

Draft Environmental Management Plan (EMP)

The Proposed Installation and Operation of Water, Sewer, Electrical Reticulation Services and associated activities in a New Extension in the Okanguati Settlement Area of the Kunene Region





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Draft as prescribed by Regulation 8(j) of the EIA Regulations (2012) – this is a living document throughout the project life cycle.

Proponent:

Kunene Regional Council Private Bag 502 Opuwo, Namibia

DOCUMENT INFORMATION

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Prepared by:

Author / Environmental	Fredrika N. Shagama
Assessment Practitioner (EAP):	
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 (<i>cum laude</i>) 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
	elas.public@serjaconsultants.com
	Postal Address: P.O. Box 27318 Windhoek, Namibia
Signature:	Fitherforma
Date:	28 March 2025

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 Installation and Operation of Water, Sewer, Electrical Reticulation Services and associated activities in a New Extension in the Okanguati Settlement Area of the Kunene Region, Serja Hydrogeo-Environmental Consultants cc declare that we:

- do not have, to our knowledge, any information or relationship with the Kunene Regional Council (the Proponent), the project design engineers (Arovar Project Engineers) 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.

Althana

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Signature:

Fredrika N. Shagama: Principal Environmental Assessment Practitioner & Hydrogeologist

Date: 28 March 2025

TABLE OF CONTENTS	
DOCUMENT INFORMATION	i
TABLE OF CONTENTS	iii
LIST OF FIGURES	iv
LIST OF TABLES	iv
LIST OF APPENDICES	iv
LIST OF ABBREVIATIONS	iv
1 INTRODUCTION	1
1.1 Project Background and Location	1
1.2 Purpose of the Draft Environmental Management Plan (EMP)	2
1.3 Limitations of the EMP	3
2 BRIEF DESCRIPTION OF THE PROJECT ACTIVITIES	4
2.1 Project Overview	4
2.2 Project Design	4
2.3 Construction Phase	4
2.3.1 Construction workforce and duration	4
2.3.2 Construction services and utilities	5
2.4 Operation and Maintenance Phase	5
2.5 Decommissioning and rehabilitation of disturbed areas on-site	6
3 LEGAL FRAMEWORK: PERMITTING AND LICENSES	6
4 EMP IMPLEMENTATION RESPONSIBILITIES	7
4.1 Amendments of the EMP	9
5 ENVIRONMENTAL MANAGEMENT MEASURES	9
5.1 Key identified potential negative impacts	9
5.2 Environmental management and mitigation Measures	10
5.3 Planning and Design	11
5.3.1 Management and Mitigation Measures for the Planning and Design Phase	11
5.4 Construction phase	13
5.4.1 Management and Mitigation Measures for the Construction Phase	13
5.5 Operations and maintenance phase measures	25
5.5.1 Management measures for the operations and maintenance of the installed wa	ater, sewer,
and electrical services	26
5.6 Environmental Monitoring Actions	31
6 RECOMMENDATIONS AND CONCLUSION	32
6.1 Recommendations	32
6.1.1 Environment Management Plan Recommendations	32
6.1.2 Conclusion	

LIST OF FIGURES

Figure 1-1: Locality map of the proposed area for the installation of water, sewer, and electrical	
reticulation services in Okanguati Settlement, Kunene Region	.1
Figure 1-2: Okanguati Settlement Layout showing the proposed New Extension for which the proposed	
services will be installed and operated	. 2

LIST OF TABLES

Table 3-1: List of legal requirements and permits for the project activities	6
Table 4-1: EMP implementation responsibilities for the proposed installation of reticulation services	8
Table 5-1: Management and mitigation measures for the planning and design phase	11
Table 5-2: Management and mitigation measures for the impacts of construction activities	14

LIST OF APPENDICES

Appendix 1: Chance Finds Procedure for Archaeological and Cultural Heritage Resources

LIST OF ABBREVIATIONS

Abbreviation	Meaning
BID	Background Information Document
DEAF	Department of Environmental Affairs and Forestry
EAP	Environmental Assessment Practitioner
ECC	Environmental Clearance Certificate
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
ELCBs	Earth Leakage Circuit Breakers
EMA	Environmental Management Act
EMP	Environmental Management Plan
GFCIs	Ground fault circuit interrupters
GG	Government Gazette
GN	Government Notice

Abbreviation	Meaning
I&APs	Interested and Affected Parties
IEC	International Electrotechnical Commission
KRC	Kunene Regional Council
MAWLR	Ministry of Agriculture, Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism
MME	Ministry of Mines and Energy
NEC	National Electrical Code
NHC	National Heritage Council (NHC) of Namibia
PPE	Personal Protective Equipment
PRVs	Pressure-reducing valves
Reg	Regulation
RCDs	Residual current devices
SCADA	Supervisory Control and Data Acquisition
SHE Officer	Safety, Health & Environmental Officer
SPDs	Surge protection devices
UPS	Uninterruptible power supply
VSDs	Variable speed drives

1 INTRODUCTION

1.1 Project Background and Location

The Kunene Regional Council (hereinafter referred to as the Proponent) proposes to install and subsequently operate water, sewer, and electrical reticulation services in a New Extension on the northeastern edge of Okanguati Settlement which is located about 110km northwest of Opuwo Town in the Kunene Region - Figure 1-1.

The New Extension will consist of 593 ervens of which 545 ervens are planned for residential purposes, i.e., residential (545), agriculture (4), urban agriculture (1), SME park (2), business (15), institutional (5), public open space (17), open market (1), and 3 civic ervens - Figure 1-2. The extension layout area to be serviced is 44.5 hectares (Ha) - the area/length of the services will only be provided once the project design is completed by the project engineers (Arovar Project Engineers).



Figure 1-1: Locality map of the proposed area for the installation of water, sewer, and electrical reticulation services in Okanguati Settlement, Kunene Region



Figure 1-2: Okanguati Settlement Layout showing the proposed New Extension for which the proposed services will be installed and operated

1.2 Purpose of the Draft Environmental Management Plan (EMP)

The Draft EMP is developed following Regulation 8(j) of the EIA Regulations (2012), which states that it should be included as part of 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 the proposed management & mitigation, and monitoring actions, set to a timeline and with specific assigned 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 adapt to address project changes and/or environmental conditions and feedback from compliance monitoring.

The EMP is therefore aimed at guiding environmental management throughout the three main phases of the project activities, namely: planning & design, construction, operational & maintenance phases.

- <u>Planning and design</u> the period during which preliminary legislative and administrative arrangements (such as appointing the construction contractor) are carried out in preparation for the construction phase, and subsequent operational and maintenance of the proposed services.
- Construction (installation) the period during which water, sewer, and electrical reticulation systems and associated components (structures) are erected and installed onsite, respectively, in preparation for the operational phase (New Extension establishment).
- <u>Operation and maintenance phase</u> the period during which the installed services and associated utilities and infrastructures are operational and maintenance is carried out by the Proponent.

1.3 Limitations of the EMP

The term 'environment' includes the biophysical and social environment, thus, this EMP deals with both. The imitations of the EMP are as follows:

- This EMP does NOT cover equally important aspects such as customer care, financial management, etc. These 'site administrative and technical management' issues are outside the scope of an EMP.
- The EMP does not make provision for the construction or operational phases of the New Extension and associated structures. This document only covers the installation of the water, sewer, and electrical reticulation services (systems) and their associated potential impacts.
- The EMP only makes provision for the management and mitigation of potential impacts that were assessed during the EIA Scoping process.
- Should amendments be proposed to the project activities, these will need to be communicated and reassessed for incorporation into the EMP and an amendment thereto submitted to the Environmental Commissioner at MEFT.

2 BRIEF DESCRIPTION OF THE PROJECT ACTIVITIES

The project phases and activities are presented below.

2.1 Project Overview

The proposed project activities will involve the installation (construction) of water, sewer, and electrical reticulation services to the New Extension in Okanguati. The services will entail a network of pipes, pumps, and other associated infrastructure required to supply water (from the Settlement's central water source to homes, businesses, and industries in the New Extension). A typical water reticulation system would consist of pipes, valves, fittings, storage tanks, and pumping stations to ensure the water reaches the end-users reliably and safely.

The second proposed service is sewer reticulation, which involves the removal of wastewater from residential, commercial, and industrial areas. Collection and transportation of wastewater (including sewage) from homes, businesses, and industries to a local treatment plant or disposal site.

The sewer system will involve a network of sewer pipes, manholes, pumping stations, and a wastewater treatment plant.

The third proposed service is electrical reticulation, which will comprise the connection to the grid, metering, distribution boards, main distribution board, and circuit breakers/fuses, as well as internal wiring and cable routing. Additional components for the electrical reticulation system include lighting and power circuits, outlets, switches, and grounding earthing systems.

2.2 Project Design

Arovar Project Engineers (design engineers) are still finalizing the design of these three proposed systems (services). However, some preliminary draft drawings or concepts (for the water and sewer reticulation system network layout) as provided in Figures 2-1 and 2-2 of the EIA Scoping Report, as well as Appendix C of the same Report.

According to Arovar Project Engineers, with regards to the sewer reticulation system, the preliminary pipe diameter of 160mm has been assumed, whereas the manholes will be spaced at a maximum distance of 100m. Based on the preliminary assessment, there will be a need for lifting/pumping stations. Added to that, the surface slopes away from the manholes as indicated by the surveyor, there will be a need for the inverts at the ponds to confirm whether there will be a need for a final lifting/pumping station.

2.3 Construction Phase

2.3.1 Construction workforce and duration

The Proponent will appoint a contractor for the construction (installation) of the services and associated infrastructures. The construction crew will be housed in Okanguati with local labourers commuting from their own houses.

The number of workers for construction is unknown at this stage. However, the number of people anticipated for employment will prioritize local employment for locally available skills.

The estimated duration of the construction period is approximately 12 months (1 year). However, this might be adjusted depending on local conditions, including the availability of funds throughout the construction period as well as the efficiency of the installation contractor.

2.3.2 Construction services and utilities

The services and utilities required during the construction phase include:

The services and utilities required during the construction phase include:

- <u>Water supply:</u> water required for the installation works will be sourced from the Settlement's water supply scheme. The amount of water required will not be significant, but the volume is not yet known.
- <u>Electricity (power supply)</u>: A diesel generator will be used for the installation works. The generator will be provided by the appointed contractor.
- <u>Sewage (toilets)</u>: Portable toilets will be supplied by the appointed contractor on site for the workers. The contractors will remove the toilets upon completion of construction works.
- <u>Solid waste management</u>: the waste will be collected in a secure central place onsite, removed from the area, and disposed of at the local waste management site (in Okanguati). If not possible, the waste will be transported to Opuwo's solid waste management facility as appropriate.
- Occupational health and safety: all project workers will be supplied with appropriate and adequate personal protective equipment (PPE) while carrying out project activities onsite. The site will also be equipped with one fully furnished first aid kit.
- <u>Accidental fire outbreaks</u>: The site will be equipped with fire extinguishers in case of accidental fire outbreaks during installation (construction) work.
- <u>Road access:</u> The project-related vehicles will use the existing access roads in the Settlement to gain access to the site area. The nearest road to the New Extension is D3700.

2.4 Operation and Maintenance Phase

This is the phase during which the installed water, sewer, and electrical reticulation services are operational, and maintenance is done by the Proponent. When needed or if the maintenance work cannot be done by the Proponent, this will be outsourced to an external maintenance contractor. This is also the stage during which the New Extension is fully established and operational, and all the services are serving the residential and business properties.

2.5 Decommissioning and rehabilitation of disturbed areas on-site

Once construction is completed, the construction (installation) contractor will need to implement site rehabilitation measures. Decommissioning and rehabilitation are primarily reinforced through either progressive rehabilitation while construction work is ongoing or rehabilitating disturbed sites after completion of work, which consists of safety, health, environmental, and contingency aspects. For safety, health, and the environment, rehabilitation of the site post-construction will include the following:

- Dismantling and removal of construction campsites and associated infrastructures from the project sites,
- 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 owner),

Further decommissioning and rehabilitation practices at the site will include:

- Backfilling of all holes and trenches (if any) associated with the construction activities in the area,
- Closing and capping of road construction holes to ensure that they do not pose a risk to both people and animals in the area, and
- Levelling of stockpiled topsoil, which will be done to ensure that the disturbed site areas are left as close to their original state as possible.

3 LEGAL FRAMEWORK: PERMITTING AND LICENSES

The Proponent has the responsibility to ensure that the project activities, as well as the EA process, conform to the principles of the EMA and must ensure that employees act per such principles. The requirements of an EMP as stipulated by Section 8 (e) of the EIA Regulations, primarily on specific approvals and permits that may be required for the project activities, are provided in Table 3-1.

Legislation	Provisions	Contact Details
Environmental	Activities listed in Government Notice (GN) No.	Mr Timoteus Mufeti:
Management Act 2007	29 of GG No. 4878 require an Environmental	Environmental Commissioner at
Environmental Impact	Clearance Certificate (ECC).	MEFT
Assessment (EIA)	The amendment, transfer, or renewal of the ECC	Tel: +264 61 284 2701
Regulations (EIAR) (GG	(EMA S39-42; EIA Regulation 19 & 20).	
No. 4878)	Amendments to this EMP will require an amendment of the ECC.	

Legislation	Provisions	Contact Details
	The ECC needs to be renewed every 3 years.	
Water Resources Management Act No. 11 of 2013	License and permit requirements of the applicable water and wastewater legislation	Mr Franciskus Witbooi MAWLR: Water Affairs (Water Law Administration & Policy) Tel: +264 61 208 7226
Road Traffic and Transport Act 52 of 1999 and its 2001 Regulations	Provides for the control of traffic on public roads and the regulations about road transport, including the licensing of vehicles and drivers.	Mr Eugene de Paauw (Roads Authority – Specialist Road Legislation) Tel.: +264 61 284 7027
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 the authority of a license or a certificate, excluding a person who possesses or stores such fuel in a quantity of 600 liters or less in any container kept at a place outside a local authority area" A consumer installation certificate should be applied for from the MME for the storage of fuel:	Mr Carlo McLeod (Ministry of Mines and Energy (MME)): Acting Director – Petroleum Affairs) Tel.: +264 61 284 8291
Forestry Act (No. 12 of 2001) Nature Conservation Ordinance No. 4 of 1975 (as amended)	Permits are required for the removal of protected plant species.	Northwest Regions Forestry Offices (MEFT) Tel: 061 208 7320 Or MEFT Head office in Windhoek Tel: +264 61 284 2111
27 of 2004)	reported to the National Heritage Council.	National Heritage Council: Tel: +264 61 301 903

4 EMP IMPLEMENTATION RESPONSIBILITIES

The Kunene Regional Council (the Proponent) is ultimately responsible for the implementation of the EMP. However, the Proponent may delegate this responsibility or 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 in. Table 4-1.

The Proponent and their appointed Project Manager, who are in charge of the whole operation, have the final responsibility for the implementation of the EMP. It is important to note that the Environmental Management Act implies that the EMP should be monitored. Monitoring needs to be more intensive (weekly) during the construction phase, while during the operational phase, it can be monthly.

Role	Responsibilities
Kunene Regional Council	-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 Design Engineer	The Engineer's responsibilities in the EMP implementation include:
	-Designing aspects of the water, sewer, and electrical reticulation systems.
	-Advising the Proponent on the most suitable services, infrastructure designs,
	and related services.
Project Manager	The responsibilities of this Manager during the construction phase will be to:
	-Implement and ensure compliance with the environmental management
	measures proposed in this document.
	-Ensure compliance with relevant environmental and related authorizations and
	license conditions.
	-Review the EMP annually and amend the document when necessary
	-Maintain stakeholder engagement and grievance mechanisms
	-Develop and manage schedules for daily activities
	-Issuing fines to individuals who may be in breach of the EMP provision and, if
	necessary, removing such individuals from the site.
	-Ensure relevant staff are trained in procedures entailed in their duties.
	-Maintain records of all relevant environmental documentation for the project.
Construction Contractor or simply	The Contractors' representative or site supervisors (as appropriate) will be
the "Contractor" and by all means	required to:
subcontractors	-Ensure that the relevant commitments contained in the EMP are adhered to.
	-Compile relevant procedures and method statements for approval by the
	Project Manager before initiation of project activities onsite.
	-Ensure that all relevant staff are trained in procedures.

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Role	Responsibilities	
	-Maintain records of all relevant environmental documentation applicable to	
	their work, i.e., all occurrences or incidents that have an environmental impact	
Safety, Health & Environmental	The Proponent may assign the responsibility of ensuring EMP compliance	
(SHE) Officer or Environmental	throughout the project life cycle to a designated member of staff or an externally	
Control Officer (ECO)	qualified and experienced person, referred to in this EMP as the SHE Officer.	
	This person will be responsible for the following activities:	
	-Planning and carrying out site inductions to workers onsite and visitors.	
	-Ensuring that the requirements of the EMP are carried out.	
	-Monitoring the overall implementation of the EMP and preparing EMP monitoring reports on a 6-month basis	
	-Ensuring that the project activities are conducted per the International Organization (ISO) standard 14001: 2015.	

4.1 Amendments of the EMP

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

5 ENVIRONMENTAL MANAGEMENT MEASURES5.1 Key identified potential negative impacts

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

- Physical land (soil) disturbance and soil erosion during construction.
- Impact on biodiversity (fauna and flora) and habitat destruction.
- Potential soil and groundwater pollution from waste products during construction and operations (in case of sewer pipeline breakages).
- Potential over-abstraction of water resources owing to the required additional volumes to supply the New Extension may result in the depletion of water resources, which may affect local ecosystems.
- General environmental pollution (littering) through mishandling of project-related waste.

- Poorly managed construction waste can contaminate nearby land and waterways, affecting both the local ecosystem and human health.
- Air pollution by potential dust from machinery and excavations during construction.
- Noise associated with the movement of heavy machinery and trucks in the Settlement.
- Occupational and community health and safety: Improper handling of materials and equipment may cause health and safety risks to workers and locals.
- Impact on archaeological and heritage resources through inadvertent unearthing of such resources during earthworks.

In terms of specific negative impacts or risks associated with electrical reticulation installation, these are as follows:

- Risks of electrical shocks are associated with poor installation or incorrect wiring, which can be dangerous for both professionals working on the system and locals or occupants of the New Extension later on.
- Fire Hazards associated with faulty wiring or overloading circuits could potentially lead to electrical fires. Inadequate grounding, incorrect installation of cables, or damaged wires can increase the risk.
- The impact of increased energy consumption owing to the inefficient design of the reticulation system. This could result in increased energy usage, leading to higher electricity bills. Overloading circuits or installing outdated systems can also cause inefficiencies.

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

5.2 Environmental management and mitigation Measures

The management actions are aimed at avoiding the above-listed potential negative impacts, where possible, and where it is impossible to avoid these impacts, measures are provided to reduce the impacts' significance. Management and mitigation measures recommended for the potential impacts in the Scoping Report were based on the:

- Planning and design phase (Table 5-1),
- Construction phase (Table 5-2), and
- Operational and maintenance management and mitigation measures under section 2.4.

5.3 Planning and Design

<u>Objective</u>: The proposed systems and their associated structures should fit into the natural environment, making full use of the natural features of the site.

<u>Who is responsible</u>: The project design Engineer must design the service components with minimal impact on the biophysical and social environment.

5.3.1 Management and Mitigation Measures for the Planning and Design Phase

The measures proposed for implementation to manage and mitigate the environmental impacts associated with the planning and design phase are provided in Table 5-1.

Aspect	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
EMP implementation and training: Lack of EMP awareness and implications thereof	 -All site personnel should be aware of necessary health, safety, and environmental considerations applicable to their respective work. -The implementation of this EMP should be monitored. The site should be inspected weekly, reporting done monthly throughout <u>the project activities</u>, and <u>a</u> compliance audit done <u>biannually for overall EMP implementation</u>. -The EMP non-compliance penalty system should be implemented. 	-Training of project personnel on the EMP	-Project Manager	Pre-construction
Employment: high local unemployment, when outsiders are often given employment opportunities over locals	 -Wherever possible, the majority of workers (semi and unskilled labor) should be hired locally, thus minimizing the need to bring in staff from outside areas. -It should be mandatory for contractors to give all unskilled and semi-skilled work to the locals before considering outsiders (anyone from outside the project site, i.e., Okanguati, and over a 5km radius of the Settlement). -Skills transfer and capacity building should be prioritized during construction. -The anticipated work opportunities and some positions should be announced through the Epupa constituency offices by the councilor and the local youth group leadership (if any). 	More opportunities are reserved for and given to the locals	-Project Manager	Pre-construction, and where necessary throughout the construction phase

Table 5-1: Management and mitigation measures for the planning and design phase

Aspect	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	-The names of the prospective workers should be screened by the local leaders and the Settlement development committee to verify their residence, to ensure that the opportunities reserved for the locals are not given to outsiders. -Equal opportunities should be given to both men and women, where possible.			
Electrical shocks due to poor installations or miswiring Fire hazards due to faulty wiring or overloading circuits	 The appointed installation contractor should have qualified, licensed professionals and ensure compliance with local building codes. Materials and equipment to be used for the installation of the services should be up to approved standards. The electrical reticulation system designs should comply with relevant national and local electrical codes and standards (such as the National Electrical Code (NEC) or International Electrotechnical Commission (IEC) standards. The project design Engineer should ensure that the tender documentation has strict requirements in terms of professionals to be part of the construction contractor (services installation contractor). Circuits should be designed with appropriate protection (e.g., circuit breakers, fuses) to prevent overloads, short circuits, and faults 	The installation designs are done correctly, and the correct wiring is checked or approved by external electrical inspectors/professionals No faulty wiring or overloaded circuits	KRC Procurement Unit -Project Design Engineers (during the design and tender document preparation)	Pre-construction, and where necessary throughout the construction phase
Procurement of goods and services	 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. 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	KRC Procurement Unit	Pre-construction, and where necessary throughout the construction phase
Water efficiency: use and management: Over-abstraction and over-use of water	 -Design all toilets to drain into properly designed septic tanks (i.e., using the relevant South African National Standard) and place them at least 5 meters from any structure. -The borehole should not be pumped at rates beyond the sustainable yield. This is to ensure that groundwater flow directions are not altered or induced toward the borehole. -Specify low-flow shower heads for the showers. 	-All the designs are done as recommended or better	-Project Design Engineer	Pre-construction

Aspect	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	-Specify appropriate minimal-water flushing devices in the toilets.			
Energy efficiency: Over-utilization of energy	-Generators should be used as little as possible.	-All energy-saving measures are put in place and part of the design.	-Project Design Engineer	Pre-construction

5.4 Construction phase

<u>Objective</u>: To construct the water, sewer, and electrical reticulation services with minimal disturbance to the surrounding biophysical environment

Environmental performance indicator: The environmental footprint of the installed services (systems) is limited to its area, with the surrounding areas and resources largely unaffected.

Who is responsible?

- The construction contractor (and subcontractors) must be instructed in writing by the Project Manager to implement the mitigation measures. It is then his responsibility to ensure that ALL the measures are implemented.
- The Project Manager should inspect the site at least twice a month to make sure that the measures are being implemented.
- The Project Manager must do a final inspection once the services are installed and issue the construction contractor with a completion letter once s/he is satisfied that the job has been done following this EMP.

5.4.1 Management and Mitigation Measures for the Construction Phase

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

Table 5-2: Management and mitigation measures for the impacts of construction activities

Aspect	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 necessary health, safety, and environmental considerations applicable to their respective work. -The implementation of this EMP should be monitored. The site should be inspected weekly, reporting done monthly throughout <u>the project activities, and a</u> compliance audit done <u>biannually for overall EMP implementation.</u> -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.	-Project Manager -Contractor -SHE Officer	Throughout the phase, and when deemed necessary
Preparatory works: site preparation, work plan notification, and identification of the construction workforce	 The Contractor should mark out (e.g., on the ground or with danger tape) the areas of all services and structures before any workers, equipment, or building materials are brought in. A 2-metre buffer can be allowed around the perimeter of buildings to allow building activities. The marked-out area should be inspected and approved by the Project Manager. Thereafter, all site staff should be informed that they may not move or disturb any areas beyond those limits. 	-All measures are in place and implemented	-Contractor -Project Manager	Throughout the phase, and when deemed necessary
Electrical shocks due to poor installations or miswiring	 -National Electrical Code (NEC) or equivalent local standards should be strictly followed. Ensure that all electrical systems are designed, installed, and maintained according to recognized safety standards. -Obtain necessary permits and inspections during and after installation to ensure compliance with regulations. -Only licensed electricians or trained professionals should carry out electrical installations. -Ensure all workers receive training in electrical safety practices and understand the risks involved. -Installers and workers should wear appropriate PPE, including insulated gloves, rubber-soled shoes, and face shields when working with electrical systems. -Ensure that all workers are equipped with the correct safety gear for both electrical shock protection and fire safety 	The installation is done correctly, or the correct wiring is done (to be checked by external electrical inspectors)	-Construction contractor	Throughout the construction phase

Aspect	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	-All electrical systems must be properly grounded according to standards.			
	-Bond all metallic parts to the ground to ensure that, in the event of a fault, the electrical current has a safe path to flow.			
	-Keep the worksite clean and dry to avoid electrical hazards. Water is a significant conductor of electricity and increases the risk of electrical shock.			
	-Ensure all tools are properly maintained, and electrical tools should have insulated handles.			
Fire hazards due to faulty wiring or overloading circuits	-Use high-quality materials (wires, circuit breakers, switches, etc.) that are certified for safety.	All necessary installation measures are put in place,	-Construction contractor	Throughout the construction
	-Ensure that cables are of the correct gauge and insulation rating to handle the expected electrical load.	and the site is inspected/done by external		phase
	-Choose flame-resistant and non-combustible materials, especially for conduits and insulation, to prevent fire hazards.			
	-Ensure that circuits are not overloaded by distributing electrical loads appropriately. Avoid using extension cords as a permanent solution and ensure each circuit is properly rated for the expected load.			
	-Install fire extinguishers that are appropriate for electrical fires (typically Class C or ABC extinguishers).			
	-Consider installing smoke detectors in areas where electrical equipment is located.			
	-Make sure that electrical panels and circuits are installed with adequate clearance and accessibility for maintenance.			
	-Circuits should not be overloaded by distributing electrical loads appropriately. Avoid using extension cords as a permanent solution and ensure each circuit is properly rated for the expected load.			
	-Install circuit breakers or fuses that are correctly rated to handle the expected load. This will prevent overloads and minimize the risk of fire.			
	-Install Residual Current Devices (RCDs) or Earth Leakage Circuit Breakers (ELCBs) to detect leakage currents and prevent electric shock hazards.			

Aspect	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	-Install surge protectors to prevent damage from power surges or lightning strikes, which could lead to electrical fires.			
Clearing of land	 The only land that may be cleared is the roads, the areas where services (pipelines and cables) will be installed. -As much land clearing as possible (e.g., the removal of rocks) should be done by hand. Heavy earthmoving equipment, which will disturb the soil, create dust, and leave tracks and scars, should be used minimally or not at all. -As far as possible, all lay-down areas, such as the areas where construction materials and equipment are stockpiled, should be areas that will later be used for parking or driveways. This means do not stockpile materials in surrounding areas beyond the actual final services installation footprint. -The construction contractor may only disturb an area up to 2m on either side of the reticulation services path/route or development area. -Site personnel should refrain from killing, snaring, or intentionally disturbing local animals that may be found on and around the site. -Personnel should not damage or cut down vegetation that is outside the demarcated footprint of the service's installation and should not unnecessarily damage or remove any plants within the footprint unless required to do so for the project activities. -Movement of vehicles and machinery should be restricted to existing roads and tracks to prevent unnecessary damage to vegetation. 	-All measures are in place and implemented	-Construction Contractor -Project Manager	Throughout this phase
Laying of pipelines and cables	 Pipelines should be buried underground or covered with rocks where burying is not possible. -Where possible, pipelines should be laid next to local roads. This is to avoid the need to make another scar on the landscape and to make it easier to inspect the pipeline when needed. -Trenches excavated should be kept open for the shortest practicable time. If practicable, trenches should be excavated in short sections at a time as opposed to the entire length of the proposed services infrastructure. 	-All measures are in place and implemented	-Construction Contractor	Throughout this phase

Aspect	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
Facilities for construction workers	-All workers should be housed on a brownfield site, where facilities such as water and energy are easily available.	-All measures are in place and implemented	-Contractor -Project Manager	Throughout this phase
	-Wherever the workers are housed (especially specialized workers who are not originally from Okanguati), they must be provided with water, toilets, and washing facilities.		i roject manager	
	-Cooking facilities must be provided, preferably with gas cookers rather than open fires. If open fires are used, these must be made in a designated, cleared kitchen area so that there is no possibility of a veld fire breakout. Firewood should not be collected from the local environment, but should be provided by the Project manager, who procures it responsibly			
Water abstraction and use	-Water should be used sparingly at all times. -All pipes and tanks must be managed and maintained so that they do not leak. Conduct a visual inspection so that all faulty and leaking taps and pipes are immediately repaired	-Daily inspections and condition reports -Water conservation awareness to all personnel	-Construction Contractor -Project Manager	Throughout the phase
	-Water reuse/recycling methods should be implemented as far as practicable.			
	-Educate the workforce on sustainable and effective use of water, e.g., clean equipment in containers.			
Soils: Physical soil/land disturbance and loss of topsoil	-Stockpiled topsoil and excavated materials should be used to backfill the excavated and disturbed site areas after completion of works. -Soils that are not within the intended footprints of the reticulation services should be left undisturbed, and soil conservation implemented as far as possible. -Project vehicles/machinery should stick to the access route	-No proliferation of informal vehicle tracks created by project activities. -No new erosion gullies. -No signs of soil compaction	-Project Manager -Construction Contractor -SHE Officer	Throughout the phase
	provided and not unnecessarily create further tracks onsite by driving everywhere, causing soil compaction and erosion.	-No disturbance to unmarked areas on-site.		
Soil and water resources pollution from garbage, cement, concrete, sewage, chemicals, fuels, oils, or any other objectionable or undesirable	 -Accidental spills must be cleaned immediately to avoid the pollution of the wetland and the groundwater. -All fuels, paints, solvents, and other chemicals must be stored in watertight containers, ensuring that they cannot react with each other or be applied and the ground and into water reactives. 	Inspection, daily reporting, and regular clean-up	-Project Manager -Construction Contractor	Throughout the phase

Aspect	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	-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 project fuel is stored in Okanguati, fuel tanks must be properly bunded. The volume of the bunded area must be impermeable and sufficient to hold 1.5 times the capacity of the storage tanks.			
	-Drip trays should be available for all equipment that is intended to be used during construction. These trays should be placed underneath each vehicle while the vehicles are parked. The drip trays should be cleaned every morning, and the spillage handled as hazardous waste.			
	-All cleaning of equipment should take place within the construction site, and the water from washing operations should be collected in a tank and disposed of in an agreed manner.			
General solid waste	-Project personnel should be sensitized to dispose of waste responsibly and not litter.	-Daily inspection and clean up.	-Construction Contractor	Throughout the phase
	-Construction waste should be stored in skips and should regularly be removed from the site for disposal at an applicable municipal waste disposal site (Opuwo).	-There are sufficient waste storage containers for different waste	-Project Manager	
	-The project site should be equipped with different waste bins for each waste type (except for sewage, which will be contained in the provided portable toilets for the construction phase)	-No littering caused by project personnel		
	-Plastics, wrapping waste, strapping, etc., should be secured in containers for general waste to prevent wind-blown waste.	-No visible litter around the project area -Provision of sufficient		
	-All combustible waste (e.g., empty plastic bags and papers) should be burned in a drum or enclosed container, with the necessary care taken to avoid the possibility of starting a wildfire.	waste storage containers -Waste management awareness		
	-All non-combustible but recyclable waste (e.g., bottles, tins, plastic packaging) should be neatly stored separately to optimize re-use and recycling, or must be removed from the site at least once a week.	-Environmental, Health, and Safety Statements and Policies are in place		
	-All materials (e.g., bricks, poles, stones, pipes, etc.) must be stored at a central storage area on site so that the site is neat and orderly,			

Aspect	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	and to avoid a situation where materials are lying scattered about on the project site.			
	-Any waste that is stored temporarily at the site must be secured to avoid it being blown into the surrounding areas and to prevent it from being scavenged by animals.			
	-Measures must be taken to prevent any waste from attracting scavengers (e.g., kitchen waste should not be left to rot in the open so that it generates smells that will attract animals).			
	-Any waste that cannot be composted, reused, recycled, or burned should be dumped only at a properly managed waste facility.			
	-Separate all organic waste (e.g., kitchen waste) and dump this in a designated compost heap. This should be an enclosed place where it cannot be dug out and scattered about by scavengers.			
	-Ensure that there is no waste left scattered on site, but rather be disposed of in allocated site waste bins and thereafter taken to the nearest approved waste management facility.			
	-No burying of waste is allowed on site or anywhere else.			
	-All domestic and general waste produced daily should be contained until such time that it will be transported to designated and appropriate waste sites weekly or as required.			
	-Provide animal-proof waste receptacles for temporary storage until transportation to the nearest approved waste facility (in Opuwo).			
Hazardous waste	 -No paint, solvents, thinners, diesel, oil, or any other harmful substances may be poured onto the ground. They must be collected in a container and removed from the site for proper disposal. -All fuels and other chemicals must be stored in leak-proof containers, ensuring that they cannot react with each other or be spilled into the ground. Bulk fuel and other liquid hazardous substances should be stored on an impervious bunded surface, with sufficient capacity to contain 1.5 times the volume of fuel/hazardous liquid (in the event of a significant spill/container failure). -No vehicles or other equipment are to be serviced or repaired onsite. However, should this be done (in cases of emergency), any 	-Daily inspection and clean up. -There are sufficient waste storage containers for different waste -No spillage on and around the project area	-Contractor -Project Manager	Throughout the phase

Aspect	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	the site for proper disposal (see waste management section below for details).			
	-Spillages of any potentially toxic materials, whether by accident or through negligence, must be scooped up immediately into designated drums/containers for hazardous waste.			
	-Hazardous waste should be collected and disposed of periodically at a hazardous waste treatment facility (e.g., Walvis Bay or Windhoek).			
Sewage management (human waste)	-Open defecation and urinating in public are strictly prohibited. Workers should be provided with appropriate toilets for the field.	Daily inspections and clean-up.	-Construction Contractor	Throughout the phase
	-Only portable chemical toilets should be used on-site and at the campsite. Under no circumstances may the waste from these toilets be dumped in the veld.	-There are sufficient toilets at the construction campsite for workers	-Project Manager	
	-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.	-No open defecation by project workers -There are sewage removal operators		

Aspect	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
Biodiversity: Loss of Flora -Avoid unnecessary removal and disturbance of site vegetation. -Vegetation found on the site, but not in the actual project footprint, should not be disturbed and, therefore, should be avoided. -Any activity resulting in the chopping down of trees or the removal of vegetation without the required authorization is strictly prohibited. Therefore, a permit for removing protected trees should be obtained from MEFT's Northwest Region's Forestry Office.	 -No complaints of unauthorized vegetation removal associated with project personnel. -No intentional disturbance or destruction of site vegetation 	-Construction contractor -SHE Officer	Throughout the phase	
	-All protected tree species (Mopane trees) should be tagged so that they are visible during construction works.	-Barricading tape (to indicate working areas)		
	-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.			
	-Alien vegetation should not be introduced to the site in the form of seeds or plants, for beautification or any other reason.			
Biodiversity: Impact on fauna: livestock, wild animals such as reptiles, birds, etc.	 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 site should not be destroyed or disturbed. Refrain from removing or destroying the bird nests on trees. Construction holes and trenches should be secured and backfilled or leveled upon completion of works to prevent animals from falling into trenches. The recommended speed of 40km/hr around, to, and from the site, should be adhered to while looking out for animals and people (especially children) in the Settlement and community at large. Three to five members of the construction workforce should receive training on how to handle snakes. This will ensure that snakes can be safely removed from the site, when necessary, as opposed to being killed. 	No complaints of stolen and killed livestock by the project workers. -No intentional disturbance and destruction of habitats and faunal species	-Construction Contractor -SHE Officer	Throughout the phase

Aspect	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	-Any suspected poaching activities should be immediately disciplined and should be reported to the nearest law enforcement officers.			
	-Establish close contact with local law enforcement and any local anti-poaching initiatives in the area to report any wildlife crime.			
	-Anti-poaching awareness should be raised among project workers to inform them of the impacts of poaching on the environment.			
	-Incorporate Environmental awareness and biodiversity preservation into the employment contracts of all workers.			
Air quality: dust proliferation due to the fine content of the soil, resulting in localized poor air quality and poor visual conditions	-A reasonable amount of water should be used to suppress the dust -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 road works and many detours.	 -Visual monitoring for dust nuisance and safety -Daily monitoring. -Complaints from the community are addressed 	-Project Manager -Construction Contractor	Throughout the phase
Noise from vehicles and construction activities	 -Noise from vehicles and equipment on site should be reduced to acceptable levels. -Construction activities, excavation, and transporting of materials should be done between 08 AM and 5 PM 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 the community are addressed -Workers operating machinery and noisy equipment are equipped with noise protection equipment	-Project Manager -Construction Contractor	Throughout the phase
Vehicular traffic safety: The 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. -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. 	 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. 	-Project Manager -Construction Contractor	Throughout the phase

Aspect	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	-Project vehicles should be parked within the boundary or demarcated areas for such purposes on-site.	-There are demarcated areas for parking,		
	-Deliveries from and to the site should be done optimally during weekdays and between the hours of 8 am and 5 pm.	offloading, and loading zones on-site.		
Occupational health and safety associated with project activities	 During induction, personnel should be provided with awareness training on the risks of mishandling equipment and materials on site. -An emergency preparedness plan should be compiled, and all personnel appropriately trained. -Train all employees and subcontractors on environmental awareness, the Proponent's internal Environmental Health and Safety Policy, and this EMP. -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 center (clinic and hospital). 3 to 5 site workers 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. -Personnel should not be allowed to consume alcohol or other intoxicants before and during working hours, as this may lead to arbit. 	 -A comprehensive health and safety plan for the activities is compiled. -Availability of fully furnished first aid kits -Trained workers to administer first aid 	-Project Manager -Construction Contractor -SHE Officer	Throughout the phase
Community health and safety	 -Construction trenches should be backfilled after completion of works. -Ensure that goods and projected loads are securely fastened to vehicles to avoid falling and injuring people near the site and along the roads. -Warning signage should be erected at danger site areas such as open trenches in the Sattlement during construction. 	The construction holes and trenches are backfilled. -There are sufficient, clear, and appropriate warning signs near the risk site areas	-Project Manager -Construction Contractor	Throughout the phase

Aspect	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	-Make provision for temporary crossroads where the community can safely cross over the working sites of the project.	-The community is warned of construction works and		
	 The site areas that are considered temporary risks should be equipped with "danger" or "cautionary" signs written in <i>Otjiherero</i> and English. Loads upon vehicles must be properly secured to avoid items falling off the vehicle at any time. 	encouraged to stay away and exercise precautions at all times when crossing the road or walking nearby		
Potential increase in 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 results 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 in Okanguati. -Emphasize the continued recruitment of locals to avoid the influx of out-of-area people into the community for casual work that can be carried out by local people.	-Occupational health and safety personnel -Sex and Health Education/Awareness -Provision of condoms at the campsite	-Project Manager -Construction Contractor	Throughout the phase
Fire management: Accidental fire outbreaks	 -Portable and serviced fire extinguishers should be available on-site and at the campsite. -No open fires should be created by project personnel on-site. -Consider using gas or paraffin cookers to prepare food instead of open fires. The cook/stove fire should be put out before leaving the campsite. -Personnel and visitors alike must be sensitized 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 fire is completely put out 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 at the campsite	-Project Manager -Construction Contractor	Throughout the phase

Aspect	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	 If any archaeological materials, human burials, or skeletal remains are uncovered during earthworks, the work in the immediate area should be halted, and the finds would need to be reported to the NHC and may require inspection by an Archaeologist. The ECO should have the area fenced off and contact NHC (Tel: +264 61 244 375), National Forensic Laboratory (+264 61 240 461) immediately. Please refer to Appendix 1. -Avoid direct damage to archaeological or heritage sites, such that may be encountered during excavations. -All accidental discoveries shall be reported immediately to the Project Manager so that an investigation and evaluation of the findings can be made and inform the NHC of the necessary actions to be taken. -Contractor and their subcontractor should adhere to the provisions 	-Preservation of all artefacts and objects that are discovered onsite -Salvage equipment -Flag tapes -GPS (site marking)	-Project Manager -Construction Contractor	As and when required
	of Section 55 of the National Heritage Act in the event significant heritage and cultural features are discovered in the course of project activities.			

5.5 Operations and maintenance phase measures

Objective: To manage the installed reticulation services with minimal disturbance to the surrounding biophysical and social environment, as well as minimize the impact on economic and technical aspects.

Who is responsible?

- The Project Manager is responsible for ensuring that the entire operation of the reticulation conforms to the standards of operations.
- The Proponent should write the job description for the Project Manager, ensuring that the relevant sections of this EMP are included as his/her duties

• The Project Manager should compile an environmental report regularly (e.g., monthly) according to a prescribed format. These reports will aid in the compilation of the 6-monthly monitoring reports, which will be required when renewal of the ECC is needed after 3 years.

5.5.1 Management measures for the operations and maintenance of the installed water, sewer, and electrical services

The measures proposed for implementation during the operations and maintenance phase of the proposed reticulation services are listed below. It should be noted that these measures are not aimed at the New Extension establishment and its subsequent operations, but exclusively for the installed reticulation services (water, sewer, and electricity) to the New Extension.

A. Water reticulation services

<u>Objective</u>: to ensure that the system operates efficiently, safely, and sustainably. These measures help prevent issues such as water wastage, contamination, system failures, and service interruptions.

- Conduct regular inspections of the entire water reticulation system, including pipes, valves, pumps, storage tanks, and meters, to detect potential leaks, corrosion, or blockages.
- Use advanced technology like acoustic sensors, pressure monitoring, or smart water meters to detect and address leaks promptly before they lead to larger problems, such as water loss or damage to the infrastructure.
- Periodically clean and flush water pipes and valves to prevent sediment buildup, biofilm formation, and blockages, ensuring a free flow of water and maintaining water quality.
- Regularly test the water quality for contaminants like bacteria, chlorine, pH levels, heavy metals, and other harmful substances at the source (borehole and reservoir). This ensures that the water is safe for consumption and complies with regulatory standards.
- Maintain proper disinfection systems (e.g., chlorination) to ensure that water remains free from microbial contamination throughout the distribution system.
- Install and maintain appropriate filtration systems to remove impurities and ensure that clean water reaches consumers.
- Pressure Regulation: Implement pressure-reducing valves (PRVs) to regulate the pressure in the system and prevent excessive pressure that can lead to pipe bursts, leaks, and damage.
- Continuously monitor water flow using flow meters to detect irregularities in the system, such as unauthorized usage, leaks, or changes in demand.

- Use hydraulic modeling tools to simulate and optimize the distribution system's flow and pressure, ensuring that the system is balanced and capable of meeting demand without stress.
- Regularly inspect and clean water storage tanks to prevent sediment buildup, algae growth, and contamination.
- Check the structural integrity of storage tanks (and reservoirs) to prevent leaks and ensure proper sealing to avoid contamination from external sources.
- Ensure that overflow and drainage systems for tanks are functioning properly to avoid flooding and water waste.
- Divide the water distribution network into zones, which allows for easier isolation during repairs or maintenance. Zoning helps minimize the area impacted during system failures or leaks.
- Install isolation valves at strategic points to allow for quick shutdown of sections of the system during maintenance, repairs, or in case of emergencies. This helps prevent disruptions to the entire system and reduces downtime.

B. Sewer reticulation services

<u>Objective</u>: to ensure the sewer system functions efficiently, safely, and reliably while minimizing environmental impact, preventing blockages, and avoiding health risks. The mitigation measures for implementation, where possible, are as follows:

- Regularly inspect the sewer network, including pipes, manholes, lift stations, and other components, to check for signs of wear, damage, or blockages.
- Periodically clean and flush sewer pipes to remove debris, grease, sediment, and other materials that may cause blockages or reduce the flow of sewage. High-pressure jetting and mechanical cleaning may be used for effective pipe cleaning.
- Inspect and maintain manholes regularly, ensuring they are structurally sound and free of debris or blockages.
- Implement a system to monitor for potential blockages in the sewer network, such as flow monitoring devices and sensors. These can help detect obstructions or flow restrictions before they become serious problems.
- Implement measures to control the entry of fats, oils, and grease into the sewer system. Encourage residents and businesses to dispose of grease and oil properly (e.g., through recycling or disposal programs) rather than pouring it down the drains.
- Install debris traps at key points in the sewer system to catch large solids before they cause blockages, reducing the need for frequent cleaning.

- Ensure proper ventilation of sewer systems, particularly in manholes and lift stations, to prevent the buildup of hazardous gases such as hydrogen sulfide, which can lead to corrosion and unpleasant odors.
- Install odor control systems such as scrubbers, carbon filters, or biofilters at strategic points (e.g., lift stations) to reduce the release of unpleasant smells and ensure air quality standards are met.
- Use gas detection systems to monitor the presence of dangerous gases like methane and hydrogen sulfide, triggering alarms and ventilation as needed.
- Install flow meters at various points in the system to measure sewage flow and identify abnormal fluctuations, which could indicate blockages, system malfunctions, or unauthorized discharges.
- Implement remote monitoring systems (such as the Supervisory Control and Data Acquisition (SCADA) systems) to track the performance of the sewer system in real-time, allowing for early detection of any operational issues and facilitating timely interventions.
- Regularly assess the capacity of the sewer system, particularly during peak periods, to ensure it can handle the anticipated volume of wastewater without risk of overflows or backups.
- Regularly inspect and maintain sewage pumps and lift stations to prevent mechanical failures and ensure they are functioning efficiently. This includes checking for wear on pump components, cleaning pumps, and ensuring proper lubrication.
- Install backup generators or uninterruptible power supply (UPS) systems at lift stations to ensure continued operation during power outages. This helps prevent sewage backups and overflows, particularly during heavy rainfall or other emergencies.
- Optimize pump operation by using variable speed drives (VSDs) to adjust pump speed according to demand, reducing energy consumption and extending the life of equipment.
- Regularly inspect and maintain the sewer system to prevent infiltration of groundwater into the pipes, which can overload the system during wet weather and lead to increased treatment costs. Seal joints and repair cracks in pipes to prevent leakage.
- Reduce the entry of stormwater into the sewer system by inspecting and maintaining downspouts, storm drains, and sewer connections. Ensure that rainwater is diverted properly to stormwater systems, not into sanitary sewers.
- Educate residents and businesses about the importance of maintaining proper connections and preventing stormwater from entering the sewer system.
- Design the sewer reticulation system with the potential for future expansion or upgrades, taking into account the expected growth in the area. Ensure the system has sufficient capacity to handle future increases in population or industrial activity.

- Use hydraulic modeling and simulation tools to predict system behavior under different conditions (e.g., peak flow periods or heavy rain events). This helps identify areas that may require upgrades or reinforcement.
- Ensure that the wastewater treatment facilities, such as sewage treatment plants, are properly maintained and operate within regulatory discharge limits. Regular monitoring of effluent quality is essential to meet environmental standards.
- Implement proper sludge management practices, such as periodic removal and proper disposal or treatment of sewage sludge. This prevents blockages and ensures compliance with environmental regulations.
- Develop and implement emergency bypass systems to manage excess flows during storm events or system overloads, ensuring that untreated or partially treated sewage does not overflow into the environment.
- Regularly train personnel responsible for the operation, maintenance, and management of the sewer system on the latest technologies, safety protocols, and regulatory requirements.
- Raise awareness among the public about the importance of proper waste disposal practices, such as not flushing non-biodegradable items (e.g., wipes, plastics) or hazardous chemicals down the sewer system.
- Develop and communicate clear emergency response procedures in case of system failures, blockages, or environmental hazards (e.g., sewage spills or overflows). Ensure staff and the community are aware of appropriate actions to take during an emergency.
- Install spill containment measures, such as retention basins or diversion channels, to minimize environmental damage in the event of an overflow or pipe failure.
- Establish a clear public notification system to inform residents and businesses in case of a sewer overflow, leak, or other emergency, ensuring they can take necessary precautions.
- Conduct periodic system audits and generate reports on operational performance, including flow data, maintenance activities, and compliance with discharge standards. This helps identify areas for improvement and ensures accountability.

C. Electrical reticulation services

<u>Objective</u>: to ensure the safety, reliability, and efficiency of the service. These measures are designed to prevent or reduce the risk of electrical hazards, improve system performance, and ensure compliance with relevant codes and standards once the New Extension is established.

- Regular inspections and maintenance: This will entail performing regular checks on the electrical system to ensure that all components are functioning properly. This includes checking for signs of wear, overheating, loose connections, and other potential issues. In addition to that, there should be a schedule for routine maintenance for components like circuit breakers, switches, transformers, and distribution boards to ensure that they remain in good working order.
- Ensure that the electrical system is not overloaded by managing the load within the system's capacity. Overloading can lead to overheating, fires, or equipment damage.
- Distribute electrical loads evenly across the phases in a three-phase system to prevent imbalance, which can cause system inefficiencies or failures.
- Implement strategies for optimizing energy use to prevent excessive demand, such as using energy-efficient devices and scheduling highload equipment usage during off-peak hours.
- Install and maintain proper circuit breakers or fuses to protect the system from short circuits, overcurrent, or other electrical faults.
- Install residual current devices (RCDs) or ground fault circuit interrupters (GFCIs) to provide additional protection against electric shocks, particularly in wet or damp areas.
- Use surge protection devices (SPDs) to protect the electrical system from lightning strikes, voltage spikes, or other electrical surges.
- Ensure that the electrical reticulation system is adequately grounded to prevent electric shock risks in case of faults. This includes the grounding of electrical equipment, panels, and metal conduits.
- Ensure proper bonding of metallic parts of the electrical system to avoid potential differences that could lead to electrical shock hazards.
- Ensure that the electrical reticulation system complies with relevant national and local electrical codes and standards (such as the National Electrical Code (NEC) or International Electrotechnical Commission (IEC) standards).
- Conduct periodic electrical audits to ensure ongoing compliance with safety and operational standards.
- Train personnel (operators) in the safe operation and maintenance of the electrical reticulation system. This includes understanding potential hazards, proper emergency procedures, and troubleshooting techniques.
- Develop and communicate emergency response procedures for electrical faults or hazards, ensuring that everyone involved in operating or managing the system is aware of how to act in an emergency.
- Implement advanced monitoring systems that allow operators to track the real-time performance of the electrical system, identify faults quickly, and optimize performance.

• Where possible, install remote monitoring and control systems that can automate load management, fault detection, and other operational aspects of the system

5.6 Environmental Monitoring Actions

To ensure that the implementation of recommended environmental management measures is working 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 on. 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 SHE Officer/ECO.¹, 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 monitoring findings should be incorporated into the 6-monthly environmental reports, which will be required when renewal of the ECC is needed after 3 years.

¹ The ECO is responsible for monitoring the implementation of the mitigation measures detailed above, might be carried out by a dedicated member of staff, or might form part of the Project Manager's responsibilities. Either way, the ECO's monitoring responsibility should be carried out on a regular basis (possibly monthly) during the operation phase.

6 RECOMMENDATIONS AND CONCLUSION

Based on the assessment of potential impacts by the environmental consultants, the project has some 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, an EMP (this document) was developed for implementation to ensure environmental sustainability.

6.1 Recommendations

To mitigate the adverse impacts that may emanate from the installation of the reticulation services and their operations, the Proponent should follow the recommendations provided below:

6.1.1 Environment Management Plan Recommendations

To ensure a healthy and safe environment in the site area and its environs, a plan for environmental management has to be instituted through monitoring. This involves the collection and analysis of relevant environmental data as well as periodic documentation and reporting.

<u>External Auditing</u>: The key to a successful EMP is appropriate monitoring and review to ensure the
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 that it is effective in operation, meet specified goals, and comply with relevant regulations and standards. Audits should be conducted during the construction phase of the project to ensure adherence to the management measures contained in the EMP.

6.1.2 Conclusion

Considering the potential impacts of the project and its associated activities, the mitigation measures contained in this EMP are considered sufficient to manage and mitigate these impacts. Therefore, Serja Consultants recommends that the Environmental Commissioner approve the installation and operations of the proposed water, sewer, and electrical reticulation services for Okanguati's New Extension and issue an ECC on condition that the Proponent will ensure 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 findings.

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 remains reported to the NHC and is correctly identified in the field.

The Project Manager 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 timeously
Superintendent	To determine the safe working boundary and request an inspection
Archaeologist	To inspect, identify, advise management, and recover remains
Procedure:	

Action by a person identifying archaeological or heritage material

- 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 the 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 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 National Forensic Laboratory, as directed.