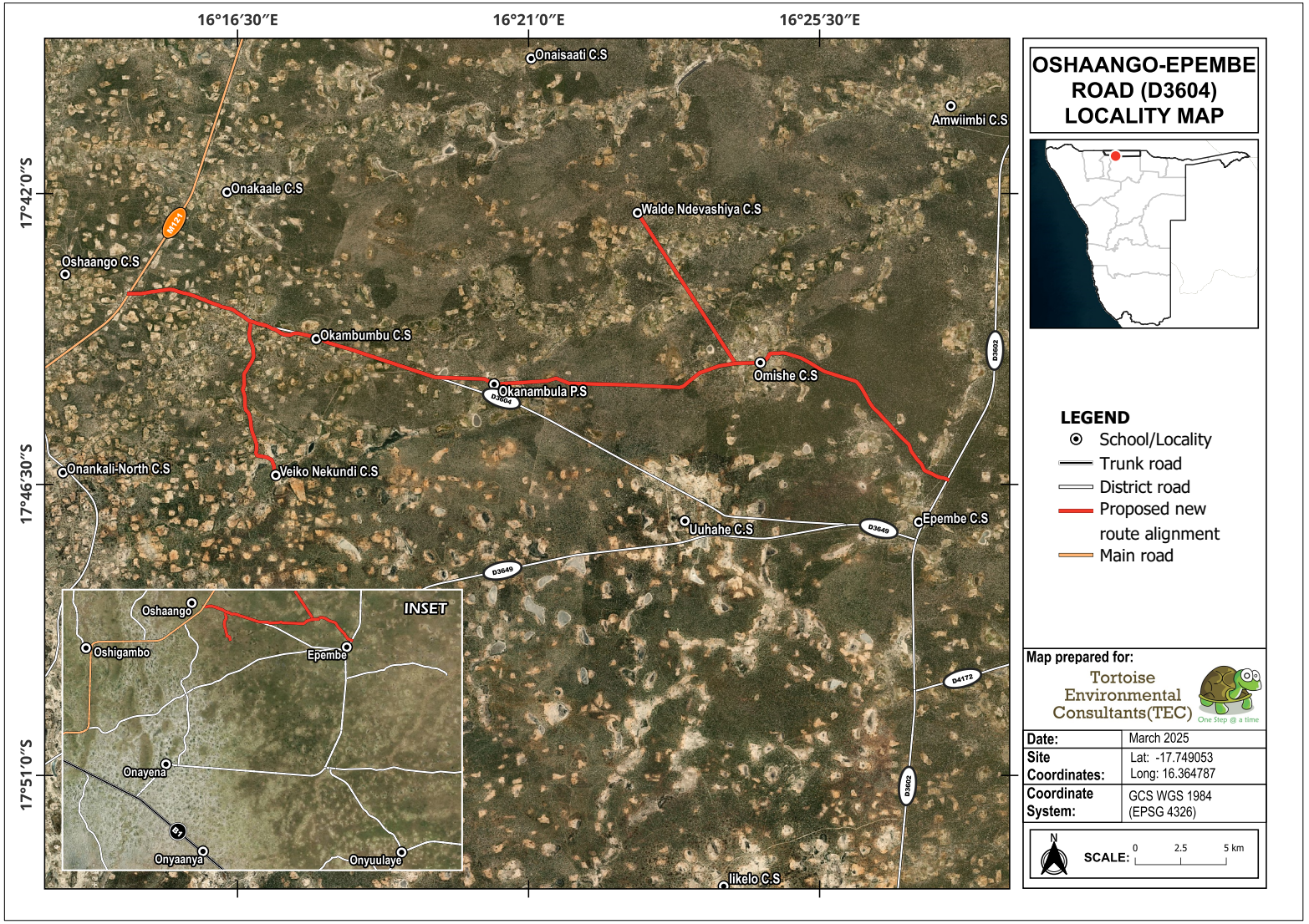

Figure 2-7: DR3604 showing the constituencies through which it will run

2.3 Technical Approach to Road Construction

The proposal is to upgrade the DR3604 to gravel standard from Oshaango to Epembe within Epembe and Eenhance constituencies. The road will cover 20 km and will traverse in a few villages and will provide to three schools namely; Okambumbu School, Okanayimbula School and Omishe School.

2.3.1 Road design considerations

2.3.1.1 Road Cross Section Design

The road's cross-section will be determined based on the Roads Authority Standard Drawing No. N3051 – Standard Gravel Road Cross-section and Details. Typically, the appropriate cross-section is selected by calculating the Annual Average Daily Equivalent Vehicle Units (AADEVU) and identifying the corresponding traffic category. These categories are designed with some overlap, allowing the Design Engineer flexibility to address specific traffic and terrain conditions.

AADEVU represents the average daily traffic volume, adjusted to account for the impact of different vehicle types during the first year of the road's design life. It does this by assigning weightings to vehicle types—one unit for a light vehicle, like a passenger car, and three units for a heavy vehicle (weighing 3.5 tons or more). This method provides a more accurate evaluation of traffic loads, supporting better-informed decisions for road design and long-term maintenance by considering both the quantity and type of vehicles expected to use the road.

2.3.1.2 Road Width

Based on a visual assessment of traffic in the project area, it was determined that only a small number of both light and heavy vehicles will use the road. Given that the primary purpose of the access road to Okambumbu Combined School is to provide connectivity to the area, the 7.5-meter-wide roadway specified in the Standard Drawing is deemed adequate to handle the expected traffic, including both light and occasional heavy vehicles.

2.3.2 Material Sourcing and Site Investigations

2.3.2.1 Phase 1: Initial Desk-Study and Field Investigations

The desk study identified potential areas where suitable construction material could be found. Aerial photo of the area were used to identify potential borrow pit sites to be explored.

2.3.2.2 Field Exploration

During the site visits, areas along the Route were investigated for signs that show the presence of road-building materials. These signs include the type of vegetation, topography, land-use and geographical characteristics.

Community members were also consulted for guidance on areas that are traditionally used for earth dams and wells as they predominantly contain gravel material.

3. INPUT MATERIALS FOR ROAD CONSTRUCTION

This section highlights the key input material needed for the construction of the proposed road.

3.1 Supporting infrastructure – input materials

Road construction involves a range of activities that require a host of supporting infrastructure to ensure that the project is completed efficiently and effectively. Effective planning, design, and management are essential to ensure the construction of safe, reliable, and long-lasting roads. The items described below are some examples of supporting infrastructure that is required for upgrading the road.

3.1.1 Borrow pit investigations for road construction material

Appropriate gravel materials are essential for constructing the various road layers, including the subbase, shoulders, gravel wearing course, and base course. Additionally, fill material is necessary to achieve the vertical alignment required for the designated design speed. To meet these requirements, materials must be sourced from borrow pits. These pits are excavated using heavy machinery, and the extracted material is transported to the designated sections of the road where it is needed. It is crucial that all materials used meet the necessary engineering specifications, which is why regular testing is conducted to ensure compliance.

Another critical consideration is the hauling distance. Borrow pits should not be located too far from the areas where materials are needed, as longer distances increase transportation and operational costs. Therefore, selecting borrow pits within a practical and cost-effective range is essential.

The *Materials study for DR3604 (Oshaango to Epembe)*, was done with a focus on borrow pit investigations, sand suitability for construction, borehole/test pit data, and tests conducted.

i. Material source investigation (borrow pits and sand)

The investigation focused on identifying suitable gravel and sand materials from within the road alignment corridor for constructing subgrade layers, base courses, shoulders, and wearing courses. All materials were sourced from shallow test pits.

The material in the top 1-meter layer consists mainly of loose, non-cohesive aeolian and fluvial sands, which have:

- Low CBR (California Bearing Ratio) values
- Weak bearing capacities
- Collapsible characteristics in the dry state
- Non-plastic behavior (no Atterberg limits)

These materials do not meet typical engineering standards for direct use in structural road layers and therefore require mechanical improvement (like compaction and stabilization) or may need to be replaced or blended with better quality materials.

ii. Number and type of excavations:

- Manual excavation of 1-meter-deep test pits.
- Test pits were excavated at 800-meter intervals along the 25 km alignment of the DR3604 road.
- This results in approximately 31 test pits (25,000 m ÷ 800 m = ~31.25).

iii. Types of tests conducted

A variety of standard geotechnical and materials tests were carried out on samples from the test pits, including:

- **Field Tests:**
  - Dynamic Cone Penetrometer (DCP): Assesses in-situ strength and estimates CBR values.
  - Conducted to 1m depth or until refusal at each test pit.
  - Results showed mostly weak soils with CBR < 10.

- **Laboratory Tests:**
  - Sieve Analysis (Grading Curves): To determine particle size distribution.
  - Indicator Tests:
    - Grading Modulus (GM)
    - Atterberg Limits: All soils were non-plastic (NP), confirming non-cohesiveness.
  - Modified AASHTO Compaction Tests:
    - To determine Maximum Dry Density (MDD) and Optimum Moisture Content (OMC)
  - Laboratory CBR Testing:
    - Classifications ranged from G5 to G10 for most materials.
    - Required for layer classification and suitability assessment.

3.1.2 Sand sourcing

As per the Materials Report for DR3604 (Oshaango to Epembe), the sand identified along the route was assessed as follows:

A. Fine, Non-Cohesive Aeolian and Fluvial Sand
- Light brown to dark brown in colour: **Fine Sand (Fi Sd); Brown Sand (Br Sd**); **Dark Brown Sand (Dk Br Sd)**
- Found consistently within the top 1-meter profile across the test pits.

B. Suitability for Road Construction
The investigated sand:
- Has low CBR values (generally <10), indicating weak bearing capacity.
- Is non-cohesive and non-plastic, which makes it unsuitable as-is for structural layers like subbase or base course.
- Is classified under COLTO grading from G5 to G10, with most samples in the G7–G9 range.

C. Engineering Assessment
- This sand is not directly suitable for use in load-bearing road layers.
- However, it may be used:
  - After mechanical stabilization (e.g. compaction, moisture conditioning)
  - Or blended with stronger materials from borrow pits
  - Or used in selected fill or shoulder layers, where lower strength is acceptable

Conclusion: No naturally occurring sand in the area was found to be suitable in its raw form for subbase or base course construction. The dominant sand type (fine aeolian and fluvial sand) can only be used after treatment or improvement.

3.1.3 Gravel sourcing

The in-situ soils along the DR3604 road are predominantly loose, fine-grained, non-cohesive sands with very low bearing capacity and CBR values mostly below 10. These are not suitable for road construction without modification.

Only two borrow pits (BP01 and BP08) (see figure 3.1) were identified as successful gravel sources that meet COLTO specifications (G5 and G6), necessary for road embankment layers.

Table 3-1: Identified Borrow Pits

Aspect	Borrow Pit	
	BP01	**BP08**
Location	• 4+000 km chainage, 0.70 km LHS from the centerline	• 23+500 km chainage, 1.7 km RHS from the centerline
Materials class	• G5/G6	• G6
Estimated quantity	• 30,000 m³	• 20,280 m³
Material Description	• Silcrete gravel, medium to high CBR (>30 at depths >2.7m)	• Dense silcrete gravel, with high CBR at >2.3m depth

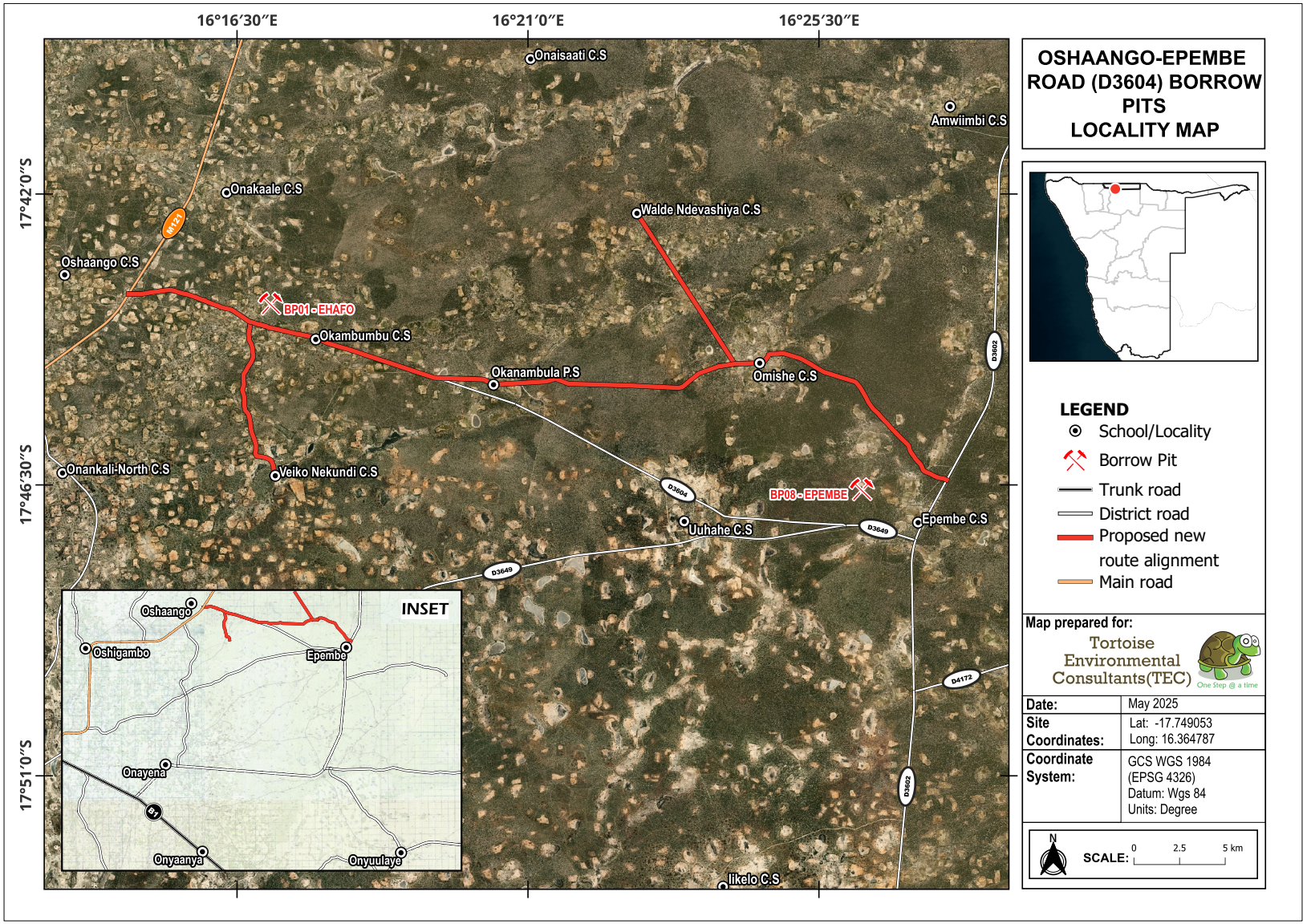

Figure 3-1: Selected borrow pits

3.1.4 Water sources for road construction

A reliable water supply is necessary to mix concrete, prepare the road surface during compaction amongst others.

There are *oshanas* in the areas, therefore dams will be excavated in *oshanas* or pans located close to the road to be constructed (Wana Consulting Engineering, 2025). These dams will be open on at least one side to permit water from the *oshanas* to flow into the dam.

The water from existing excavated dams or old borrow pits can also be utilized with permission from the local community (Wana Consulting Engineering, 2025). The quality of the water has been found to be generally acceptable for earth- and layer work construction purposes. (Wana Consulting Engineering, 2025).

Boreholes will be considered as a potential water source for further investigation. If the borehole water has high salinity levels, it may still be suitable for use in constructing the lower layers of the road (Wana Consulting Engineering, 2025). However, in cases where materials for the upper layers naturally contain very low salinity, the use of saline water must be carefully controlled to avoid compromising material quality (Wana Consulting Engineering, 2025).

Table 3-2:Water sources for the road

Water demand	Potential water source
Approx. 5000 – 10 000 m^3	• Boreholes • Open pits and earth dams • Piped water networks: Bulk NamWater line from Oshaango to Epembe

3.1.5 Accommodation facilities for construction workers

The type of accommodation provided for road construction workers depends on factors such as the project's location, its duration, and the size of the workforce. Given that the construction of the road is expected to last for approximately 22 months, a temporary camp will need to be established. This camp should be outfitted with essential facilities, including tents, bunkhouses, mobile trailers, ablution blocks, and other necessary amenities.

In addition to housing, specific areas must be designated for storing construction materials and for parking construction vehicles. The operation of heavy machinery such as bulldozers, excavators, graders, and rollers will also require enough space for maneuvering. As such, careful consideration must be given when selecting the camp location to minimize disruption to nearby communities.

4. COMPLIANCE AND LEGAL FRAMEWORK

This chapter outlines the regulatory framework.

4.1 Compliance to the EMP

The EMP is binding to the proponent, and all contractors / sub-contractors. This implies that every entity that may have any kind of engagement or involved in/with the activities of the road construction should comply with the EMP throughout the project lifespan. Non-compliance may have serious consequences e.g License withdrawal.

4.2 Environmental Management Act (No.7 of 2007)

Section 27 of the Environmental Management Act 2007 (Act No. 7 of 2007) (EMA) provides a list of activities that may not be undertaken without an Environmental Clearance Certificate (ECC) (herein referred to as: listed activities). The proposed road construction triggers the following listed activities.

The EMP should conform to the provisions of the Environmental Management Act (EMA), Act No. 7 of 2007 and EIA regulations of 2012 (Government Notice: 30).

The EIA Regulations defines a '*Management Plan*' as:

"…a plan that describes how activities that may have significant impacts on the environment are to be mitigated controlled and monitored."

4.3 EMP Requirements

Table 4-1: EMP Requirements as outlined in Section 8 of the EIA Regulations

Requirement
(j) a draft management plan, which includes – *(aa) information on any proposed management, mitigation, protection or remedial measures to be undertaken to address the effects on the environment that have been identified including objectives in respect of the rehabilitation of the environment and closure;* *(bb) as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of the activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and* *(cc) a description of the manner in which the applicant intends to modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation remedy the cause of pollution or degradation and migration of pollutants.*

4.4 Listed Activities

The proposed project triggers a number of Listed Activities as set out in the Environmental Management Act, 2007 (Act No. 7 of 2007) (herein referred to as the EMA) and the Environmental Impact Assessment Regulation, 2007 (No. 30 of 2011) (herein referred to as the EIA Regulations).

Listed Activities may not be undertaken without an Environmental Clearance Certificate (ECC), and hence an Environmental Impact Assessment (EIA) is required. The EIA entails the development of the EIA Scoping Report and Environmental Management Plan (EMP) which should be submitted to the MET as part of the application for the ECC.

Table 4-2: Listed Activities triggered by the proposed project

Listed Activity	Activity Description	Relevance to the proposed project
Activity 3: Mining and Quarrying Activities:	3.2 The Other forms of mining or extraction of any natural resources whether regulated by law or not	Extraction of sand and gravel for road construction purposes.
Activity 8: Water Resource Development	8.1 The abstraction of ground or surface water for industrial or commercial purposes	The construction activities will require water which will be collected from boreholes.
Activity 10: Infrastructure	10.1 The construction of: b) Public roads	The project involves the construction of the DR3604

4.5 Legal Framework Relevant to the EMP

In addition to the EMA and the Environmental Assessment Policy, there exists a host of legal and policy documents and guidelines that must be considered when undertaking an EIA as indicated in table 5.3, below.

The proponent has the responsibility to ensure that the road construction conforms to all relevant National developmental plans and legal framework.

Table 4-3: Policies, Plans and Strategies

Policy / Plan	Relevancy/Summary	Applicability to the Proposed Project
5th National Development Plan (NDP) and Vision 2030	Outlines the country's national development ambitions, in line with the Harambee Prosperity Plan, and Vision 2030. NDP5 incorporates the principles and recommendations contained in the Stockholm Declaration on the Human Environment (1972) and associated Action Plan, as well as Agenda 21 which merged from the Convention on Biological Diversity, Rio De Janeiro (1992).	The proposed project is a development that forms part of the bigger picture of achieving economic progression, social transformation and environmental sustainability.

Table 3.2: National Statutes

National Statutes	Relevance/Summary	Applicability to the Proposed Project
Environmental Management Act, 2007 (Act No. 7 of 2007)	Promote sustainable use of natural resources based on the principles of environmental management. Regulates environmental clearance certificate for listed activities	Provides the framework for the EIA and development of mitigation measures outlined in the EMP
Pollution Control and Waste Management Bill (in preparation and adopted as best practice)	Intent to repeal the outdated Atmospheric Pollution Prevention Ordinance (11 of 1976).	Aim to regulate and prevent the discharge of pollutants into the environment (land, air and water).
Water Resources Management Act, 2013 (No. 11 of 2013)	Came in force in August 2023. Provide framework for managing water resources based on the principles of integrated water resource management (IWRM)	Section 44 – Regulates water abstraction licenses Section 68 – Prevent water pollution. Section 69 and 72 regulates and licensing of wastewater treatment plants and effluent discharge
Soil Conservation, (Act 76 of 1969) and Amendment (Act 38 of 1971)	Makes provision for the prevention and control of soil erosion	Through vegetation removal there may be the risk of affecting soil quality.
Forest Act 12 of 2001 Forest Act Regulations 2015	To provide for the protection of the environment and the control and management of forest.	Provision for the protection of protected or endangered plant species.
National Heritage Act, No. 27 of 2004.	The Act provides for the protection and conservation of places and objects with heritage / archaeological significance.	Potential for chance find of cultural heritage or archaeological artefacts
Public and Environmental Health Act (Act No. 1 of 2015)	The Public Health Act aims to protect the public from nuisance or other condition liable to be injurious or dangerous to health	The proponent should ensure that the workers are provided with protective gear to safeguard their wellbeing.
Labour Act No. 11 of 2007	Occupational Health is aimed at the promotion and maintenance of physical, mental and social wellbeing of workers in all occupations.	Prevent or manage work-related hazards and maintain healthy standards at the workplace and protection of workers against exploitations

5. RECEIVING ENVIRONMENT

The environmental baseline for the proposed project has been collected through a desktop study as well as a site assessment.

The assessment is categorised into two categories, the socio-economic aspect and physical and biological environment.

5.1 Socio – Economic Profile

5.1.1 Regional Profile

Ohangwena is one of Namibia's 13 regions, it is situated in the northern part of the country, bordered by Angola to the norther, Oshana region to the west, Kavango region to the east and Oshikoto region to the south. (Mouton & Dirkx, 2014)

The region consists of 11 constituencies namely: Ongenga, Engela, Endola, Ohangwena, Oshikango, Omulonga, Ondobe, Eenhana, Omundaungilo, Epembe and Okongo. Eenhana is the region's administrative and political capital (Mouton & Dirkx, 2014).

5.1.2 Population and Demography

Ohangwena has population of approximately of 337 729 people, 159701 males and 178028 females (Namibia Statistics Agency, 2023). The population living in the area between Eenhana and Okambumbu is currently under 20,000, with more than 50% of the youth unemployed (Namibia Statistics Agency, 2023).

There is a noticeable trend of youth migrating to urban areas, often driven by the misconception that better job opportunities exist there (Wana Engineering Consulting , 2025). This trend is evident in towns like Eenhana and Oshikango, where both male and female labour force participation is high, yet these towns also record some of the highest unemployment rates among both genders (Wana Engineering Consulting , 2025).

Most residents along the DR3604 route engage in subsistence farming, producing just enough to meet their household needs, with little to no surplus for sale. As these farmers generally do not employ workers, the sector contributes minimally to job creation, further compounding the region's unemployment challenges.

Table 5-1: Population of Ohangwena by age

Total population	Age Groups				
337729	0 – 4	5 - 14	15 - 34	35 - 59	60+
	54 756	98 202	101 026	56 629	27 116

5.1.3 Land uses and land tenure systems

The area is predominantly rural, with limited infrastructure in Okambumbu, including a clinic, a combined school, a church, and a few informal "cuca shops." The administrative center of the constituency is located at Onamugolo, about 10 kilometers from Okambumbu, where the local councilor's office is situated.

The residents of Ohangwena engage mainly in communal agricultural production for subsistence purposes. There two main land tenure systems, freehold (in urban areas) and customary tenure on communal land (in rural areas) (Mendelsohn , Shixwameni , & Nakamhela, n.d). Communal land is divided into small plots of a few hectares, where rural households mostly cultivate omahangu (pearl millet) and keep small numbers of goats, cattle, donkeys, chickens and pigs (Mouton & Dirkx, 2014).

5.1.4 Employment

Formal employment opportunities in the region are limited to Eenhana and, to a lesser extent, Helao Nafidi. Informal employment opportunities are available in rural areas for, inter alia, cultivating fields, herding livestock, cleaning houses, washing clothes, and collecting water, firewood, fencing materials and thatching grass (Mouton & Dirkx, 2014).

5.2 Physical Environment

5.2.1 Climatic Conditions and Rainfall

The Ohangwena Region experiences a sub-tropical climate, characterized by hot summers and mild to cool winters. It falls within a semi-arid zone, with annual rainfall ranging from approximately 480 mm in the west to 600 mm in the eastern parts (Ohangwena Regional Council, 2025). The hottest period is typically from November to February, with average temperatures between 20°C and 36°C, though temperatures can occasionally reach as high as 40°C. The coldest months occur from May to August, when morning temperatures drop to between 3°C and 10°C, while daytime temperatures range from 18°C to 22°C (Ohangwena Regional Council, 2025).

5.2.2 Topography

Ohangwena Region is largely flat to gentle topography, it forms part of the Cuvelai-Etosha Basin which consists of sections of shallow drainage channels known as *iishanas*. This flat landscape is spread with shallow, sandy depressions and seasonal watercourses known locally as oshanas, which fill with water during the rainy season, creating temporary wetlands (Wana Engineering Consulting , 2025). The elevation ranges between 1080 and 1150 meters above sea level. Seasonal flooding is experiences, especially in the southern parts, contributing to the Cuvelai Drainage System which drains into the Etosha Pan.

5.2.3 Soils and Geology

The North-central part of Namibia lies in the Owambo Basin, comprising a topographic depression that is filled with sediments (Mendelsohn , el Obeid, & Roberts , A Profile of North-Central Namibia, 2000). There are, however, other rock formations that are found along the rim of the basin, manifesting as hills and low ridges of rock outcrops.

The Ohangwena Region is part of the Kalahari Basin, which was formed 130 million – 180 million years ago (Wana Engineering Consulting , 2025).

5.2.4 Hydrogeology

The region lies within the Kalahari Sand plateau, characterised by deep sand. There are two major drainage systems in the Region are the Cuvelai at the northwest that stretches from Angola to Etosha Pan; and the Omulamba which stretches from Otavi highlands and drains to Etosha Pan.

The project is situated in an area covered with sediments of the Kalahari Group that consists of fine to coarse sands with varying clay and silt content (Wana Engineering Consulting , 2025). The bedrock beneath this basin, which is filled with Kalahari Sequence sediments, is not well understood. However, it is believed to be composed of the older rocks from the Damara Sequence, overlain by Karoo Sequence sediments that have been intruded by volcanic rocks from the Karoo period (Wana Engineering Consulting , 2025). Calcrete, a paedogenic material, occurs within the sediments of the Kalahari Group and is covered with a sandy overburden often more than 2 metres.

5.3 Biological environment

5.3.1 Vegetation

The vegetation in Ohangwena is largely shaped by the semi-arid climate, supporting a mix of savanna and dry woodland (Wana Engineering Consulting , 2025). Mopane and marula trees are common, along with scattered acacias and grasses adapted to the seasonal availability of water. In areas near the Oshanas, the soil tends to be more fertile, supporting slightly denser vegetation.

Figure 5-1: Main biomass is Mopane trees (Source: Wana Engineering Consulting, 2025)

5.3.2 Fauna

As a result of land clearing, hunting, and other human activities, much of the region's original wildlife has disappeared (Wana Engineering Consulting , 2025). The remaining wildlife is largely confined to protected areas, such as Etosha National Park (Wana Engineering Consulting , 2025). The DR3604 area no longer supports a significant wildlife population, and no large, rare, or endangered species have been observed or reported in the area (Wana Engineering Consulting , 2025). The most commonly found animals are livestock, primarily cattle, which make up about 99% of the total animal biomass in the region.

6. IMPACT ASSESSMENT METHODOLOGY

6.1 EIA Methodology

The EIA methodology applied to this EIA has been developed using the Namibian Draft Procedures and Guidance for EIA and EMP (Republic of Namibia, 2008); international and national best practice; and over 20 years of combined EIA experience. The method of each step in the EIA process is described in the next sections.

6.1.1 Screening

As per the Draft Procedures and Guideline for Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) (Ministry of Environment and Tourism, 2008), the determination of a proposal and if it triggers a Listed Activity in the EMA is the first stage of the EIA process. The proposed project triggers several Listed Activities as per Section 1.4 and therefore an ECC is required.

6.1.2 Alternatives Considered

As stipulated in the Environmental Management Act (EMA) and EIA regulations, alternatives should be considered during the project design, to determine if an alternative site (different locality) or alternative project (different project) would yield better socio-economic benefits.

Construction of the gravel road is the only alternative considered for this project.

6.1.3 Scope of Assessment

The Scoping Process is a fundamental stage in the EIA process. Through a high-level assessment, the likely effects and severity of effects as a result of the development and operations of a proposed project can be identified. Any likely significant effects are taken forward for further assessment (detailed EIA). This stage is important in the EIA process to enable the assessment to be concise and focus on key issues that are central to efficient decision making.

If no likely significant effects are anticipated, a detailed EIA is not undertaken and a Scoping Report detailing the high-level assessment is submitted as part of the ECC application.

As there was uncertainty around the potential effects and their severity, a scoping process was undertaken for the proposed development. The Draft Procedures and Guideline for Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) (Ministry of Environment and Tourism, 2008) were followed to undertake the scoping stage.

The baseline environment that could be affected by the project was reviewed and potential effects on receptors identified. Receptors under the following aspects were considered (Ministry of Environment and Tourism, 2008):

- Geology and soils
- Topography
- Groundwater and surface water resources
- Environmentally sensitive areas
- Air quality
- Sound levels
- Socio-economics
- Infrastructure services
- Cultural resources
- Project Economics

Embeded mitigation and industry best practice measures were considered in the review and conclusion drawn identifying those effects that needed to be assessed further due to the potential severity and significance.

The findings of the scoping process are presented in chapter 7.

6.1.4 Detailed Impact Assessment

Through scoping, potential significant effects were identified. These potential effects are then considered further to determine the level of significance and identify additional mitigation required to avoid, reduce, or compensate for the effect.

6.1.5 Impact Significance

The level of significance is identified through the assessment process in order to understand the potential severity of the effect and identify appropriate mitigation. The significance of effect after mitigation is also considered during the decision-making.

The significance of an impact is determined by considering and measuring the temporal and spatial scales and magnitude of the project and the specific activities associated with the project.

6.1.6 Impact Assessment Criteria

For each impact, the **EXTENT** (spatial scale), **MAGNITUDE** and **DURATION** will be described. These criteria are used to ascertain the **SIGNIFICANCE** of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure/s in place. The mitigation described in the Scoping Report and EMP would represent the full range of plausible and pragmatic measures.

Table 6-1: **Assessment criteria for the evaluation of impacts**

CRITERIA	CATEGORY	DESCRIPTION
Sensitivity or importance/value of receptor	**High**	Of value, importance or rarity on a national scale, and with very limited potential for substitution; and/or Very sensitive to change, or has little capacity to accommodate a change.
	Medium	Of value, importance or rarity on a regional scale, and with limited potential for substitution; and/or Moderate sensitivity to change, or moderate capacity to accommodate a change
	Low	Of value, importance or rarity on a local scale; and/or Not particularly sensitive to change, or has considerable capacity to accommodate a change.
Extent or spatial influence of impact	**National**	Beyond a 20km radius of the site
	Regional	Within a 20 km radius of the site
	Local	Within a 2 km radius of the centre of the site
	Site specific	On site or within the boundaries of the property
	Zero	
Magnitude of impact (at the indicated spatial scale)	**High**	Natural and/ or social functions and/ or processes are *severely* altered
	Medium	Natural and/ or social functions and/ or processes are *notably* altered
	Low	Natural and/ or social functions and/ or processes are *slightly* altered
	Very Low	Natural and/ or social functions and/ or processes are *negligibly* altered
	Zero	Natural and/ or social functions and/ or processes remain *unaltered*
Duration of impact	**Zero**	Zero time
	Short Term	Up to 18 months
	Medium Term	0-5 years (after operation)
	Long Term	5- 10 years (after operation)
	Permanent	More than 10 years (after operation)
Probability	**Definite**	Estimated greater than 95 % chance of the impact occurring.
	Very likely	Estimated 50 to 95% chance of the impact occurring
	Fairly likely	Estimated 5 to 50 % chance of the impact occurring.
	Unlikely	Estimated less than 5 % chance of the impact occurring.
	Zero	Definitely no chance of occurrence

CRITERIA	CATEGORY	DESCRIPTION
Confidence	**Certain**	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.
	Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.
	Unsure	Limited useful information on and understanding of the environmental factors potentially influencing this impact.
Reversibility	**Irreversible**	The activity will lead to an impact that is permanent.
	Reversible	The impact is reversible, within a period of 10 years.

6.1.7 Impact Severity

Impact severity = impact significance. The impact significance is determined using a risk matrix **(below).**

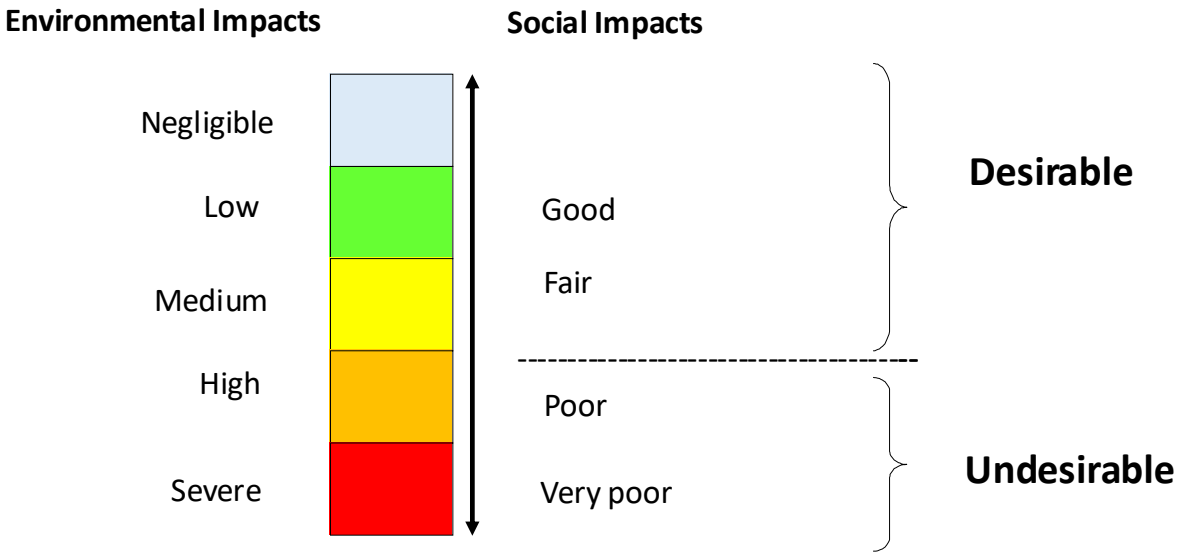

Figure 6-1: Impact Assessment Scale (Source: TEC, 2025)

6.1.8 Impact Significance

The significance of an impact is identified determined by qualifying the potential severity of the effect, before and after mitigation. The impact significance after mitigation should be considered during the decision-making process.

The significance of an impact is determined by assessing the magnitude of scale (both temporal and spatial.

Significance is not defined in the Namibian EIA Regulations, however the Draft Procedure and Guidance for EIA and EMP states that the significance of a predicted

impact depends upon its context and intensity and qualified into the following categories, as guided by literature:

- **High**: effects associated with features or resources of national importance and, if lost, cannot be replaced, and thus likely to be key decision-making factors.
- **Medium**: effects associated with the features or resources of regional importance, but which are unlikely to be key decision-making factors.
- **Low**: effects considered to be local importance, but unlikely to be critical to decision-making factors.

Impact significance is determined by multiplying the potential severity of the effect, and qualitative assessment of the receptor sensitivity and magnitude of change. If effects garner a severity score, they are considered to be significant.

For significant impacts, supplementary assessments / Specialist studies may be required to further enhance understanding on the consequences (e.g through modelling or other assessment techniques) and identification of appropriate mitigation measures to reduce the effect.

6.2 Assessment of Cumulative Impacts

The Environmental Assessment Policy in Namibia requires cumulative environmental impacts to be considered in all environmental assessment processes.

Cumulative impacts can arise when a single resource or receptor is affected by more than one impact or activity of the proposed project. For example, the view of a local resident's property could be altered through the construction phase of the proposed development and noise levels could increase due to excavation activities. In isolation, the impacts may be insignificant, however when combined, the impacts on the local resident may result in a significant impact.

Cumulative impacts may also arise as a result of the combination of two or more projects on the same receptor. The receptor could be affected by the same activities of these projects resulting in the same impact or by completely different activities resulting in different impacts. An example of this is as follows; dust generated during the construction stage of the proposed project may not cause a significant effect in isolation; however, a sensitive receptor (e.g. local resident) may be significantly impacted when dust from the proposed project is combined with noise generated from other projects.

A high-level cumulative impact assessment has been undertaken for the proposed project as part of the scoping phase as the anticipated effects are expected to be local and of minor significance. If effects were determined to be significant, a detailed EIA would be required.

6.3 Mitigation Measures

For each impact assessed during the scoping phase and detailed assessment, mitigation measures are identified to reduce and/ or avoid negative impacts. These mitigation

measures are also incorporated in the EMP to ensure that they are implemented throughout the lifespan of the proposed project. The EMP forms part of the Scoping Report, and upon project approval, the implementation thereof, would become a binding requirement.

6.3.1 Mitigation Hierarchy

Actions to mitigate a potential impact can be done in as systematic manner as guided by what is referred to as Mitigation Hierarchy (Figure 4.1).

From the onset, the positive impacts of the proposed project should be **enhanced**, however, where an impact in is inevitable, the following sequence should be followed.

Impact avoidance: This step is most effective when applied at an early stage of project conceptualization and planning. It can be achieved by:

- Not undertaking certain projects or elements that could result in adverse impacts;
- Avoiding areas that are environmentally sensitive; and
- Putting in place preventative measures to stop adverse impacts from occurring.

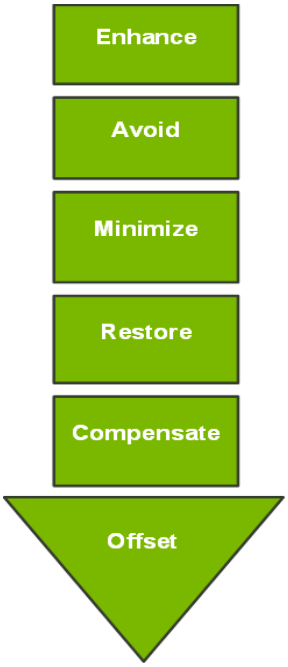

Figure 6-2 - Mitigation Hierarchy

Impact minimisation: This step is usually taken during impact identification and prediction to limit or reduce the degree, extent, magnitude, or duration of adverse impacts. It can be achieved by:

- Scaling down or relocating the proposal;
- Redesigning elements of the project; and
- Taking supplementary measures to manage the impacts.

Impact compensation: This step is usually applied to remedy unavoidable residual adverse impacts. It can be achieved by:

- Rehabilitation of the affected site or environment, for example, by habitat enhancement;
- Restoration of the affected site or environment to its previous state or better; and
- Replacement of the same resource values at another location (off-set), for example, by wetland engineering to provide an equivalent area to that lost to drainage or infill.

7. ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT

7.1 Socio-Economic Impacts

Namibia has one of the highest unemployment rates in the world. According to the Namibia Statistics Agency (NSA, 2025), the official unemployment rate in 2024 is estimated at 37% of the labour force, and the majority (47%) of the unemployed is the youth (including graduates from Universities and Vocational Training Centres).

However, economists from independent institutions dispute the Government or NSA's estimate of 37%, arguing that NSA has changed the "Unemployment Definition" and that the unemployment rate in Namibia is much higher. In a Newspaper Article dated 01 February 2025, Tannan Groenewald from Cirrus Capital data and analytics, argues that if the broad definition of unemployment historically used is applied, only about 46.2 of the working-age population is employed and the true unemployment stands at 54.8%.

7.1.1 Improved access to essential services

Impact category	Access to essential services

Negative impacts	Key mitigation measures to maintain or improve +ve impacts
• Poor access to clinics, hospitals and schools • Poor road conditions is high risk for accidents • Prolonged travel time • High vehicle maintenance	• Improved access to clinics, hospitals and schools • Reduced accidents • Reduced travel time

Before Project Commencement							After Project Completion						
Impact type	Extent	Magnitude	Duration	Probability	Confidence	Significance	Impact type	Extent	Magnitude	Duration	Probability	Confidence	Significance
+Ve	Local	Medium	Medium-term	Very likely	Sure	Very poor	+Ve	Local	Medium	Long-term	Definite	Certain	Good

Monitoring

Monitoring Aspects	Frequency	Responsibility	How
• Community access and feedback	Annually	Local authority Proponent	Surveys and traffic records

7.1.2 Short employment opportunities

Impact category	**Road Construction will create Short-term Employment Opportunities for locals**

Negative impacts	**Key measures to maintain or improve +ve impacts**
• High unemployment • Poor livelihoods • Breeding ground for crime (livestock theft, house / cuca shop break-ins, robberies – restricted community movements)	• Prioritise job opportunities for locals during the construction phase • Provide on-site training and fair wages

Before Project Commencement							**After project commencement**						
Impact type	**Extent**	**Magnitude**	**Duration**	**Probability**	**Confidence**	**Significance**	**Impact type**	**Extent**	**Magnitude**	**Duration**	**Probability**	**Confidence**	**Significance**
+Ve	Local	Medium	Medium-term	Very likely	Sure	Very poor	+Ve	Local	Medium	Long-term	Definite	Certain	Fair

Monitoring			
Monitoring Aspects	**Frequency**	**Responsibility**	**How**
• Number of new employment opportunities created • Number of local people employed • Compliance with labour laws	Quarterly	Contractor / Site manager Ministry of Labour / Contractor	Employment records and database Labour inspection reports

7.1.3 Rural development and Local economic growth

Impact category	**Establishment of new businesses and increase in investment opportunities**

Negative impacts	**Key measures to maintain or improve +ve impacts**
• Poor road condition unattractive for businesses development • Poor local economy, household incomes and livelihoods	• Establishment of new businesses • Improvement in household incomes and livelihoods • Stimulate micro-enterprises and increase demand for local goods.

Before Project Commencement							**After project Completion**						
Impact type	Extent	Magnitude	Duration	Probability	Confidence	Significance	Impact type	Extent	Magnitude	Duration	Probability	Confidence	Significance
+Ve	Local	Medium	Medium-term	Very likely	Sure	Poor	+Ve	Local	Medium	Long-term	Definite	Certain	Good

Monitoring			
Monitoring Aspects	**Frequency**	**Responsibility**	**How**
• Income levels and livelihood improvements • Number of new businesses established	Annually	Local authority Proponent	Household surveys and physical observations

7.2 Construction related impacts

7.2.1 Vegetation clearance

Impact source	Site clearance and excavation with heavy and mobile equipment						**Key Mitigation Measures:** • Adherence to site vegetation clearance checklist/procedure • i.e. avoid removal of protected tree species which do not directly affect the construction • explore option to relocate and replant some plants such as aloe plants						
Classification	Vegetation clearance												
Potential Negative Impacts: • Unselective removal of protected tree species currently on project site													
Without Mitigation							**With Mitigation**						
Impact type	**Probability**	**Extent**	**Duration**	**Severity**	**Reversible**	**Significance**	**Impact type**	**Probability**	**Extent**	**Duration**	**Severity**	**Reversible**	**Significance**
-ve	**Definite**	**Local**	**Short-term**	**Severe**	**No**	**Medium**	**-ve**	**Definite**	**Site specific**	**Short-term**	**Low**	**Yes**	**Low**
Qualitative assessment							**Qualitative assessment**						
Monitoring Program													
Monitoring Aspects				**Frequency**			**Responsibility**				**How**		
• Number of trees species removal versus species saved • Number of trees or plant species relocated and successfully replanted				Weekly / Monthly			Site manager Authority (Environmental Compliance Officer)				Physical observations		

7.2.2 Water abstraction

Impact source	Water abstraction for construction activities	**Key Mitigation Measures:** • Abstraction volumes to be within licensed and sustainable limits. • Conduct borehole testing to determine borehole yield and optimum water abstraction rates. • Allow borehole resting for recharge
Potential Negative Impacts: • Over-abstraction		

Without Mitigation							**With Mitigation**						
Impact type	**Probability**	**Extent**	**Duration**	**Severity**	**Reversible**	**Significance**	**Impact type**	**Probability**	**Extent**	**Duration**	**Severity**	**Reversible**	**Significance**
-ve	Definite	Local	Short-term	Severe	No	**Severe**	-ve	Definite	Site specific	Short-term	Low	Yes	**Low**
Qualitative assessment							**Qualitative assessment**						

Monitoring Program			
Monitoring Aspects	**Frequency**	**Responsibility**	**How**
• Water abstraction volumes	Weekly / Monthly	Contractor / Proponent Authority (Environmental Compliance Officer)	Physical observation and measurements

7.2.3 Sand and Gravel mining

<table>
<tr><td colspan="2">Impact source</td><td colspan="7">Sand and gravel for construction (excavation)</td><td colspan="7" rowspan="2">Key Mitigation Measures:
• Smoothen the borrow pit edges to ensure that the angles are not steep sloped, but rather gentle sloped at less than < 30° slope angles.
• Borrow pit edges should be gentle so that the is no tipping point, where people or livestock can fall in. Meaning even if the is water, people and livestock can go in with minimal danger.</td></tr>
<tr><td colspan="9">Potential Negative Impacts:
• Dangerous Vertical / Steep borrow pit slopes (>30°)
• Risk of animals and people falling into the pits (tipping slopes)
• Steep slopes make it difficult for animals and people to move in and out and the borrow pits
• Risk of drowning or getting stuck in mud (especially during rainy season when pits fill with water)</td></tr>
<tr><td colspan="9">Without Mitigation</td><td colspan="7">With Mitigation</td></tr>
<tr><td>Impact type</td><td>Probability</td><td>Extent</td><td>Duration</td><td>Severity</td><td>Reversible</td><td>Significance</td><td>Impact type</td><td>Probability</td><td>Extent</td><td>Duration</td><td>Severity</td><td>Reversible</td><td>Significance</td></tr>
<tr><td>-ve</td><td>Definite</td><td>Local</td><td>Short-term</td><td>Severe</td><td>No</td><td>Severe</td><td>-ve</td><td>Definite</td><td>Site specific</td><td>Short-term</td><td>Low</td><td>Yes</td><td>Low</td></tr>
<tr><td colspan="9">Qualitative assessment</td><td colspan="7">Qualitative assessment</td></tr>
<tr><td colspan="16">Monitoring Program</td></tr>
<tr><td colspan="6">Monitoring Aspects</td><td colspan="3">Frequency</td><td colspan="4">Responsibility</td><td colspan="3">How</td></tr>
<tr><td colspan="6">• Steepness of borrow pit edges
• Safety measures (signage/ fencing)</td><td colspan="3">Monthly</td><td colspan="4">Contractor / Site manager
Authority (Environmental Compliance Officer)</td><td colspan="3">Physical observations
Community feedback</td></tr>
</table>

7.2.4 Dust

Impact source	Site clearance, excavation with heavy mobile equipment and transportation of sand	**Key Mitigation Measures:** • Adherence to site standard/safe operating procedure (cover trucks when transporting sand) • Identify and implement appropriate Personal Protective Equipment (PPEs) as a result resort to prevent or reduce exposure to workers • Dust suppression • Speed limit as per existing site policy
Potential Negative Impacts: • Employee exposure to contaminated dust since area is already disturbed site • Dust emission to environment with potential increase background dust emission		

Without Mitigation							**With Mitigation**						
Impact type	**Probability**	**Extent**	**Duration**	**Severity**	**Reversible**	**Significance**	**Impact type**	**Probability**	**Extent**	**Duration**	**Severity**	**Reversible**	**Significance**
-ve	**Definite**	**Local**	**Short-term**	**Severe**	**No**	High	**-ve**	**Definite**	**Site specific**	**Short-term**	**Low**	**Yes**	Low
Qualitative assessment							**Qualitative assessment**						

Monitoring Program			
Monitoring Aspects	**Frequency**	**Responsibility**	**How**
• Dust fallout and dust chemical analysis • Workers exposure to dust • Community dust complaints	Weekly / Monthly	Contractor / Site Manager Authority (Environmental Compliance Officer)	• Laboratory analysis • Use of respirable dust samplers, PPE audits • Complaint registers

7.2.5 Noise from Earthmoving Equipment

<table>
<tr><td colspan="2">Impact source</td><td colspan="5">Excavation works</td><td colspan="7" rowspan="2">Key Mitigation Measures:
• Where possible, install silencer in machinery exhaust to reduce noise levels
• Avoid working late at night or under bad weather (heavy rain or wind)
• Provide earmuffs to workers in high-noise zones
• Prevent abnormal noise from earthmoving machinery (below the recommended noise levels of -85dB (A)).</td></tr>
<tr><td colspan="7">Potential Negative Impacts:
• Abnormal and excessive noise is not just a nuisance, but can lead to health issues (hearing, poor sleep, fatigue, etc)</td></tr>
<tr><td colspan="7">Without Mitigation</td><td colspan="7">With Mitigation</td></tr>
<tr><td>Impact type</td><td>Probability</td><td>Extent</td><td>Duration</td><td>Severity</td><td>Reversible</td><td>Significance</td><td>Impact type</td><td>Probability</td><td>Extent</td><td>Duration</td><td>Severity</td><td>Reversible</td><td>Significance</td></tr>
<tr><td>-ve</td><td>Definite</td><td>Local</td><td>Short-term</td><td>Severe</td><td>No</td><td>High</td><td>-ve</td><td>Definite</td><td>Site specific</td><td>Short-term</td><td>Low</td><td>Yes</td><td>Low</td></tr>
<tr><td colspan="7">Qualitative assessment</td><td colspan="7">Qualitative assessment</td></tr>
<tr><td colspan="14">Monitoring Program</td></tr>
<tr><td colspan="4">Monitoring Aspects</td><td colspan="3">Frequency</td><td colspan="4">Responsibility</td><td colspan="3">How</td></tr>
<tr><td colspan="4">• Noise levels (dB) near machinery
• Worker exposure
• Community complaints on noise</td><td colspan="3">Monthly</td><td colspan="4">Contractor / Site Manager
Authority (Environmental Compliance Officer)</td><td colspan="3">• Decibel meter readings
• PPE compliance audits
• Maintain log of complaints</td></tr>
</table>

7.2.6 Contractors camp

Classification:	Contractors Temporary Camp Domestic Waste (Solid and Wastewater)
Scale	About 50 workers for about 22 Months construction duration

Potential Negative Impacts:

- Lack of ablution facilities – leading to open defecation, environmental pollution (scattered human waste), stench smell and washing of faecal waste into water streams
- Long-drop toilets – not suitable for bigger groups (>50 people) over long period at one site (e.g 22 months)
- Poor solid waste management – throw away culture

Key Mitigation Measures:

- Adequate solid waste management *(contain – drums / bins, sort, burn combustible materials and recycle non-combustible materials)*
- Awareness on the impacts of open defecation *(stench smell, used toilet papers blown by the wind all over the place, food contamination by flies, potential water contamination from faecal waste, etc)*
- Recommend Flushing toilets with provision of a containerized septic tank, honey sucked for disposal at approved oxidation ponds, or
- Adequate pit latrines: Ventilated (closed air-vent), slab (removable), toilet pot (closed)

Without Mitigation							**With Mitigation**						
Impact type	**Probability**	**Extent**	**Duration**	**Severity**	**Reversible**	**Significance**	**Impact type**	**Probability**	**Extent**	**Duration**	**Severity**	**Reversible**	**Significance**
-ve and +ve	Definite	Local	Long-term	Medium	Yes	High	-ve	Definite	Site specific	Short-term	Low	Yes	Low
Qualitative assessment							**Qualitative assessment**						

Monitoring Program

Monitoring Aspects	**Frequency**	**Responsibility**	**How**
Ablution facilities (Flushing toilets) Containerised septic tank Wastewater collection schedule and records Waste bins, collection schedule and records	Weekly	Contractor / Site Manager Authority (Environmental Compliance Officer)	Physical observations Records

8. CONCLUSION

The environmental assessment employed standard EIA Methodology, National regulatory framework and best practices.

Appropriate mitigation measures have been identified for all social and environmental receptors.

On that basis, TEC recommends issuance of an ECC, on conditions that the management and mitigation measures specified in the ESMP are implemented and adhered to.

References

Ministry of Environment and Tourism. (2008). *Draft Procedures and Guideline for Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) .* Widnhoek: Government of Namibia.

Mendelsohn , J., Shixwameni , L., & Nakamhela, U. (n.d). *An overview of communal land tenure in Namibia: Unlocking its economic potential .* Windhoek : Bank of Namibia .

Wana Engineering Consulting . (2025). *Environmental Scoping Report: Construction of DR3604 (Oshaango - Epembe) access gravel roads to Okambumbu, Okanaimbula and Omishe School in Ohangwena Region.* Windhoek.

Mendelsohn , J., el Obeid, S., & Roberts , C. (2000). *A Profile of North-Central Namibia.* Windhoek: Gamsberg Macmillan Publishers.

Mouton , R., & Dirkx, E. (2014). Ohangwena Region. In U. Dieckmann, M. Thiem , E. Dirkx, & J. Hays, *"Scraping the pot:" San in Namibia Two Decades after Independence* (pp. 233 - 288). Windhoek: Legal Assistance Center and Desert Research Foundation of Namibia.

Ohangwena Regional Council. (2025, May 26). *Government of the Republic of Namibia .* Retrieved from Ohangwena Regional Council : https://ohangwenarc.gov.na

Namibia Statistics Agency. (2023). *Namibia 2023 Population and Housing Census .* Windhoek : Namibia Statistics Agency .

Wana Consulting Engineering. (2025). *Inception Report .*