Environmental Management Plan (EMP)

The Proposed Construction of the New Oute River Bridge on District Road 3703 (DR3703) in the Kunene Region

ECC Application No.: **APP-007177**

Proponent: **Roads Authority of Namibia**

Project Consulting Engineer: **D&P Engineers, Archetype Project Consultants & Tweya Consulting Engineers Joint Venture (DAT JV)**

April 2026

DOCUMENT INFORMATION

Title: Draft Environmental Management Plan (EMP) – The Proposed Construction of the New Oute River Bridge on District Road 3703 (DR3703) in the Kunene Region

Prepared by:

Author / Environmental Assessment Practitioner (EAP):	Fredrika N. Shagama
Qualifications:	Ph.D. Student: Civil Engineering (Geotechnics & Environmental Hydrogeology), VSB - Technical University of Ostrava, Czech Republic; Post Graduate Diploma in Environmental Studies, International University of Management (IUM), Namibia; MSc. Geological Engineering (*cum laude*) with a focus in Hydrogeology, VSB - Technical University of Ostrava, Czech Republic; BSc. Geological Engineering, VSB - Technical University of Ostrava, Czech Republic
Professional Affiliations:	Environmental Assessment Professionals of Namibia (EAPAN) - Practitioner (Membership No. 183); Geoscience Council of Namibia (GSCN) – Geoscientist, Registration No. GSCN/G-057; International Association of Hydrogeologists (IAH) - Full Member, Membership No.139790; Namibian Hydrogeological Association (NHA) – Member
Contact Details:	Mobile No.: +264 81 749 9223; eias.public@serjaconsultants.com Postal Address: P.O. Box 27318, Windhoek, Namibia
Signature:	
Date:	20 April 2026

SERJA'S STATEMENT OF INDEPENDENCE

As the Appointed Environmental Consultant to undertake the EIA Study and prepare this Environmental Management Plan (EMP) for the Proposed Construction of the New Oute River Bridge on District Road 3703 (DR3703) in the Kunene Region, Serja Hydrogeo-Environmental Consultants cc declares that we:

- do not have, to our knowledge, any information or relationship with the Roads Authority of Namibia (Proponent), nor the Ministry of Environment, Forestry and Tourism (MEFT)'s Department of Environmental Affairs and Forestry (DEAF) that may reasonably have the potential of influencing the outcome of this EMP and the subsequent Environmental Clearance Certificate applied for.
- have knowledge of and experience in conducting environmental assessments, the Environmental Management Act (EMA) No. 7 of 2007, and its 2012 Environmental Impact Assessment (EIA) Regulation, as well as other relevant national and international legislation, guidelines, policies, and standards that govern the project activities as presented herein.
- have performed work related to the ECC application in an objective manner, even if the results in views and findings, or some of these may not be favorable to the Proponent.
- have complied with the EMA and other relevant regulations, guidelines, and other applicable laws as listed in this document.
- declare that we do not have and will not have any involvement or financial interest in the undertaking/implementation of the project, other than remuneration (professional fees) for work performed to conduct the EIA and apply for the ECC in terms of the EIA Regulations' requirement as an Environmental Assessment Practitioner (EAP).

Disclaimer: Serja Hydrogeo-Environmental Consultants will not be held responsible for any omissions and inconsistencies that may result from information that was not available at the time this document was prepared and submitted for evaluation.

…….

Signature:

Fredrika N. Shagama: Principal Environmental Assessment Practitioner & Hydrogeologist

Date: April 2026

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

Abbreviation	Meaning
AASHTO	American Association of State Highway and Transportation Officials

Abbreviation	Meaning
CBR	California Bearing Ratio
BP	Borrow Pit
CLO	Community Liaison Officer
DAT JV	D&P Engineers, Archetype Project Consultants, and Tweya Consulting Engineers Join Venture
DEAF	Department of Environmental Affairs and Forestry
DR	District Road
EAP	Environmental Assessment Practitioner
ECC	Environmental Clearance Certificate
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
GG	Government Gazette
GN	Government Notice
HSE Officer	Health, Safety & Environmental Officer
I&APs	Interested and Affected Parties
MEFT	Ministry of Environment, Forestry and Tourism
MAWLR	Ministry of Agriculture, Fisheries, Water, and Land Reform
MIME	Ministry of Industries, Mines and Energy
NHC	National Heritage Council (NHC) of Namibia
PPE	Personal Protective Equipment
PRO / CLO	Public Relations Officer/ Community Liaison Officer
PS	Primary School
RA	Roads Authority of Namibia
RE	Resident Engineer
Reg, S	Regulation, Section

1 INTRODUCTION

1.1 Project Background and Location

The Roads Authority of Namibia (RA) intends to construct and operate the Oute Bridge in the Kunene Region (the Project). The proposed bridge is located on the District Road 3703 (DR3703) over the Oute River (also known as the Hoarusib River) between Okaundje and Orotjitombo Villages (Figure 1-1), about 33km west of Opuwo Town in the Opuwo Rural Constituency. The DR3703 runs from the Epupa Constituency via the Opuwo Rural Constituency until the Opuwo Urban Constituency, as shown on the map in Figure 1-2. The DR3703 is an important route connecting the villages of Otjitanda and Etanga, and the town of Opuwo, which is the main centre for economic and social facilities. However, the road has become inaccessible during the rainy season when the Oute River flows, thereby cutting off communities from accessing much-needed services in Opuwo. The project, therefore, includes the design of a new bridge or major culvert across the Oute River on DR3703 and subsequently, the bridge construction works.

The bridge construction will commence upon completion of the project design by the joint venture of three consulting engineers (D&P Engineers, Archetype Project Consultants, and Tweya Consulting Engineers, hereinafter referred to as DAT JV). The JV engineering team will administer the construction contract and supervise the construction works of the bridge. The project design will entail the following components:

- Geotechnical investigation and evaluations,
- Hydrological and hydraulic analyses,
- Drainage considerations (75mm diameter weepholes installed at 1.5m centres in the bridge deck to discharge surface runoff into the river), and
- Construction materials investigation. At this stage, the availability and suitability of coarse and fine aggregates and construction water for structural concrete works have not yet been confirmed, as a detailed geotechnical site investigation and materials investigation are pending completion. The information in this section is therefore preliminary and will be updated once test results and supply options are confirmed.

Furthermore, other activities associated with bridge construction include the abstraction of construction materials, as well as water supply for construction from the area (near the project site).

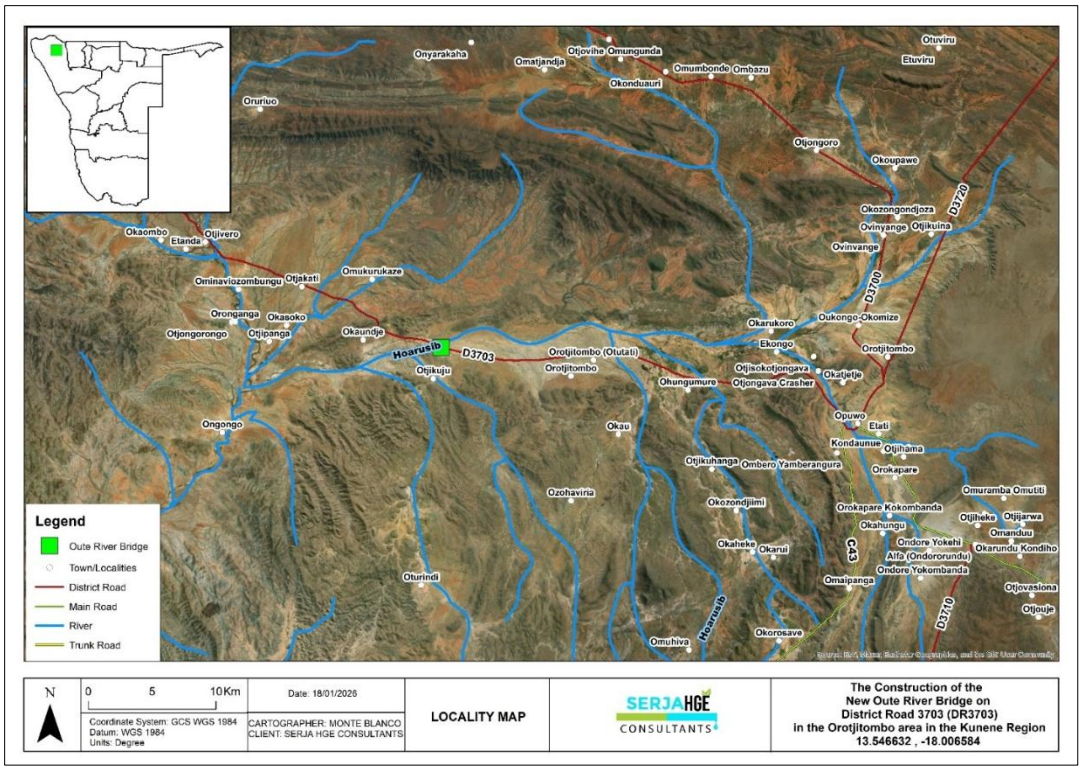

Figure 1-1: Locality map of the proposed New Oute Bridge on the DR3703 near Otjikuju and Orotjitombo Villages in the Kunene Region

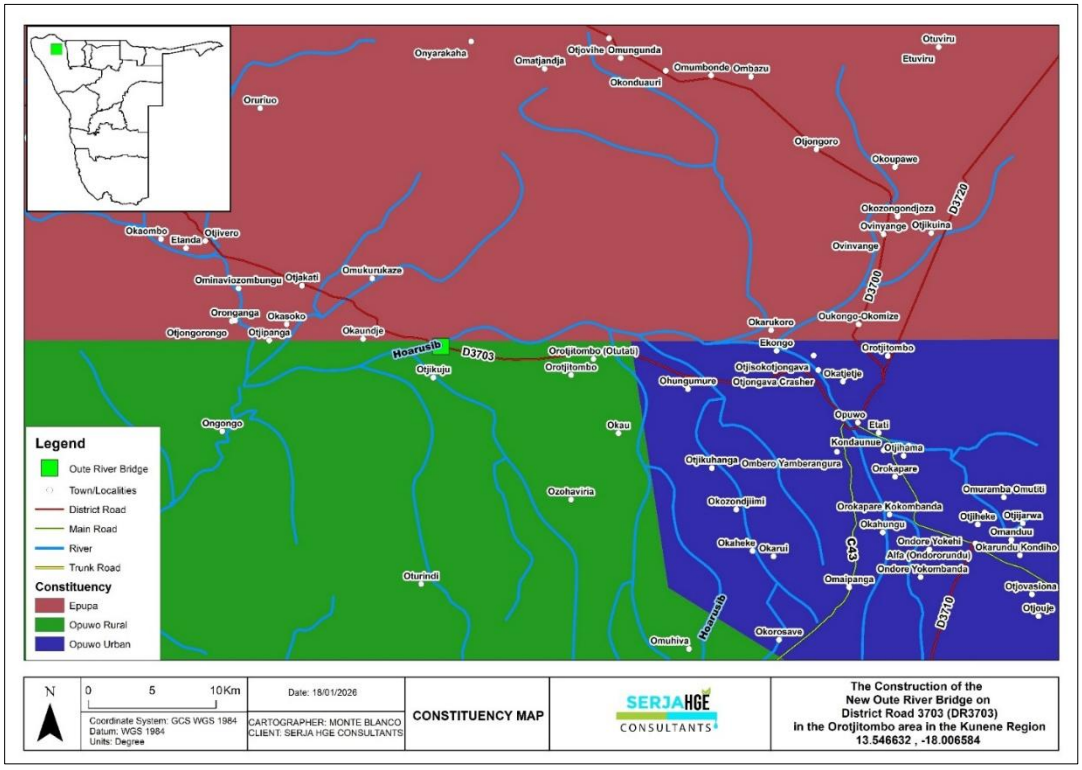

Figure 1-2: The constituency and villages map through which the DR3703 passes (with the proposed Bridge)

1.2 Purpose of the Draft Environmental Management Plan (EMP)

The Draft EMP was developed in accordance with Regulation 8(j) of the EIA Regulations (2012), which states that it should be included in the Environmental Assessment Scoping report. A '**Management Plan**' is defined as:

> *"…a plan that describes how activities that may have significant environmental effects on the environment are to be mitigated, controlled, and monitored."*

An EMP (herein referred to as an Environmental Management Plan (EMP)) is one of the most important outputs of the EIA process, as it synthesizes all proposed management & mitigation actions and monitoring actions, sets them to a timeline, and assigns specific responsibilities. It provides a link between the impacts identified in the EIA process and the required mitigation measures to be implemented to manage project impacts. It is important to note that an EMP is a statutory document, and a person who contravenes the provisions of this EMP may face imprisonment and/or a fine. This EMP is a living document and can be amended to address project changes/or environmental conditions, and compliance monitoring feedback.

The EMP is therefore aimed at guiding environmental management throughout these phases of the project, namely planning & design, construction, and the post-construction phase (decommissioning of construction works and rehabilitation of disturbed sites).

1.2.1 Planning and design

The main components of the project planning and design will include the following, as provided by the DAT JV Preliminary Design Report (2026):

1.2.1.1 Geotechnical investigation and evaluations

This entails project-specific geotechnical recommendations, including founding levels, allowable bearing pressures, pile/caisson feasibility, excavation conditions, and seepage/dewatering requirements. These will be provided upon completion of the geotechnical investigation and interpretation of the results.

1.2.1.2 Hydrological and hydraulic analyses

The hydrological and hydraulic analysis recommendations are based on the findings of the hydrological and hydraulic analyses, undertaken in terms of the requirements of the RA's "Drainage Manual" (1st Edition, October 2014). The project's Hydrological and Hydraulic Analyses Report concluded with the following recommendations for the Oute River Bridge:

- 1:50-Year Flood Event (given return period discharge (QT) = 464.63m³/s)
- 1:100-Year Flood Event (Q2T = 580.10m³/s).

1.2.1.3 Drainage considerations

75mm diameter weepholes installed at 1.5m centres in the bridge deck to discharge surface runoff into the river.

1.2.1.4 Construction materials and water supply investigation

This entails the investigation of the availability and suitability of coarse and fine aggregates and construction water for structural concrete works. However, these have not yet been confirmed at this stage, as a detailed geotechnical site investigation and materials investigation have not yet been completed.

1.2.1.5 Structural considerations

Two bridge concepts were considered at this preliminary design stage to identify the preferred structural form for further development. In selecting alternative structural forms suitable for the Oute River crossing, these design objectives were used as the primary screening criteria:

- Safety (strength, stability, and robustness, including performance under extreme flood events).
- Durability and serviceability (whole-life performance, maintenance requirements, and reliability in a harsh environment).
- Economy and constructability (with specific emphasis on the rural/remote site setting, logistics, programme risk, and the availability of local construction capability), and
- Aesthetics, appropriate to the surrounding environment and road context (DAT JV, 2026).

1.2.2 Construction

The construction phase will include clearing of vegetation at the demarcated areas for the bridge, stripping topsoil, and shaping the site. The layers of gravel needed for the construction works will be sourced from approved borrow pits in the area, transported, spread, and compacted in layers. Culverts and side drains are installed to manage surface water, and signage and safety features are added. The environmental management plan will be implemented and monitored throughout to minimize ecological and social impact.

1.2.3 Decommissioning and rehabilitation of disturbed site areas (post-construction)

The phase during which construction works are completed, and disturbed sites are rehabilitated. This will include backfilling of construction-related trenches, holes, dismantling of temporary construction supporting infrastructure and structures, as well as the backfilling/levelling of borrow pit sites that are no longer needed in the long term (or complete fencing of pits for safety).

1.2.4 Operational and maintenance phase

This is the phase that succeeds the construction phase, when the newly constructed bridge will be operational with regular maintenance to ensure usability and safety. The bridge maintenance (when and as necessary) will be carried out by the RA’s Maintenance Department in the Kunene Region. Routine inspections will also be critical to prolong the bridge's life and reduce long-term costs.

2 BRIEF DESCRIPTION OF THE PROJECT ACTIVITIES

The project will involve the design, construction, and eventual operation of the Oute Bridge across the DR3703 between Okaundje and Orotjitombo Villages in the Kunene Region. The current condition of the site for the proposed Oute Bridge across the DR3703 by March 2026 is as shown in **Error! Reference source not found.**.

Figure 2-1: The condition of the DR3703-Oute River site for the bridge construction in March 2026

Based on the preliminary constructability and durability assessment, the bridge to be constructed will be a cast-in-situ reinforced concrete cellular type. This is considered the most appropriate structural solution for further development. The cast-in-situ reinforced concrete cellular bridge option best matches the project constraints associated with a remote rural site, reduces reliance on specialist construction expertise and heavy plant. The option also supports the Roads Authority's objective of uplifting emerging contractors, and it is expected to provide a more durable and less service-intensive solution over the design life when compared with the prestressed precast beam alternative (DAT JV, 2026).

In addition to the above, the bridge construction will also address the erosion aspects through the drainage systems to be designed. Bridge construction materials from a borrow pit with quality material sites (to be identified and sited by materials personnel), and sources of nearby raw and fresh water will be determined.

The project phases anticipated for the project operations are presented below.

2.1 Planning and Design

The main components of the project planning and design will include the following, as provided by the DAT JV Preliminary Design Report (2026). The consulting engineering works will focus on the detailed engineering design, including consultation, data collection, survey, geotechnical and materials investigation and testing, geometric design, structural and drainage design, and tender documentation. Further responsibilities for the engineering team will include the administration of the tender process, contract administration, and site supervision of the bridge construction.

2.1.1 Geotechnical Investigations and Evaluations

This entails project-specific geotechnical recommendations, including founding levels, allowable bearing pressures, pile/caisson feasibility, excavation conditions, and seepage/dewatering requirements. These will be provided upon completion of the geotechnical investigation and interpretation of the results.

2.1.2 Hydrological and hydraulic analyses

The hydrological and hydraulic analysis recommendations are based on the findings of the hydrological and hydraulic analyses, undertaken in terms of the requirements of the RA's "Drainage Manual" (1st Edition, October 2014). The project's Hydrological and Hydraulic Analyses Report concluded with the following recommendations for the Oute River Bridge:

- 1:50-Year Flood Event (given return period discharge (QT) = 464.63m³/s)
- 1:100-Year Flood Event (Q2T = 580.10m³/s).

2.1.3 Drainage considerations

75mm diameter weepholes installed at 1.5m centres in the bridge deck to discharge surface runoff into the river.

2.1.3 Construction materials and water supply investigation

This entails the investigation of the availability and suitability of coarse and fine aggregates and construction water for structural concrete works. However, these have not yet been confirmed at this stage, as a detailed geotechnical site investigation and materials investigation have not yet been completed.

2.1.4 Structural considerations

Two bridge concepts were considered at this preliminary design stage to identify the preferred structural form for further development. In selecting alternative structural forms suitable for the Oute River crossing, these design objectives were used as the primary screening criteria:

- Safety (strength, stability, and robustness, including performance under extreme flood events).

- Durability and serviceability (whole-life performance, maintenance requirements, and reliability in a harsh environment).
- Economy and constructability (with specific emphasis on the rural/remote site setting, logistics, programme risk, and the availability of local construction capability), and
- Aesthetics, appropriate to the surrounding environment and road context (DAT JV, 2026).

2.2 Construction Phase

The construction phase will include clearing of vegetation at the demarcated areas for the bridge, stripping topsoil, and shaping the site. The layers of gravel needed for the construction works will be sourced from approved borrow pits in the area, transported, spread, and compacted in layers. Culverts and side drains are installed to manage surface water, and signage and safety features are added. The environmental management plan will be implemented and monitored throughout to minimize ecological and social impact.

2.2.1 Borrow Pits (BPs) for bridge construction works

The construction of the bridge requires materials such as sand and gravel that will be sourced (extracted) from selected localities near the site. The exploration/survey and materials testing for the borrow pit to select suitable site for the borrow pit for the construction materials will be done to determine preliminary locations. The selection of the BP site (upon confirmation of good materials) will be based on materials that meet the quality requirements for bridge construction.

It is important to note that the BPs will be on communal land. Thus, the exploration, establishment, and utilisation of the BP site have been communicated with communities in the consultation meeting held on the 24th of March 2026 in Ohungumure Village.

For any new BPs where additional BPs may be required, compensation guidelines, as per the Roads Authority and relevant government policies (National Compensation Policy), will be followed for implementation. This is to ensure that the affected landowners/land custodians are compensated fairly and that the process and material extraction are done efficiently, safely, and amicably.

2.2.2 Required Resources and Services Infrastructure

2.2.2.1 Human resources

The bridge construction will potentially employ about 90 to 100 people. The workforce will comprise safety officers, the resident engineer, contracts manager, land surveyor, quality control technicians, maintenance artisans, general foremen, operators, labourers, security guards, etc. Locals will be prioritised for employment (semi-skilled to unskilled labour).

2.2.2.2 Contractors' accommodation

Local labourers will be commuting to the project site from their homes in villages near the site. The skilled project workforce that is from outside the area will be accommodated in a construction camp established in either Otjikuju, Orotjitombo, or Okaundje Villages, which are near the bridge site. However, before the camp can be established, the contractor will need to obtain consent from the relevant traditional authority (headmen) of the area.

2.2.2.3 Vehicles and equipment

The project equipment, machinery, and vehicles will be stored at designated areas inside the contractor's campsites. Machinery and vehicles such as excavators, dump trucks, bulldozers, loaders, support vehicles (such as 4x4 wheel-drive cars and other maintenance vehicles), etc., will also be parked at designated sites at the campsites.

2.2.2.4 Water supply

The required water will be used for the actual bridge construction works and dust suppression. This water will be obtained from the existing borehole in proximity to the site, i.e., borehole WW8235 at these GPS coordinates: -18.0047 13.5529. The borehole was drilled in 1964 and has an excellent yield of 91m^3/hr, and this is probably explained by its location in the river (which acts as a direct source of recharge to the borehole). However, the water should be tested to check if it meets the water quality standards for the bridge construction works, as the groundwater quality in the area is poor. Therefore, this borehole may only be able to supply the raw water for the bridge construction works. With that said, the fresh water supply for the project will be obtained from the nearby fresh water supply scheme, transported to the site by a water truck, and stored in tanks on-site. The water will be stored in an industry-standard water storage tank on-site and refilled as necessary throughout the project.

It is important to note that, for the abstraction and utilisation of groundwater (from the borehole) **for industrial** and commercial purposes, a license should be applied for and obtained from the MAFWLR's Department of Water Affairs (Water Law Administration & Policy) – see Table 3-1.

2.2.2.5 Fuel supply

Diesel will be used for machinery and equipment, and a fuel generator to ensure an uninterrupted fuel supply to the project. The fuel will be stored in a 23,000-litre tank or less, which will be temporarily installed at a selected point on-site to ensure an uninterrupted supply during construction.

The base of the tank will be lined with the impermeable Polyvinyl chloride (PVC) material under a concrete layer to prevent accidental oil spills from infiltrating the soil and groundwater. There will be oil spill control measures onsite, i.e., the absorbent material contained in the fuel spill equipment (such as a natural sponge-like material) that can absorb accidental fuel spillage or leaks. It is anticipated that the fuel tank will be refilled once a week. The Construction Contractor will apply for a consumer installation certificate for the tank from the Ministry of Industries, Mines, and Energy (MIME).

2.2.2.6 Occupational health and safety

All project workers will be provided with appropriate and adequate personal protective equipment (PPE) while carrying out on-site project activities. The site will be equipped with fully furnished first aid kits.

2.2.2.7 Accidental fire outbreaks

The campsite and vehicles will be equipped with fire extinguishers in case of accidental fire outbreaks.

2.2.2.8 Waste management (solid waste)

All waste generated from the project activities will be sorted, stored on-site in designated waste containers, and transported to the nearest approved solid waste dumping site in Opuwo. Consent and approval to dispose of solid waste on the Opuwo Town dumpsite will need to be obtained from the Opuwo Town Council before doing so.

2.2.2.9 Human waste/sanitation

The appointed contractor will establish portable toilets for the workers and project-related visitors. The toilets will be emptied according to the manufacturer's instructions and as regularly as deemed necessary.

2.2.2.10 Hazardous waste (fuels)

The hazardous waste (waste fuel, grease, and oils) will be properly captured, stored on site in designated waste containers, and transported to the appropriate hazardous waste management facility (in Windhoek). Therefore, no hazardous waste will be disposed of in the project area or any other unapproved waste management facility in the project area or the Kunene Region at large.

2.3 Decommissioning of Construction Works and Site Rehabilitation

After construction work is completed, temporary infrastructure such as construction camps and detours will be dismantled. Borrow pits are rehabilitated in accordance with environmental regulations, usually by reshaping and re-vegetating the land. Topsoil is replaced, and disturbed areas are stabilized to prevent erosion and encourage natural regrowth, ensuring long-term environmental sustainability.

Decommissioning and rehabilitation are primarily addressed through a decommissioning and rehabilitation plan that encompasses safety, health, environmental, and contingency aspects. Therefore, it is best practice for the Proponent through their contractor to ensure the project and associated activities, mainly the BP sites, are ceased in an environmentally friendly manner and sites are rehabilitated by carrying out the following:

- Dismantling and removal of campsites and associated infrastructures from the project site areas,
- Carrying away all project equipment and vehicles, and
- Clean up of site working areas and transporting the recently generated waste to the nearby approved waste management facility (as per agreement with the waste facility operator/owner),

Further decommissioning and rehabilitation practice at the BPs will include:

- Backfilling of pits and trenches associated with the construction materials sourcing in the area,

- Closing of holes to ensure that they do not pose a risk to both people and animals in the area, and
- Levelling of stockpiled topsoil. This will be done to ensure that the disturbed land sites are left as close to their original state as possible.

2.4 Operations and Maintenance

This is the phase that succeeds the construction phase, when the newly constructed gravel road will be operational with regular maintenance to ensure usability and safety. It is anticipated that road maintenance will be carried out by the Roads Authority of Namibia's Maintenance Department in the Region. The maintenance works will include grading to smooth out surface irregularities, repairing erosion damage, cleaning and maintaining drainage systems, and periodically reapplying gravel. Routine inspections will also be critical to prolong road life and reduce long-term costs.

The descriptions of the project activities, resources, services, and infrastructure are provided in the EIA Report.

3 LEGAL FRAMEWORK: PERMITTING AND LICENSES

The Proponent (Roads Authority of Namibia) is responsible for ensuring that project activities and the EA process conform to the principles of the EMA and that employees act in accordance with such principles. Table 3-1 The list below sets out the requirements of an EMP as stipulated by Section 8(e) of the EIA Regulations, primarily regarding specific approvals and permits that may be required for the project activities.

Table 3-1: List of legal requirements and permits for the project activities

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
Environmental Management Act EMA (No 7 of 2007)	Requires that projects with significant environmental impacts undergo an environmental assessment process (Section 27). Details of the principles that are to guide all EAs.	The EMA and its regulations should inform and guide this EA process. Should the ECC be issued to the Proponent, it should be renewed every 3 years, counting from the date of issue. For any amendments to the EMP (and subsequent ECC), an appropriate application should be submitted to the Office of the Environmental Commissioner at the Department of Environmental Affairs (DEAF) and Forestry of the MEFT. The contact details are: **Mr. Timoteus Mufeti:** Environmental Commissioner **Tel: +264 61 284 2701**
Environmental Impact Assessment (EIA) Regulations GN 28-30 (GG 4878)	Details requirements for public consultation within a given environmental assessment process (GN 30 S21). Details the requirements for what should be included in a Scoping Report (GN 30 S8) and an Assessment Report (GN 30 S15).	

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
Water Resources Management Act (No 11 of 2013) and its 2023 Water Regulations: Regulated under the Ministry of Agriculture, Fisheries, Water, and Land Reform (MAFWLR)	The water resources should be managed, protected, and conserved in a manner consistent with, or conducive to, the fundamental principles set out in Section 66 - protection of aquifers, Subsection 1 (d) (iii) provide for preventing the contamination of the aquifer and water pollution control. (Section 68). Thus, the protection (both quality and quantity/abstraction) of water resources should be a priority. A groundwater abstraction & use license is required for commercial purposes.	The MAFWLR, Department of Water Affairs (DWA), is responsible for issuing the borehole water abstraction licenses as well as the wastewater discharge permits. For the utilisation of groundwater (from the borehole) **for industrial** and commercial purposes, a license should be applied for and obtained from the MAFWLR's Department of Water Affairs (Water Law Administration & Policy). **Contact: Mr. Franciskus Witbooi: Deputy Director** **Tel: +264 61 208 7226**
	For any project wastewater planned for discharge into the environment, a discharge permit should be applied for and obtained.	**Contact: Ms. Elise Mbandeka: Senior Hydrologist, Water Environment Division** **Tel: +264 61 208 7167**
Traditional Authority Act (Act No. 25 of 2000):	The Act also stipulates that Traditional Authorities (TAs) should ensure that natural resources are used sustainably to conserve the ecosystem.	The local Traditional Authority for the area of Orotjitombo, Otjikuju, Okaundje, Ohungumure, and nearby affected communities should be consulted regarding land-use consent, and engagement should continue throughout the project. The respective headmen/foremen for the affected villages should be consulted and engaged. **Chief Muharukua: Orotjitombo Area** **Tel: +264 81 746 4039**

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
	The Act implies that TAs must be fully involved in planning land use and development in their area. It is the responsibility of the TAs' customary leadership, the Chiefs, to exercise control on behalf of the state and the residents in their designated area.	
Petroleum Products and Energy Act (No. 13 of 1990) Regulations (2001)	Regulation 3(2)(b) states that "No person shall possess or store any fuel except under authority of a licence or a certificate, excluding a person who possesses or stores such fuel in a quantity of 600 litres or less in any container kept at a place outside a local authority area."	The Proponent, through their construction contractor, should obtain the necessary authorisation from the MIME to store fuel on-site. This entails the application of a consumer installation certificate. The consumer installation certificate is being applied for under a different application with its own EMP. **Mr. Carlo McLeod: Acting Director of Petroleum Affairs** **Tel: +264 61 284 8291**
Forestry Act (Act No. 12 of 2001	The Act provides for the management and use of forests and forest products.	The Proponent will apply for the relevant permit under this Act if it becomes necessary to remove protected trees, such as the protected trees at or within the bridge footprint. A vegetation survey to verify the number and type of trees to be removed (where necessary) and to issue a permit will need to be conducted by personnel of the Forestry Directorate before any site works commence. Thus, the Contractor's cost will need to make provision for this field verification survey. Contact the MEFT's Forestry Directorate Office in the Kunene Region (Opuwo) **Mr. Johnson Ndokosho: Director: Forestry** **Tel: +264 61 208 7666**

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
National Heritage Act No. 76 of 1969	Call for the protection and conservation of heritage resources and artefacts.	Should any archaeological material, such as bones, unknown graves, old weapons/equipment, etc., be found onsite, work should stop immediately, and the National Heritage Council of Namibia must be informed as soon as possible. The Heritage Council will then decide whether to clear the area or conserve the site or material. The grave site near the bridge site (within 200m to the north). Therefore, this site will be avoided at all costs. Contact Details at the National Heritage Council (NHC) of Namibia **Mrs. Erica Ndalikokule – Director: NHC** **Tel: +264 61 301 903**
Hazardous Substance Ordinance, No. 14 of 1974: **regulated by the Ministry of Health and Social Services**	The ordinance provides for the control of toxic substances. It covers manufacture, sale, use, disposal, and dumping, as well as import and export. Although the environmental aspects are not explicitly stated, the ordinance provides for the importing, storage, and handling.	The handling, storage, and use of hazardous substances should be managed properly to prevent harm or compromise to the site environment. For better management and handling of waste fuel, the contractor can contact **Waste Oil Recyclers (Oiltech Namibia CC, Windhoek, https://oiltech.com.na/)** **Tel: +264 81 343 5676**

4 EMP IMPLEMENTATION RESPONSIBILITIES

Roads Authority of Namibia (RA) is ultimately responsible for implementing the EMP. However, the Proponent may delegate this responsibility, or any part of it, at any time as they deem necessary. The roles and responsibilities of all delegates/parties involved in the effective implementation of this EMP are set out. Table 4-1.

Table 4-1: The EMP implementation responsibilities for the borrow pits activities

Role	Responsibilities
Roads Authority of Namibia (RA) (The Proponent)	-Managing the implementation of this EMP and updating and maintaining it when necessary. -Management and monitoring of individuals and/ or equipment on-site in terms of compliance with this EMP and issuing fines for contravening EMP provisions.
Project / Site Manager	This individual will be responsible for ensuring that the project activities are completed on time. The Manager's duties and responsibilities will include: -Ensure that relevant commitments contained in the EMP are adhered to. -Ensure relevant staff are trained in procedures entailed in their duties. -Maintain records of all relevant environmental documentation for the project. -Reviewing the EMP annually and amending the document when necessary. -Issuing fines to individuals who may be in breach of the EMP provision and, if necessary, removing such individuals from the site. -Cooperate with all relevant interested and affected parties/stakeholders. -Development and management of schedules for daily activities
Consulting Engineer (DAT JV)	The Consulting Engineer's responsibilities in implementing the EMP will include (during the design and planning phase): -Reviewing the EMP by ensuring that the EMP is comprehensive, realistic, and aligns with the project's scope and legal requirements. -Adapting the EMP to the specific site conditions and project design. -Assisting the Proponent in obtaining environmental permits and clearances from regulatory bodies (EIA study done under them to verify baseline conditions to benchmark pre-construction conditions, and obtaining an ECC).

Role	Responsibilities
	For the construction phase, the Consulting Engineer's responsibilities include: -Guiding the Contractor on implementing EMP requirements. -Conducting training or toolbox talks for site staff on environmental best practices and mitigation measures. -Site Supervision and Monitoring, i.e., monitoring the implementation of mitigation measures (e.g., erosion control, dust suppression, waste management). -Carrying out site inspections and audits to ensure compliance with EMP. -Overseeing or conducting regular monitoring of environmental parameters (air quality, noise levels, etc.) as per the EMP. -Identifying non-conformances and recommending corrective actions. -Ensuring the timely implementation of corrective measures by the Contractor. -Maintaining detailed records of environmental monitoring, inspections, incidents, and corrective actions.
Resident Engineer (RE)	The RE of the Engineering Consulting Team will act with restricted powers and responsibilities as delegated by the Engineer in writing. The RE may fulfil the function of the Health, Safety, & Environmental (HSE) Officer/ECO, thereby taking responsibility for the ECO's duties (see below) on this project. Any on-site decisions regarding environmental management are ultimately the responsibility of the RE, with consultation with the environmental Consultant. Therefore, the RE must assign the ECO role to a competent member of its site supervising team. The RE shall assist the ECO where necessary and will have the following responsibilities in terms of the implementation of this EMP: -Ensuring that the Contractor has obtained the necessary environmental authorisations and permits. -Assisting the Contractor in finding environmentally responsible solutions to problems with input from the ECO, where necessary. -Ordering the removal of person(s) and/or equipment not complying with the EMP specifications. -Issuing fines for transgressions of site rules and penalties for contravention of the EMP.

Role	Responsibilities
Construction Contractor, or simply the ‘’Contractor ", who is also responsible for their subcontractors	The Contractor’s representative or site supervisors (as appropriate) will be required to: -Ensure that the relevant commitments contained in the EMP Action Plans are adhered to. -Compile relevant procedures and method statements for approval by the applicable phase site manager before initiation of project activities on the sites. -Ensure that all relevant staff are trained in procedures. -Maintain records of all relevant environmental documentation applicable to their work
Kunene Region Governor’s Office	The Governor’s Office will be responsible for stakeholder communication, coordination, and engagement facilitation, in terms of, but not limited to: -Acting as the primary communication channel between the project proponent and regional stakeholders (communities, traditional authorities, local leaders). -Coordinating and facilitating public meetings, consultations, and engagement sessions. -Supporting grievance redress: receive, record, and channel community grievances to the project team, as well as participating in the Grievance Redress Mechanism (GRM) and supporting timely resolution. -Liaising with traditional authorities and local structures by facilitating engagement with traditional authorities and communities. The Governor’s office will ensure that the construction contractor respects local customs, land use practices, and cultural heritage. Advise the project team on culturally sensitive issues. -Resolution and Mediating conflicts by acting as a neutral mediator in disputes between the community and the project proponent/construction contractor, etc.
Health, Safety, & Environmental (HSE) Officer, commonly referred to as Environmental Control Officer (ECO)	The Proponent may assign the responsibility of ensuring EMP compliance throughout the project life cycle to a designated member of staff or an external qualified and experienced person, referred to in this EMP as the HSE Officer. This officer will have the following responsibilities: -Management and facilitation of communication between the Proponent and communities / I&APs and stakeholders regarding this EMP.

Role	Responsibilities
	-Conducting site inspections of all areas concerning the implementation of this EMP (monitor and audit its implementation). -Advising the Proponent or Project/Site Manager on the removal of person(s) and/or equipment not complying with the provisions of this EMP. -Making recommendations to the Manager with respect to the issuing of fines for contraventions of the EMP. -Undertaking an annual review of the EMP and recommending additions and/or changes to this document.
Public Relations / Community Liaison Officer (PRO) / CLO	The PRO/CLO will be responsible for the following tasks: -Liaising between the stakeholders, communities, and the Proponent (**the best PRO/CLO would be someone from the community who is fluent in both English and Otjiherero/Otjizemba).** -Ensure effective communication with stakeholders, media (if necessary), and the community. -Organising and overseeing public relations activities, -Managing public and community relations issues. -Preparing and submitting public relations reports, if required. -Collaborating with personnel and maintaining project-related open communication among personnel.

4.1 Financing of Environmental Control

The financing of environmental requirements, as outlined in this document, apart from the appointment of the Environmental Assessment Practitioner (Environmental Consultant) and specialists, is the sole responsibility of the Contractor appointed by the RA. Therefore, it is accepted that the cost incurred by the Contractor in implementing this EMP would be allocated in the tender document. Any responsibilities not defined in this document or where any uncertainties arise in this matter will be the responsibility of RA.

4.2 Amendments of the EMP

Any party involved with the project can suggest changes to the EMP via the Environmental Consultant or Resident Engineer. Therefore, such suggestions or changes will need to be discussed collectively. Approved changes will be drafted and incorporated into the existing EMP as an appendix or amendments.

4.3 Procedures for non-compliance with the EMP

The Contractor shall comply with the environmental specifications and requirements on an ongoing basis, and any failure to do so will entitle the Resident Engineer (RE) to impose a penalty. This applies to the EMP.

In the event of non-compliance, the following recommended process shall be followed (as adopted from ESMP for DR3633)[1]:

- The RE shall consult the environmental consultant and, if agreed, issue a notice of non-compliance to the Contractor, stating the nature and magnitude of the contravention. A copy shall be provided to the ECO.
- 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 shall provide the RE 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. A copy shall be provided to the ECO.
- In the case of the Contractor failing to remedy the situation within the predetermined time frame, the RE shall impose a monetary penalty based on the conditions of the contract.
- In the case of the Contractor being unable to remedy the situation due to permanent environmental damage already incurred, the RE shall impose a monetary penalty based on the conditions of the contract.
- In the case of non-compliance giving rise to physical environmental damage or destruction, the RE 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 concerning or arising out of the interpretation of the conditions of the EMP, disagreement regarding the implementation or method of implementation of conditions of the EMP, etc., any party shall be entitled to require that the issue be referred to independent specialists for determination.
- The RE shall at all times have the right to stop work and/or certain activities on site in the case of safety and EMP non-compliance or failure to implement remediation measures.

[1] EnviroPlan Consulting. (2021). Environmental & Social Impact Assessment for the Upgrade to Low Volume Seal (LVS) Standard of the DR3633 Tsandi - Ongulumbashe (22km) in the Omusati Region, Namibia: Environmental and Social Management Plan (ESMP). Windhoek. MEFT.

4.4 Fines and Penalties related to the EMP Contraventions

The following fines and penalties apply to the transgressions listed below. It will be issued after the procedures contained herein have been duly followed, and only in severe cases and after repeated non-compliance. Each specific penalty justifies the gravity of the transgression.

4.4.1 Fines

Fines may be issued on a per-incident basis at the discretion of the RE. Such fines will be issued in addition to any remedial costs incurred as a result of noncompliance with the EMP. The RE will inform the Contractor of the contravention and the amount of the fine and will deduct the amount from monies due under the Contract.

The RE will impose fines for the activities detailed below on the Contractor and/or his Subcontractors.

Any person, vehicle, plant, or thing related to the Contractor's operations within the designated boundaries of a "no-go" area.	**N$2,000**
Any vehicle guilty of reckless driving on and in the vicinity of the site, including excessive speeds.	**N$1,000**
Any vehicle being driven, and items of plant or materials being parked or stored outside the demarcated boundaries of the site.	**N$2,000**
Persons repeatedly walking outside the demarcated boundaries of the site.	**N$1,000**
Persistent and unrepaired spills of hazardous materials and materials causing pollution.	**N$3,000**
Persistent littering on the site.	**N$500**
Individuals repeatedly fail to make use of the designated toilet facilities.	**N$200**
Disposal of waste other than agreed upon in the waste management plan.	**N$5,000**
Deliberate lighting of illegal fires on site (e.g., outside of the designated campsite).	**N$2,000**

For each subsequent similar offence, the fine may, at the discretion of the RE, be doubled in value.

The RE shall be the judge as to what constitutes a transgression in terms of this document.

4.4.2 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 the specification, environmental damage due to negligence,
- The safety of Contractor personnel and the public is being compromised due to negligence.

- the Contractor fails to comply with corrective or other instructions issued by the Engineer within a specific time,
- the Contractor fails to respond adequately to complaints from the public, and
- Payment of any fines in terms of the contract shall not absolve the offender from being liable for prosecution in terms of any law.

The RE will be responsible for a report on non-repairable damage and/or non-compliance based on visual and other evidence, and will issue the penalty to the Contractor with the report attached. The suggested penalties for transgressions regarding the biological, physical, and social components are provided in Table 4-2 below. A copy must be handed to the ECO.

Table 4-2: The penalties suggested for transgressions

Actions leading to erosion:	A penalty equivalent in value to the cost of rehabilitation plus 20%.
Oil spills:	A penalty equivalent in value to the cost of the clean-up operation plus N$1,000.
Damage to indigenous vegetation:	A penalty equivalent in value to the cost of restoration plus N$2,000.
Damage to trees:	A penalty of a maximum of N$5,000 shall be paid for each tree removed without prior permission, or a maximum of N$2,000 for damage to any tree, which is to be retained on site.
Damage to indigenous vegetation:	A penalty equivalent in value to the cost of the restoration operation plus N$2,000.
Damage to the sensitive environment:	A penalty equivalent in value to the cost of the restoration operation plus 20%.
Damage to cultural sites:	A penalty of a maximum of N$100,000 shall be paid for any damage to any cultural or historical site.
Damage to natural fauna:	A penalty of a maximum of N$2,000 for damages to any naturally occurring animal.
Accident due to safety negligence:	A penalty of a maximum of N$50,000 for injuries to personnel or the public.

5 ENVIRONMENTAL MANAGEMENT MEASURES

5.1 Key Identified Potential Negative Impacts

The key potential negative impacts identified, described, and assessed in the EIA Report, for which the management measures (action plans) have been provided, are listed below:

- Soil and water pollution: improper handling of wastewater may lead to pollution of surrounding soils and eventually water resources systems (through wastewater runoff and infiltration).
- Habitat destruction: excavations for material sourcing (borrow pits) can lead to the destruction of natural habitats for plants and animals. This can disrupt local biodiversity.
- Soil erosion: The removal of large amounts of soil and vegetation from borrow pits and bridge positions can increase the risk of soil erosion, especially during heavy rainfall events.
- Depletion of local groundwater table: excavation of borrow pits may affect the local water table, leading to changes in groundwater levels.
- The depletion of the local groundwater table can impact the availability of water for vegetation that relies on groundwater as a water source in the area.
- Land use change: The conversion of natural landscapes into borrow pits can permanently alter landscapes, affecting the aesthetic value of the area.
- Deforestation: construction may require the clearing of trees and vegetation at and near the site to set up construction infrastructure and services, resulting in habitat loss.
- Impact on air quality: dust and particulate matter generated during the excavation of materials (sand and gravel) and transportation (the movement and operation of heavy vehicles and machinery) can compromise air quality in the surrounding area.
- Water pollution: Runoff from construction activities can carry pollutants such as oil, fuels, and heavy metals into the Oute River and nearby surface water bodies, thus impacting aquatic ecosystems.
- Noise associated with the movement of heavy machinery and trucks can disturb nearby locals and animals.
- Disruption of hydrological systems by borrow pits can alter natural drainage patterns, causing changes in surface water flow in the area and potentially exacerbating flooding or drought conditions in the area.
- General environmental pollution through the mishandling of project-related waste associated with the project.

- Occupational and community health and safety: Improper handling of materials and equipment may cause health and safety risks to workers and locals. Community safety can also be compromised by unfenced borrow pits or abandoned borrow pits (that are not properly rehabilitated to safe conditions).
- Potential archaeological and cultural heritage impact: borrow pits and site preparation activities may impact local cultural heritage sites or traditional land use practices through inadvertent unearthing of such resources (sites and objects).

The management and mitigation measures are provided under the next chapter for implementation.

5.2 Environmental Management and Mitigation Measures

Management actions are aimed at avoiding the above-listed potential negative impacts where possible; where this is not possible, measures are provided to reduce their significance. Management and mitigation measures recommended for the potential impacts in the EIA Report were based on the following:

- Planning and Design Phase (Table 5-1),
- Construction Phase (Table 5-2),
- Construction Phase (borrow pits establishment and use) - Table 5-3,
- Rehabilitation of the project-related borrow pits (Table 5-4).

5.2.1 Planning and Design: Management and mitigation measures for impacts from the bridge construction works

The measures proposed for implementation to manage and mitigate the environmental and social impacts during the planning phase are presented in Table 5-1.

Table 5-1: Planning and Design Management and mitigation measures for the impacts of the bridge construction works

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
EMP implementation and training	Lack of EMP awareness and implications thereof	-EMP training should be provided to all workers on-site. -All site personnel should be aware of the necessary health, safety, and environmental considerations applicable to their respective work. -The implementation of this EMP should be monitored. The site should be inspected, and a compliance audit should be done throughout **the project activities (monthly) and biannually for overall EMP implementation.** -The EMP non-compliance penalty system should be implemented.	-Records of EMP compliance/monitoring conducted biannually -The ECC is renewed every 3 years -Records of EMP training conducted.	-Roads Authority of Namibia -Project Manager	Throughout the phase, and when deemed necessary
Authorizations	Lack of Agreements, Permits/ Licenses	-All the required agreements and licenses, or permits, should be applied for and signed, and obtained, respectively, before commencement of the project activities, or as required. -The permits and agreements referred to herein include: (a) Land access by the farm owners (landowners). (b) Waste management disposal permits from the relevant facility operator/owner (Opuwo Town Council for solid waste). (c) Water supply agreements for freshwater and boreholes abstraction & use permit (to supply raw water for construction). A license for borehole water use should be applied for and obtained from the MAFWLR's Department of Water Affairs (Water Law Administration & Policy) – see Table 3 1 (d) Storage permit from MIME for any fuel stored on-site.	-Applicable permits and licenses to be obtained from relevant authorities. -Agreements/permits signed and obtained on time, min. 2 months (or as per agreements before the planned commencement date of works.	-Consulting Engineer -Construction Contractor	Pre-construction
Employment opportunities	'Outsiders' are given employment opportunities at	-During the preparation of tender documents, the consulting engineer includes provisions designed to maximise the use of local labour. All unskilled labour shall be sourced from local communities.	-The Contractors' tender makes provision for a detailed recruitment plan in their tender application	-Consulting Engineer with the advice of village leadership (headmen and	Pre-construction

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	the expense of capable locals. Unfair employment practices between men and women	-Specific recruitment procedures should be spelled out. -At least 25% of recruits must be women for non-strenuous jobs. -Employment contracts should be well prepared for every employee, and compensation should follow the stipulated minimum wage.		women) and the local development committee to determine employment considerations	
Procurement of goods and services	The awarding of services and goods tenders to out-of-area/region companies at the expense of local businesses	-The procurement stage for the project construction works should follow a fair and transparent process. -Encourage the provision of goods and services that are locally available, and should be sourced from locally available businesses, especially small and medium businesses in the area and nearby Towns in the Region. If companies are not available in the Kunene Region, companies in nearby Towns, such as Oshakati in the Oshana Region, should be considered. -If the construction contract is awarded to an out-of-area company, they should be obliged to team up with an available local company to ensure capacity building for locals.	-Records of local or regional businesses involved in the service provision to the project	-Roads Authority of Namibia: Procurement Unit -Consulting Engineers -Construction Contractor (for subcontractors)	Pre-construction, and where necessary throughout the construction phase
Occupational health and safety	Health and safety risks to the workers and public due to uncontrolled access to the public during construction	-Before starting construction works, all construction workers should undergo environmental induction. -Ensure that Contractors who tender make provision for the co-opting of an HIV/AIDS health officer from the regional health office in their tender application -The tender preparation should make it mandatory for the Contractor to include the cost of personal protective equipment (PPE) for all workers, as well as first aid kits.	-Environmental, health, and safety inductions are carried out in the construction phase, but before work starts.	-Consulting Engineer	Pre-construction
Conflicts	Community conflicts owing to nuisances caused by the contractor Lack of communication	-A meeting should be arranged with the community once the Contractor has been appointed. -The Contractor shall appoint an HSE Officer/ECO from the construction team to take responsibility for the implementation of all provisions of this EMP.	-The Contractor tender has made provision for the appointment of an HSE Officer in their tender application	-Roads Authority of Namibia -Consulting Engineer	Pre-construction

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	between the Contractor and the community	-A public relations officer (or if the HSE Officer will take up this role) should be introduced to the community, and their contact details provided to local leaders.	-The meeting is arranged once the Contractor has been appointed	-Construction Contractor	
Compensation for land use (borrow pits	Lack of consultation, clear communication, and clarity on the compensation policy	-Compensation should be communicated and explained clearly to the affected landowner/land custodian (Headmen and women of the respective villages/local traditional authority). -The landowners should be compensated fairly and according to the policies, and ensure harmony throughout the process.	-The Construction Contractors have made provision for compensation for land loss due to construction activities -Consent for borrow pit(s) has been issued by the authorities	-Roads Authority of Namibia -Consulting Engineer -Construction Contractor	Pre-construction
Property and services displacement	Displacement of existing properties and infrastructure (building structures, fences, and service infrastructure).	-The surveying team should conduct a detailed asset/property survey and timely engage affected land or property owners. -A fair and transparent compensation aligned with Namibia's Compensation Policy should be implemented for property loss or displacement. -Timely and advance notice to affected property owners should be given before displacement. -A grievance mechanism should be compiled and accessible to all. -Where possible, avoid or minimize displacement through alignment optimization. -Hold further engagements with the community to explain project timelines. -Provide early notification (at least 3 months) before the agreed-upon extent of displacements of fences or structures/infrastructures. -Establish a grievance system for affected communities to report issues related to displacements and compensation.	-All affected structures and services are identified and documented before any clearing works. -All eligible affected property owners are compensated before displacement, and all property owners are provided adequate support. -No unresolved cases at time of construction commencement	-Roads Authority of Namibia -Construction Contractor	Pre-construction
Irresponsible use of water resources	Water wastage due to careless	-An agreement to be supplied water from the nearby water supply scheme should be obtained from the MAFWLR's Rural	-All required water supply permits are obtained	-Roads Authority of Namibia	Pre-construction

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	practices during construction. Leaks from tanks and taps, and or water earth dam	Water Supply and NamWater before utilizing the water for the project. -The costs associated with water supply should be included in the tender documents. Water storage tanks/taps, and earth dam and earth dam liner should also be included in the tender documents for the Contractor. -Water should be used sparingly and encourage the re-use and recycling of water for certain activities during construction, such as washing of non-greasy (non-hydrocarbon contaminated) equipment and vehicles, as well as dust suppression.	-The tender documents have made provision for water provision and supply -Water is used sparingly and reused-	-Consulting Engineer -Construction Contractor	
Biodiversity	Loss of Flora due to unauthorized removal of protected species	-The area to be constructed on the site, as well as lay-down areas, access routes, etc., should be demarcated. The workforce must be instructed to operate within these boundaries. -Any activity resulting in the chopping down of trees or the removal of vegetation without the required authorisation is strictly prohibited. Therefore, a permit for removing protected trees should be **obtained from MEFT's Kunene Region Forestry Office (in Opuwo) upon their inspection and verification – see contact details in Table 3-1.** **-With regards to the preceding point, a cost for a vegetation verification survey should be allowed for, so that the Forestry Directorate can verify the vegetation species that would require permitting before removal (if necessary).** -With the help of the Forestry Directorate, all protected tree species should be tagged so that they are visible during construction works.	-The permits for removing protected tree species (where extremely necessary) are issued -Barricading tape (to indicate working areas) is in place -Biodiversity conservation awareness is raised among workers/personnel	-Consulting Engineer -Construction Contractor -HSE Officer	Pre-construction
Archaeological and cultural heritage sites protection	Unintentional disturbance and destruction of grave sites and other present cultural sites near the project site	-Consult local stakeholders (via the Kunene Governor's Office) to identify, map, and avoid all known cultural and heritage sites, including the establishment of buffer/no-go zones.	-Completion of heritage assessment -The number of sites identified and protected -There are zero disturbances to the known sites	-Roads Authority of Namibia -Construction Contractor to source an Archaeologist	Pre-construction

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
				-Kunene Governor's Office	
Disruption of hydrological systems by borrow pits (BPs)	Altering natural drainage patterns, causing changes in surface water flow, and potentially exacerbating flooding	-The borrow pit site should be carefully sited to avoid areas that are part of natural drainage paths and floodplains. -Prioritize locations outside sensitive catchment areas or those with minimal impact on surface water flow. -Borrow pits should be designed with controlled slopes and drainage outlets to prevent water stagnation or rapid runoff. -Plan for the implementation of progressive rehabilitation, where parts of the pit are restored while others are still in use. -The rehabilitation of BPs should be costed for in the tender documentation, and funds should be kept aside for this activity (phase).	-The borrow pit sites are planned outside areas with natural drainage paths or floodplains -The recommended measures are implemented, and improvements are made throughout, as needed -There is a provision for rehabilitation funds	-Consulting Engineer -Construction Contractor	Pre-construction, and if new borrow pits are required during the next phase (construction), then continuing

5.2.2 Construction Phase: Management and mitigation measures for impacts stemming from the bridge construction works

The measures proposed for implementation to manage and mitigate the environmental and social impacts of bridge construction works are provided in Table 5-2.

Table 5-2: Management and mitigation measures for the impacts from the bridge construction works – Construction Phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
EMP implementation and training	Lack of EMP awareness and implications thereof	-EMP training should be provided to all workers on-site. -All site personnel should be aware of the necessary health, safety, and environmental considerations applicable to their respective work. -The implementation of this EMP should be monitored. The site should be inspected, and a compliance audit should be done throughout **the project activities (monthly) and biannually for overall EMP implementation.**	-Records of EMP compliance/monitoring conducted biannually -The ECC is renewed every 3 years -Records of EMP training conducted.	-Site Manager -Construction Contractor -HSE Officer	Throughout the phase, and when deemed necessary

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
		-The EMP non-compliance penalty system should be implemented.			
Communication between the Proponent and land custodians/users, as well as communities	Lack of communication between land custodians/users, the Proponent, and the communities concerning the project	-The Proponent should appoint a Public Relations Officer (PRO)/Community Liaison Officer (CLO), preferably someone from the communities (who can speak both the local language and some English), to maintain dialogue with communities as well as liaise between the RA, Construction Contractor, and communities throughout the construction period. -A clear communication procedure/plan, which should include a grievance mechanism, should be developed using the generic Grievance Redressal Mechanism (GRM).	-A PRO/CLO is appointed -PRO contact details provided to land custodians and community leaders -The GRM is in place -There is a Complaint's logbook	-Roads Authority of Namibia -Construction Contractor -Resident Engineer	PRO/CLO appointment (Before project activities) and their responsibilities throughout the project activities
Project communication: Centralised stakeholder communication via the Governor's Office	Delays in information reaching communities	-Communication should flow primarily through the Governor's Office, which will then cascade information to the Regional Council and other stakeholders, as well as the community, as needed. -Establish a formal communication protocol with the Governor's Office, including defined turnaround times.	-Time taken to disseminate information to communities	-Roads Authority of Namibia -Kunene Governor's Office -PRO/CLO	Pre-construction and ongoing
	Community dissatisfaction if engagement is perceived as indirect or insufficient	-Coordinate stakeholder meetings through the Governor's Office while ensuring community-level participation	-Number of meetings facilitated through the Governor's Office; attendance levels	-Kunene Governor's Office -Roads Authority of Namibia -HSE Officer	Throughout the project lifecycle
	Miscommunication or message distortion through intermediaries	-Provide clear, written, and approved communication materials to the Governor's Office for distribution	-Accuracy and consistency of messages; reduction in misinformation complaints	-Kunene Governor's Office -Public Relations / Liaison Officer (PRO) / CLO	Continuous throughout the project lifecycle

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	Slow resolution of complaints due to bureaucratic processes	-Integrate the project Grievance Redress Mechanism (GRM) with the Governor's Office. -Establish a joint grievance register accessible by both the project team and the Governor's Office.	-Number of grievances resolved within the set timeframe	-HSE Officer -Kunene Governor's Office -Project/Site Manager	Continuous throughout the project lifecycle
	Project delays due to administrative bottlenecks	-Maintain regular coordination meetings with the Governor's Office.	Frequency of coordination meetings and decision turnaround time	-Kunene Governor's Office -Project/Site Manager	Weekly or monthly coordination meetings and reporting
	Perceptions of unfair recruitment if information is not widely shared	-Disseminate job opportunities through the Governor's Office and local structures (local traditional authorities development committees).	-Number of applications received locally -Reduction in complaints related to job opportunities	-Construction Contractor's Human Resources Officer -Kunene Governor's Office	Pre-construction and throughout the construction, as needed
Conflict	Communities are dissatisfied with the activities Nuisances caused by the Contractor	-Establish clear communication between the Contractor and community (and or through their leaders) on the anticipated schedule/timeframe for operations and the duration of the construction phase. This should be provided for in the form of a Public Consultation Plan, which should include at least: a) Means for lodging a complaint concerning materials extraction, and provision of feedback to the complainant from the Contractor stating how the issue is being addressed. b) Report back on issues raised and how addressed from the Contractor to the Resident Engineer and Proponent. -The detailed construction programme should be presented in ongoing meetings with the local communities or their leaders.	-There are records of minutes from the community engagement meetings. -There is a community communication plan related to construction works	-Resident Engineer -Construction Contractor -Public Relations/Liaison Officer (PRO) / CLO	Throughout the phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	Exclusion of traditional leaders if communication is only centralised	-Use the Governor's Office to facilitate engagement with traditional authorities	-Number of engagements with traditional leaders	-Kunene Governor's Office -PRO/CLO	Pre-construction and ongoing throughout the project phase
Construction progress	Delayed construction, which has cost implications and causes low community satisfaction	-Programme delays into the schedule and communicate this to the community through their respective headmen (for Okaundje, Otjikuju, Ohungumure, and Orotjitombo villages)	-Resident Engineer and Contractor to constantly monitor delays and adapt the programme accordingly. -Constantly update communities (through the leaders) on delays and latest schedules.	-Resident Engineer -Construction Contractor -Public Liaison Officer	Throughout the phase
Borrow Pit Sites	Sand mining/road material mining	-The Contractor, in consultation with the environmental consultant and/or Resident Engineer, should visit all potential excavation sites before excavation (for new sites). The engineers and surveyors must then draft a plan for approval before commencement of excavations. This plan must indicate the required resources and the sensitive areas that may not be mined (e.g., mature trees). -No removal of trees with a stem diameter of 200mm or more. Protect clusters of trees and individual trees with a space buffer of at least 5m. -The top 150mm of topsoil must be stored separately for use to rehabilitate the borrow pit. -The removal of material at excavation sites shall be focused on where the least significant vegetation exists. -The Contractor should liaise with the applicable residents regarding the location of excavation sites.	-The Contractor and environmental consultant are to visit all potential excavation sites during environmental monitoring	-Resident Engineer -Construction Contractor	Throughout the phase
Soils	Physical soil/land disturbance and loss of topsoil	-Stockpiled topsoil and excavated materials should be used to backfill the excavated and disturbed sites after completing work on the pits.	-No proliferation of informal vehicle tracks created by project activities. -No new erosion gullies.	-Site Manager -Construction Contractor	Throughout the phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
		-Soils that are not within the intended footprints of the road and its reserve should be left undisturbed, and soil conservation implemented as far as possible. -Project vehicles/machinery should stick to the access route provided and not unnecessarily create further tracks on-site by driving everywhere, causing soil compaction and erosion. -The movement of vehicles to and across the site should be controlled. Construction materials required should be moved to where they are needed, using wheelbarrows (when possible) instead of trucks to minimize soil impact. -For the safety of the community members who utilize the existing access paths (to BP sites), the Contractor should create safer routes to be used by the bridge construction vehicles only and avoid the existing community paths, if possible.	-No signs of soil compaction -No disturbance to unmarked areas on-site.	-HSE Officer	
Soil and water resources	Soil and water pollution from garbage, cement, concrete, sewage, chemicals, fuels, oils, or any other objectionable or undesirable material	-Accidental spills must be cleaned immediately to avoid the pollution of the wetland and groundwater, since the soil around the site is highly permeable. -Construction works should be scheduled during dry months of the year to easily manage and handle hazardous materials (oils, fuel, and grease) without them being potentially washed into the river, i.e., between April and November, and not between December and April when it is raining. -Hazardous waste should be disposed of in the prescribed manner to prevent contamination of soils (see waste management heading). -In case of accidental spills, the contaminated soil must be suitably disposed of in a container for hazardous waste -If fuel is stored at the construction camp, fuel tanks must be properly bunded. The volume of the bounded area must be sufficient to hold 1.5 times the capacity of the storage tanks. The floor of the bunded area must be impermeable, and the sides high enough to achieve 1.5 times the holding capacity. -Drip trays should be available for all equipment that is intended to be used during construction. These trays should be placed	Inspection daily, reporting, and regular cleaning up	-Construction Contractor -Site Manager -HSE Officer	Throughout the phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
		underneath each vehicle while the vehicles are parked. The drip trays should be cleaned every morning, and the spillage should be handled as hazardous waste. -Cement should not be mixed on open soil. A designated metal container should be made available for this purpose. -All cleaning of equipment should take place within the construction site, and the water from the washing operation should be collected in a tank and disposed of in an agreed manner.			
Irresponsible use of water resources: Over-abstraction of surface water (rural water supply schemes) and groundwater (boreholes)	Water wastage due to careless practices during construction. Leaks from tanks and taps, and or water earth dam	-Educate the workforce on sustainable and effective use of water, e.g., clean equipment in containers. -A license to abstract and use water from the borehole should be applied for and obtained from the MAFWLR's Water Affairs Department. -Water should be used sparingly throughout construction. It is the site coordinator's responsibility to ensure that water conservation is strictly enforced. -Water tanks/taps and earth dam liner breakages must be fixed immediately. The water tank or taps must have water meters and be accessible to visual inspection. All faulty and leaking taps and pipes shall be immediately repaired.	-A water abstraction license is obtained from the MAFWLR -Daily inspections and condition reports -Water conservation awareness to all personnel	-Construction Contractor	The water use license should be obtained before commencing with construction works, or at least before abstracting water from the borehole -Throughout the phase
	The reduced access to water or availability for local communities and livestock; disruption of downstream ecological flows	-The abstraction volumes should be limited to the approved water abstraction and use license. -Non-potable sources of water should be prioritized for construction, where possible (where freshwater is not required) -Water-use efficiency measures, such as re-use and recycling, should be implemented. -The abstraction of water during low-demand periods of the project should be scheduled.	-Abstraction volumes are within permitted limits for the project. -No recorded complaints from local users about water availability	-Construction Contractor -Resident Engineer	Pre-construction and throughout the construction phase
	The increased pressure on existing infrastructure, leading to system	-Install a temporary storage tank on-site to store water and avoid 24-hour pumping of the borehole. -The water tank and pipeline should be inspected for leakage, and any leaks or spills should be fixed immediately.	-There are no service interruptions recorded -Water infrastructure is functioning properly	-Construction Contractor	Pre-construction planning and the construction phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	failures or reduced supply reliability			-Consulting Engineer	
	The decline in groundwater levels may affect community boreholes and ecosystems.	-Groundwater levels of the borehole should be monitored weekly. However, baseline water levels of the borehole to be used and surrounding boreholes within a 2km radius of the abstraction point (borehole) should be taken before abstraction for the project activities. -The abstraction rates should be limited, and abstraction should only be done to pump the required water to avoid unnecessary pumping of the borehole.	-Groundwater levels remain within acceptable thresholds -Abstraction rates comply with approved limits in the water use license	-Construction Contractor -Consulting Engineer	Baseline groundwater level and quality are recorded pre-construction) and continuous monitoring during construction
	The reduced water quality due to over-pumping (e.g., salinization or turbidity	-Water quality testing of the borehole water should be conducted before utilizing it for the project. -Over-pumping of the borehole is not allowed -A flow meter should be installed at the borehole to record volumes abstracted and implement controlled pumping schedules.	-Water quality parameters are within national standards and requirements for construction water -There are no water quality and levels deterioration trends observed	-Construction Contractor -HSE Officer	Pre-construction baseline and periodic monitoring during construction
	The conflict with local water users and stakeholders over water access	-Engage with local communities before construction works begin. -A grievance mechanism (complaints logbook) should be established for the project. -Ensure that there is transparent communication on water use; obtain necessary permits and approvals	-The number of grievances recorded and resolved amicably -Stakeholder satisfaction levels are good	-Construction Contractor -HSE Officer -PRO/ CLO	-Pre-construction engagement and ongoing throughout construction
	The long-term depletion of water resources, if not properly managed	-Develop and implement a Water Management Plan -Incorporate alternative water sources such as rainwater harvesting and use the water for construction activities, where feasible.	-No long-term decline in resource availability in the area	Project Proponent; Environmental Specialist; Contractor	During the construction phase
Biodiversity	Loss of Flora – protected species	-Avoid unnecessary removal and disturbance of site vegetation. -Vegetation found on the site, but not in the actual footprint, should not be disturbed; therefore, it should be avoided.	-No complaints of unauthorised vegetation	-Site Manager	Throughout the phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	Planting of alien flora species in the area	-The area to be constructed on the site, as well as lay-down areas, access routes, etc., should be demarcated. The workforce must be instructed to operate within these boundaries. Any activity resulting in the chopping down of trees or the removal of vegetation without the required authorisation is strictly prohibited. Therefore, a permit for removing protected trees should be **obtained from MEFT's Kunene Region Forestry Office (in Opuwo) upon their inspection – see contact details in Table 3-1.** -All protected tree species should be tagged so that they are visible during construction works. -Avoid leaving equipment or machinery leaning on vegetation. -Environmental awareness on biodiversity preservation (both plants and even small animals encountered onsite) should be provided to the workers and the Contractor during EMP induction. -No alien vegetation may be introduced to the site in the form of seeds or plants, for beautification or any other reason. -At the end of construction, all alien vegetation that has established itself should be eradicated.	removal associated with project personnel. -No intentional disturbance and destruction of site vegetation -Barricading tape (to indicate working areas) -Biodiversity conservation awareness is raised among workers/personnel Regular review of photographic records. Take photographs before construction starts as a record	-Construction Contractor -HSE Officer	
	Impact on fauna: livestock and wild animals such as reptiles and birds.	-The killing, snaring, trapping, and stealing of community livestock is strictly prohibited. -The illegal harvesting of wildlife is strictly prohibited. -Refrain from disturbing or killing small soil and animal species found on and around the site. -Visible breeding sites for birds and animals occurring on and around the sites should not be destroyed or disturbed. -Refrain from removing or destroying the bird nests on trees. -BPs and associated trenches should be secured and backfilled or levelled upon completion of works to prevent animals from falling into trenches or even drowning during rainy seasons. -The recommended speed of 40km/hr around, to and from road working sites, should be adhered to while looking out for animals and people (especially children) in the community.	-No complaints of stolen and killed livestock by the project workers. -No reports of illegal hunting or trapping of wild animals in the area associated with the project personnel -No intentional disturbance and destruction of habitats and faunal species	-Construction Contractor -HSE Officer	Throughout the phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
		-Incorporate Environmental awareness and biodiversity preservation into the employment contracts of all workers.			
Waste management	Construction waste: Incorrect or infrequent disposal of building rubble. Construction waste blown by wind (e.g., plastic bags and material seals).	-Construction waste should be stored in skips and should regularly be removed from the site for disposal at the nearest approved municipal waste disposal site (in Oshakati). -Empty cement bags, plastics, wrapping waste, strapping, etc., to be secured in containers for general waste to prevent wind-blown waste.	Regular inspection on site.	-Resident Engineer -Construction Contractor -HSE Officer	Throughout the phase
	Domestic waste from the construction team: Increased general waste	-Waste should be separated according to cardboard/paper materials, plastic, bottles, and tins. -The various waste types should be disposed of at appropriate municipal and recycling facilities. -Appropriate containers should be placed on site for waste separation, and the workforce trained and sensitised accordingly. In other words, sufficient waste bins should be provided at the bridge working sites and campsite to prevent waste or rubbish from being thrown into the environment. -Only the general waste, which cannot be recycled, shall be disposed of at the nearest approved Town Council's waste disposal facility. -The workforce must be sensitised to dispose of waste responsibly and not to litter, not at the construction site, and not at the campsite or in the wider environment. -Domestic waste, which cannot be recycled, should be stored in a skip and removed via truck once a week to an approved waste disposal site. -After each day's work, ensure that there are no wastes left on-site or scattered within the site premises. -All domestic and general project waste produced daily should be contained on-site until such time that it is transported to designated waste sites.	-Daily inspection and clean up. -There are sufficient waste storage containers for different types of waste -No littering caused by project personnel -No visible litter around the project area -Provision of sufficient waste storage containers -Waste management awareness -Waste disposal permits for the municipality -Environmental, Health, and Safety Statements and Policy are in place	-Resident Engineer -Construction Contractor -HSE Officer	Throughout the phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
		-No waste may be buried or burned on site or anywhere else. -A penalty system for the irresponsible disposal of waste onsite and anywhere in the area should be implemented.			
	Hazardous waste: Accidental/negligent spillages from equipment working on site. Storage of hazardous materials.	-Spillages of any potentially toxic materials, whether by accident or through negligence, must be scooped up immediately into drums. -Contact Wesco Group https://www.wesco.com.na/page/waste-management and or Oiltech Namibia https://oiltech.com.na/ to salvage the spilled materials -Bitumen products waste, oil sludge, oily rags, contaminated spill clean-up materials, contaminated soils, and other hazardous materials waste must be kept off-site or in a dedicated separate container on-site. These containers must be locked and accessible only to the site foreman. Wesco Group or Oiltech should be approached to collect these wastes periodically or as needed	Daily inspection and clean up.	-Resident Engineer -Construction Contractor -HSE Officer	Throughout the phase
	Ablution waste (sewage): Construction team.	-Open defecation and urinating in public are strictly prohibited. Workers should be provided with appropriate toilets for the field. -Only portable chemical toilets should be used on site at the campsite. Under no circumstances may the waste from these toilets be dumped in the veld. -The waste should be removed at least once a week to the nearest municipal sewage site for handling and treatment. Alternatively, it may be pumped out into sealable containers and stored until it can be removed by truck. If stored, the containers should be kept out of direct sunlight and should not be stored for longer than a month. People responsible for cleaning these toilets should be provided with latex gloves and masks. -Spillage or leakage is to be cleaned up and fixed immediately.	Daily inspections and clean-up. -There are sufficient toilets at the campsites for workers -No open defecation by project workers -There are sewage removal operators	-Resident Engineer -Construction Contractor -HSE Officer	Throughout the phase
Air quality	Dust generation: Dust proliferation due to soil's fine content, resulting in localized poor air	-Soil stacks should be placed downwind from the main activity areas and the road detour. -All construction areas and soil stacks should be regularly wetted.	-Visual monitoring for dust nuisance and safety -Daily monitoring.	-Resident Engineer	Throughout the phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	quality and poor visibility.	-A reasonable amount of water should be used to suppress the dust on-site. -Vehicles should be driven at a speed of 40km/hr to avoid the generation of dust owing to high speeds. This is also to ensure road safety due to ongoing roadworks and numerous detours.	-Complaints from neighbours -Records of how complaints or grievances have been addressed.	-Construction Contractor -HSE Officer	
Noise	Noise from vehicles and construction activities	-All machinery should be calibrated and maintained regularly. -Noise from vehicles and equipment on sites should be reduced to acceptable levels. -Construction activities, excavation, hauling, and transporting of materials from the BPs hours should be done between 07 am and 5 pm, and over weekends to prevent noise generated by equipment and movement of heavy vehicles. -When operating excavators and other noise-generating machinery onsite, workers should be equipped with personal protective equipment (PPE) such as earplugs to reduce exposure to excessive noise.	-Daily monitoring. -Complaints from neighbours -Records of how complaints or grievances have been addressed -Workers operating machinery and noisy equipment are equipped with noisy PPE	-Resident Engineer -Construction Contractor -HSE Officer	Throughout the phase
Vehicular traffic safety	Presence of heavy vehicles in the area	-Vehicle drivers and equipment operators should have valid and appropriate driving licenses or operating permits and adhere to the road safety rules. -Make provision for haul roads and maintain them so that the local small vehicles can continue to use their community roads. -Drivers should drive slowly (40km/hour or less) while on-site. -Vehicles should be in a roadworthy condition and serviced regularly to avoid accidents owing to mechanical faults. -Vehicle drivers should only make use of the designated site access roads provided and as agreed. -Vehicle drivers should not be allowed to operate vehicles while under the influence of alcohol. -Project vehicles should be parked within the boundary or demarcated areas for such purpose at sites. -Deliveries from and to the site should be done optimally during weekdays and between the hours of 8 am and 5 pm.	-No complaints from members of the public regarding vehicular traffic issues related to the project activities. -All personnel operating the project vehicles and machinery are appropriately licensed and possess valid driving licenses. -Demarcated areas for parking, offloading, and loading zones on-site.	-Site Manager -Construction Contractor -HSE Officer	Throughout the phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
Occupational and local (community) health and safety associated with project activities	General health and safety for workers	-During induction, personnel should be provided with an awareness training of the risks of mishandling equipment and materials on site. -Appropriate and written warning signage should be placed on-site, where visible. -A fully furnished first aid kit should be placed at each working site to attend to minor injuries, while major injuries should be attended to at a nearby health centre (clinic or hospital). 1 or 3 site personnel should be trained on how to administer first aid. -Projected loads should be securely fastened to vehicles to avoid falling off and injuring people. -Heavy vehicles and equipment should be properly secured to prevent any harm or injury to both project personnel and locals. -When working on site, employees should be properly equipped with personal protective equipment (PPE) such as coveralls, masks, gloves, safety boots, earplugs, safety glasses, and hard hats (helmets). -Personnel should not be allowed to consume alcohol or other intoxicants before and during working hours, as this may lead to mishandling of equipment, resulting in health and safety risks.	-A comprehensive health and safety plan for the activities is compiled. -Availability of fully furnished first aid kits -Trained workers to administer first aid	-Construction Contractor -HSE Officer	Throughout the phase
	Community health and safety	-Construction trenches should be backfilled progressively. -Ensure that goods and projected loads are securely fastened to vehicles to avoid falling and injuring people near the site. -Warning signage should be erected at dangerous site areas, such as open trenches on the road. -Make provision for temporary crossroads at growth centres or where a community vehicle access path crosses over the road so that the community can cross over safely. -The site areas that are considered temporary risks should be equipped with "danger" or "cautionary" signs written in languages such as *Otjiherero/Otjizemba*, and may be English.	-The road trenches are backfilled -There are sufficient, clear, and appropriate warning signs near risk site areas -The community is warned of bridge construction dangers and encouraged to stay away and exercise precautions at all times when crossing the road or walking nearby	-Site Manager -Construction Contractor -HSE Officer	Throughout the phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	Potential increase of prevalence of HIV and AIDS, as well as other sexually transmitted diseases (STDs) prevalence	-Engage workers in sexual health talks and training about the dangers of engaging in unprotected sexual relations, which result in contracting HIV/AIDS and other sexually transmitted infections. -Provision of condoms and sex education through the distribution of pamphlets and health training. These pamphlets can be obtained from the nearest local health facility, such as Opuwo District Hospital in Opuwo. -Emphasize the continued recruitment of locals to avoid the influx of out-of-area people into the community for casual work that local people can carry out. Thus, reducing the creation of new sexual relations between local women and out-of-area men results in the potential transmission of STDs and HIV/AIDS.	-No new infections recorded linked to project workers -Occupational health and safety personnel -Sex and Health Education/Awareness -Provision of condoms at the campsite	-Site Manager -Construction Contractor -HSE Officer	Throughout the phase
Fire management	Accidental fire outbreaks	-Portable and serviced fire extinguishers should be available at the working sites and the construction camp (campsite). -No open fires should be created by project personnel on-site. -Make provision for smoking areas for crew members who smoke. This is to ensure that the cigarettes' fire is completely extinguished and disposed of in the allocated on-site bins. -Consider using gas or paraffin cookers to prepare food instead of open fires. The fire on cookers/stoves should be put out before leaving the camp. -Personnel and visitors alike must be sensitised about responsible fire protection measures and good housekeeping, such as the removal of flammable materials (e.g., rubbish, plastics, papers, clothing, dry vegetation, and hydrocarbon-soaked soil) near hazardous substances' containment and handling areas. In other words, these flammable materials should not be left or thrown near the areas. Regular inspections should be carried out to check for these materials at the site. -Make provision for smoking areas for crew members who smoke. This is to ensure that the cigarette's fire is completely extinguished and disposed of in the allocated bins in the smoking area.	-No veld fires recorded (due to the presence of project personnel) -Fire extinguishers (1 per vehicle) and a minimum of 2 extinguishers at the camp	-Site Manager -Construction Contractor -HSE Officer	Throughout the phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
		-Potential flammable areas and structures, such as fuel storage tanks, should be marked as such with visible signage. -Raise awareness among workers on the impact of careless handling of fires and flammable substances in the workplace.			
Archaeology and heritage	Accidental disturbance of archaeological or heritage objects	-A 200m buffer zone around the grave site north of the bridge site (at GPS coordinates: -18.006111 13.545063, see Figure 5-1) **and cemeteries/graves should be maintained. No activity should be done within the buffer zone.** -Respect traditional rituals and consult spiritual/traditional leaders before key activities, such as drilling, can be undertaken. Build consensus to avoid disputes over cultural heritage matters. -All accidental discoveries, or any other archaeological materials, human burials, or skeletal remains are uncovered during earthworks, the work should be halted, and the finds should be reported to the NHC, which may require inspection by an Archaeologist. The area should be fenced off, and contact NHC and the National Forensic Laboratory immediately. -Avoid direct damage to archaeological or heritage sites that may be encountered during excavations. -Adhere to the provisions of Section 55 of the National Heritage Act in the event significant heritage and cultural features are discovered in the course of project activities.	-Preservation of all artefacts and objects that are discovered onsite -The number of chances found correctly managed -Compliance with stop-work procedures	-Site Manager -Construction contractor -HSE Officer -PRO/CLO -Kunene Governor's Office	Throughout the project phase, as and when required
	Destruction of unknown/buried archaeological materials	-Implement a strict Chance Find Procedure (CFP) in **Appendix 1** during construction, including immediate stop-work protocols. -Notify the relevant authorities (NHC) and obtain clearance before resuming work. -Provide worker training on heritage protection, continuously monitor construction activities, and maintain ongoing engagement with communities and traditional authorities to prevent damage and resolve concerns. -Train construction contractor (and employees, particularly specialised out-of-area workers) to respect local customs, land use practices, and cultural heritage. Advise the project team on culturally sensitive issues	-The number of training sessions conducted -The percentage of the workforce trained on the CFP -The absence of heritage-related incidents/complaints	-Site Manager -Construction contractor -HSE Officer -PRO/CLO -Kunene Governor's Office	Throughout the project phase, as and when required

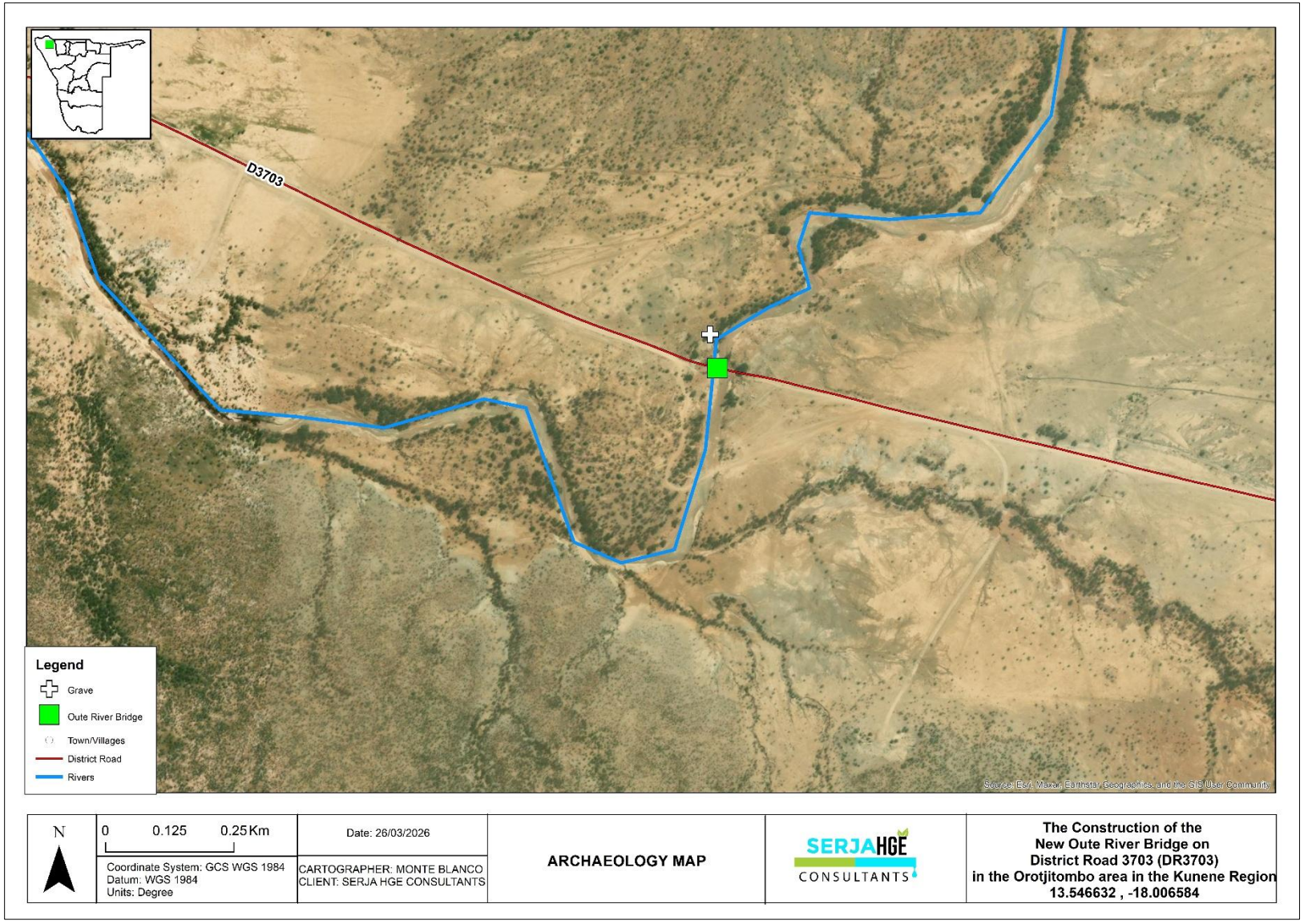

Figure 5-1: The known archaeological site near the bridge site (at GPS coordinates: -18.006111,13.545063)

5.2.3 Management and mitigation measures for impacts stemming from the utilization of borrow pits

The measures proposed for implementation to manage and mitigate the environmental and social impacts of borrow pits are provided in Table 5-3.

Table 5-3: Management and mitigation measures for borrow pits (BPs) – establishment and utilization

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
EMP implementation and training	Lack of EMP awareness and implications thereof	-EMP training should be provided to all workers involved in the project and its associated activities. -All site personnel should be aware of the necessary health, safety, and environmental considerations applicable to their respective work. -The implementation of this EMP should be monitored. The site should be inspected, and a compliance audit should be conducted throughout the project activities, monthly and biannually, to ensure **overall EMP implementation.** -The EMP non-compliance penalty system should be implemented.	-Training of project personnel on the EMP -Records of EMP compliance/monitoring conducted biannually -The ECC is renewed every 3 years -Records of EMP training conducted.	-Site Manager -Construction Contractor -HSE Officer	Throughout the operation phase, and when deemed necessary (for certain activities such as ECC renewal)
Conflict	Communities are dissatisfied with the activities. Nuisances caused by the excavation activities	-Establish clear communication between the Construction Contractor and community (and or through their leaders) on the anticipated timeframe for operations at the sites. This should be done as follows: a) Means for lodging a complaint concerning materials extraction, and provision of feedback to the complainant from the Contractor stating how the issue is being addressed. b) Report back on issues raised and how addressed from the Contractor to the Project/Site Manager and Proponent (RA). -The affected communities or neighbours to the site should be consulted before establishing a BP. The communication can be shared through their headmen, and they can then decide together on what to do with the BPs after use (backfill with stockpile material or rehabilitate them into an earth dam).	-There are records of minutes from the community engagement meetings. -There is a community communication plan related to the BPs -Communities are consulted and or represented through their headmen (leaders) on BP activities and end use (post-excavation)	-Construction Contractor -Site Manager -Public relations/Liaison Officer	Throughout the phase
Soils	Physical soil/land disturbance and loss of topsoil	-Stockpiled topsoil and excavated materials should be used to backfill the excavated and disturbed sites after completing work on the pits.	-No proliferation of informal vehicle tracks created by project activities.	-Site Manager -Construction Contractor	Throughout the phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
		-Soils that are not within the intended footprints of the BPs should be left undisturbed, and soil conservation implemented as far as possible. -Project vehicles/machinery should stick to the access route provided and not unnecessarily create further tracks on-site by driving everywhere, causing soil compaction and erosion.	-No new erosion gullies. -No signs of soil compaction -No disturbance to unmarked areas on-site.	-HSE Officer	
Loss of vegetation, habitat, and local communities	impact on the natural environment, such as loss of vegetation and habitat for some wild animals, and generally affects the local environment (communities).	-Concentrate on the use of the borrow areas not visible from the road to limit the visual impact. -Shape and rehabilitate used borrow areas to blend in with the surrounding landscape, -Consider and consult affected landowners on any desires to have water holes established from the borrow pit (BP) areas for agricultural and other uses in accordance with environmental considerations and laws, -Borrow pits will further be fenced off during construction to prevent people and livestock from injury by falling therein, and after construction, they are to be rehabilitated to be made equally safe.	-The percentage of BPs sited outside direct road view -The number of complaints from road users/public regarding the visual impact -The approval of BP locations by the HSE Officer -The percentage of BPs reshaped to an acceptable slope (e.g., ≤30° or as specified) -The topsoil is replaced and evenly spread -Evidence of vegetation re-establishment (e.g., % vegetation cover) -There are no visible erosion or unstable slopes after rehabilitation -The number of consultations held with affected landowners/communities -The signed agreements or records of consultation	-Construction Contractor (Site Manager) in collaboration with the local Traditional Authority Leaders (village headmen and headwoman) -HSE Officer -Consulting (Resident) Engineer	Planning & design phase (before excavation begins) Progressive rehabilitation was done during construction and immediately after BP closure. Before and during construction (before final rehabilitation of each borrow pit) Fencing: During construction Rehabilitation: Before demobilisation/project closure

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
			-The percentage of suitable BPs converted to beneficial use (e.g., water storage for livestock watering) -Compliance with environmental regulations and approvals. - % of active borrow pits fenced during construction -The number of safety incidents (target: zero injuries to people/livestock) -All BPs are rehabilitated or made safe before project close-out -Final inspection and sign-off by the HSE Officer		
Water resources	Lowering of the groundwater table owing to excavation activities	-The excavation depth should be limited to minimize the impact on the groundwater table. This can help in reducing the drawdown effect. -Excavate in phases rather than all at once. This allows for localized groundwater impacts to stabilize between phases. -For long-term activities at certain borrow pits, consider establishing retention ponds or sumps to collect water that seeps into the excavation area. This can help in maintaining a higher groundwater level nearby. -Upon completion of excavation activities, the site should be rehabilitated, thus restoring natural drainage patterns and vegetation, which can help to recharge groundwater.	-Monitoring of the water movement in the BPs and acting accordingly -Implementation of the provided measures, where possible.	-Construction Contractor -Site Manager	Throughout the phase
Disruption of hydrological systems by borrow pits	Altering natural drainage patterns, causing	-Use perimeter drainage channels or bunds to divert surface water away from active borrow pits, reducing the risk of erosion or sediment transport downstream.	-Monitoring of the water movement in the BPs and acting accordingly	-Construction Contractor	Throughout the phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	changes in surface water flow, and potentially exacerbating flooding or drought conditions in the area.	-Avoid excavating below the water table or altering the natural infiltration capacity of the soil. -Limit the size and depth of pits to maintain surface hydrology balance. -Plan for the implementation of progressive rehabilitation, where parts of the pit are restored while others are still in use.	-Implementation of the provided measures, where possible.	-Site Manager	
Biodiversity	Loss of Flora	-Avoid unnecessary removal and disturbance of site vegetation. -Vegetation found on the site, but not in the actual footprint, should not be disturbed; therefore, it should be avoided. -The area to be constructed on the site, as well as lay-down areas, access routes, etc., should be demarcated. The workforce must be instructed to operate within these boundaries. Any activity resulting in the chopping down of trees or the removal of vegetation without the required authorisation is strictly prohibited. Therefore, a permit to remove protected trees should be **obtained from MEFT's Kunene Region Forestry Office (in Opuwo) upon the inspection – see contact details in Table 3-1**. • Mopane (*Colophospermum mopane*) trees • Red-bark acacia (*Vachellia reficiens*). • Camelthorn (*Vachellia erioloba*) • Commiphora species (*Commiphora saxicola*) • Shepherd's tree (*Boscia albitrunca*) • Leadwood (*Combretum imberbe*). -All protected tree species should be tagged so that they are visible during construction works. -Avoid leaving equipment or machinery leaning on vegetation. -Environmental awareness on biodiversity preservation (both plants and even small animals encountered onsite) should be provided to the workers and Contractors during EMP induction.	-No complaints of unauthorised vegetation removal associated with project personnel. -No intentional disturbance and destruction of site vegetation -Barricading tape (to indicate working areas)	-Site Manager -Construction contractor -HSE Officer	Throughout the phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
		-No alien vegetation may be introduced to the site in the form of seeds or plants, for beautification or any other reason. -At the end of construction, all alien vegetation that has established itself should be eradicated.			
	Impact on fauna: livestock and wild animals such as reptiles and birds.	-The killing, snaring, trapping, and stealing of community livestock is strictly prohibited. -Refrain from disturbing or killing small soil and animal species found on and around the site. -Visible breeding sites for birds and animals occurring on and around the sites should not be destroyed or disturbed. -Refrain from removing or destroying the bird nests on trees. -BPs and associated trenches should be secured and backfilled or levelled upon completion of works to prevent animals from falling into trenches or even drowning during rainy seasons. -The recommended speed of 40km/hr around, to and from sites, should be adhered to while looking out for animals and people (especially children) in the community. -Incorporate Environmental awareness and biodiversity preservation into the employment contracts of all workers.	No complaints of livestock being stolen or killed by the project workers. -No intentional disturbance and destruction of habitats and faunal species	-Site Manager -Construction Contractor -HSE Officer	Throughout the phase
Vehicular traffic safety	Presence of heavy vehicles in the area	-Vehicle drivers and equipment operators should have valid and appropriate driving licenses and adhere to the road safety rules. -Make provision for haul roads and maintain them so that the local small vehicles can continue to use their community roads. -Drivers should drive slowly (40km/hour or less) on the roads. -Project vehicles should be in a roadworthy condition and serviced regularly to avoid accidents owing to mechanical faults. -Vehicle drivers should only make use of the designated site access roads provided and as agreed. -Vehicle drivers should not be allowed to operate vehicles while under the influence of alcohol. -Project vehicles should be parked within the boundary or demarcated areas for such purpose at sites.	-No complaints from members of the public regarding vehicular traffic issues related to the project activities. -All personnel operating the project vehicles and machinery are appropriately licensed and possess valid driving licenses. -Demarcated areas for parking, offloading, and loading zones on-site.	-Site Manager -Construction Contractor	Throughout the phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
		-Deliveries from and to the site should be done optimally during weekdays and between the hours of 8 am and 5 pm.			
Occupational and local health and safety	General health and safety for workers	-During induction, personnel should be provided with an awareness training of the risks of mishandling equipment and materials on site. -Appropriate and written warning signage should be placed on-site, where visible. -A fully furnished first aid kit should be placed at each working site to attend to minor injuries, while major injuries should be attended to at a nearby health centre (clinic and hospital). 1 or 3 site personnel should be trained on how to administer first aid. -Projected loads should be securely fastened to vehicles to avoid falling off and injuring people. -Heavy vehicles and equipment should be properly secured to prevent any harm or injury to both project personnel and locals. -When working on site, employees should be properly equipped with personal protective equipment (PPE) such as coveralls, masks, gloves, safety boots, earplugs, safety glasses, and hard hats (helmets). -Personnel should not be allowed to consume alcohol or other intoxicants before and during working hours, as this may lead to mishandling of equipment, resulting in health and safety risks.	-A comprehensive health and safety plan for the activities is compiled. -Availability of fully furnished first aid kits -Trained workers to administer first aid	-Site Manager -HSE Officer	Throughout the phase
	Community health and safety	-Construction trenches should be backfilled after completion of road works at sections of the road before proceeding further. -Ensure that goods and projected loads are securely fastened to vehicles to avoid falling and injuring people along the road during transportation. -Warning signage should be erected at dangerous site areas, such as open trenches on the road. -Make provision for temporary crossroads at growth centres or where a community vehicle access path crosses over the road so that the community can cross over safely.	-The road trenches are backfilled -There are sufficient, clear, and appropriate warning signs near risk site areas -The community is warned of the dangers of walking around BP sites and encouraged to stay away and exercise precautions at all times	-Site Manager -Construction Contractor -HSE Officer	Throughout the phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
		-The site areas that are considered temporary risks should be equipped with "danger" or "cautionary" signs written in languages such as *Oshiwambo* and may be English.			
	Potential increase of prevalence of HIV and AIDS, as well as other sexually transmitted diseases (STDs) prevalence	-Engage workers in sexual health talks and training about the dangers of engaging in unprotected sexual relations, which result in contracting HIV/AIDS and other sexually transmitted infections. -Provision of condoms and sex education through the distribution of pamphlets and health training. These pamphlets can be obtained from the nearest local health facility, such as the Opuwo District Hospital in Opuwo. -Emphasize the continued recruitment of locals to avoid the influx of out-of-area people into the community for casual work that local people can carry out. Thus, reducing the creation of new sexual relations between local women and out-of-area men results in the potential local transmission of STDs and HIV.	-No new infections recorded linked to project workers -Occupational health and safety personnel -Sex and Health Education/Awareness -Provision of condoms at the campsite	-Site Manager -Construction Contractor -HSE Officer	Throughout the phase
Fire management	Accidental fire outbreaks	-Portable and serviced fire extinguishers should be available at the working sites and campsite. -No open fires should be created by project personnel on-site. -Make provision for smoking areas for crew members who smoke. This is to ensure that the cigarettes' fire is completely extinguished and disposed of in the allocated on-site bins. -Consider using gas or paraffin cookers to prepare food instead of open fires. The cooker/stove's fire should be put out before leaving the camp. -Personnel and visitors alike must be sensitised about responsible fire protection measures and good housekeeping, such as the removal of flammable materials (e.g., rubbish, plastics, papers, clothing, dry vegetation, and hydrocarbon-soaked soil) near hazardous substances' containment and handling areas. In other words, these flammable materials should not be left or thrown near the areas. Regular inspections should be carried out to check for these materials at the site. -Make provision for smoking areas for crew members who smoke. This is to ensure that the cigarette's fire is completely	-No veld fires recorded (due to the presence of project personnel) -Fire extinguishers (1 per vehicle)	-Site Manager -Construction Contractor -HSE Officer	Throughout the phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
		extinguished and disposed of in the allocated bins in the smoking area. -Potential flammable areas and structures, such as fuel storage tanks, should be marked as such with visible signage. -Raise awareness among workers on the impact of careless handling of fires and flammable substances in the workplace.			
Littering and waste management	Environmental Pollution	-Responsibly dispose of waste and do not litter. -After each daily work, ensure that there are no wastes left on-site or scattered within the site premises. -All domestic and general operational waste produced daily should be contained on-site until such time that it is transported to designated waste sites. -No waste may be buried or burned on site or anywhere else. -The site should be equipped with separate waste bins for solid and general/domestic waste. -A penalty system for the irresponsible disposal of waste onsite and anywhere in the area should be implemented.	-No visible litter around the project area -Provision of sufficient waste storage containers -Waste management awareness -Waste disposal permits to the nearest municipality -Environmental, Health, and Safety Statements and Policy	-Site Manager -Construction Contractor -HSE Officer	Throughout the phase
	Sewage generated by workers	-Provide sufficient toilet facilities for workers while on-site (portable chemical toilet, if possible). -No open defecation is allowed on and around the site. Use the provided portable toilets for the workers on-site and at the campsite. -Sewage waste should be stored as per the portable chemical toilets supplied on site, and regularly disposed of at the nearest treatment facility.	-Adequate toilets and basic ablution facilities at sites -Chemical toilets Sewage removal operator -Waste treatment agents/chemicals.	-Construction Contractor -HSE Officer	Throughout the phase
Noise	Noise from project activities	-Noise from vehicles and equipment on sites should be reduced to acceptable levels. -Excavation, hauling, and transporting of materials from the BPs hours should be done between 07:00 and 17:00 to prevent noise generated by equipment/movement of heavy vehicles. -When operating excavators and other noise-generating machinery onsite, workers should be equipped with personal protective equipment (PPE) such as earplugs to reduce exposure to excessive noise.	-No complaints of noise associated with the project	-Construction Contractor -HSE Officer	Throughout the phase

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
Air quality	Dust generation: Dust proliferation due to soil's fine content, resulting in localized poor air quality and poor visibility.	-Soil stacks should be placed downwind from the main activity areas and the road detour. -All site areas and soil stacks should be regularly wetted. -During windy days, materials transporting trucks from BPs should be covered to prevent dust release from wind-blown loaded material. -A reasonable amount of water should be used to suppress the dust on-site. -Vehicles from and to BP sites should be driven at a speed of 40km/hr to avoid the generation of dust owing to high speeds. This is also to ensure road safety due to ongoing roadworks and numerous detours.	-Visual monitoring for dust nuisance and safety -Daily monitoring. -Complaints from neighbours -Records of how complaints or grievances have been addressed.	-Resident Engineer -Construction Contractor -HSE Officer	Throughout the phase
Archaeology and heritage	Accidental disturbance of archaeological or heritage objects	**-A 200m buffer zone around the grave site north of the bridge site (at GPS coordinates: -18.006111 13.545063),** as shown in Figure 5-1) **and cemeteries/graves should be maintained. No activity should be done within the buffer zone.** -Should archaeological materials like human burials or skeletal remains be uncovered during earthworks, the work should be halted, and the finds should be reported to the NHC, which may require inspection by an Archaeologist. The area should be fenced off and contact NHC (Tel: +264 61 244 375) and the National Forensic Laboratory (+264 61 240 461) immediately. -Avoid direct damage to archaeological or heritage sites that may be encountered during excavations. -All accidental discoveries shall be reported immediately to an archaeologist/heritage practitioner so that an investigation and evaluation of the finds can be made, acting upon which the HSE Officer will advise the necessary actions to be taken. -The Construction Contractor and the Subcontractor should adhere to the provisions of Section 55 of the National Heritage Act in the event significant heritage and cultural features are discovered in the course of project activities.	-Preservation of all artefacts and objects that are discovered onsite -The number of chances found correctly managed -Compliance with stop-work procedures	-Site Manager -Construction contractor -HSE Officer	As and when required, i.e., throughout the site establishment.

5.2.4 Borrow Pits Site Rehabilitation: Management Measures

The measures proposed for implementation to decommission and rehabilitate the borrow pit sites are provided in Table 5-4.

Table 5-4: Management and mitigation measures for borrow pits rehabilitation

Aspect	Impact	Management and Mitigation Measure(s)	Monitoring actions and Methods	Implementation Responsibility	Timeline
Unsightly borrow areas	Unstable slopes of an unrehabilitated borrow pit. Loose sediment washed away from unstable slopes.	-Shape all sides of the borrow pit to 30° to the horizontal. Rip the terrain and access routes, and replace the stored topsoil evenly over the terrain. -The stockpiled topsoil should be levelled soon after completion of works at sites. Some of the stockpile materials should be used for rehabilitation	Inspection by the Resident Engineer and the Environmental Consultant after rehabilitation	-Construction Contractor -Consulting Engineer	Throughout this phase and before abandoning the area
Rehabilitation of borrow pits	Unfenced/unsecured and unrehabilitated borrow pits	-Since complete rehabilitation of borrow pits is impossible (because one would need to get materials elsewhere to fill up the pit, and this leaves another pit in the area where one gets materials). Therefore, the Contractor should level the BPs as far as possible to minimise the risk, so that the BPs, or some of them, can be used for future purposes, such as rainwater storage structures for the communities, where possible. -BPs can also be rehabilitated by using stockpiled materials that were removed from the top layers of the BPs to raise the base or fence off the borrow pits that pose a hazard to the communities and cannot be safely rehabilitated. -Refill or reshape pits post-use to prevent them from becoming artificial catchments or stagnant water bodies, which can attract disease vectors or disrupt downstream flow. -Respective community leaders should be consulted to approve/sign off on BP Rehabilitation to their satisfaction.	Inspection by the Resident Engineer and the Environmental Consultant after rehabilitation	-Construction Contractor -HSE Officer	Throughout this phase and before abandoning the area
	Disruption of surface water runoff	-During rehabilitation, restore original contours and re-establish drainage lines to mimic pre-disturbance hydrology closely.			

Aspect	Impact	Management and Mitigation Measure(s)	Monitoring actions and Methods	Implementation Responsibility	Timeline
		-Use natural vegetation to stabilize soil and slow runoff, enhancing water infiltration and reducing erosion			
	Community dissatisfaction and persistent complaints	-Involve local communities in reporting water-related issues and incorporate traditional knowledge about seasonal water movement. -Coordinate with local authorities (MAFWLR) for integrated water resource management.			
Monitoring of borrow pits and action	Lack of monitoring of the efficiency/success of the borrow pit rehabilitation	-Annual inspections should be carried out on all rehabilitated BPs to determine rehabilitation success and assess any potential weed infestations. -Use additional seeding of local species if adequate vegetation growth has not been achieved using the seed bank in topsoil. -Any weeds present, weed control measures to be undertaken.			
	Altered hydrological flows	-Establish monitoring programs to assess changes in surface water flow and drainage post-construction (post-cessation of materials extraction from the borrow pits). -If the impact is observed, adapt management strategies, such as adding additional drainage or reinforcing certain areas with erosion control structures.	Inspection by the Resident Engineer and the Environmental Consultant after rehabilitation	-Construction Contractor -HSE Officer	Throughout this phase and before abandoning the area

5.3 Environmental Monitoring Actions

To ensure that the implementation of recommended environmental management measures is effective and produces the desired results (minimizing the "medium" and upholding the "low" significance ratings of impacts), certain key impacts will need to be monitored and reported. The ‘’Observation*, compliance status, and ‘’Recommended Action*’’ columns will be completed for every monitoring done on site. Monitoring reports are to be compiled by the project HSE Officer, audited by an Independent Environmental Consultant, and submitted to the DEAF for archiving on a bi-annual basis (every 6 months throughout the project operations) or as required by the Environmental Commissioner (as per the ECC conditions). The environmental components or features provided in the Table will be updated accordingly once the project commences.

6 RECOMMENDATIONS AND CONCLUSION

Based on the assessment of potential impacts by the environmental consultants, the project has some adverse (negative) impacts on the biological, physical, and social environment. However, to minimize the significance of these impacts while maximizing the benefits of the project activities, there should not be significant environmental degradation. It is for this reason that this EMP was developed to ensure sustainable land use for the borrow pits and subsequent bridge construction works, thereby promoting prosperity.

6.1 Recommendations

To mitigate the adverse impacts that may emanate from the bridge construction works and associated activities, the Construction Contractor and RA should follow the recommendations as follows:

6.1.1 Environment Management Plan Recommendations

To ensure a healthy and safe environment in the road area and its environs, an environmental management plan must be implemented through monitoring. This involves the collection and analysis of relevant environmental data as well as periodic documentation and reporting.

- External Auditing: The key to a successful EMP is appropriate monitoring and review to ensure effective functioning of the EMP and to identify and implement corrective measures promptly. If discrepancies are identified, the problem must be investigated and attended to. All the results obtained during environmental monitoring must be documented for audit purposes.

  An audit of the environmental management actions undertaken is essential to ensure they are effective in operation, meet specified goals, and are performed in accordance with relevant regulations and standards. Audits should be conducted during the facility's operational phase to ensure adherence to the management measures in the EMP.

6.1.2 Conclusion

Considering the potential impacts of the project and its associated activities, the mitigation measures in this EMP are sufficient to manage them. Therefore, Serja Consultants recommends that the Environmental Commissioner approve the proposed construction of the bridge and issue an ECC, subject to the Proponent ensuring complete compliance with the developed EMP.

APPENDIX 1: CHANCE FINDS PROCEDURE (AFTER KINAHAN, 2020)

Areas of project activities are subject to heritage survey and assessment at the planning stage. These surveys are based on surface indications alone, and it is therefore possible that sites or items of heritage significance will be found during development (operations and decommissioning) works. The procedure set out here covers the reporting and management of such finds.

Scope: The "*chance finds*" procedure covers the actions to be taken from the discovery of a heritage site or item to its investigation and assessment by a trained archaeologist or other appropriately qualified person.

Compliance: The "chance finds" procedure is intended to ensure compliance with relevant provisions of the National Heritage Act (27 of 2004), especially Section 55 (4): "*a person who discovers any archaeological …. object ……must as soon as practicable report the discovery to the Council*". The procedure of reporting set out below must be observed so that heritage reported to the NHC is correctly identified in the field.

The Site Manager/Supervisor must report the findings to the following competent authorities:

- **National Heritage Council of Namibia: Head Office: +264 61 244 375**

  Technical Office +264 61 301 903
- **National Museum (+264 61 276 800)**
- **National Forensic Laboratory (+264 61 240 461)**

Responsibility:

Operator:	To exercise due caution if archaeological remains are found
Foreman:	To secure the site and advise management promptly
Superintendent:	To determine safe working boundaries and request an inspection
Archaeologist:	To inspect, identify, advise management, and recover remains

Procedure:

<u>Action by a person identifying archaeological or heritage material</u>

a) If operating machinery or equipment, stop work

b) Identify the site with a flag tape

c) Determine the GPS position if possible

d) Report findings to the foreman

Action by the foreman

a) Report findings, site location, and actions taken to the superintendent

b) Cease any works in the immediate vicinity

Action by the superintendent

a) Visit the site and determine whether work can proceed without damage to findings

b) Determine and mark the exclusion boundary

c) Site location and details to be added to the project GIS for field confirmation by an archaeologist

Action by an Archaeologist

a) Inspect the site and confirm the addition to the project GIS

b) Advise NHC and request written permission to remove findings from the work area

c) Recovery, packaging, and labelling of findings for transfer to the National Museum

In the event of discovering human remains

a) Actions as above

b) Field inspection by an archaeologist to confirm that the remains are human

c) Advise and liaise with NHC and Police

d) Recovery of remains and removal to the National Museum or the National Forensic Laboratory, as directed.