Environmental and Social Impact Assessment and Environmental and Social Management Plan for the Oshakati Water Purification Plant Extension Project

Scoping Report

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Disclaimer

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Executive Summary

1. Background

1.1 Project Background and Objectives

The Government of Republic of Namibia (GRN) is financially supported by the African Development Bank (AfDB) to implement the Namibia Water Sector Support Program (NWSSP). This program aims to achieve sustainable production and transfer of water resources towards improved access, quality, and security to safe drinking water for human consumption and for industrial use in urban and rural centers of the country. On behalf of the GRN, the Namibia Water Corporation (NamWater) is implementing the "Oshakati Water Purification Plant Extension Project" (OWPPEP) under the NWSSP.

The proposed development project's goal is to improve water supply services in the north central regions of Namibia, as a long-term water security plan to serve regions of Ohangwena, Oshana and Oshikoto. Specific objective of the proposed development is to extend the treatment capacity of the Oshakati water purification plant. The scope of activities has been grouped into two phases.

Phase I

a) Investigation of options for extending the Oshakati treatment capacity.
b) Detail designs and cost estimates for the selected development option.
c) Compilation of the required tender documents and contracting.
d) Environmental and social impact assessment and project clearance.

Phase II

a) Construction of the approved infrastructural plans.
b) Contract supervision and monitoring compliance to environmental and social requirements.
c) Commissioning for operations of the completed infrastructure.

The location of the proposed development is the Oshakati town in Oshana region, the present host of the existing Oshakati waterworks. The Oshakati water treatment plant is the heart of water supply to the north central regions, a densely populated area hosting close to half the population of the country. The existing plant is old however is facing a growing demand for water supply and thus at times required to operate over its design capacity. It is therefore an utmost necessity that interventions are developed to ensure water security to this area in the immediate, medium, and long-term planning framework.

Due to arid climatic conditions, Namibia is one of the water scarce countries in the sub-Saharan region and has limited water supply alternatives to meet growing demand from a growing population. The proposed development project is the most feasible option to meet water supply challenges of the north central regions of the country and towards meeting the country's long-term developmental agenda of Vision 2030.

2. Project Description

The proposed development project envisages carrying out the following activities;

a) Planning and design of the proposed extensions works to the Oshakati waterworks
b) Construction of the following infrastructure;
    i. A new water treatment plant of capacity 50 000 m^3/day, premised on the conventional water treatment process like the existing treatment plant.

ii. Extensions to the existing raw water storage dam to secure adequate raw water quantities for the two-treatment plant's production.
iii. Construction of pump stations for raw water and final treated water.
iv. Construction of lagoons for storage and decanting of the water treatment sludge.
v. Mechanical, electrical and electronic works for the operations of the extended waterworks alongside the existing treatment plant.

3. Description of Project Locality

The proposed project location is on the premises of the Proponent in the local authority area of Oshakati Town. The premises accommodates the existing waterworks consisting of water treatment plant, a raw water storage dam, pump stations for raw and final water and several reservoirs for storage of water, along with associated support structure of offices and workshops.

The siting of the proposed development infrastructure is planned as follows;

a) Existing NamWater premises:
   i. The new water treatment plant and connecting lines
   ii. Extensions to the existing raw water storage dam
   iii. Modifications to the existing raw water pump station
   iv. Final treated water pump station

b) Adjacent Portion of land
   i. Further extensions to the existing raw water storage dam (RWSD)
   ii. Sludge lagoons and connecting lines

4. Biophysical Characteristics of the Localities

4.1 The Existing NamWater Premises

The existing premises is a brownfield area, consequent of the current operational footprint of the existing waterworks. Occurrence of microfauna (i.e., insects) as the most apparent is merely associated with scanty vegetated areas, much of which are seasonal grasses. Macroflora is limited to peripheries of the premises, out of the envisaged construction footprint, typical observation to an urban setting.

4.2 Adjacent Portion of land

The adjacent piece of land to the east, upon which the sludge lagoons and further extension of the RWSD are planned, is a disturbed site like the existing premises. The operational footprint of the existing waterworks extends to this area. Silt and mud dredged from the existing RWSD is deposited in this area. There is minimal vegetation except on embankments areas of the mud ponds; however, its appearance is inconsistent due constant disturbance from movement of people and livestock in the area.

5. Potential Environmental and Social Impacts

The following significant environmental and social impacts were identified and evaluated in this assessment;

5.1 Beneficial Impacts

a) *Increased access to potable water and improved sanitation - the* overall aim of the proposed development is to improve access to potable water for communities in urban and rural areas of the north central regions. Realization of the project is therefore envisaged to increase security and access to safe drinking water to areas where such is limited or non-existent, specifically rural areas. Moreover, in areas already supplied with piped water, the implementation of the project will further enhance security of supply in the short and long-term responding to population growth and migrations.

b) *Employment and enhanced business opportunities* - It is anticipated that employment opportunities will be created from the implementation of the project. These opportunities will benefit the local communities especially the poor and marginalized members of the society and thus improve their livelihoods. Moreover, these opportunities have potential to induce increased trading for the local businesses and thus enhance the local economy.

c) *Improved rendering of water supply services* - The proposed development will enhance the Proponents mandate to supply clean water to the north central regions of Namibia and secure such supply in the long term. This has implication for good governance of state entities in their mandate towards the nation.

d) *Unintended creation of ecosystems* – the extended RWSD is likely to attract biodiversity such as birds, fishes and other vertebrates, which in urban land developments are always lost. However due this development, although unintended, offers habitats and thus offsetting biodiversity losses due to habitats elsewhere.

e) *Potential to reuse of redundant structures*– at the end of design span of various structures, there exists potential to reuse some of the redundant structures for other developmental activities with social and economic values.

5.2 Adverse Impacts

f) *Potential increased need for abstraction from the Kunene River for the extended* OWW – There is potential that the increased throughput requirements of the extended waterworks will require volumes above present supplied capacity. This would necessitate increasing abstraction rates at the water source and thus potential to exert pressure on the availability of adequate water in the system to meet other needs such as environmental flows, hydropower generation downstream and provision of clean water in the host country.

g) Uncertainty over capacity of existing infrastructure to convey and secure adequate water supply to the OWW - the extension of the OWW increases demand for raw water and subsequently likely to require increased conveyance through the canal and storage onsite. Inadequacies in the existing infrastructure comprising the canal and the RWSD lends the expected development unsustainable in the long term.

h) *Impediment/disturbance to stormwater drainage* – due to proximity to adjacent settlement of the expansion of the RWSD, it is anticipated that construction activities may disturb and impede characteristic storm water flows paths. This can increase the frequency of localized floods as; water received from precipitation may accumulate and flood some of the residents if such flow paths are unaccounted.

i) *Generation of noise and vibrations* - construction activities have potential to produce noise and vibrations to the surrounding environment. Such has potential to disturb the livelihoods of adjacent communities that it may disrupt sleeping patterns, become a source of irritation to some members of the community in the surrounding and a health hazard at unsafe exposure levels, levels beyond 70 dB (A).

j) *Dust generation* – at the height of the construction activities involving the movement of earth moving vehicles, trucks and other machinery, these have implications of generating vast dust into the surroundings with potential implication posed on health of the workers, and the communities exposed. Dust further is a nuisance to structures where such may accumulate over time, lending such to require unplanned renovations.

k) *Potential hazards to the health, safety and welfare of the workers and public* – activities related to the various phases mainly construction, operation and decommission has potential for hazards to the health, safety and welfare of the workers and the public. Such includes exposure to accidents, requirement for access to basic needs such as shelter, safe water, and sanitation facilities. Further to above, there is need to protect communities from devastating effects of diseases such as HIV/AIDS, and Covid 19.

l) *Emission of excess smoke, noxious and greenhouse gases* - In the construction and decommission phases of the proposed project, several activities have potential to impact ambient air and the atmosphere through the release of smoke, noxious gases and greenhouses gasses. The release of noxious emissions has potential health implications for those exposed for prolonged periods. Included in this category of emissions are carbon monoxide, carbon dioxide, and nitrogen oxides.

m) *Generation of waste* – construction and general waste is envisaged from the construction areas as well as other supporting areas such as offices and living quarters. If unmanaged, in waste has potential to litter the landscape, but further cause irritant odours and smell that become a safety hazard to workers and potentially the public.

n) *Climate change effects on operation of the waterworks* – although challenging to anticipate the actual effects, these cannot be overlooked, and need accounted for as they may pose threats to sustainability of water supply in the long-term. These potential effects include reduced precipitation over the catchments that is likely to lead to reduced river flows and thus raw water supply.

6. Legislative and Institutional framework

The following instruments are identified with specific requirements to the proposed project;

6.1 Legislative Framework

a) The Constitution of the Republic of Namibia
b) Environmental Management Act (No. 7 of 2007) and EIA Regulations (No. 30 of 2012)
c) Water Resources Management Act (No. 11 of 2013) and Water act (No. 54 of 1956).
d) The Forest Act (Act No. 12 of 2001)

e) National Heritage (Act No. 27 2004)
f) The Flexible Land Tenure Act (2012)
g) The Labour Act (No 11 of 2007)
h) The Public and Environmental Health Act (No.1 Of 2015)
i) The Local Authorities Act (No 23 of 1992).
j) The Petroleum Products and Energy Amendment Act, 2003 (Act 16 of 2003) and Regulations GN. 155 of 2000
k) Hazardous substances Ordinance (No. 14 of 1974)
l) Soil Conservation Act (No. 76 of 1969)
m) The Atmospheric Pollution Prevention Ordinance (No. 11 of 1976)

6.2 National Policy Framework

n) The National Gender Policy (2010)
o) National Policy On HIV/AIDS (2007)
p) The National Land Policy (1998)
q) The National Disability Policy (1997)
r) National Policy on Climate Change for Namibia (2010)
s) Environmental Impact Assessment Policy (1995)

6.3 National Developmental Framework

t) Vision 2030 and National Development Plans (NDP 5, HPP II)
u) National Disaster Risk Management Plan (2011)

6.4 International Conventions

v) Convention on Biological Diversity (1992)
w) The Kyoto Protocol to the United Nations Framework Convention on Climate Change (1998)
x) Ramsar Convention (1971)

6.5 The AfDBGs ISS

The environmental and social requirements for AfDB financed projects are engrained in its Integrated Safeguards System (ISS) elaborated into Operational Safeguards. The five operational safeguards are;

a) The Operational Safeguard 1 (OS1) for environmental and social assessments – governing the process of determining a project's environmental and social category and the resulting environmental and social assessment requirements.
b) The Operational Safeguard 2 (OS2): Involuntary Resettlement - consolidates the policy commitments and requirements set out in the Bank's policy on involuntary resettlement.
c) The Operational Safeguard 3 (OS3): Biodiversity and Ecosystem Services – aims to conserve biological diversity and promote the sustainable use of natural resources, including encompassing commitments on integrated water resources.
d) The Operational Safeguard 4 (OS4): Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials and Resource Efficiency - covers the range of key impacts of pollution, waste, and hazardous materials for which there are agreed international conventions.
e) The Operational Safeguard 5 (OS5): Labor Conditions, Health, and Safety - requirements for its borrowers or clients concerning workers' conditions, rights and protection from abuse or exploitation.

7. Public Participation

7.1 Planning for Public Consultation

The public participation process is guided by Section 21-24 of the EIA regulations (GN 30. of 2012) of the EMA (No. 7 of 2007) at national level. Further, the requirements from AfDB financed projects are outlined in the OS1. The public consultation was aiming at information disclosure and open public submission of comments on the project. The public participation and information disclosure process undertook the following steps;

i. Identification of interested and affected parties (I & APs).
ii. Classification of identified I & AP's.
iii. Development of a consultation strategy for various groups of stakeholders.
iv. Publication of notifications on the proposed project and call for registration as I & APs.
v. Sharing of background information document (BID) with registered I & APs and identified key stakeholders.
vi. Letters of invite for comments on the proposed project to key stakeholders.
vii. Holding of public consultation sessions
viii. Preparation of feedback from initial engagements
ix. Public notification of feedback meetings, update of BID and sharing
x. Public feedback meetings

7.2 Public Consultation Meetings

The stakeholder consultation process were caried out as follows;

a) Public notification and call for comments were opened from the 24 May 2022 to 28 June 2022 based on a circulated BID.
b) Public and focused consultation meetings were held from the 9 – 14 June 2022 in Oshakati and Ongwediva.
c) Feedback meetings were held from the 12- 14 October 2022
d) Circulation of Reports for review by stakeholders (24 – 04 October 2022).

The stakeholders in the table below were engaged and requested to submit comments on the proposed projects as key to the proposed project;

Regional and local authorities	Government institutions	Social and community organizations	Water basin institutions	Private sector and academic institutions
○ Oshana Regional Council ○ Traditional Authorities & surrounding Headmen ○ Oshakati Town Council ○ Ongwediva Town Council	○ Ministry of Agriculture, Water and Land Reform (Directorates of Water Resources Management, Water Supply and Sanitation Coordination, Land Reform and Resettlement) ○ Ministry of Health and Social Services (Regional Health Office)	○ Solidarity Community Care Organization ○ Namibia Development Trust ○ Ongwediva Rural Development Centres ○ Oshoopala Settlement Development Committee	○ The Cuvelai Watercourse Commission (CUVECOM)	○ University of Namibia (Eng. José Eduardo dos Santos Campus) ○ UNAM Oshakati campus ○ Oshakati Premier Electric ○ Namibia Chamber of Commerce and Industry

○ Ondangwa town council ○ Helao Nafidi Town Council	○ Ministry of Gender Equality and Child Welfare (Regional Office e) ○ Ministry of Urban and Rural Development (Regional office) ○ Ministry of Environment, Forestry and Tourism (Forestry office) ○ Ministry of Fisheries and Marine Resources (Aquaculture and inland Fisheries office)	○ Oneshila Settlement Development Committee ○ Women's Action for Development ○ Oshoopala Community ○ Oneshila Community ○ Ongwediva community ○ General Oshakati Community		○ Namibia Chamber of Environment

7.3 Public Consultation Outcomes

Key concerns and issues from public consultation process are recorded in the below with feedback provided.

Raised Issue	Description	Stakeholder	Response
Potential relocation and resettlement of communities	If settlements are to be relocated, are there prepared areas for relocation? Will this resettlement area be in town or in rural area? Will we be informed on time on relocation?	Oshoopala Settlement community	No relocation is to take effect as the project scope is altered after a flood risk studies. Moreover, the potential implication of mitigation falls short of the implication of high-risk events should a RWSD be built where it was initially proposed.
The risk of flooding of adjacent areas	Alternative 3 of the proposed RWSD is preferable however there remains the need for measures to mitigate floods such as deepening the channel and embarkments		Project has been altered, despite the favourability of alternative 3 for the RWSD the risk remained for high flood events.
Employment of locals	The project is well supported is hope for employment and local companies to get work.	Oneshila Settlement Community	Views are recorded and necessary requirements will be engrained in the preparation of tendering document for opportunities to the local communities.
Alignment with the flood master plan	It is important to align the current plan with the Oshakati flood master plan, as it has measures aimed at mitigation floods in town.	Oshakati Town Council	The master plan has been considered in design and led the alternations to the plan for siting of the RWSD.
Sludge management	How will sludge be handled?		Sludge is stored in the ponds to dryness and upon that, removed for disposal. For improved handling, the Proponent will seek to obtain a site for future disposal.

8. Consideration of Alternatives

Various alternatives were considered to this project. These alternatives varied from alterative water source, alternative location of structures, forfeiting the development and proceeding to realize the project. These are described as follows:

a) Alternative water source to supply the north central areas of Namibia

There are minimal feasible alternative water sources to secure adequate water for the north central regions, relative to the proposed extensions with water source from the perennial Kunene River. This alternative has advantage of taping already existing water conveyancing infrastructure, and benefits from the existing conducive bilateral agreement of the two basin States on utilization of the waters of the Kunene.

b) Alternative sites (location of infrastructure)

An alternative site to locate the entire development could be considered for the proposed development, however the founding principle for the development is to mimic and complement the existing infrastructure. Therefore, locating the new water treatment plant (WTP) at a site away from the existing WTP, undermines the founding purpose. Moreover, the location of the entire or main component of the project in proximity to existing waterworks alleviates the financial investment required for a new development elsewhere. More so, the current premises of the Proponent has ample area upon which the treatment plant can be constructed.

While aligning with the founding principle on retaining the location of the treatment plant to the existing premises, it is however possible to locate other accompanying structures at alternative sites. The following were evaluated for locating of other structures elsewhere;

i. The RWSD

The RWSD was envisaged for a location on an adjacent land (Portion A of Oshakati town and townlands) availed by the Local Authority. Two main alternatives designs were considered for siting the storage dam (Alternative 1 and Alternative 3). Public consultation process gathered preference for the development of Alternative 3, however, arising necessity to put in place adequate mitigation of residual impacts. The flood risk assessment study confirmed public concerns of the need to provide measures for mitigating residual impacts from implementation of Alternative 3. Moreover, the study indicated that even with mitigation, there remains residual high risk to flood events of 1:50 and 1:100 years. This analysis and associated environmental and social implications triggered alteration of the project scope and thus resultant exclusion of the construction of a new RWSD to the later phases of the project at a different location. Thus, a new RWSD is excluded from the scope of this environmental and social study.

Other support structures (i.e., pump stations and sludge lagoons) are dependent on the location of the main waterwork structures (i.e., water treatment plant, and the RWSD) and are infeasible to independently site away and thus these have not alternatives.

c) Sludge management

i. Onsite offsite disposal

Sludge from the WTP is held onsite in lagoons to dryness upon which dry residues are disposed offsite. This method is common in Southern Africa; however, offsite disposal requires sound approaches either through a dedicated site or if accepted at landfill sites.

ii. Disposal to a watercourse
Disposal in any other ways such as discharge to a watercourse deviate from best environmental management practices and presents several environmental and social concerns.

iii. Disposal to wastewater systems
Disposal into sewer systems is not feasible, since such systems are not designed for these discharges and more so, domestic sewer systems of many local authorities are already under strain from increasing domestic wastewater.

Therefore, onsite - offsite disposal remains the feasible alternative. This feasible approach can be complemented with further alternatives such as reuse of sludge as cover for landfilling process at landfill sites or land reclamation and even further, use for activities such as brick making.

d) No go alternative
The no-go alternative entails that the project is not implemented and thus the entire north central area continues distress to secure water in the present, medium to long term future. This alternative is considered infeasible for both social and economic limitations and more so, minimal environmental gains. This is an enormous loss since the present proposed development could be more costly to undertake in future than now, as it is investable to implement and thus an opportune time.

e) The Go-ahead alternative
The go-ahead alternative is preferable, where the implementation of the project has broader benefit to the people of north central areas of Namibia both socially, economically within the spectrum of sustainable development. This aligns with the Namibian Constitution, and further overall government efforts as laid out in the medium- and long-term planning agendas.

9. Environmental and Social Management Plan

The following summary Impacts and mitigation measures is contained as a detailed ESMP.

Impact/Aspect	Mitigation	Timeframe
BENEFICIAL IMPACTS		
Utilization of Existing premises to full potential	The Proponent issues necessary clearance for use of the sites as planned.	Preconstruction
Increased access to potable water and improve sanitation	All necessary regulatory requirements are met for the realization of the project.	Preconstruction
Employment and enhanced business opportunities	Preparation of bid documentation to engrain provision for local participation of communities and business.	
Improved rendering of water supply services	Liaison with stakeholders to expand supply network to reach deprived areas of potable supply	Operation Phase
Unintended creation of ecosystems	Management of the storage dams with consideration of the natural role to ecosystem.	Operation Phase
Potential to reuse of redundant structures	Consider the alternative use of some structures at end of the design active span.	Decommission Phase
ADVERSE IMPACTS		
Potential need for increased abstraction from the Kunene River for the extended OWWs	Establish throughput requirements and available capacity to verify if requirements are above agreed abstraction quota.	Preconstruction
Uncertain capacity of existing infrastructure to convey and secure adequate water supply to the OWW	○ Initiate rehabilitation work to the Ogogno-Oshakati section of the canal ○ Finalization of plans for the expansion to the existing RWSD ○ Proponent to engage process and finalise a new site for location of a new RWSD.	(As per Institutional strategic plan)
Impediment/disturbance to stormwater surface drainage	○ Provide and maintain stormwater flow paths in expansion of the RWSD	Construction phase
Generation of noise and vibrations	○ Construction work to be restricted within normal official working hours ○ Machinery and equipment's with excessive noise or vibration not to be used until they are repaired. ○ All equipment's to be regularly serviced. ○ Noise levels to be monitored for compliance within acceptable standard below 70 dB (A).	Construction phase
Dust generation	○ Dust generating activities to be avoided on windy days ○ Wetting and sprinkling of areas to suppress dust ○ Reduction of speed limits onsite to 30-40km/h	
Potential contamination of surface groundwater from water treatment sludge	Sludge will be stored in impermeable lagoons to dryness prior disposal to dedicated site or landfill site.	
Potential hazards to the health, safety and welfare of the workers.	○ All workers are to be provided with PPE	

	○ Sanitation and basic facilities are provided such as accommodation where necessary, meal preparation areas, safe drinking water. ○ Person with special needs are identified and provided with necessary enablers and services ○ All equipment and machinery are kept in sound working order to prevent hazards.	
Emission of excess smoke, noxious and greenhouse gases	○ All machinery is kept in sound working order ○ Avoidance of unnecessary operation of equipment that release smoke or noxious gases or greenhouse gases. ○ Halt the use of faulty equipment or machinery that release excess smoke or noxious gases until repairs are caried out.	
Generation of waste (solid and liquid)	○ Wastewater from the mobile sanitation units to be safely stored onsite and transported offsite to appropriate facilities for disposal ○ All construction waste to be kept in demarcated areas and where possible separated for potential reuse or disposal at the waste disposal site ○ Domestic and general waste collection points to be demarcated, where possible separated for potential reuse and disposal at waste disposal site	
Hazardous waste storage, and use	○ A storage area is demarcated and secured for hazardous substances such as paints, fuels, lubricants, and thinners. ○ Such storages to be bunded or constructed of impermeable surfaces. ○ Regular monitoring of the area for compliance ○ Drip trays should be provided for potential leakages or spillages from machinery and equipment ○ All machinery and equipment's to be services and fuelled in demarcated area with impermeable surfaces. ○ All contaminated material to be stored at demarcated area.	

10. Conclusion and Recommendation

This report for the environmental and social impact (ESIA) for the OWPPEP aimed at collating and synthesizing information on the proposed extensions of the Oshakati Waterworks in accordance with ascribed requirements of legislation, and other requirements. Moreover, the report further aimed to outline the implications of the proposed development if implemented on social systems, the environment, and economic implications. This process came to identify significant positive and adverse outcomes should the project be realised. Steps were required and were applied in the preconstruction (i.e., planning and design) phase that include alteration of the project scope by exclusion of a components with high environmental and social adverse impacts (i.e., the new RWSD). This alteration of the project implementation concept is aimed towards achieving the principles of sustainable development. These pillars have guided the development of this document to ensure achieving sound implementation approach.

Further to above, although measures to ensure sustainability of the proposed project in mitigating potential adverse impacts have guided the project, an environmental and social management plan (ESMP) has been developed providing standards and best practice measures to lessen residual negative impacts in the latter phases of the project (i.e., Construction, Operation and potential decommissioning). These measures are applied in similar project with similar activities around the world, while others have been considered fit for local context. These measures are acceptable in contemporary best practice environmental management field and align with sustainability principles at mitigating similar impacts. It is therefore on this basis that the implementation of this project is recommended subject to implementation of a complementary management plan to the latter.

The Environmental Assessment Practitioner (EAP) in his professional opinion is confident that should the measures be implemented; these residual impacts will be at acceptable and manageable levels. Therefore, in confidence, the EAP recommends consideration of this document by the Environmental Commissioner as adequate and mitigation measures practical to implement towards environmental clearance of the proposed activity.

Abbreviations

Abbrev	Description	Abbrev	Description
AfDBG	African Development Bank Group	MEAs	Multinational Environmental Agreements
BID	Background Information Document	MEFT	Ministry of Environment, Forestry and Tourism
CEB	Cuvelai Etosha Basin	NDPs	National Development Plans
CUVECOM	The Cuvelai Watercourse Commission	NDRMP	National Disaster Risk Management Plan
DEAF	Directorate of Environmental Affairs and Forestry	NWSSP	Namibia Water Sector Support Program
DWSSC	Directorate of Water Supply and Sanitation Coordination	OEC	Office of the Environmental Commissioner
ECC	Environmental Clearance Certificate	OWPPEP	Oshakati Water Purification Plant Extension Project
EIA	Environmental Impact Assessment	OTC	Oshakati Town Council's
ESIA	Environmental and Social Impact Assessment	OSs	Operational Safeguards
ESMF	Environmental and Social Management Framework	OWTP	Oshakati Water Treatment Plant
ESMP	Environmental and Social Management Plan	OWWs	Oshakati Water Works
FB	Free Board	RCs	Regional Councils
GRN	Government of the Republic of Namibia	RWSD	Raw Water Storage Dam
HPP II	Harambee Prosperity Plan II	SWD	Side Water Depth
GRM	Grievance Redress Mechanism	TAs	Traditional Authorities
GRP	Grievance Redress Process	TDS	Totals Dissolved Solids
I&APs	Interested and Affected Parties	VCBs	Vacuum Circuit Breakers
ISS	Integrated Safeguards System	WRMA	Water Resources Management Act
LAs	Local Authorities	WTP	Water Treatment Plant
MAWLR	Ministry of Agriculture, Water and Land Reform		

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Chapter 1

1. Introduction

1.1 Background

The Namibia Water Sector Support Program (NWSSP) aims to achieve sustainable production and transfer of water resources leading to improving access, quality, and security to safe drinking water for human consumption and for industrial use in urban and rural centres. The target areas for this program are the Central, Northern Central and Eastern Areas of the country (MAWF & AfDB, 2019). The Ministry of Agriculture, Water and Land Reform (MAWLR) is the implementing arm of the NWSSP on behalf of the Government of the Republic of Namibia (GRN). The NWSSP is financially supported by the African Development Bank (AfDB). The 'Oshakati Water Purification Plant Extension Project' (OWPPEP) is one of several projects under this program. The proposed development project is aimed at expanding and improving water supply service to the north central areas of Namibia, with the Oshana, Ohangwena and Oshikoto Regions being the prime beneficiaries.

The Namibia Water Corporation Pty. Ltd (NamWater) is the executing institution for the OWPPEP. NamWater therefore, appointed Shah Technical Consultants Pvt Ltd. (STC) - a Joint Venture (JV) to undertake the Engineering Consultancy Services for the planning and design, supervision of construction, and the subsequent commissioning for operation, the extended Oshakati Waterworks (OWW).

The extension to the OWW was recognized in the Environmental and Social Management Framework (ESMF) for the NWSSP as needing an environmental assessment, resultant of impacts of activities of the proposed (MAWF & AfDB, 2019). These envisaged project activities fall under those listed in the Government Gazette No 29. of 2012, with specific reference to Section 8 on Water Resources Developments. These activities may not be undertaken without an Environmental Clearance Certificate (ECC). Subsection 8.5 specifically points to the construction of dams, reservoirs, levees, and weirs.

Complementary to the above stated national legislative requirements, the ESMF re-classified the OWPPEP in Category 1 of the AfDB Operational Safeguards System on environmental and social assessments. Based on this category, the activities of the proposed project are likely to induce

important adverse environmental and/or social impacts that are irreversible, to significantly affect environmental social components considered sensitive by the Bank or the borrowing country. Thus, it is required therefore that a full Environmental and Social Impact Assessment (ESIA), including the preparation of an Environmental and Social Management Plan (ESMP) (AfDBG, 2013).

To meet prescribed requirements, and at the same align with the environmental and social commitments, the Proponent (NamWater) required in the terms of reference (ToR) for the engineering consulting works, that an independent Environmental Assessment Practitioner (EAP) is a pre-requisite part of the team. The EAP is to carry out necessary services related to environmental and social impact assessment for the project. Subsequently, an EAP under Namib Consulting Services is commissioned to carry out these obligations.

1.2 Independence of the Environmental Assessment (EA) Practitioner

Namib Consulting Services CC is a consulting firm providing professional technical services in the geoscience and environmental fields. The firm is independent of the appointed Engineering Consultants (EC) for the planning and design of the OWPPEP, in that no prior linkage has existed between the Joint Venture Consultants. Furthermore, the firm commits to carrying out the scope of the environmental assessment in a professional and independent manner as practically possible to all prescribing requirements and further ensure acceptable best practices in the field of environmental management are engrained in the proposed project implementation approach.

1.3 Project Rationale

Namibia is among the driest countries in the Sub-Sahara region, characterized by an arid climate. Precipitation is erratic, utmost the entire country except peripheries of the north to northeastern parts of the country. The climatic pattern translates to availability of water resources for various purposes it is required for. Inside the vast Namibian landscape, ephemeral rivers are dominant however reliant on erratic rainfall events. The country's perennial rivers flow at peripheries of the Namibian landscape. Although perennial rivers are more reliable water sources, they are far located from higher demand areas and thus in many cases are underutilized.

The north central areas of the country benefits from perennial river systems shared with neighboring States. Water supply to the north central regions of the country is hugely reliant on a 160-km long canal and pipeline system that conveys water from the Calueque Dam on the Kunene River in Angola, towards this densely populated area (Kluge et al. 2008). The canal and pipeline scheme were constructed in the 1960's (PJTC's Kunene River awareness kit, 2022; Burmeister & Partners, 1996).

This north central water supply scheme covers the Cuvelai-Etosha basin area encompassing administrative regions of Omusati, Oshana, Ohangwena and Oshikoto, supplied via the bulk infrastructure consisting of canal and pipeline network. This scheme is further extended by a rural network of pipelines of the Directorate of Water Supply and Sanitation Coordination (DWSSC) of the Ministry of Agriculture, Water and Land Reform (LCE, 2014). Figure 1-1 below provides the extent of the north central bulk water supply infrastructure, specific to canal and main pipelines infrastructure, and Figure 1-2 showing an overview of the extensive rural network of pipelines of the DWSSC.

The existing agreement between the governments of Angola and Namibia allows for a maximum abstraction rate of 6 m^3/s for uses in northern Namibia for the Bulk Transfer Scheme. However, Namibia previously indicated that they intend to increase abstractions up to 12 m^3/s to meet future water demand (PJTC's Kunene River awareness kit, 2022; Burmeister & Partners, 1996).

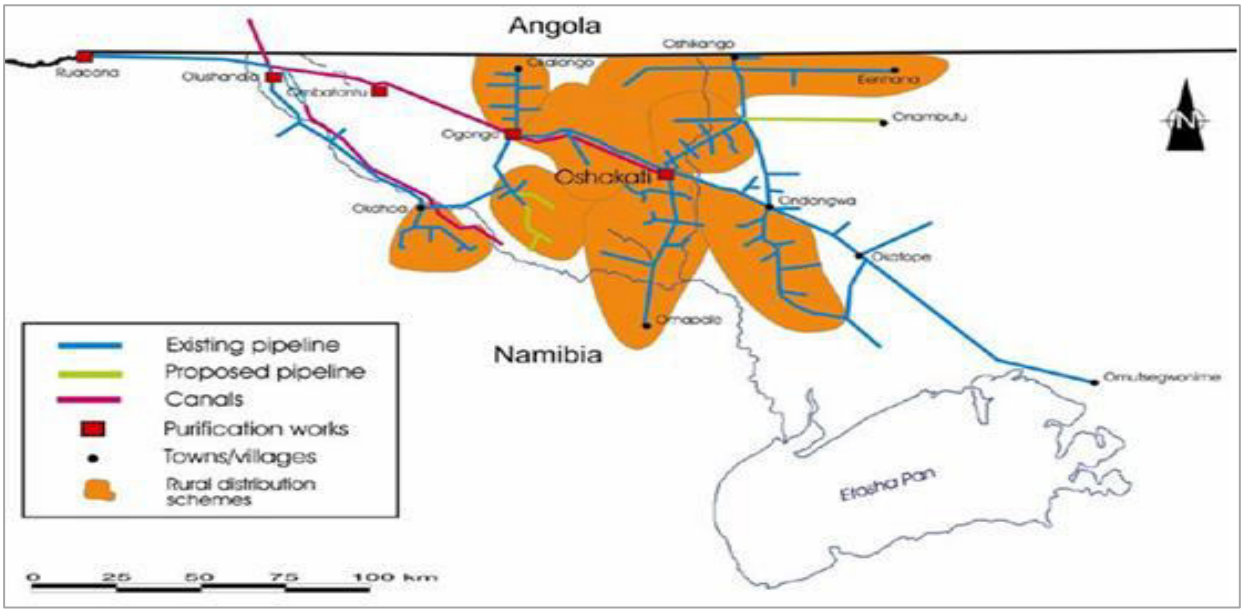


Table 1-1 Bulk water infrastructure for the north central water supply scheme

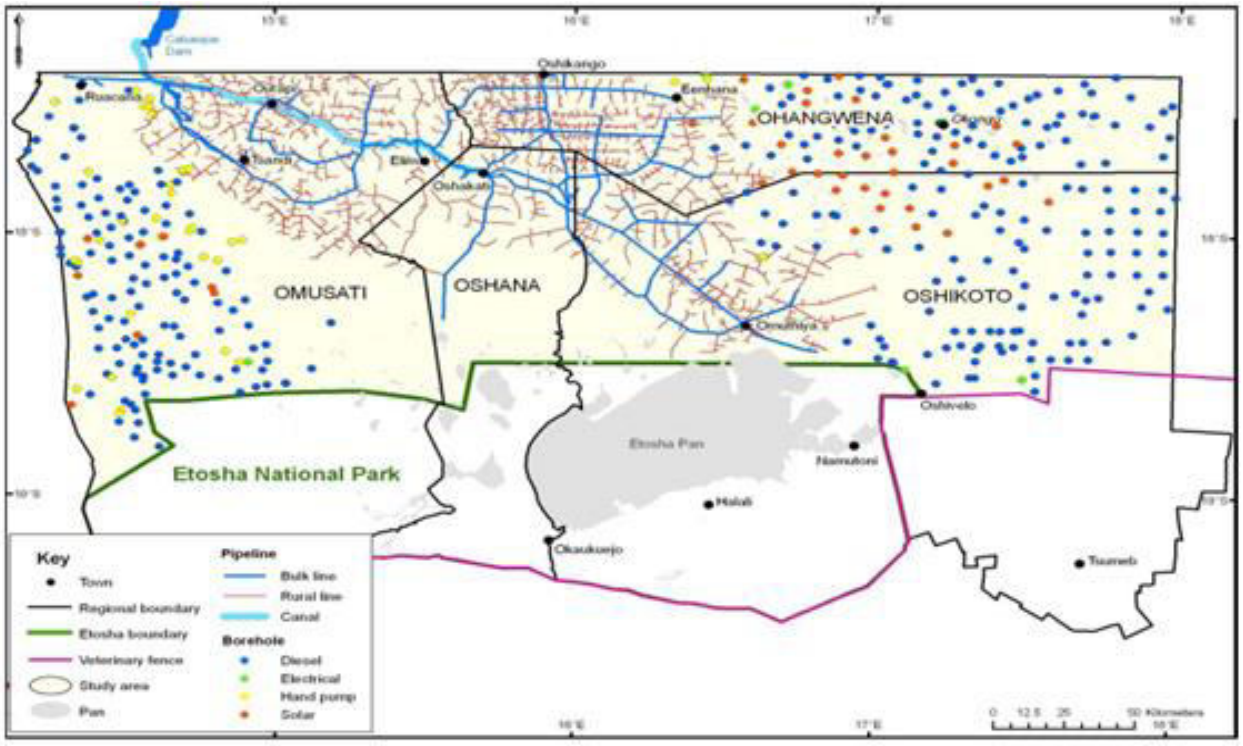


Table 1-2 An overview of the pipeline network of the north central bulk water supply infrastructure

1.4 Need and Desirability of the Project

The OWW is the heart of water supply to the north central areas of Namibia. The primary objective of the plant is to supply potable water to the urban and rural areas of the Oshana, Ohangwena and Oshikoto Regions. The ToR for the works outlines that the main concern to existing WTP is the capacity to produce water in the right volumes relative to several pressing factors. Studies undertaken by the Infrastructure Planning (2016) Division of NamWater, came to reveal that at times, the plant produces above its design capacity, therefore, a motivation for a newer treatment plant. The following factors are significant drivers to the need for the extension to the OWW;

i. Ageing of the existing Water Treatment Plant
ii. Increasing or growing demand for water in north central areas
iii. Limited water source alternatives

1.4.1 Ageing infrastructure

The existing OWW was constructed in the 1960's although with lesser capacity then and has been expanded over time. In 1992, the capacity of the treatment was reported at 12 000m^3 per

day (Reformulation mission: Ogongo - Okalongo and Oshakati - Omakango water schemes report, 1992). Recent works to the Oshakati water works were completed in 1996 (NamWater, 2021). The present capacity stands at 40 000m^3 per day, however constant demand requires operating the plant beyond this capacity. In consideration of its running time, operating beyond its design capacity is a huge risk, since any structural or operational failures can lead a calamitous water supply situation to the north central regions of Namibia.

1.4.2 Increasing demand for potable water

The north central parts of the country are densely populated, with an estimate 40% of the Namibian population located in the area. The population density in the Ohangwena and Oshana regions is reported highest (i.e., 20 people per square kilometre) of any other region in Namibia. This is inferable to growing demand for potable water both in urban and rural areas of the north central regions and thus the need for increased capacity to meet growing demand.

1.4.3 Limited water source alternatives

To ensure sustained supply that meets growing demand, it is required that a sustainable water source is found. Among potential sources, groundwater serves an important water source for several urban centres and the vast rural areas of Namibia. However, this source is hindered by quantity and quality potential in many parts of the country and more so in north central areas. It is therefore undeniable for reliance on other means such as the existing transfer scheme as more feasible to sustain water requirements for socio-cultural and economic needs.

It is therefore evident from the above description that the current proposed project is highly needed and desirable to secure water supply to the north central regions of Namibia and extend water supply and sanitation facilities to remote areas in the regions in the current, medium- and long-term futures. This endeavour further aligns with the medium to long term national planning framework.

1.5 Structure of the Report

This report has been prepared by the environmental assessor to meet the requirements set out below and further outlined in Table 1-1.

i. National legislative requirements as set out in subsection 2.1 of this report.

ii. The African Development Bank's requirements on set out in subsection 3.5 of this report

iii. The Proponent's environmental commitments and practices on environmental assessments.

Table 1-3 Structure of the scoping report

Chapter	Title in Report	Description	Legislative requirements of subsection 2.1 of this report
1	Introduction	Provides background information on the proposed project, its context as national priority project to the local context of the project setting. It further describes the legislative framework that underpins its implementation and outline the needfulness and desirability of the concept, and its alignment with national priorities in the broader context of national planning.	(vi)
2	Approach and Methodology	Outlines the methodology adopted for the entire EIA process to align with legislative and other requirements prescriptive on the process. It outlines the key steps of the assessment process.	-
3	Public Consultation	This chapter outlines the steps to public consultation and information disclosure. It provides an overview of the Interested and Affected Parties (I&AP's) consulted, the consultation strategy devised, and key issues raised, and feedback provided. Moreover, it further outlines the grievance redress process developed for the project.	(v)
4	Legislative framework and standards	Reviews relevant institutional and legislative framework, including standards and associated requirements placed on the envisaged project from a stakeholder perspective. It provides an overview of the AfDB's environmental policy and operating safeguards, and the obligations placed on the financed projects.	(iv)
5	Project Description	An EIA is project specific, and this chapter thus provides a detail description of the site envisaged for development, relaying geospatial information of the site and providing an orientation of the surroundings. It describes the various components of the envisaged extensions work of the Oshakati WTP project and associated envisaged activities. Moreover, this chapter further evaluates if there are alternatives to consider to the current proposed project.	(i), (ii), (vi)
6	Description of the Biophysical and Socioeconomic Environment	This chapter is aimed at providing baseline information, providing a description of the biophysical, social, cultural, heritage, and economic characteristics within the existing realm, that could be impacted due to interactions with the proposed project components in the various phases.	(iii)
7	Environmental Impacts Evaluation	This chapter provides a description of the process to impact identification, impact evaluation and results thereof, outlining the key environmental impacts envisaged in the implementation of each component of the project in the various project lifecycle phases.	(vii) (viii)

Chapter	Title in Report	Description	Legislative requirements of subsection 2.1 of this report
		This section chapter further guides where needed the required specialist studies	
8	Environmental and Social Management Plan	This chapter proceeds to outline the management plan necessary where this phase has provided adequate information and mitigation to the foreseeable impacts.	(ix)
9	References	Provide recognition of all literature and reports consulted in the compilation of the scoping report.	

Chapter 2

2. Approach and Methodology

2.1 The Scope of ESIA's

The Environmental Impact Assessment Regulations (GN No. 30 of 2012) of the Environmental Management Act (No. 7 of 2007) sets out the scope of an Environmental Impact Assessment (EIA) study. This scope provides the ToR for an environmental assessor in developing and drafting the environmental assessment reports providing sufficient information required for the Environmental Commissioner to make an informed decision on the proposed project. The regulations set out the scope as minimum requirements to apply for an ECC as follows;

i. A description of the proposed activity.
ii. A description of the site on which the activity is to be undertaken and the location of the activity on the site.
iii. A description of the environment that may be affected by the proposed activity and the manner in which the geographical, physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed listed activity.
iv. An identification of laws and guidelines that have been considered in the preparation of the scoping report.
v. Details of the public consultation process.
vi. A description of the need and desirability of the proposed listed activity and any identified alternatives to the proposed activity that are feasible and reasonable, including the advantages and disadvantages that the proposed activity or alternatives have on the environment and on the community that may be affected by the activity.
vii. A description and assessment of the significance of any significant effects, including cumulative effects, that may occur resultant of undertaking the activity or identified alternatives or resultant of any construction, erection or decommissioning associated with the undertaking of the proposed listed activity.
viii. ToR for any detailed assessments
ix. A draft management plans

Therefore, the above are the legislative ToR for the appointed EAP, complemented by the Proponent's specific requirements in the ToR, towards meeting the overall objectives of this proposed project.

2.2 The ESIA Process

The Environmental Assessment Policy (1995) sets out the process and steps for an environmental and social impact assessment. The set-out process is explicit in the policy, however the steps outlined in table (Table 2-1) below, details the approach peculiar to this study in meeting prescribed underpinning requirements.

Table 2-1 The EIA process steps carried out

Phase	Requirements
Project Screening Phase	○ Preliminary description of proposed activity and associated impacts in Background Information Document (BID) ○ Submit EIA Application form to the MEFT: DEAF for project registration
	○ Project Registration and Setting out of Scope (by DEAF)
	○ Identification of I&APs and notifications
Project Scoping Phase	○ Register I&APs, receive comments/inputs and provide more information
	○ Hold public consultation meetings to provide information and receive comments. ○ Hold key stakeholder meetings and record comments and inputs
	○ Hold a feedback public meeting ○ Provide feedback and continually engage I&APs throughout the process ○ Engage grievance redress process (where required)
	○ Carry out a review of the institutional and legislative framework, description of the project site, project activities and baseline assessment of the biophysical and socio-economic characteristics of the receiving environment. ○ Assess impacts from activities (propose mitigation measures)
	○ Submit draft Scoping Report (SR) to authorities and public for comments
	○ Finalize SR; incorporating comments and provide feedback (where required) ○ Develop an environmental management plan (if SR is adequate)
	○ Produce ToRs for Specialist Assessment (where required)
Detailed ESIA Phase	○ Appoint specialists and commission studies ○ Conduct Specialist studies and preparation of reports
	○ Prepare Detailed ESIA Report ○ Develop the Environmental and Social Management Plan (ESMP)
	○ Provide opportunities for comments/inputs on the EIA Report and EMP
	○ Finalize DESIA Report and EMSP; incorporate comments and feedback where necessary
Decision Making & Review Phase	○ Submit DESIA Report and ESMP to MEFT: DEAF ○ Await and follow-up on decision of the Environmental Commissioner
	○ Receipt of Decision ECC issuance or Review of decision in case of non-approval.

2.3 Public Participation Process

2.3.1 Legislative Requirements for Public Participation

Sections 21-24 of the Environmental Impact Assessment Regulations (GN. No. 30 of 2012) of the Environmental Management Act (No. 7 of 2007) prescribes the requirements for the process of public consultations. The key components of the public participation process are outlined in Table 2-2 below isolated from national legislative. This chapter describes the steps caried out to meet meet prescribed legislative requirements.

Table 2-2 Key Legislative requirements on public consultations

Regulatory Requirements	Prescriptions
1. Notification of all I&APs of the application to be made to the Environmental Commissioner	(a) Notices affixed to public conspicuous places (b) Notices to relevant key stakeholders (c) Public adverts in newspapers once a week for two consecutive weeks, providing details of the application
2. Establish and maintain a register of I&APs	Open and maintain a register which contains the names and addresses and be able to provide such register upon request from any interested party
3. Comprehensive information disclosure	The applicant must give registered I&APs access to the report and give an opportunity to comment in writing on the report.
4. Rights of I&APs to comment on the application made to the Office of the Environmental Commissioner (OEC)	(a) A I&APs is entitled to comment in writing on all written submissions made to the Environmental Commissioner by the applicant responsible for the application.
5. All I&APs' comments and redress solutions are recorded and included in reports to the office of the environmental commissioner.	Any written comments received by the applicant from a registered interested or affected party must accompany the report

2.3.2 AFDB's OS Requirements on Public Participation

The Operational Standards (OS) of the AfDB aim to mainstream environmental and social considerations including climate change matters and thus contribute towards sustainable development. The objective of OS 1 on public participation points to;

> *"Provide for stakeholders' participation during the consultation process so that affected communities and stakeholders have timely access to information in suitable forms about Bank operations and are consulted meaningfully about issues that may affect them".*

The financier's requirements therefore outline that the recipient conducts and provides evidence of meaningful consultation (i.e., consultation that is free, prior, and informed) with

communities likely to be affected by environmental and social impacts, with local stakeholders, and ensuring broad community support, especially for Category 1 projects and for projects affecting indigenous people'. The key requirements in public participation are included in Table 2-3.

Table 2-3 Key Requirement of the AfDB's OS on public consultations

Requirement	Prescription
1. Identification of relevant stakeholders, especially potentially affected communities	List of stakeholders and potential role in the public consultation process
2. Disclosure of adequate project information and environmental and social information to ensure that participants are fully informed	Carry out all reasonable steps to sharing project information on the potential impacts of the project
3. Conducting information disclosure in a timely manner	Timely provision of information in language understood in the project area and surroundings. In the context of key project preparation steps, in an appropriate language, and at an accessible place.
4. Establishes a credible, independent, and empowered Grievance and Redress Mechanism (GRM).	A prescriptive document that will outline a process to receive, facilitate and follow up on the resolution of affected people's grievances and concerns about the environmental and social performance of the project.
5. The GRM shall be always accessible to the stakeholders.	The GRM shall be provided and made available during the various applicable project cycles, and all responses to grievances will be recorded and included in project supervision formats and reports.

The Public consultation process for this project was carried out to align to the above prescription of national legislation and the described requirements of the AfDB's Integrated Safeguard System.

2.3.3 Development of a Grievance Redress Mechanism

A Grievance Redress Mechanism (GRM) was developed to establish a process to follow should grievances arise during the different phases of proposed project implementation. The GRM is based on national legislative requirements and further the AfDB Group's Independent Review Mechanism (IRM). Chiefly among its requirements, is full information disclosure to I & APs about the project and providing affected communities the opportunities to raise their concerns. This should further provide that any arising grievances are received, considered and addressed in an independent and transparent manner.

The developed grievance redress procedure aims to resolve grievance as swift as possible at a local level (i.e., project setting level or domain), however critical is ensuring that local processes of grievance redress are not precluded but upheld in seeking resolution where necessary. Where issues escalate above all possible attempts for resolution within the bounds of the redress process, the GRM frees the affected party to seek other remedial processes steps that may deem necessary to reach satisfactory results. The developed GRM for this project is included as Annexure C of this report and includes a developed form for grievance registration to any party that intends to submit a grievance. The grievance redress steps are outlined in Figure 2-1 below.

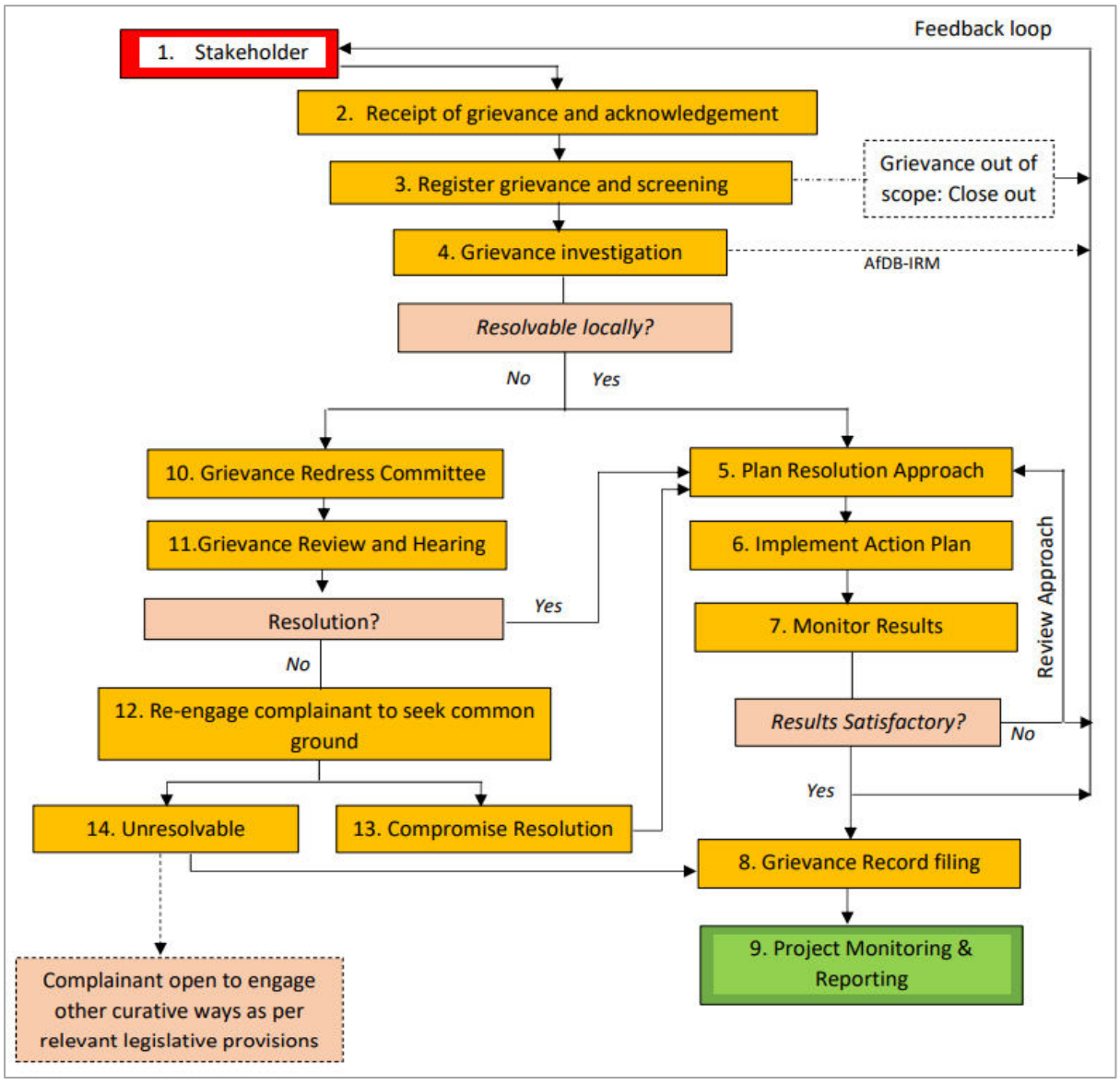


Table 2-4 Grievance redress process flow

2.3.4 Stakeholder Identification and Engagement Strategy

All stakeholders with interest or affected by the proposed project were identified, listed and classified into categories to devise a public consultation strategy/approach. Table 2-4 below summarises the steps followed in the identification, and categorization of all potential stakeholders and the consultation approach devised for various classes, to achieve the highest possible participation and information disclosure of the proposed project. The full stakeholder database is provided in Annexure D-4.

Table 2-5 Stakeholder identification, categorization, and consultation approach

Phase 1: Listing of the stakeholder/ I&AP's						
Regional Authorities	**Local Authorities**	**Ministries**	**Bilateral Institutions**	**Academic institutions**	**Public, Community organizations & Committees**	**Power utilities & business community**
1. Oshana Regional Council 2. Traditional Authorities	1. Oshakati Town Council 2. Ongwediva Town Council 3. Ondangwa Town council 4. Helao Nafidi Town Council	1. Ministry of Agriculture, Water and Land Reform ○ Directorate of Water Resources Management ○ Directorate of Water Supply and Sanitation Coordination ○ Directorate of Land Reform and Resettlement 2. Ministry of Health and Social Services ○ Regional Health Office 3. Ministry of Gender Equality and Child Welfare ○ Regional Office e 4. Ministry of Urban and Rural Development ○ Regional office 5. Ministry of Environment, Forestry and Tourism ○ Forestry Regional Office 6. Ministry of Fisheries and Marine Resources ○ Aquaculture and inland Fisheries Regional Office	The Cuvelai Watercourse Commission (CUVECOM)	1. University of Namibia i. Eng. José Eduardo dos Santos (JEDS) Campus ii. Oshakati campus	1. Solidarity Community Care Organization 2. Namibia Development Trust 3. Ongwediva Rural Development Centres 4. Oshoopala Settlement Development Committee 5. Oneshila Settlement Development Committee 6. Women's Action for Development 7. Oshoopala Community 8. Oneshila Community 9. Ongwediva community 10. Oshakati Community	1. Oshakati Premier Electric 2. NamPower 3. Namibia Chamber of Commerce and Industry

Phase 2: Consultation Approach/Strategy	
Key Stakeholders	**Notification and Information Disclosure Strategy**
1. Oshana Regional Council 2. Oshakati Town Council	Newspaper Adverts BID sharing

3. Ministry of Agriculture, Water and Land reform (Directorate of Water Resources Management) 4. Ministry of Agriculture, Water and Land reform (Directorate of Water Supply and Sanitation Coordination) 5. The Cuvelai Watercourse Commission 6. NamWater (Business Unit North Office) 7. NamWater (Environmental Services Division)	Presentation Focused Discussion Meetings Public Invitations
Potentially Affected Communities	**Notification and Information Disclosure Strategy**
1. Oneshila Settlement Development Committee 2. Oneshila Community	Newspaper Adverts Presentation in local language Local radio station notices (local language) Sharing of hard copy presentation Public posters
Interested or potentially affected	**Notification and Information Disclosure Strategy**
1. Traditional Authorities 2. Oshakati town residents and surrounding headmen's 3. Ministry of Urban and Rural Development (Oshana Regional office) 4. Ministry of Fisheries and Marine Resources (Inland Fisheries Regional Office) 5. Ministry of Health and Social Services (Regional Health Office) 6. Ministry of Gender Equality and Child Welfare (Regional Office) 7. Ministry of Urban and Rural Development (Regional Office) 8. Ministry of Environment, Forestry and Tourism (Forestry Regional Office) 9. University of Namibia (JEDS & Oshakati campus) 10. Solidarity Community Care Organization 11. Namibia Development Trust 12. Ongwediva Rural Development Centres 13. Oshoopala Settlement Development Committee 14. Oneshila Settlement Development Committee 15. Women's Action for Development 16. Ongwediva Community 17. Oshakati Premier Electric 18. NamPower 19. The Namibia Chamber of Environment 20. Namibia Chamber of Commerce and Industry	Newspaper Adverts Local radio station notices (local language) Targeted letters requesting comments Public consultation Public meetings Sharing BID

2.3.5 Public and Key Stakeholder Notifications

Notification of stakeholders was caried out in the methods outlined below.

2.3.5.1 Newspaper Notices

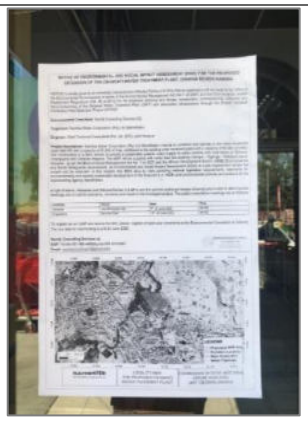
To meet notification requirements in subsections 2.3.1 and 2.3.2 of this report, notifications were placed in nationally circulated daily newspapers. These notices briefly provided information about the project as follows; title of the project, description of the proposed activity, proposed location, the Proponent, preliminary potential impacts, and an invitation to the public to register as I & APs. Moreover, the newspaper notices provided information to the public on the scheduled engagement meetings. The newspaper notices are included as Annexure D-2 to this report. Table 2-5 below provides details on the placements of advertorial notices.

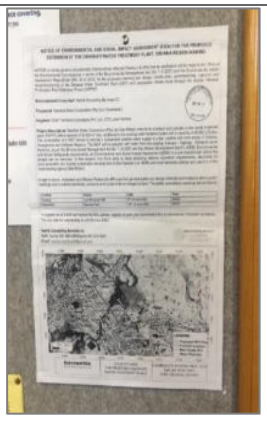
Table 2-6 Newspaper notices placement details

New Era Newspaper	**Namibian Newspaper**
24 May 2022	31 May 2022
1st June 2022	02 June 2022

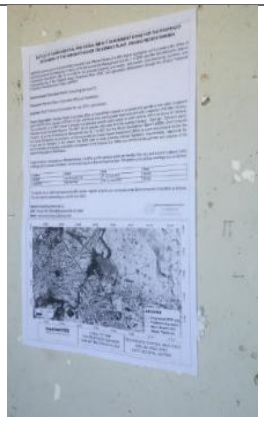
2.3.5.2 Poster Notices

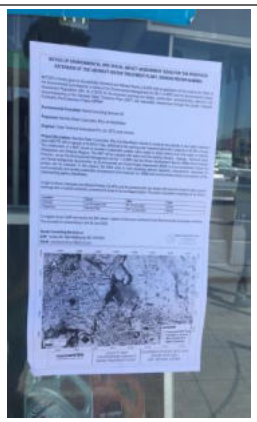
Poster notices were produced and placed at various conspicuous points in Oshakati Town (Figure 2-2).





Oshakati Spar/ Oshakati Town Council





Oshana Regional Council / Etango Mall Complex

Table 2-7 Project Information poster

2.3.5.3 Radio Broadcasting Notices

Project information notice was prepared and submitted to the Namibian Broadcasting Corporation's Oshakati Office for broadcasting. The notices were broadcasted in the local language (Oshiwambo) prior and during the week of the public meetings (01 and on 09 June 2022).

2.3.5.4 Targeted Communication

Targeted letters were prepared and delivered through electronic mails and direct physical delivery to key stakeholders requesting appointments to hold focused discussion meetings about the proposed project. Further to above, potentially affected community settlement leadership were contacted to inform them of the scheduled public consultation meetings to facilitate communication through respective channels of '*operandi*' to members of the settlements. The Oshakati Town Council's public relations office assisted in arranging with members of the settlement development to prepare the settlement meetings.

2.3.6 Public Consultations

2.3.6.1 Public and Settlement Meetings

Public consultation meetings were held as provided in Table 2-6. Attendance registers for the meetings are included as Annexure D-3.

Table 2-8 Public meetings schedule

Date	Meeting Venue	Target Stakeholders
9th June 2022	Leo Shoopala Hall (Oshana Regional Council)	General public of Oshakati Town
10th June 2022	Bennie's Entertainment Park	General public of Ongwediva Town
15th June 2022	Oshoopala Community Development Centre	Community of Oshoopala Settlement
15th June 2022	Oneshila Community Development Centre	Community of Oshoopala settlement

2.3.6.2 Focused Discussions Meetings

The focused discussion engagements held are provided in Table 2-9. The attendance registers are included in Annexure D-3.

Table 2-9 Focused discussions meeting schedule

Date	Meeting Venue	Target Stakeholders
9th June 2022	Oshakati Town Council Boardroom	Oshakati Town Council Management Structure and Staff
10th June 2022	Ongwediva Town Council Boardroom	Ongwediva Town Council Management Structure and Staff
13th June 2022	CUVECOM Office Boardroom	CUVECOM Ministry of Agriculture, Water and Land Reform's DWSSC

2.3.6.3 Direct submission of comments

Invitation to I & APs to submit comments opened on the 24th of May 2022 with publication of notifications. The validity of the notices although was to come to expire on the 20th of June 2022, was extended to the 28th of June 2022.

2.3.7 Summary of Stakeholders Concerns/Issues

The key comments received from the public consultation process are in Table 2-8.

Table 2-10 Summary of Issues/Concerns of Public Consultation Process

Key Concerns/Issue Raised	Updated Feedback (13 October 2022)	Platform Raised
1. *Flooding of areas* - The proposed utilization of the wetland (Oshana) without letting water to flow through (i.e., blocking the northern channel), will Intensify flooding (this is in reference to Alternative 1 of Raw Water Storage Dam). Alternative 3 design for the Raw Water Storage Dam is more preferable. Moreover, even without blocking the flow, the channel through to the Oshana needs to be deepened to convey the flow, as it is too shallow presently. Further, consideration should be given to alternatives design that incorporate flood harvesting for the envisaged structures.	1. The impacts of locating the RWSD as initially proposed, and concerns raised were considered within the project scope. Results of the potential flood risk revealed that high-risk events of 1:50 and 1:100 years remain a major issue that could be exacerbated. Moreover, the required mitigation measures are financially intense to undertake. Due to these and raised social concerns, this component of the project was excluded from this phase of the project with focus on developing structures within the existing premises of the Proponent and immediate minimal surrounding.	○ Oshakati Public Meeting ○ Oshoopala/Oneshila Community Meeting
2. The planning and design of the new water works should take into consideration the *Oshakati flood master plan* for alignment with the local authority flood mitigation plans. 3. *Roads* to be utilized should be well planned as Council will not allow certain roads to be used by construction vehicles to cause nuisance to the town. 4. Consider the disposal of *excess earth material* from bulk excavations. The council could benefit from this and use as infill for some potential developmental areas in town.	2. The Oshakati Flood Master plan was consulted to guide the planning process for the proposed development. The proposed plans on utilization of initially availed land for the RWSD altered the master plan measures for flood mitigation although not extensively. This like other factors provided above, triggered the need to review scope for the RWSD and thus exclusion of the new RWSD subcomponent of the project within the current scope to alternative site. 3. The OTC clarified that the reduced scope implies concerns of road usage are minimal and thus will be acceptable although caution must be taken. 4. The envisaged area that was to be excavated has been reduced with the exclusion of the new RWSD from the current scope and thus the quantities of material produced are unseen to be in high excess.	○ Oshakati Town Council meeting
5. *Disposal of sludge and permits there is a need for* careful planning as it is hazardous waste.	5. Sludge will be discharged into lined lagoons as per current practice and similar onsite design. Sludge will be held in ponds to dryness upon which dry resides will be removed for disposal. To ensure sound management	○ Oshakati Public Meeting

Key Concerns/Issue Raised	Updated Feedback (13 October 2022)	Platform Raised
The Proponent will require a permit for the sludge handling and disposal from the new plant	of dry residues, a process for site acquisition will be engaged with the local authority. Sludge is reusable and thus perception of hazardous is speculative except where reuse is towards growing edible crops and thus requires further long-term safety assurance.	
6. If there is *relocation and resettlement*, will notice be given in advance? Will land for relocation be made available? It is preferable that similar conditions are retained in case of relocation within an urban setting as present than relocated to rural setting	6. The new RWSD that was initially part of the scope is excluded and thus confirmation that **no relocation and resettlement** is to occur within the modified project scope. Further to this is that alternative 3 that was indicated as preferable during public consultations meetings further averted relocations.	○ Oshoopala Community Meeting ○ Oneshila Community meeting

2.3.8 Stakeholder Project Update and Feedback Consultations

The first public consultations meetings held in June 2022 were followed by project update and feedback meetings to update stakeholders on the proposed project and provide feedback on prior concerns and issues raised. These feedback meetings provided further opportunity to clarify any further concerns about the envisaged activities. The following activities were carried as preparation for the feedback meetings;

- Update of the BID and sharing with stakeholders
- Publication of notifications
- Public feedback Meeting (Oshakati Town)
- Community Feedback at Oshoopala and Oneshila Settlements
- Sharing of Draft Scoping Report (ESIA) and Draft ESMP

Each of the steps are described below;

i. Update of the BID and sharing

The initial BID for the project was updated with latest information from the planning and design of the proposed project and shared with the list of stakeholders in the database. See Annexure D-0.1 of updated BID.

ii. Public notification of feedback meetings

Notification was publicized in a nationally circulated daily newspaper for the scheduled stakeholder feedback meeting. This notification further provided updated information through a call to request for updated BID. The notification is included to this report in Annexure D-2, appearing on the 5th of October 2022 in the New Era Newspaper Publication.

iii. Public feedback Meeting (Oshakati Town)

A public feedback meeting was held in Oshakati Town on the 13th of October 2022, to provide the opportunity of all residents, organizations, and government institutions to get updated developments on the proposed project. The minutes of the feedback meeting are included in Annexure D-5.

iv. Community Feedback at Oshoopala and Oneshila Settlements

Public community feedback meeting was arranged at Oshoopala and Oneshila Settlements to provide the opportunity of all settlement residents to get updated developments on the project from the first public meetings. These meetings were held on the 13th of October 2022.

v. Sharing of Draft ESIA and ESMP Reports

The ESIA and ESMP Report were circulated to the stakeholders from 24th of October to 04 November 2022 for comments as agreed in the public feedback meetings.

2.3.9 Summary of Residual Feedback Stakeholder Comments

The outcomes and feedback provided from the feedback engagement on the proposed project are included in Table 2-3 below.

Table 2-11 Feedback consultations engagement outcomes

Key Concerns/Issue Raised	Residual Feedback	Platform Raised
Clarity on sludge management and type of site required for disposal	Firstly, sludge will not instantly be required to be disposed once plant comes into operation. The planning and design considered capacity of at least 10 years to fill all the four lagoons. However, desludging of filled lagoons will potentially be caried out at intervals of 2 to 3 years. Thus, there is no instant need to dispose dry sludge when plant comes into operation. Secondly, the chemicals used in the treatment are chlorine in various forms, Aluminum Chloralhydrate as coagulants, polyamines, potassium permanganate and soda ash and lime. 90% of the sludge is liquid that is returned to the raw water storage and blends with water treated continually. A permit will be obtained from the regulatory authority for operation of the sludge lagoons. When sludge in the lagoons is dry, that will be removed the dry residues disposed through offsite. Onsite involves first storage in ponds. Where offsite disposal requires a site or land to be acquired. Studies done in South Africa other parts of the world indicate that the dry residues are reusable more specifically in activities that do not involve production of edible products. Dust could be one of the most prominent issues in locating of the site as the solids may breakup and become loose fines that can be dispersed by air. However, a site assessment could also be required for this dedicated site. Another alternative is to use the dry residues as cover at landfill site of the council. The risk may be considered substantial for use that aim at edible crop production than others.	Oshakati Town Council Meeting Oshakati Public Meeting
Recruitment of labour should consider approach through the Proponent than merely Office of Councillor due far location	The matter of recruitment is acknowledged.	Oneshila & Oshoopala Meeting
Worker's health and safety to promote health check-ups	Measures towards ensuring the health and safety of the workers have been included in the ESMP and includes regular health check-ups for workers and also consideration of the people with special conditions.	Oshakati Public Meeting

Key Concerns/Issue Raised	Residual Feedback	Platform Raised
What happens to the new RWSD that was initially planned? The RWSD is critical to the development and needs be developed.	There are engagements between the Proponent and Council on the matter of land suitable and available for the RWSD. An EIA will be independently required for the new site in order to take into consideration possible impacts the project may have in that area both socially and environmentally. The matter of the new RWSD is critical to the proposed development. Although the present scope plans to merely refurbish and expand the existing RWSD, these are merely for the first phase. a new location with adequate capacity to provide for construction of another RWSD will potentially increase storage above the remainder 7 days unaccounted for from the critical 14 days period to potentially more days. However, the suggestion to further plan for up to 3 months security is acknowledged.	Oshana Regional Council Meeting Oneshila Community Meeting Direct submissions

Chapter 3

3. LEGISLATIVE, POLICY AND INSTITUTIONAL REQUIREMENTS

3.1 Introduction

This section provides a description of the policy and legislative framework, and other requirements that underpins the proposed activities at national to international level. The global awakening towards sustainable development has led many nations to develop instruments that ensures that environmental and social aspects are an integral part of project development process towards envisaged economic beneficiation. These are aimed at ensuring that proposed developments enhance the quality of life of societies whilst retaining vitality of the natural resource base as foundation of life's support systems. Therefore, it is necessary that for projects of this magnitude, all prescriptive requirements for the proposed projects are identified, described and specific applicability elaborated unearthed.

3.2 National Legislative Framework

3.2.1 The Constitution of the Republic of Namibia (1990)

The Constitution is the supreme law of the country and sets the foundational governance principles of the Republic of Namibia. As supreme law, it sets out the fundamental basic rights in the following articles:

- Article 6 -The right to life,
- Article 8 - Respect for human dignity,
- Article 9 - Prohibition of slavery and forced labour,
- Article 10 - Equality and freedom from discrimination,
- Article 15 - Children's rights,
- Articles 18 - Administrative justice.

Further to above rights, Article 95 in its subsection (a, b, i, l) recognizes rights regarding matters of gender, health, labour and environment. The state commits to *actively promote and sustain the welfare of the nation by formulating and institutionalizing policies to accomplish the sustainable objectives of*:

- Guarding against overutilization of biological natural resources
- Limiting over-exploitation of non-renewable resources
- Ensuring ecosystem functionality

- Maintaining biological diversity

Requirement	*The fundamental rights prescribed by the supreme law are reflected in processes that underscore the various phases of the proposed Oshakati Water Purification Plant Extension Project. Specific requirements are handled to be handled as per appropriate legislation.*

3.2.2 Environmental Management Act (No. 7 of 2007) and EIA Regulations

The Environmental Management Act (Act No 7 of 2007) (EMA) is a 'principles-based Act' and is an overarching statute regulating various aspects of natural resources use, integrated environmental management and pollution control. The Act provides for the right to an environment that is not harmful to the health and wellbeing of the people, sustainable development, environmental protection, equitable distribution of natural resources and the formulation of environmental management frameworks. Its definition of the environment includes the land and water of the earth, microorganisms, plant and animal life or a combination of them, and the inter relationships among them. The Act aims to provide for cooperative environmental governance by establishing principles for decision making on matters affecting the environment, institutions that will promote co-operative governance, and procedures for coordinating environmental functions exercised by organs of state. Section 27 provides for listing of activities and prohibition in respect of listed activities that may not be undertaken without an environmental clearance certificate.

The EIA regulations (GN 30 of 2012) implement the broader principles of the EMA. Critical to the EIA Process are Sections 21-24 on satisfactory public consultation process, aiming to ensure that I&APs are comprehensively informed and involved in the project concept development and that their wellbeing is considered, and necessary measures taken to maintain or improve their welfare. Moreover, Schedule to Annexure (GN 29. 2012) lists projects that cannot be undertaken without an environmental clearance certificate. The OWPPEP activities are classified under Section 8, Water Resources Developments, with subsections 8.5, 8.6 and 8.8 applicable.

Subsection 8.5 refers to the construction of dams, reservoirs, levees and weirs. The proposed project involve some construction of a dam and levees except weirs and reservoirs. Subsection 8.6 although refers to the construction of industrial or domestic wastewater systems, this

section is proactively considered applicable to further include the construction of water treatment systems as precursors to the former. Lastly, the subsection 8.8 is considered applicable as locating of certain activities may extend in areas considered storm water flow paths.

Requirement	i. *Application for environmental clearance certificate and carryout the EIA process as required by the Act and its regulations. An application form need be completed and submitted to the environmental commissioner for the OWPPEP.* ii. *Carryout public consultation process as prescribed in sections 21-24 of the EIA regulations. It is necessary to carry out public consultations as prescribed and provide prescriptive evidence.* iii. *Submit required compiled reports for evaluation on the proposed project. Final environmental and social assessment and any associated management plan reports for the OWPPEP are to be submitted to the office of the environmental commissioner for consideration.*

3.2.3 Water Resources Management Act (2013) and Water act (No. 54 of 1956).

The Water Resources Management Act (No. 11 of 2013) provides for the management, protection, development, use and conservation of water resources and the regulation and monitoring of water services. Relevant principles of the Act include, inter alia:

- Equitable access for all people to safe drinking water is an essential basic human right to support a healthy productive life.
- Harmonization of human water needs with the requirements of environmental ecosystems and species that depend on them, while recognizing that the water resource quality for those ecosystems must be maintained;
- Promotion of the sustainable development of water resources based on an integrated water resources management plan which incorporates social, technical, economic, and environmental issues.
- Development of the most cost-effective solutions, including conservation measures, to infrastructure for the provision of water; and
- Promotion of water awareness and the participation of persons having interest in the decision-making process should form an integral part of any water resource development initiative.

A person may only abstract and use water from a water resource that exceeds thresholds authorized in terms of a law if the person holds a license issued by the Minister.

The Water Resources Management Act (WRM Act) is yet to be promulgated and thus the Water Act No. 54 of 1956 (i.e., Water Act) remains the presiding legislation regulating water resources related activities such as utilization and prevention of pollution of water sources. The Water Act prescribes regulation of the following specific areas relevant to the OWPPEP;

- abstraction from rivers or aquifers over certain threshold volumes requires a permit (Section 9A).
- disposal of untreated effluent into the environment (Section 21)
- prevention of pollution of water sources (surface or subterranean) (Section 23).

In terms of the quality of water supplied, the water quality guidelines (1988) established under the Water Act, guides the treatment for drinking water and further, wastewater prior any discharge into the environment. These therefore guide service providers in terms of supply of safe water for various purposes, primarily drinkable water, and treatment of resultant wastewater.

The WRM Act has further come with draft water quality standards, that are to enhance the treatment of safer drinking water to the nation. Although the WRM Act is yet to be promulgated, these standards are already being applied in their current state for portable water and effluent discharge. The Oshakati WTP will be required to comply with the draft water quality standards of the WRM Act and its regulations in water treated and supplied.

Requirement	i. *To operate a wastewater (industrial) treatment facility requires a permit, therefore necessary that an application to the responsible authority is made at appropriate time of the project phase.* ii. *Devise adequate measures to ensure that surface or groundwater sources are protected from potential pollution. Risks to water sources from proposed OWPPEP activities need be addressed through establishing adequate measures.* iii. *Abstraction from the river courses requires a permit and or collaborative instruments that govern shared resources.* iv. *Water quality treatment process for envisaged new WTP conforms to the requirements for drinking water as per the draft water quality standards.*

3.2.4 The Forest Act (Act No. 12 of 2001)

The Act is aimed towards protection of various plant species. Section 22 of the Act prohibits cutting or removal of vegetation on sand dunes, drifting sand or gully (a) or 100m of a river or stream or watercourse (b) except under authorization of a license. Moreover, subsequent sections restrict deforestation of land sizing over 15 000 hectares and to a volume of 500 cubic meters in 1 year. The Forest Regulations (No. 170 of GN. 5801 of 2015) outlines protected plant species in its Annexure 2, as per conditions set out in section 13 (1).

Requirement	*It is required that project locality is investigated for potential protected vegetation species, and that necessary measures for preservation are taken if required.*

3.2.5 National Heritage (Act No. 27 2004)

The heritage Act prescribes preservation of heritage sites from development. Through section 46, prohibition is placed on removing or demolishing, destroying, or despoiling, developing, or excavating all or part of a protected place. Under subsequent sections of the Act, such can only be conducted under provisions of an exemption or under a permit issued by the Heritage Council. Moreover, during conducting of activities, should an object of cultural, historical or heritage significance be uncovered, the operations are to be halted instantly and the required procedure for clearance be undertaken.

Requirement	*During project baseline assessment and subsequent implementation, the discovery of objects of cultural and heritage interests such as graves, artefacts and objects believed to be older than 50 years, requires that measures are taken to protect these objects until the National Heritage Council of Namibia have been informed, and approval to proceed with the operations granted accordingly.*

3.2.6 The Flexible Land Tenure Act (2012)

This Flexible Land Tenure Act (FLT Act) seeks to accelerate access as well as delivery of secure tenure in urban informal settlement areas to people without rights to land they presently occupy. Some objectives of the Flexible Land Tenure Act of 2012 are;

- Provide security of title for persons who live in informal settlements or who are provided with low-income housing.

- Empower the persons concerned economically by means of these rights.

The Act provides that an application to establish a land hold title scheme may be submitted to the relevant authority by someone who resides on a piece of land or a group of people who reside on a piece of land. The relevant authority may also decide to establish a land hold title scheme on its own land, without receiving an application from anyone.

Requirement	*It is necessary that clarification with the local authority is made if there are areas envisaged under this FLT Scheme that may be potentially affected by the project.*

3.2.7 The Labour Act (No 11 of 2007)

The objectives of the labour Act are to ensure the welfare of the various parties in labour related matters. Chapter 2 to 8 prescribes matters relating to the;

- fundamental rights and protections relating to the prohibition and restriction of child labour, forced labour, discrimination, and sexual harassment in employment and provide for the freedom of association.
- basic conditions of employment and terms termination, remuneration, hours of work, leave and accommodation.
- duties of employers to employees and persons other than employees, as well as employee duties.
- fair and unfair labour practices, and the to belong to labour associations
- Safety and health in the working environment.

Compliance to the stipulated requirements of the Act is obligatory and thus the contractor, and subcontractors on the project will be required to adhere.

Requirement	*Compliance to the requirements relating to prescribed practices or provisions is a prerequisite for operations in Namibia, and thus all contractor and subcontractors are required to meet compliance requirements.*

3.2.8 Public and Environmental Health Act (No.1 Of 2015)

The Public and Environmental Health Act provides a framework for a structured uniform public and environmental health system in Namibia. Sections 47, 48, 49, 53 and 54, relates to the safety of water supplies, foods, waste disposal and sanitation in a local authority. The Act empowers

local authorities as focal institutions to ensure orderly conduct of activities to ensure public safety and health.

Requirement	*Matters of Public health requirements need be integral part of the project concept development and implementation. Such includes potable water quality assurance, sound waste handling mechanism and sanitation.*

3.2.9 The Local Authorities Act (23 of 1992)

The Act governs local authorities in their mandate to provide urban services such as allocation of land, provision of basic services such as water and electricity supply whilst also ensure public health through collection and safe disposal of waste. The Act further empowers the Local Authority to control usage of acquired land in its area to ensure that this is accordingly to their town planning standards and requirements.

Requirement	*i. Meet requirements for land acquisitions as may be necessary per provisions of the Act* *ii. Compliance to approval processes for land use in urban areas* *iii. Obtain consent on handling of required basic services consequent of project activities.*

3.2.10 Petroleum Products and Energy Amendment Act, 2003 (No. 16 of 2003) and Regulation GN. 155 of 2000.

The Act is administered by the Ministry of Mines and Energy and governs possession and sale of fuels through issuing of licenses. While the Act focuses on acquisition and sale of fuels, it further extends to address the acquisition of fuels for other purposes such personal uses in bulk to ensure safety. It will be necessary therefore that where necessary due to operations that fuels are obtained in to acquire and bulk for storage onsite, an applicable license is obtained.

Requirement	*If so required to store bulk fuels for vehicles and machinery onsite, an authorization is required under consumer installation category.*

3.2.11 Soil Conservation Act 76 of 1969

The Act intends to combat and prevent soil erosion, and for the conservation, protection and improvement of the soil, vegetation and the sources and resources of the water supplies. Under

section, 4 the Minister may by means of a directive order the owner of land to construct the soil conservation works.

Requirement	*Ensure project soil stability to prevent erosion processes in designs of structures or landforms or features.*

3.2.12 Atmospheric Pollution Prevention Ordinance 11 of 1976

The Act aims towards the prevention of pollution of the atmosphere. The Act sets to ensure activities that produce fumes, dust or smoke take necessary measures to control ensure these are to minimal levels.

Requirement	*Necessary measures need be taken to ensure release of noxious gases and dust is minimized in proximity to human settlement areas and prevent pollution. dust and noxious gases in prescribed areas such as urban environments.*

3.2.13 Hazardous Substances Ordinance 14 of 1974

This Act guides the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure thereby in certain circumstances. It further provides for the prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances.

Requirement	*Sets restrictions on import, storage and sale of certain groups of hazardous substances without a permit for overall human safety and health.*

3.3 National Policy Framework

3.3.1 The National Gender Policy (2010)

The policy aims to achieve gender equality and the empowerment of women in the socio-economic, cultural, and political development of Namibia. The Policy aims towards actualizing the basic human rights enshrined in the Constitution, to eradicate discriminatory practices and allow participation of all genders in the socioeconomic development of the society.

Requirement	*iv. Fair opportunities to all and empowerment of marginalized sections of the society based on gender roles. The OWPPEP to provide fair opportunities to the public with* *v. Ensure that there are mechanisms to address gender related discriminatory practices that may arise.*

3.3.2 National Policy On HIV/AIDS (2007)

The policy aims to provide a supportive environment for the implementation of programmes aimed at reducing the infections, improving care and treatment and mitigation of impacts inadeptly supporting vision 2030. Objectives 4, 6 7 and 8 are important to the project in that they drive towards fair opportunities, treatment and access to services that facilitate mitigation for those infected or affected by HIV/AIDS.

Requirement	*i. No discriminatory practices towards people infected or affected by HIV/AIDS in job opportunities or other opportunities that may arise from the implementation of the project.* *ii. Ensure that those requiring access to services are provided with such opportunities to access services where needed. These may relate to being afforded time to access facilities to obtain medications, attend to family members or obtain information.*

3.3.3 The National Land Policy (1998)

The policy hinges its principles on the fundamental human rights enshrined in the constitution and aims to overcome inequalities in the land delivery system to enable access by the poor and disadvantaged sectors of society. The policy further recognizes the fate of informal settlement in urban areas and a multisector approach to making land available to those displaced in the process of formalization of urban land. Where access to land is denied for the poor and marginalized sectors of the society, this is considered a violation of the fundamental rights enshrined by the constitution.

3.3.4 The National Disability Policy (1997)

The national disability policy points to equal opportunities for persons with disabilities to have a productive and gainful employment in the labour market. Moreover, addresses that person living with disability should be safeguarded from abuse and violence. Such provides that where there is discrimination purported towards persons with disability, such causes need for remedy.

3.3.5 National Policy on Climate Change for Namibia (2010)

Namibia's National Climate Change Policy takes a cross-sectoral approach and elaborates on climate change adaptation and mitigation in Namibia. The policy outlines a coherent, transparent, and inclusive framework on climate risk management in accordance with Namibia's national development agenda, legal framework, and in recognition of environmental constraints and vulnerability. Furthermore, the policy pursues the strengthening of national capacities to reduce climate change risk and build resilience for any climate change shocks.

Requirement	*Climate change impacts and mitigation are reflected in the project processes.*

3.3.6 Environmental Impact Assessment Policy (1995)

The Environmental Impact Assessment (EIA) Policy of 1995 promotes accountability and informed decision making through the requirement of EIA's for listed programs and projects (activities). The EIA Policy is currently enforced through the Environmental Management Act (No. 7 of 2007 (EMA)) and the EIA Regulations (GN no 30 of 2012).

Requirement	*Prescribes the steps required in undertaking environmental impact assessments. These steps are applicable to the OWPPEP towards environmental clearance.*

3.4 National Developmental Framework

3.4.1 Vision 2030 and National Development Plans

Namibia's overall development ambitions are articulated in the Nation's Vision 2030. The vision articulates that all 'Namibian everywhere are to enjoy a steady supply of good water for direct consumption, but must be of adequate supply to meet household, agriculture, and industrial needs. At the operational level, five-yearly national development plans (NDP's) are prepared through extensive consultations led by the National Planning Commission in the Office of the President. Presently, the programmes are aligned under NDP5, launched in 2017/2018 and coming towards its final year of 2021/22. Overall, NDP5 had been structured under four pillars, the economy, community, environment, and good governance as an enabler. Although coming towards to its end, the OWPPEP resides under the pillar of economic progression, in the category of "Expansion and Modernization of Physical Infrastructure" and specific focus on 'Upgrade Existing Water Infrastructure' (i.e., the Calueque – Oshakati canal). This pillar has linkage in

outcomes to other pillars of environment, and community. The proposed project will increase availability of services (provision of water) in Oshana, Ohangwena and Oshikoto Regions as well as creating long and short-term employment that will be in fulfilment to the NDP and Vision 2030.

3.4.2 National Disaster Risk Management Plan (2011)

The Disaster Risk Management Plan (NDRMP) was developed to ensure that appropriate actions are taken prior to, in the event of and after disasters. This plan is relevant to the envisaged project due to the flood risk associated with the implementation of the project.

This plan provides disaster managers with a set of disaster prevention priorities, guidelines for disaster preparedness, response, recovery, and emergency procedure guidelines. Some of the NDRMP's guiding principles are:

- Protecting sustainable development gains in Namibia by mainstreaming disaster risk reduction into development.
- Sustainable ecosystem and environmental management.

Requirement	*Consider the existing flood management plans in the planning of the proposed infrastructures.*

3.4.3 The Harambe Prosperity Plans

The Harambee Prosperity Plans (HPPs) is a targeted Action Plan intended to accelerate development in selected priority areas, with the overall goal of attaining prosperity in Namibia. The Plan does not replace but complement the National Development Plans (NDPs) and long-term Vision 2030. The HPP's introduces an element of flexibility in the Namibian planning system by fast tracking development in areas where progress is insufficient. They plans incorporate new development opportunities and aims to address challenges that have emerged after the formulation of NDPs.

In 2021, the Harambee Prosperity Plan II (HPP II) was formulated and comprises of five pillars. More relevant to this project is the fourth pillar on Infrastructure Development whose second goal is 'Secured and Cost-Effective Water Supply'. This goal aims to ensure access to water for human consumption and industrial activities which will be achieved through actions such as; i) Expanding the rural water supply infrastructure, ii) Refurbishing and upgrading the Calueque to

Oshakati canal system. It is therefore, accordingly that the OWPPEP is in line with the strategic planning framework of the country.

3.5 International Conventions

Relevant international conventions to which Namibia is a signatory are summarized below:

3.5.1 Convention on Biological Diversity (1992)

The convention aims to reduce the rate of loss of biological diversity. In its Article 1; articulates the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources. Namibia is signatory to this UN statutory instrument signed in 1992 and is obliged to ensure conservation of biodiversity.

Relevance	*It is necessary that measures that aim to reduce loss of biodiversity are put in place, specifically those resources that requires special attention due to nature of their conservation status. In case of OWPPEP, occurrence of species of special conservation status requires that measure to preserve such are implemented.*

3.5.2 The Kyoto Protocol to the UNFCCC (1998).

The Kyoto Protocol which follows the United Nations Framework Convention on Climate Change is one of the chief instruments for tackling climate change. It contains undertakings entered into by industrialized countries to reduce their emissions of certain greenhouse gases that are responsible for global warming. Developing countries that are signatories are to implement and/or further elaborate policies and measures in place in order to achieve quantified emission limitation and reduction commitments in order to promote sustainable development. Namibia is a signatory to this UN statutory instrument and is obligated to prevent human interference with the climate system.

Relevance	*Activities within the proposed developmental plan with potential emission of greenhouse gasses need be identified and measures taken to ensure reductions.*

3.5.3 Ramsar Convention (1971)

Namibia is signatory to this statutory instrument and is obligated to enforce conservation and sustainable use of wetlands and their resources. Through this instrument, specific areas around the world have been recognized for their preservation and associated resources due to uniqueness in serving as biodiversity hotspots and socio- cultural roles.

Relevance	*The Etosha Pan as the lowest point of the Cuvelai-Etosha System is recognized as a Ramsar site and as such, it is critical that the interconnected systems of flow channels maintain surface flows towards this conservation area. It is important therefore that the OWPPEP activities preserve and maintain the flow paths of surface water towards Etosha pan to maintain ecological processes.*

3.6 The African Development Bank Group's Policy and Operational Safeguards

The AfDB finances the proposed project, as such; the project must be undertaken in a manner that complies with the requirements of the institutions Policy on the Environment. The AfDB developed an Integrated Safeguards System (ISS) updating its safeguards policies and thus consolidated into Operational Safeguards (OS's). The Bank adopted five OS's to achieve goals and optimal functioning of the ISS. These OS's are;

- *The Operational Safeguard 1* (OS1) for environmental and social assessments – governing the process of determining a project's environmental and social category and the resulting environmental and social assessment requirements.
- *The Operational Safeguard 2* (OS2): Involuntary Resettlement - consolidates the policy commitments and requirements set out in the Bank's policy on involuntary resettlement.
- *The Operational Safeguard 3* (OS3): Biodiversity and Ecosystem Services – aims to conserve biological diversity and promote the sustainable use of natural resources, including encompassing commitments on integrated water resources.
- *The Operational Safeguard 4* (OS4): Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials and Resource Efficiency - covers the range of key impacts of pollution, waste, and hazardous materials for which there are agreed international conventions.
- *The Operational Safeguard 5* (OS5): Labor Conditions, Health, and Safety - requirements for its borrowers or clients concerning workers' conditions, rights and protection from abuse or exploitation.

It is therefore important that the proposed project be designed strategically to align, address, and meet the above safeguards requirements.

3.7 Gap Analysis of National Policy and Legislation to the AfDBG's ISS

A gap analysis was carried out, however at a broader scale deciphering where there may exist limitation or robustness in the instruments. Table 3-1 below provided the gap analysis.

Table 3-1 Gap analysis of the AFDB's ISS requirements and National Policy and legislation

AfDBGs ISS	ISS key requirements	Parallel National Legislations	Similarity Description	Gaps if any
The Operational Safeguard 1 (OS1) for environmental and social assessments and development of ESMPs	- Undertaking of ESIA/ESMP - Free informed consultations - Increased access to information - Community impacts - Vulnerable groups and indigenous communities. - Development of a GRM	Environmental Management Act No 7 of 2007 Environmental Regulations GN 30 of 2012 Environmental Impact Assessment Policy (1996)	The Environmental Assessment policy outlines the steps to an environmental impact assessment. Subsequent, EMA and its regulations identify or lists certain activities that requires environmental clearance prior being undertaken. These align with the OS1, that establish the category of a developmental activity premised on the extent of its environmental and social assessment requirements. Both requirements align that they provide and requires checks and balances through affording concerned parties to submit views about the project and require that their concerns are satisfactorily addressed prior to the development and throughout.	The requirements of national legislation are silent on involvement of native and marginalised communities as pointed out in the OS1, however stresses the engagement of potentially affected communities to the proposed development throughout the process. The proposed location is in an urban setting and thus tenancy may not fit the description of indigenous. However, Involvement of marginalised communities is within the scope of the ESIA process, through social community organizations.
The Operational Safeguard 2 (OS2): Involuntary Resettlement	- Free informed consultation - Avoid internal conflict - Improve overall livelihoods - Provide secure land tenure - Compensate on full replacement cost not market values	- The National Land Policy of 1998 - The FLT Act	National policy and legislation provide that no removal of structures against the will of occupiers shall be carried out. Moreover, relocation where unavoidable should be conducted justly and compensation effected. The FLTS implements a land tenure system to ensure the low income and marginalised are afforded the opportunity to land ownership. The above align with the OS2 requirements. The aim of the above provision is for improvement of the livelihoods of the vulnerable groups due to their social status.	The delivery of serviced land is priority to national policy and legislation and as such, relocation and resettlement are necessary towards achieving some secure land tenure system for residents of informal areas in the urban environment. However, just compensation accordingly with national policy is applied to ensure losses and welfare of the communities are addressed. Issues of human rights although covered, are less explicit in national legislation relative to that of the OS2.

AfDBGs ISS	ISS key requirements	Parallel National Legislations	Similarity Description	Gaps if any
				The project has set priority that relocation and resettlement are a last resort and priority placed on avoidance to prevent impacting people's livelihoods though these processes.
The Operational Safeguard 3 (OS3): Biodiversity and Ecosystem Services	- Protection of habitats, ecosystems and species - Priority to livelihoods and ecosystems - Environmental flows - Mitigation hierarchy and offsets	- The Constitution of the Republic of Namibia - The nature conservation ordinance of 1976 - The environmental management Act - The water act of 1956 - The Water resources management act of 2013 - Party to the CBD	The national policies and legislations align with the OS3 and provides robust approach to ensure the conservation of biodiversity through requirements for measures to mitigate and where possible offset, inclusive of sustainable use of water resources. The linkage of ecosystem to social systems are explicit in both requirements.	National legislation takes a broader context to addressing issues related to biodiversity conservation, relative to OS3 providing more specifics related to various ecosystems and the level of consideration that are to be afforded each identified.
The Operational Safeguard 4 (OS4): Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials and Resource Efficiency	- Waste management - Hazardous materials - Usage of pesticides - Resource efficiency - Greenhouse gases	- The EMA - The Water Act and WRM Act - The Hazardous substances ordinance - Climate change policy	The OS4 and national legislation align in areas specified. Coverage comes in the listing of specific activities that are not to be carried out without an ECC. Moreover, the Hazardous substances ordinance regulates acquisition, storage and use of such substances. Further, the Climate Change policy articulates the importance of adopting technologies that reduces GHG emissions	The aspect of resource efficiency is ambiguously addressed in national legislation as specifically articulated in the OS4. However, such can be taken as implied in some legislation where issuance of licenses towards use of certain resources is taken as promoting efficiency in use. Despite the above-identified limitations, the EMA allows for inclusion of such matters, as it requires measures that address all potential implication from project activities inclusive of resources use.
The Operational Safeguard 5 (OS5): Labour Conditions, Health, and Safety	- Protection of workers conditions	- The Constitution - The labour Act - National disability Policy	National policy and legislation provide comprehensive alignment with the key requirements of the OS4.	The available tools are adequately requirements in alignment

AfDBGs ISS	ISS key requirements	Parallel National Legislations	Similarity Description	Gaps if any
	- Workers organizations and rights of collective bargaining - Protection from abuse - Forced labour and child labour - Provision of medical services	- National Policy On HIV/AIDS (2007) - The National Gender Policy (2010) - The national health and safety policy (2021) - Convention on the Rights of the Child - Social Security Act, 1994 (No. 34 of 1999, as amended - Employees Compensation Act, 1995 (No.5 of 1995) - Regulations relating to the health and safety of employees at work (GN 156 of 1997)		

Chapter 4

4. Project Description

4.1 Project Location,

The proposed extensions to the OWW will complement the existing WTP to serve the north central regions (Oshana, Ohangwena and Oshikoto). The location of the proposed activities is restricted to the Oshana Region and specifically the town of Oshakati. Figure 4-1 indicates the location of the proposed project in the northern parts of Namibia.

4.2 Land Availability and Zoning

The Proponent owns Portion 3 of Farm Oshakati Town, and Townlands No. 880 where located the exiting OWWs (Figure 4-2). The existing premises are zoned for civic purposes (Figure 4-3). The adjacent proximities are zoned for office use in the west, undetermined use in the east and a wetland (i.e., locally referred as Oshana) to the north termed Portion A of Farm of Oshakati Town and Townlands. The present premises hosts waterworks infrastructure listed in Table 4-1 and shown in Figure 4-2.

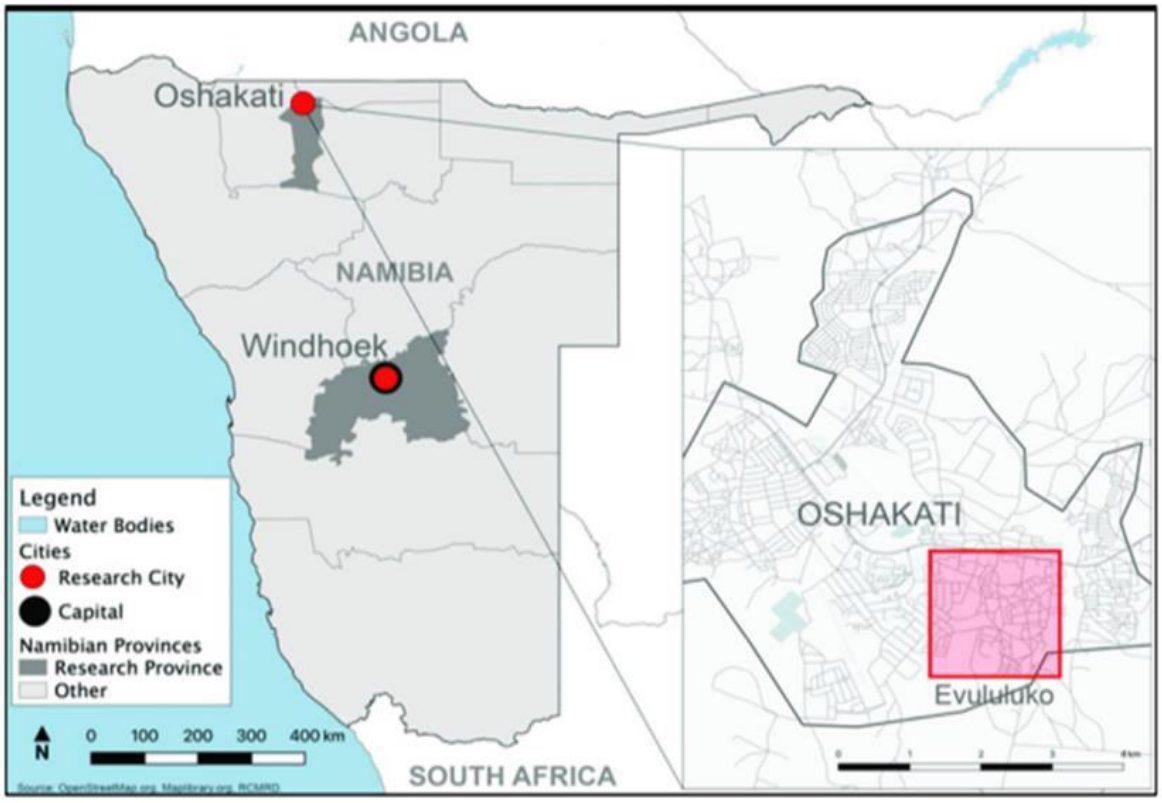


Table 4-1 Proposed Project Location

Table 4-2 Project Site Orientation

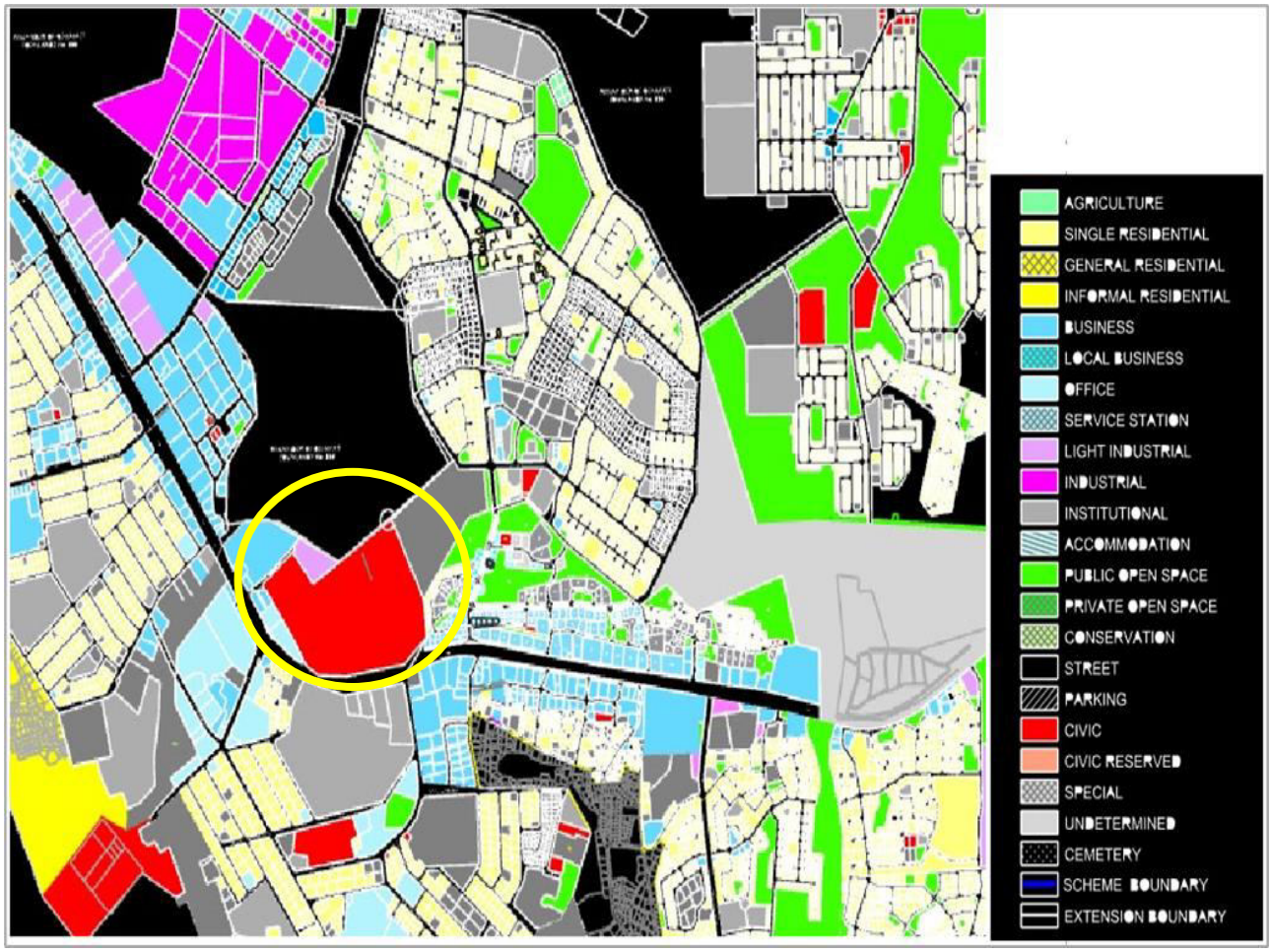


Table 4-3 Land use cadastral for Oshakati Town

Table 4-4 Infrastructure within the existing premises

Buildings	Reservoirs & Concrete Structures	Earthworks	Pump Stations
○ Administration block ○ Workshops and storehouses	○ The existing Oshakati water treatment plant ○ Square reservoir (75 000m^3) ○ Small square reservoir (9 000m^3 capacity) ○ Small round reservoir (Omapale) (2 500 m^3 capacity) ○ Round reservoir (13 500 m^3 capacity)	○ The Oshakati canal entrance ○ Raw water storage dam (i.e., fore dam) ○ Sludge lagoons	○ Raw water pump station ○ Ondangwa new pump station ○ Omakange pump station ○ Omapale pump station ○ Oshakati pump station ○ Ondangwa old pump station

4.3 Description of the Existing Waterworks Operations

Operations of the existing infrastructure in production and distribution of water to supply various demand areas of north central regions involves a series of successive steps that are described in subsequent sections.

4.3.1 Canal Raw Water Supply

The source of water treated at the existing waterworks is from the Kunene River. Abstraction at the Calueque pump waterworks is on average 2.5 m^3/s. In the project context, emphasis was placed on the state of the last section of the canal from Ogongo to Oshakati to deliver adequate quantities required for the proposed development. This was considered critical to the proposed project cognisant of the state the canal has over years of service (Figure 4-4). The design capacity of the referred section of the canal is 1.3 m^3/s and is considered adequate to support an operation requiring raw water input of 112 320 m^3/day for a 24-hour operation. However, due to the state of the canal over decades of operation, the Terms of Reference (ToRs) required that verification of its capacity be carried out for security of supply to the proposed extended waterworks.

Table 4-5 Impairment to the Ogongo-Oshakati canal

4.3.2 The Raw Water Storage Dam (RWSD)

The Ogongo -Oshakati section of the Calueque canal discharges into an onsite raw water storage within the existing premises. In like manner to the canal, the capacity of the existing RWSD (also referred as fore dam) was highlighted as critical to the proposed development. It was outlined

in the ToR that the present capacity of the dam needs be evaluated towards validating capacity to secure raw water supply to the existing and proposed WTPs. Information on the original design capacity of the existing RWSD, was not available.

4.3.3 Raw Water Abstraction and Quality

4.3.3.1 Raw water pumping

Raw water is pumped from the fore dam to the existing WTP by three vertical turbine pumps (2 Active duty and 1 Standby) of capacity 350 LPS, RPM 1475 driven by 50 kW power capacity. The inlet to the abstraction point comprises screens to remove suspended debris (Figure 4-5). A ductile iron pipe of 800 mm diameter transmits pumped water from this point to the hydraulic flash mixer of the existing WTP, where the water treated process begins.

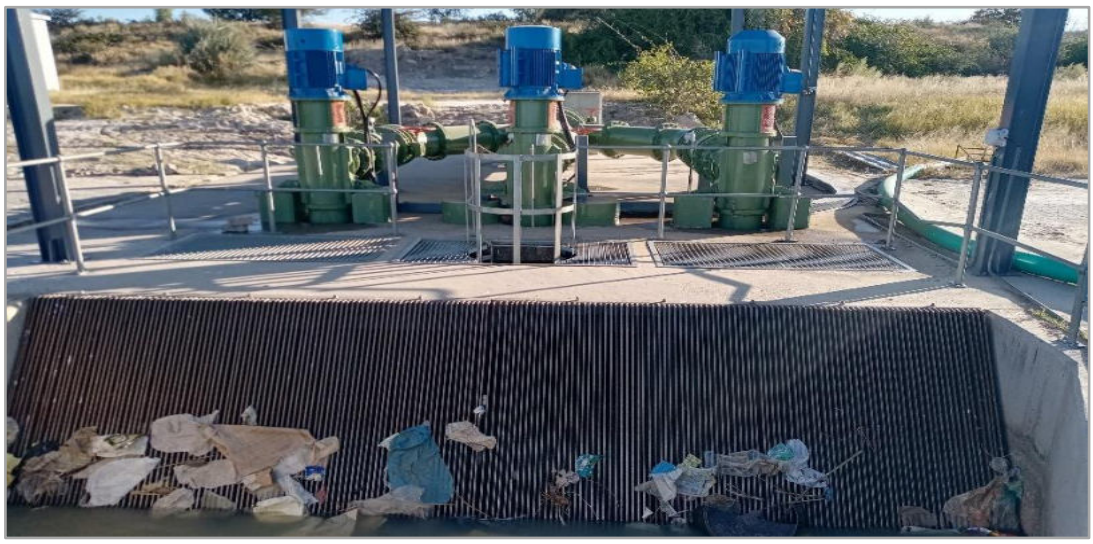


Table 4-6 Manual screens at raw water pump works inlet

4.3.3.2 Raw water quality

The characteristics of raw water and specification for the final product determine the treatment process. The most critical water quality parameters requiring significant consideration in the raw abstracted water were outlined in the ToR as total hardness and turbidity.

In case of total hardness, the characteristic raw water is considered aggressive to cement structures. The 95th percentile values for the raw water quality, reflects that the water is soft

with total hardness of 45.83 mg/l (below 75 mg/l). Moreover, even at 50th percentile of 33 mg/l, the raw water is still considered aggressive and therefore requires some treatment.

In terms of turbidity, a 95th percentile for turbidity is 210 NTU, however much of the water treated at OWWs measures turbidity less than 60 NTU. Occurrences of high turbidity in raw water is associated with months of January to April, during which there are experiences of floods (i.e., locally known as Efundja) and thus peaking values.

4.3.3.3 Water treatment Steps

The water treatment process is a conventional as outlined in Figure 4-6. The initial stage of treatment process addresses the referred water quality aspects (Section 4.3.3.2). Lime is utilized to raise the pH of the water, towards preventing damage to cement structures, however this is carefully considered as it influences other water quality parameters and effectiveness of later stages of the treatment process. Subsequent stages in the treatment process address turbidity challenges in raw water. The process of treatment is described as follows;

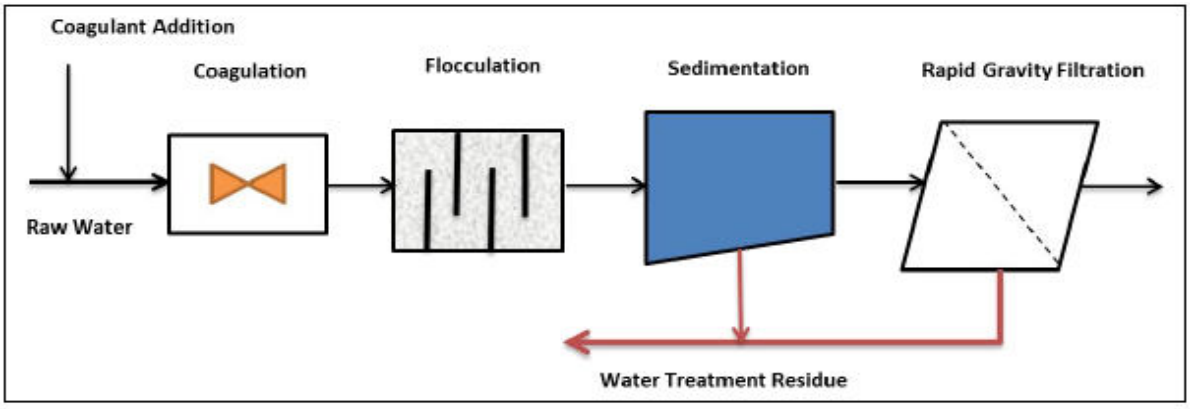


Table 4-7 Conventional Water Treatment Process (WRC, 2012)

a) Hydraulic Flash Mixing

Raw water from the fore dam is pumped into the hydraulic flash mixer of the WTP where lime, and a coagulant are added to the flash mixing process. To facilitate the flocculation process, Aluminium Chloralhydrate is added at this stage of the treatment process. The mixing process comprises two sets of flocculation channels with six channels per set. The first two channels contain eleven round-and-about bends each; the next two channels have nine bends each,

followed by the fifth channel with seven bends and the last channel with six bends. These bends facilitate increased turbulence to assist in the mixing process.

Dosage of flocculate varies between 5 mg/l to 80 mg/l dependent on turbidity of raw water, where higher turbidity values necessitate higher dosage. Operational practice is that 4 to 5 mg/l dose of polyelectrolyte is added in the flocculation tank after flock formation as and when required. In normal fair seasons, a dose of 1 mg/l is used while during high turbidity periods, dosing goes up to 10 mg/l of Aluminium Chloralhydrate. The polyelectrolyte used in the treatment process is stored in two tanks (each tank 500 litres) of enough holding capacity for two days' worth of operations. Two metering pumps operate the tanks automatically.

b) Sedimentation

The settling process involves two vertical settling tanks, with four lamella type clarifiers installed for solid liquid separation on a total settling area of 463 m^2. The up-flow velocity in the tanks approximates 4.3 m/h (without lamellae). Opening valves discharge sludge collected in the hopper periodically. The frequency of valve operation and duration of opening is automatic, and timer based.

c) Filtration

The filtration stage comprises six sand filters with underdrainage nozzles. These filters operate at a filtration rate of 5.3 m^3/h. The filters beds are installed with Aquazur's V-filter with a siphon flow control system.

d) Disinfection and Clear water well

The final stage of the treatment involves disinfection by chlorination of the final treated water. The final water flowing from the filtration processes is dosed with chlorine flowing into the chlorination tank (deep water well) to allow more contact time.

Although the design of the plant allows for chlorination at three different stages, only post chlorination is applied, while pre-chlorination is carried out to improve the removal of green

algae and controlling growth. To chlorinate the final water (i.e., post chlorination) a 5 000 m^3 capacity Chlorine Contact Tank (CCT) is provided, called a deep water well. Moreover, chlorine dosing is also applied in 13 500 m^3 concrete reservoir.

4.3.4 Final Treated Water Quality, Storage and Distribution

4.3.4.1 Water quality testing

The quality of the water is monitored throughout the process through online instrumentation for basic *exsitu* parameters such as pH, and turbidity to establish effectiveness of the treatment process. Moreover, water sampling is carried out weekly of for raw and final water. The Proponent utilises the Namibian Water Quality guidelines for quality assurance of the final treated water for distribution. Figure 4-6 below provides seasonal variation of chemicals used in the treatment process, mainly chlorine and flocculants.

4.3.4.2 Final treated water storage

Water from the deep water well is pumped by two pumps of capacity of 22 kW to the 75 000 m^3 reservoir, with two similar capacity pumps installed as standby. An 800 mm diameter mains pipeline is utilized to feed the 75 000 m^3 reservoir, while a 600 mm diameter branch is provided to transfer water to the 13 500 m^3 reservoir. The combined capacity of the two reservoirs sums 88 500 m^3.

4.3.4.3 Potable water production and distributions

Several onsite infrastructures are operated to distribute the final water to various demand areas. The following reservoir and pump stations are located within the current premises to distribute final water;

- Omakango pump station
- Omapale reservoir (2 500m^3 capacity) and pump station
- Oshakati pump station
- Ondangwa old pump station
- Ondangwa new pump station

Figure 4-7 provides quantities of raw water input and final water produced to meet demand from various areas of the north central regions through the above referred infrastructures.

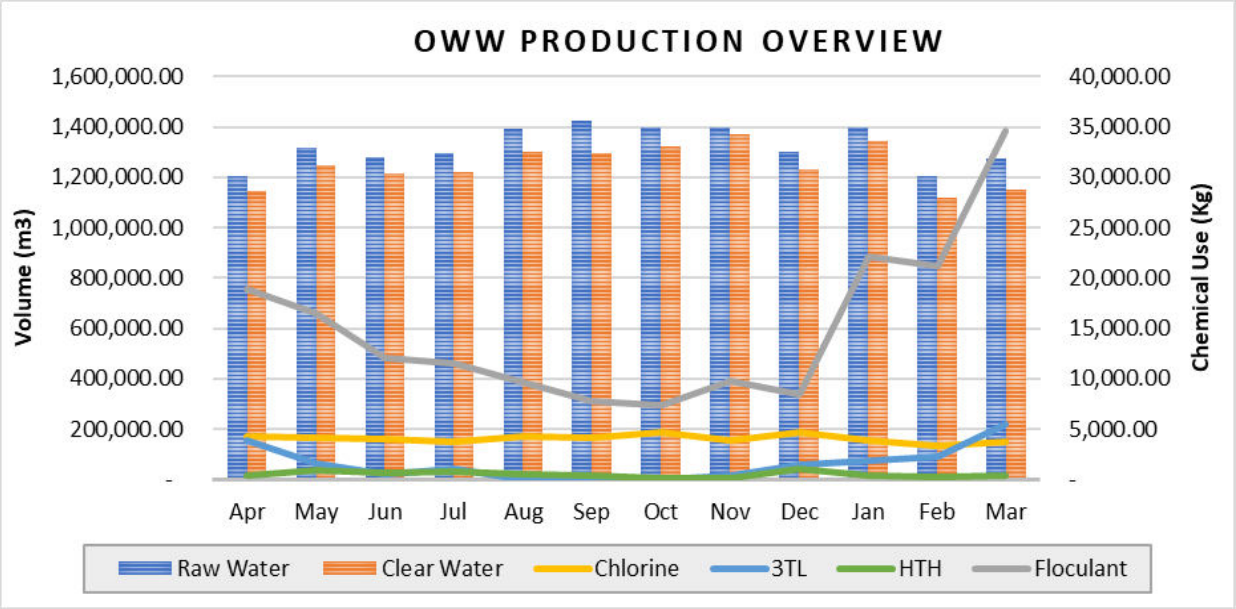


Table 4-8 Oshakati Water Works (OWW) Production

4.3.5 Water Treatment Sludge management

Sludge from clarifiers and backwash water from filters is discharged through an 800 mm diameter common pipe into sludge lagoons/ponds. The sludge line has provision for polyelectrolyte dosing; however, this is unutilized. The supernatant from ponds is diverted into the fore dam and blends with raw water destined for continuous treatment. Operational protocols of the ponds involve sequential filling through sluices, with the top sluice gates as control to the next pond. The filled-up ponds are left to dry as the filling sequence proceeds to other remaining three (3) ponds. Dried sludge residue is mechanically removed for disposal.

4.3.6 Storage of Water treatment Chemicals

A total of six (6), 10 000 litres tanks are provided for storage of Aluminium Chloralhydrate. There are two dry feeders for lime with enough installed capacity providing adequate supply and standby capacity. The chemicals used in the water treatment process include granular chlorine (HTH) and liquid chlorine. Sudfloc also referred to as 3TL is utilised to facilitate the flocculation process post the rapid mixing stage. Utilization of these chemical onsite is provided in Figure 4-7. Dosage requirement stands at 9 000 kg/month however consumption during rainy season rises to 30 000 kg/month.

4.3.7 Site Access Roads

The route to access existing premises of the Proponent is from C46 main road through a provided exit to the east. All waterworks structures are connected and accessed through paved and unpaved roads.

4.3.8 Power Supply

An 11-kV overhead line supplies power to the existing WTP. Three transformers of 630 kVA, 500 kVA and 400 kVA are installed to supply power to the raw water intake pump house, the existing WTP and three clear water pump houses, making maximum demand of 934 kVA.

4.4 Proposed New Infrastructure and Operations

The proposed OWPPEP activities follows conventional project development phases of pre-construction, construction, operation and end of structural design lifespan decommission.

4.4.1 Conceptual Planning Framework

The project concept intends mimicking the existing WTP in the quality of water produced, however increased quantity to the current production capacity. Therefore, the following pre-requisite specifications guide the preconstruction phase;

a) Verification of the capacity of the Ogongo - Oshakati canal to deliver quantities as per known design capacity.
b) Verification of sufficiency of the existing fore dam for sustainable supply of raw water to the existing WTP and proposed new WTP, while simultaneously consider a two (2) weeks operation of the plants without canal water supply.
c) Produce detailed designs and construction drawings
d) Investigate soft water and turbidity characteristics of raw water and propose remedial (i.e., stabilization) in the treatment process.
e) Consider and ensure effective decanting of the supernatant from the sludge ponds into the fore dam.

4.4.2 Preconstruction phase

This phase is aimed at planning and design of the proposed extension infrastructure to the OWWs. The following pre-design requisites are necessary activities;

a) Verification of the Ogongo- Oshakati canal capacity to deliver adequate quantities for the development.
b) Verification of the capacity of the existing RWSD to store and supply raw water over a period of two weeks during shutdowns of the canal.
c) Establish throughput requirement and potential need for increased abstraction from the Calueque system, if necessary.
d) Establish site suitability and propose location of structures on existing premises and adjacent areas.
e) Detail design of waterworks structures
f) Ensure compliance to urban land use acquisitions where necessary and approval of proposed land use plans/alterations or additions. on land use
g) Bid preparations for tendering process for the construction phase.

4.4.3 Construction Phase

The construction phase will oversee the following activities;

a) Mobilization and Site preparation for construction activities
b) Clearance of construction sites and access roads.
c) Erect temporal facilities for the constructions phase (offices, storages, and other support facilities necessary facilities).
d) Site demarcation for bulk excavation, digging and trenching on construction for new WTP, sludge lagoons, extension of the existing RWSD, expanding the existing raw water pump station, and laying of linear infrastructure.
e) Procure, transportation, delivery and storage of construction materials onsite
f) Construction of the new WTP, sludge lagoons, extensions work to the existing RWSD and pump stations.
g) Produce, store, and manage various waste onsite
h) Produce and store excavated earth materials (i.e., soils)
i) Attend to the wellbeing and welfare of workers
j) Erecting and connection of power supplies to the new infrastructure
k) Management of external stakeholders.
l) Installation, testing and automation of the waterworks instrumentation.
m) Site preparation for commissioning of the completed structures for operation.

4.4.4 Operation Phase

This phase is envisaged to involve the following activity flow;

a) Canal discharge to maintain raw water storage in the extended RWSD
b) Abstraction from the RWSD through the expanded raw water pump station to the new WTP through the new raw water feed pipeline.
c) Raw water process treatment of the new WTP through a conventional treatment process.
d) Transfer of the final treated water to the existing reservoirs for distribution.
e) Transfer of wet sludge to the new sludge lagoons for and subsequent disposal of dry sludge. Decanting of the supernatant to the RWSD.
f) Maintenance of waterworks structures including necessary mechanical works
g) Operation of the waterworks through instrumentation.
h) Water quality assurance through sampling, testing and online monitoring.

4.4.5 Decommission phase

The end design lifespan activities are to rehabilitate site to pre-development state, however, initial activities of decommissioning will aim to seek alternative use prior rehabilitation of the site. Activities envisaged include;

a) Investigate alternative uses and obtain stakeholder consent and approval
b) Engage rehabilitation where no alternative uses are found, thus the following activities;
    - Removal of all temporal and permanent structures and demolition of concrete surfaces, where not alternative.
    - Cleanup of the area and removal of all remnant waste
    - Loosening of compacted areas, shaping and smoothening of any rough surfaces and edges to provide land stability and promote the growth of vegetation.

4.4.6 Project Inputs and Outputs

The main inputs and outputs of the proposed project are outlined below:

4.4.6.1 Project Inputs/Raw Material

The key inputs to the proposed project are;

a) Various construction materials for the proposed new structures (i.e., new WTP, sludge lagoons, expansion of the raw water pump station, linear infrastructures). These will include, cement, reinforced steel, structural steel, aggregates of various sizes for the concrete works, various sized pipes of HDPE type and ductile iron, pumps, valves, power transformers, wood for formwork, water, fuels for machinery and vehicles, tanks, precast tank units, connectors, filters, pole posts and wire.
b) Human/labour resources of both skilled and unskilled for various works. And
c) Machinery and equipment for the construction activities, including an excavator, front loader, and dump trucks.
d) Capital, and operation and maintenance financial injection into the proposed project.
e) Raw water supply of the canal into onsite RWSD.
f) Raw water abstraction/pumping from the RWSD into the new WTP.
g) Water treatment chemicals for the water treatment process.
h) Power supply input to the new infrastructure.
i) Instrumentation and mechanical equipment.

4.4.6.2 Project Outputs/Byproducts

a) Final treated water at rate of 50 000 m^3 per day to feed the 75 000m^3 and 13 500m^3 reservoirs.
b) Wet sludge from the clarifiers (2%) and filters (3%) to sludge lagoons at quantity of 2 338 m^3/day. Dry sludge residue after duration of drying in the sludge lagoons.
c) Various types of solid waste from construction operation and decommission phases of the project. Such will include vegetation waste, building rubble, packaging waste, general and domestic waste, and contaminated materials/substances.
d) Wastewater from sanitation facilities.
e) Excavated earth/soil material.
f) New extensions to the OWW with extended RWSD, new WTP, expanded raw water pump station, new sludge lagoons, final water pump stations to feed two reservoirs (i.e., 75 000m^3 and 13 500m^3), linear infrastructure (roads, pipelines).

4.5 Description of Project Activities

4.5.1 Pre-construction Phase

4.5.1.1 Raw Water Supply and Throughput Requirements

a) Abstraction Requirements from the raw water source

A water source for the proposed project remains that abstracted at Calueque dam in Angola, fed, and conveyed through the Calueque canal, and discharging at OWWs. The agreement between the two basin states of Angola and counterpart Namibia, allows the latter to abstract up to 6 m^3/s. Abstraction from the Calueque pump station was confirmed at an average of 2.5 m^3/s (Pers. Communication, Mr T. Shikwa of NamWater). The design requirements have indicated envisaged operation within the existing abstraction levels and thus will not require increasing abstraction rates beyond the existing agreement.

b) The Ogongo-Oshakati Canal Delivery Capacity

Hydraulic modelling was carried out of the Ogongo – Oshakati section of the canal to verify capacity to deliver adequate quantities to the proposed expanded OWWs. The results of this assessment indicate a minimum capacity to convey 1.1 m^3/s to the OWWs (Annexure B). Subject to shortcomings of field model verification, it was accepted with the Proponent that the canal could still deliver adequate capacity for the required throughput for the extended OWWs. However, this is mindful that the results is a baseline upon which remedial steps in the long-term are needed to assure adequate conveyance of raw water to the OWWs site.

c) Existing Raw Water Storage Dam Capacity

The capacity of the existing RWSD or fore dam was assessed, and the results are provided in Table 4-2. The existing dam has potential design holding capacity of 264 610.5 m^3, with the maximum wetted area delineated as potentially able to hold volume capacity up to 162 546.45 m^3. Effective storage was approximated at 135 482.25 m^3 at assessment time. This effective storage capacity can only secure supply of raw water for 1.5 days of throughput requirements for the extended OWWs, at target output of 90 000 m^3. This verifies that the existing RWSD is by far inadequate to sustain the two WTPs over a 14-day canal shut down period for maintenance. It is therefore of priority that expanding storage capacity of raw water for the proposed development is critical.

Table 4-9 Characteristics capacity of the existing RWSD

Dam characteristic	Area	Effective depth (m)	Approximate Volume Capacity (m^3)
The total area of the fore dam including the embanked area	88 298 m^2	2.99 m	264 610.5 m^3
Maximum Capacity of Wetted area	75,603m^2	2.15 m (average)	162 546.45 m^3
Wetted area at survey	63,015m^2	2.15 m (average)	135 482.25m^3

d) New Throughput and Supply Storage Requirements

The planned new WTP will treat and produce 50 000 m^3/day over a 20-hours operation. The combined envisaged production of the extended waterworks is 90 000m^3/day. Losses for the new plant are calculated at 15%, of which 5% from the production process and 10% evaporation losses from the system. Losses for the existing plant are approximated at 20%. The total demand therefore for the intake volume into the new plant is calculated and designed at 52 500 m^3/day. The total water requirements for the combined waterworks in future is provided in Table 4-3.

Table 4-10 Calculation for storage volume requirements

Specifications	Capacities
Capacity of existing WTP	40 000 m^3/d
Capacity of proposed new WTP	50 000 m^3/d
Total envisaged capacity of combined production	90 000 m^3/d
Add 15% losses in the system (5% for WTP production loss + 10% Evaporation loss) and additional 20% losses for the old WTP = 35%	108 824 m^3/d
Total Volume Required for 14 Days	1 523 530 m^3
Capacity of existing fore dam supply	210 470 m^3
Potential Capacity through extension to the exiting fore dam extensions (at 3m depth)	139 200 m^3
Calculated required additional holding storage for security over 14 days shutdown of canal	1 173 860 m^3

e) Raw and Final Water Quality Requirements

i. Raw water quality

An analysis of the water quality results from December 2021 to June 2022 indicated high turbidity and iron content in raw water. Alkalinity, TDS and pH show minimal issues with

saturation of pH of water, an important characteristic in the treatment process. The conventional treatment process is recommended as adequate to handle raw water treatment and is retained for the new WTP, however additional measures have been recommended as follows;

- To handle soft characteristic of raw water, the use of caustic soda has been recommended to stabilise its aggressiveness to structures.
- Turbidity challenges have been considered manageable through steps of the conventional treatment process retained.
- Elevated iron levels in raw water to be handled through application of potassium permanganate.

ii. Final Water Quality Assurance

The final treated water from the existing and new WTP is required to meet specified water quality standards for supply to the nation. NamWater proactively strives to meet the draft Namibian water quality standards of the WRM Act for the evaluation of drinking water for human consumption. These standards are based on WHO standards but further national water quality targets for potable water supply.

4.5.2 Construction Phase

The following activities are proposed for the construction phase of the OWPPEP;

4.5.2.1 Extension of the existing RWSD

To extend security of raw water supply to the extended OWWs, it is a critical to enhance onsite existing raw water storage to meet the proposed throughput requirements more importantly for the two weeks canal redundancy for maintenance. It therefore planned that the existing fore dam is expanded. Raw water storage in the existing RWSD is affected by invasion of vegetation and siltation as can be seen on the margins of the dam in Figure 4-9, while dredged mud removed from the dam is shown in (Figure 4-8). Dam rehabilitation works will aim at expanding the extent of the RWSD into adjacent areas (Figure 4-9) but also refurbish the existing sections. The aerial extend of the dam will attain 12 hectares in total at 3m to 5m depth. Expected works include minimal clearance of areas for expansion, bulk excavation, loading and hauling of earth material. The excavated areas will be compacted and layered as per designs and subsequent

shaping of embankments. This will further include removal of accumulated silt and invading vegetation through dredging.

Table 4-11 Dredged silt (mud) from the existing fore dam

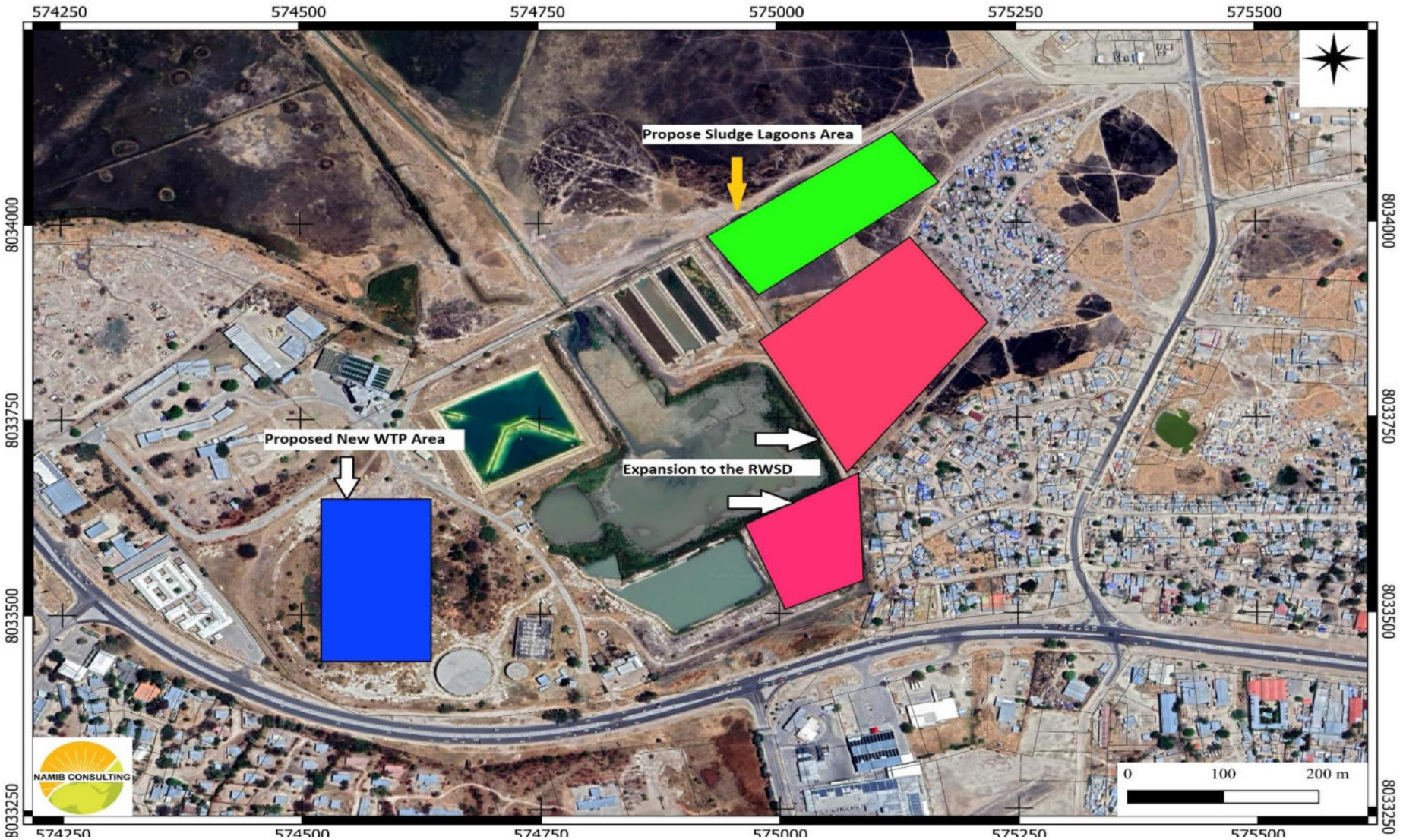


Table 4-12 Proposed location of extended waterworks infrastructure

4.5.2.2 Expansion of the Intake Structures

The existing raw water pump station will be modified and expanded to satisfy additional pumping requirements for the new plant. These alterations will involve widening of the inlet structure for increased flow towards the abstraction point, expansion of the abstraction points for additional pumps installation for the new WTP.

These works will involve the use of steel and concrete works to expand column, floors, and walls of the intake structure.

4.5.2.3 The New Water Treatment Plant

The new WTP retains the conventional treatment process as in the existing WTP with the following stages: pre-treatment, coagulation, flocculation, sedimentation, filtration, disinfection, and clear water storage. The construction aims at operationalizing the treatment process as outlined in Figure 4-11. The location of the new WTP is proposed inside the existing premises as indicated in Figure 4-9.

Construction works will involve minimal site clearance, infilling, and compaction of depressed area towards providing stability to the site for the proposed structure. Excavations for the foundation works will be carried out and subsequent steel and concrete works for columns, bases, slabs, and walls of the various components of the WTP. Further, this will include the installation of prefabricated components such as tank units within the treated plant. The schematic design layout of the treatment plant is shown in Figure 4-10.

The various components of the new WTP will comprise those outlines in subsection that follow.

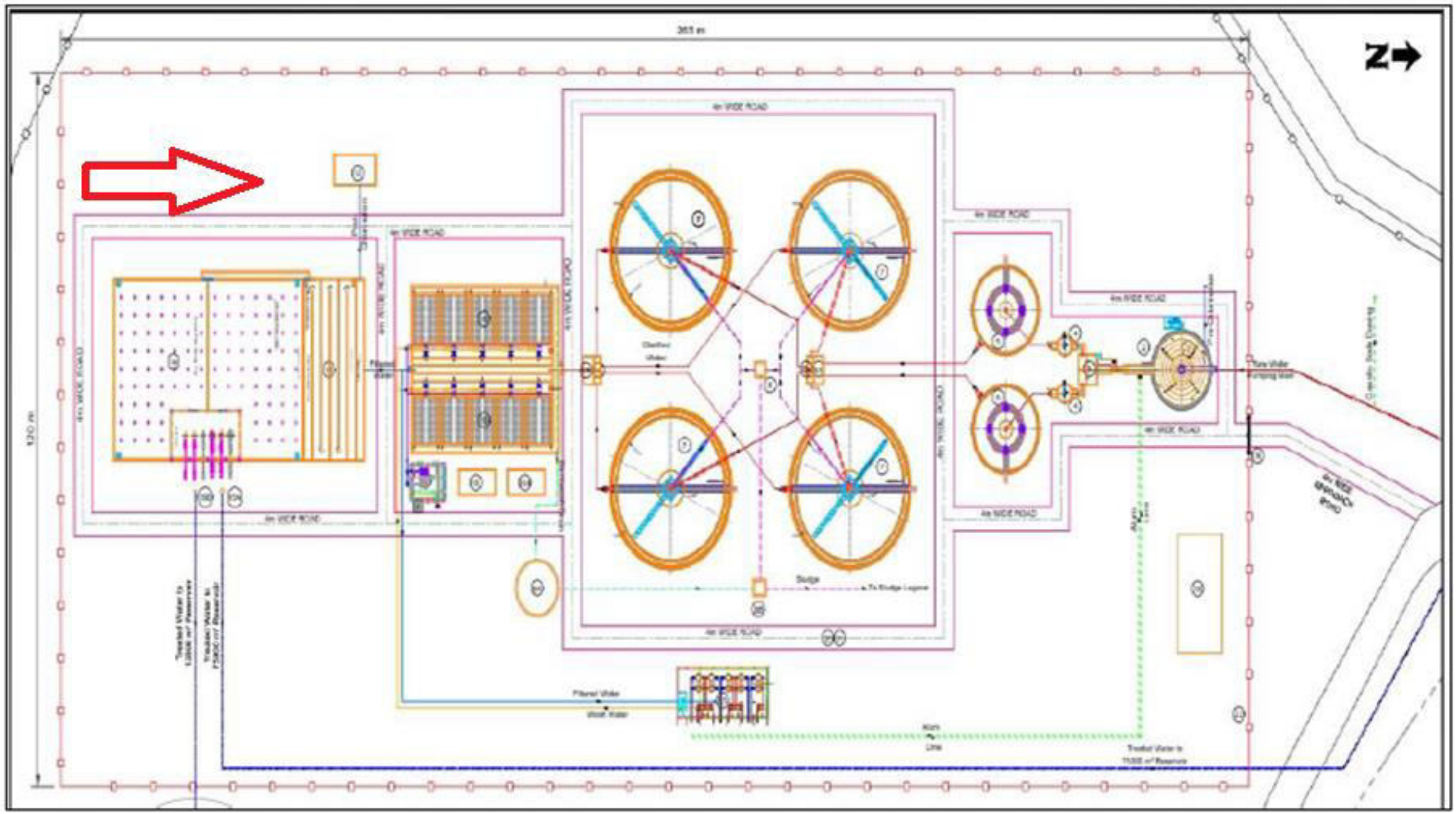


Table 4-13 Schematic design layout of the Proposed WTP

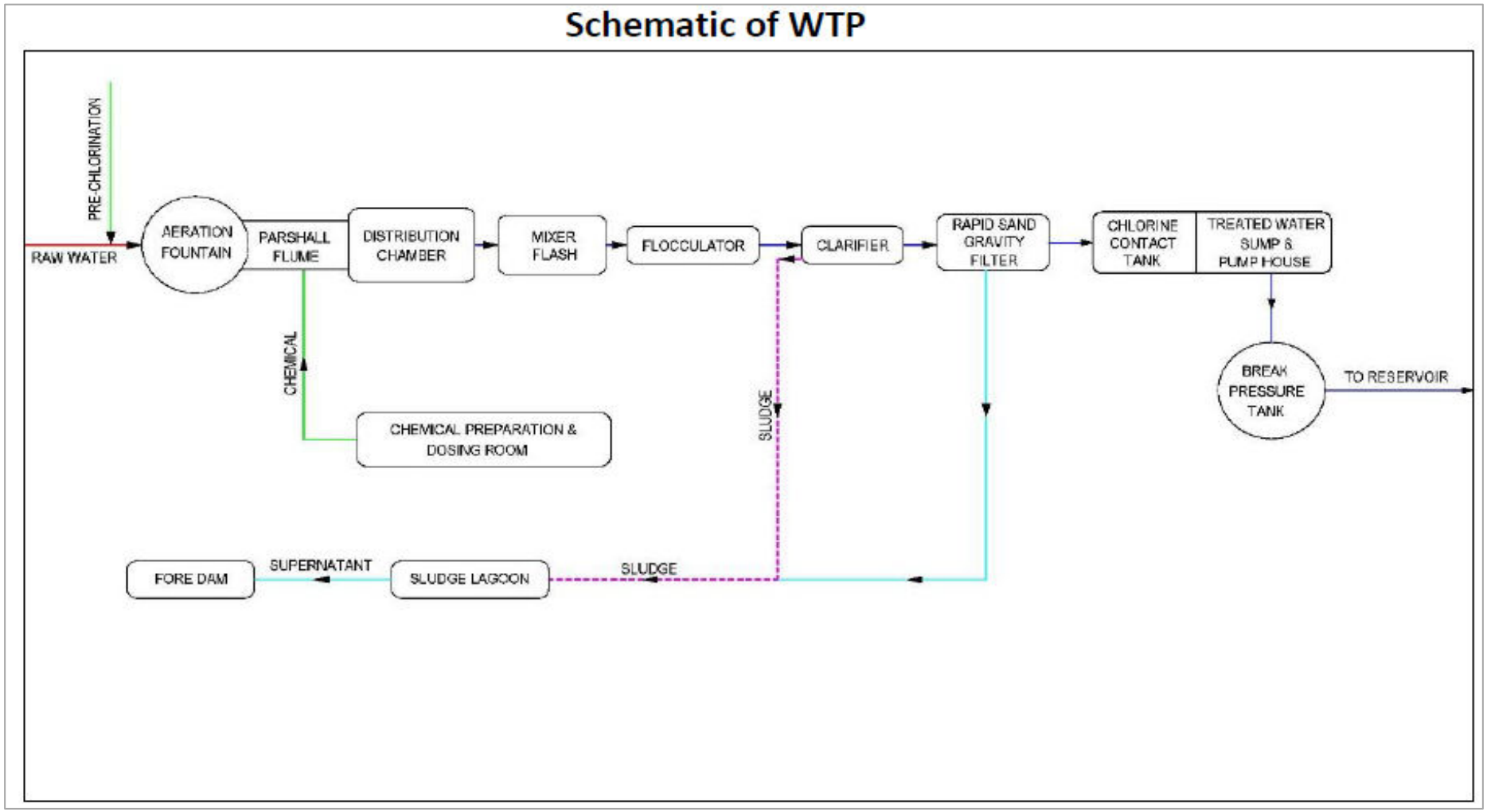


Table 4-14Proposed Water treatment process flow

a) Cascade Aerator

A gravity type cascade aerator (Figure 4-12) is proposed of dimensions 1.0 m (W) x 0.4 m (SWD) x 0.3 m (FB)) and with loading rate of 0.03 $m^3/h.m^2$.

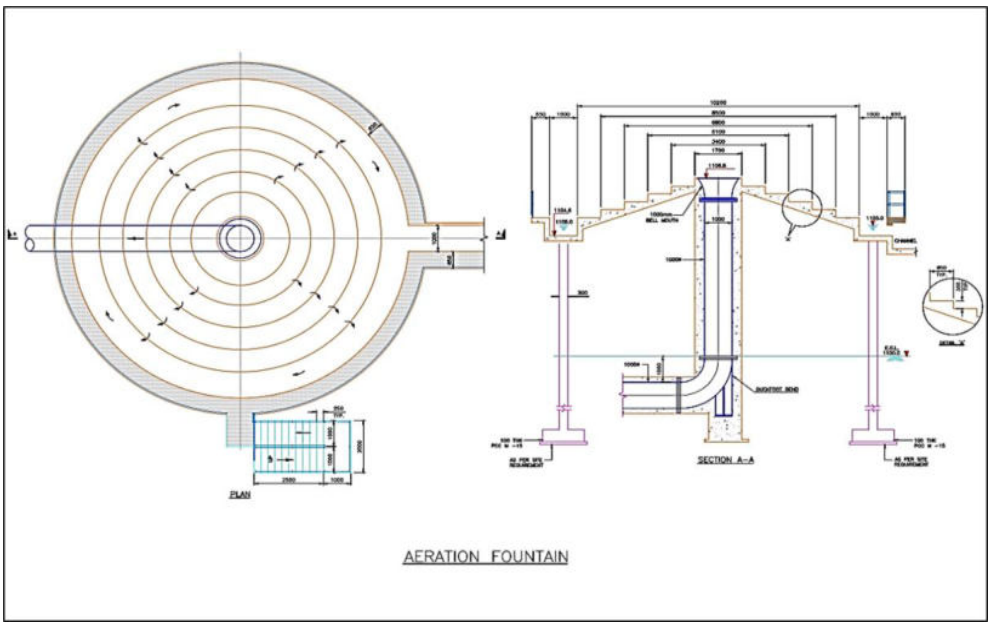


Table 4-15 Aerator design

b) Parshall Flume

A partial flume unit will measure discharge varying from 0.001 m^3/s to 100 m^3/s (for throat width 75 to 1 000 mm). The size of the channel shall comprise 12.50 m (W) x 0.6 m (SWD) x 0.76 m (FB) (Figure 4-13).

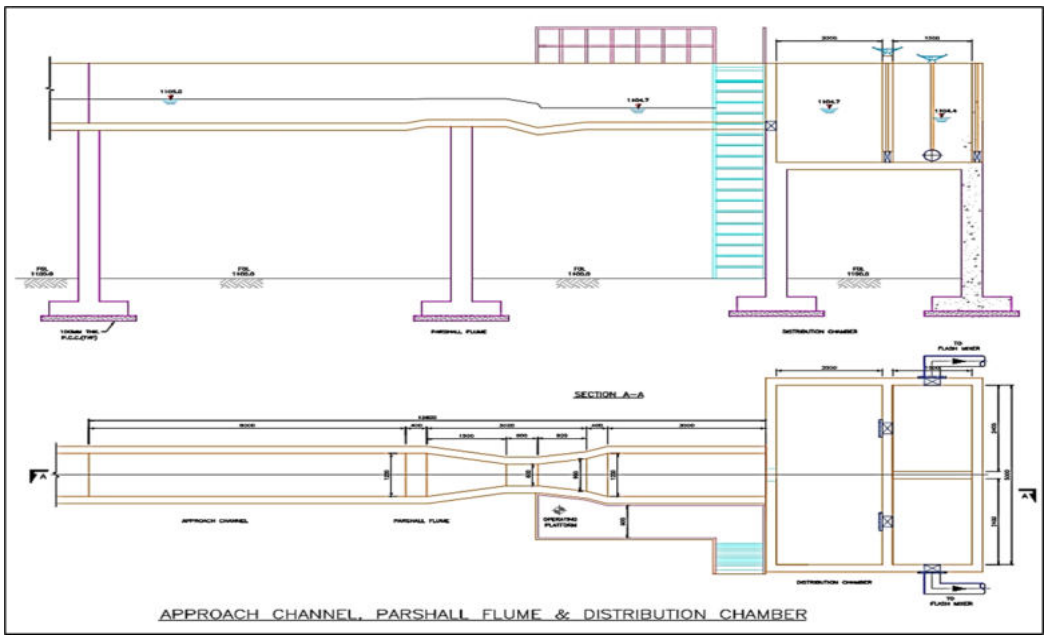


Table 4-16 Design of the partial flume

c) Flocculator unit

A single unit of size 3.0 m (diameter) x 3.0 m (LD) for rapid mixing is proposed with turbine type impellers (Figure 4-14).

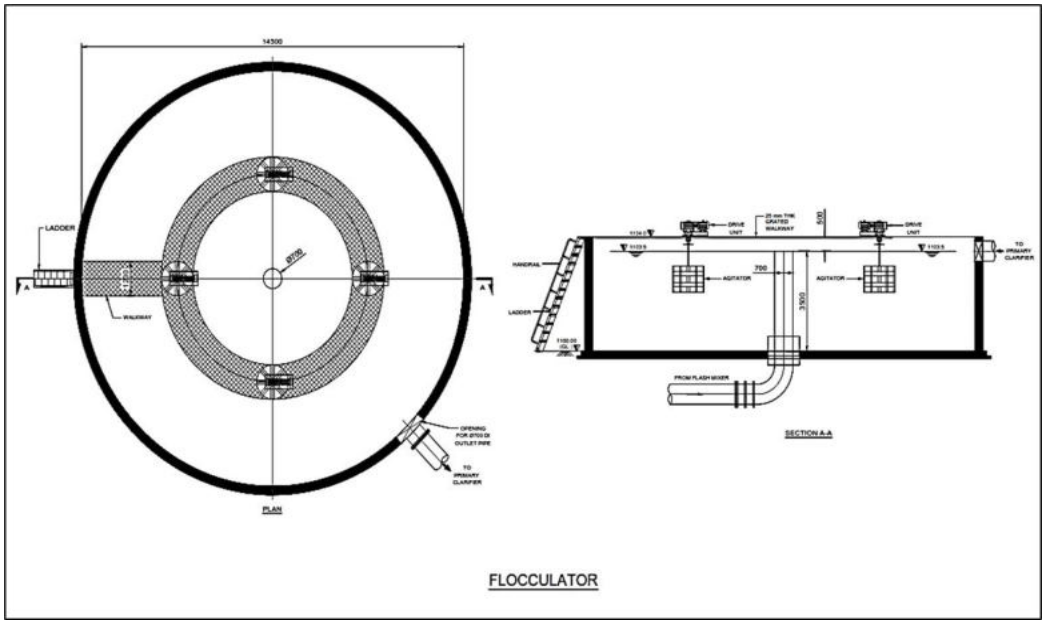


Table 4-17 Design of the Flocculator

d) Clarifiers

Four units of clarifier (Figure 4-15) are proposed of design total size of 24.0 m, x 3.0 m (SWD) x 0.5 m (FB).

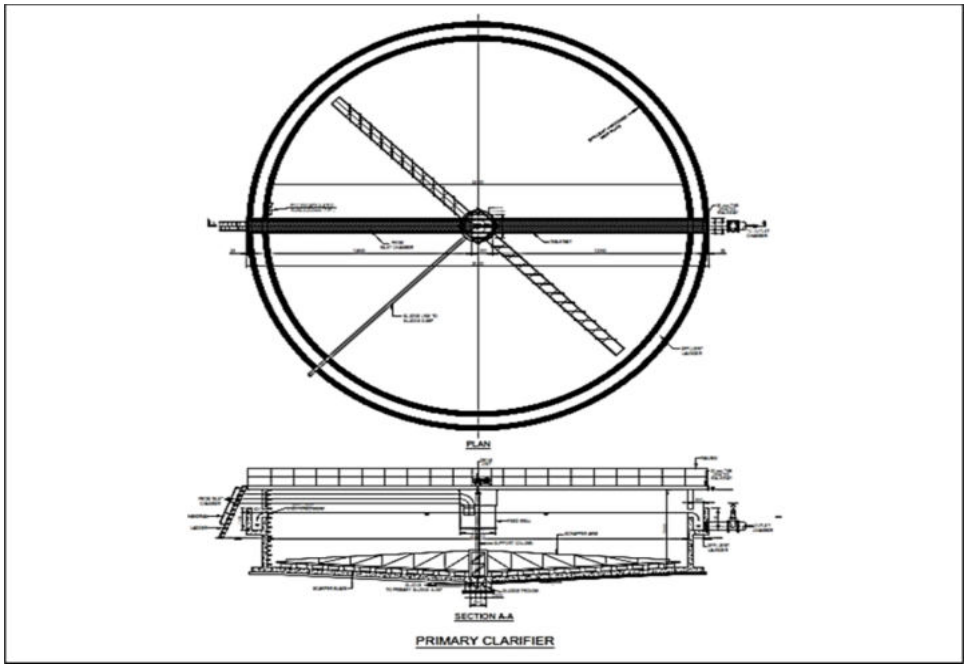


Table 4-18 Design of the clarifier

e) Filters

Rapid gravity sand filters system will be retained in the filtration system. This system will comprise 10 filter units of the size 8.0 m (L) x 6.0 m (W) x 3.6 m (D). The recommended sand sizes are 0.6 mm with filter depth of 0.5 m.

f) Chlorination Tank

A single chlorine contact tank (Figure 4-16) is proposed of the size 30 m (L) x 11.5 (W) x 4.0 m (SWD) x 0.5 m (FB), with detention time of 30 minutes.

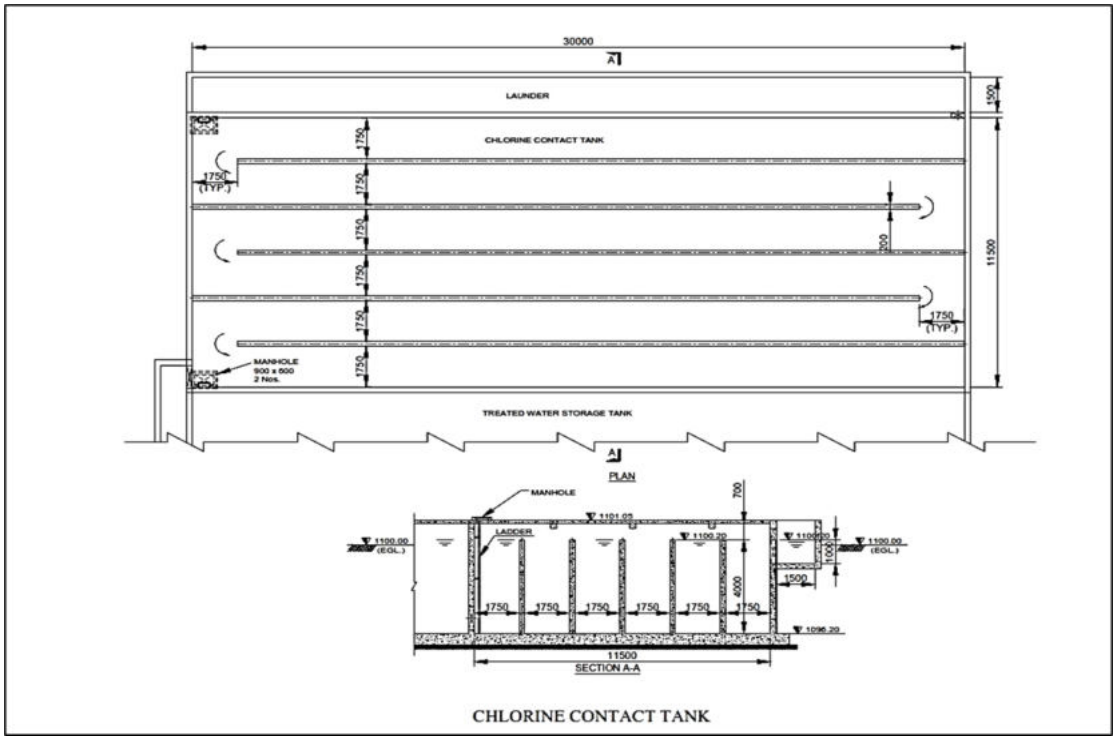


Table 4-19 Design for the chlorine contact tank

g) Treated Water Tank

A single unit treated water tank is envisaged of the size 42 m (L) x 30.0 m (W) x 4.0 (SWD) x 0.5 m (FB), with a detention time of 2 hours.

4.5.2.4 Sludge lagoons

To adequately handle the envisaged quantity of wet sludge, aligned with the operational design approach to current practice, four sludge lagoons are envisaged of the size 48 m x 48 m x 2.5 m. The location of these sludge lagoons is indicated in Figure 4-9. The total capacity of the lagoons will be 22, 240 m^3.

Construction works will involve minimal site clearance, bulk excavations, compaction, shaping of the lagoons and embankments, surfacing with concrete base and walls.

4.5.2.5 Other Structures and Support services

i. Power Supply

Since an 11-kV overhead power supply line is available for the existing OWW, the estimated power requirement for new WTP, Raw Water Pumping Station and Clear Water Pumping Station has been established at an additional 800 kVA to the 930 kVA of the existing structures. The design of onsite electrical supply infrastructure is premised on the existing incoming 3-phase 11kV, with outgoing feeders VCBs for transformers totalling five (i.e., 3 for the existing transformers of the existing WTP and 2 for the new WTP). This power supply is expected to be sourced from the town's power supplier.

ii. Reservoirs and distribution

Existing reservoirs will be utilised for storage of final treated water prior distribution to demand areas. The 50 000 m^3/day clear water will be independently pumped into the 75 000 m^3 and 13 500 m^3 reservoirs, with each consisting of 2 active-duty pumps and 1 standby, of power capacity 75 kW and 18.5 kW respectively.

iii. Site Access

Access routes will be constructed inside the premises to be able to connect various construction areas. An access gate is proposed on the eastern areas of the site (Figure 4-17).

iv. Accommodation facilities and Offices

Housing of workers onsite is not preferable, as the proposed project is in an urban environment where accommodation can be easily obtained for the construction workers. Accommodating workers onsite shall be considered a last resort in special circumstances. Should this be necessary as stipulated, a temporal accommodation is proposed for set up at the location marked in Figure 4-17.

The Proponent has indicated availability of office space to the Engineering Consultants (ECs) in the existing administration building facilities for the duration of the construction phase. It

proposed that temporal mobile offices are proposed for the contractor at demarcated areas (Figure 4-17). These shall comprise of moveable materials such as a container built of prefabricated material built-up on paved surfaces.

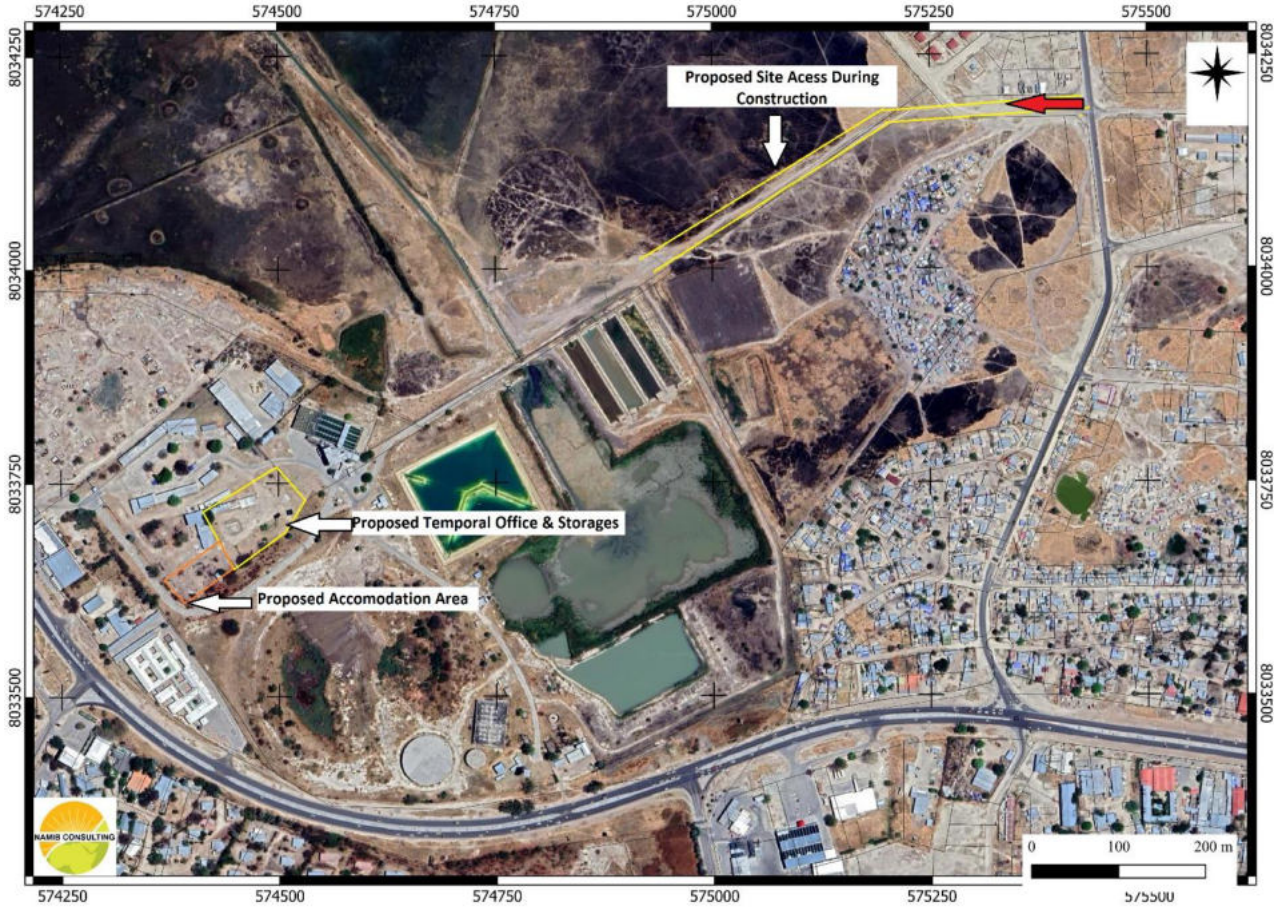


Table 4-20 Proposed Site Access, temporal storage and office space areas

v. Basic services and facilities

The presence of workers onsite requires that their welfare and wellbeing in relation to necessities be provided. These necessities include potable water, kitchen facilities for preparation of meals, and sanitation facilities. The following are recommended;

- Kitchen facility for meals preparations and rest areas
- Adequate mobile toilet facilities
- Potable water points

vi. Storages of construction materials

Storage for construction materials is envisaged to utilise existing yards within the premises. The Proponent will avail a storehouse/workshop building for storage of construction material that requires protection from certain weather conditions such as rain.

vii. Pipelines

A 900mm ductile pipeline will connect the raw water pump station to the new WTP, with a 800 mm connecting the plant to the 75 000 m^3 reservoir and a 400 mm pipe to the 13 500m^3 reservoir.

viii. Instrumentation

Instrumentation for the new WTP will be integrated with the existing WTP, for joint operations and monitoring as was recommended in the ToR.

4.5.3 Operation Phase

The commissioning of the completed waterworks will activate the operations as follows;

4.5.3.1 Raw water abstraction and treatment process

Raw water will be abstracted from the RWSD at the inlet structure through a ductile pipe of 900 mm diameter, conveying to the new WTP. Vertical turbine pumps are retained to abstract raw water (2 duty and 1 standby) of 90 kW power capacity. The raw water at the inlet of the WTP will undergo the following stages or treatment;

a) Pre-Treatment

At the inlet of the WTP, raw water will undergo pre-chlorination at the collection launder of the cascade aerator. This stage will serve to remove undesirable dissolved gases in water and to add oxygen to water to convert undesirable substances to more manageable form. The loading rate of the aerator is at recommended at 0.03 $m^3/h.m^2$.

A hypochlorite dosing system (Sodium/Calcium) will be used for pre-chlorination for the purpose of preventing algal growth in raw water, destruction of some taste/odour producing compounds, oxidation of iron, manganese, and hydrogen sulphide and aid coagulation. The recommended dosage is at 3ppm or based on chlorine demand of raw water.

A partial flume unit will measure discharge varying from 0.001 m^3/s to 100 m^3/s.

b) Rapid Mixing

This stage aims to generate a homogeneous mixture of raw water and coagulants resulting in the destabilization of the colloidal particles in the raw water to enable coagulation. Mixing will be facilitated by turbine type impellers. The recommended detention time is 60 seconds at normal flow and 45 seconds during overload conditions and gradient velocities of 300 – 600 per second.

c) Coagulation

The aim of this stage is to agglomerate particles that are too small for gravity settling so that they may be successfully removed during the sedimentation process. To facilitate the coagulation process, Aluminium Chloralhydrate dosing is retained as in the existing WTP process.

d) Flocculation

The flocculation step aims to gently stir and mix water and a coagulant to generate floc. This will be carried out in two units. The detention time is at 25 minutes and velocities gradient of 40 per second.

e) Sedimentation / Clarification

The removal of particulate matter will be accomplished in settling tanks also referred as clarifiers. The surface loading rate in the four units is envisaged at 30 $m^3/m^2.d$ and detention time of 2.0 hours. Under calm conditions, floc embedded suspended particles settle at the bottom and clear effluent overflows into the peripheral launder.

f) Filtration

Rapid gravity sand filters system is retained as in the existing WTP. These filters are effective for raw or coagulated waters with turbidity as high as 10 NTU and are approximately 90 percent efficient in the removal of applied bacteria. This system will comprise 10 filter units with the flow or filtration rate at 6.0 $m^3/m^2/hr$ with a backwash rate of 15 m/hr.

g) Chlorination/ Disinfection

Disinfection of potable water will be carried out by gas chlorination in a single chlorine contact tank with detention time of 30 minutes. Chlorinated final water will flow into the treated water tank with a detention time of 2 hours.

h) Final Treated Water storage

The final 50 000 m^3/day clear water is pumped into the 75 000 m^3 and 13 500 m^3 reservoirs, independently, with each route consisting of 2 active-duty pumps and 1 standby of power capacity 75 kW and 18.5 kW respectively. These existing reservoirs will be utilised for storage of final water prior distribution to various demand areas.

i) Sludge discharge and management

Water treatment sludge from the clarification and filtration stages will discharge via gravity feed to the new lagoons. These lagoons shall receive 10 % plant losses per day. Each sludge pond volume will be designed at 5 560 m^3 capacity, all totalling 22 240 m^3. The total sludge quantity expected from the new WTP is 2 338 m^3/day and will operate to accumulate to a depth of 0.6 m to the top of the active lagoon upon which discharge is into the active second lagoon.

Wet sludge consists approximately 9% solid matter, and thus the ponds are designed to allow decanting of the supernatant (liquid) that returns to the RWSD, and further forms part of the raw water abstracted for treatment. Moreover, the discharged sludge is exposed at surface to the sunny conditions for evaporation processes. These processes are further complemented by percolation of the base of the pond, where collected liquid is removed and retained to the RWSD. These processes allow continued effective operation of the lagoons over time without instant filling up, overflowing or use of successive second active lagoon.

Over successive receiving of sludge and outflows of the supernatant, a lagoon will accumulate residue sludge and thus filling up. Once the first lagoon is filled to 0.6m of freeboard to surface, the filled-up ponds is allowed to dry. Duration time to dry relies primarily on weather conditions such that this is enhanced in summer conditions that winter. Thickened dry sludge is dislodged from the lagoon for disposal. with loading range from 50 to 100 kg/m^2 per year.

j) Plant maintenance

It is expected that continual operation of the plant will require continual maintenance of the waterworks infrastructure. This will include activities such as;

i. Backwashing to remove accumulated residues and ensure efficiency of the treatment process.
ii. Carry out repairs and replacement to the WTP and pump stations that may be structural, mechanical or electrical/electronics.
iii. Continual maintenance of the raw water storage dam to enhance efficiency in securing of storage of raw water for supply to the plant. Such will include removal of silt from the bottom of the dam and removal of invading vegetation.

k) Water quality monitoring

Monitoring of water quality will be carried out through sampling for laboratory testing of raw water, throughout the various stages of treatment process and final water. An online monitoring of quality parameters will be carried out to facilitate timely response to deviations if such occurs. This will aim to ensure quality assurance and compliance to the draft water quality standards of the WRM Act (2013), whilst at minimum meet the presiding water quality guidelines of the Water Act (1956).

4.5.4 Decommission Phase

The proposed new WTP is designed with a lifespan to serve a for 30 years, upon which it may require refurbishment to extend its lifespan or where in the absence, the need for continued operation may become obsolete requiring decommission. This will apply to the associated support structure such as pump stations, pipe or power lines, and dams for raw water or sludge.

The decommission approach adopted will aim to achieve two-fold objectives;

- Objective 1: Seek alternative use for the built-up obsolete structures
- Objective 2: Return the land to pre-construction conditions.

The two objectives are described below in further details.

4.5.4.1 Seek alternative uses for dormant structures

In terms of any structures of the waterworks developed through the proposed project, consideration of alternatives uses is a priority prior engaging rehabilitation and decommission works. This approach shall seek to engage a process to evaluate potential opportunities for reuse of the redundant structure. Involvement of stakeholders in the process shall form basis for a consensus decision of the use of such structure for alternative uses and any prerequisites for such uses.

4.5.4.2 Site rehabilitation

In the absence of opportunities for alternative uses, it shall be required that all structures that had come to exist for the proposed project are removed from site towards a reversal to pre-construction conditions. This process will involve a series of the following activities;

a) Appointment of a contractor for the rehabilitation works
b) All sites for removal of structures to be condoned off.
c) Dismantling and removal of movable components of the WTP, pump or flow feed stations including mechanical, electrical and electronics equipment.
d) Demolition and crushing of all concrete works including walls, floors, and columns and potential removal of steel.
e) Crushing, loading, and hauling of all rubble concrete offsite for disposal at disposal site. Area cleanup of any waste
f) Landscaping, shaping and loosening of surfaces.

4.6 Human and Financial Resource Requirements

4.6.1 Human Resources Requirements

The human resources requirements for the extended waterworks rests on the capacity of the existing OWWs. It is recognized that additional capacity will be required, to complement the existing capacity. Additional human resource requirements have been recommended in Table 4-4 to complement the existing capacity of the NamWater Cuvelai Office.

Table 4-21 Additional human resource requirements

System Component as per Flow Line (Sr.no)	Category of staff	Pump House	Raw Water Rising Main	Treatment Works and Clear Water Pump	Clear Water Rising Main	Sludge Line and Sludge Lagoons
1	Superintendent Manager (A.E.E.)	-	-	1	-	-
2	Supervisor/ Asst. manager (A.E.)	-	-	1	-	-
3	Assistant supervisor/ junior manager	-	-	1	-	-
4	Operators	7*	-	7*	-	-
5	Helpers/Fitters	3	1	3	1	1
6	Electrician / Mechanics	-	-	1 Electrician+2 Mechanics	-	-
7	Watchman	1		3		

**Based on one operator per shift and one additional to cover leave.*

4.6.2 Financial Resource Requirements

The cost of the proposed development project has been estimated to include both capital and operation and maintenance costs. Table 4-5 below outlines the cost implication for the proposed development.

Table 4-22 Summary of Costs associated with the proposed development

Components	Costs (N$ 'Million)
Pumping Main	17.33
Civil Works	346.98
Mechanical Works	18.57
Electrical Works	43.79
Water Treatment Plant	95.14
Other Costs (chemicals etc.)	5.23
Net Project Costs	**527.04**
Contingencies (15%)	79.06
VAT Taxes (15%)	90.91
Gross Project Costs	**697.01**

Chapter 5

5. Project Alternatives

5.1 Introduction

In alignment with national legislation (i.e., EMA Act, No. 7 of 2007) and AfDB's operational safeguards, it is required that alternatives to the proposed project concept or its activities are identified and evaluated.

This evaluation shall consider feasibility, reasonability, and further outline advantages and disadvantages the proposed activity or alternatives have on the environment, communities and derivable. The following alternatives were identified and evaluated to the proposed project concept or its activities;

- Alternative water source to supply the north central areas of Namibia
- Alternative sites (i.e., location of entire proposed project or certain structures)
- Alternative design or layout of the project
- No go alternative
- Go-ahead alternative

5.2 Alternative Water Source

Two conventional water sources are common in Namibia: surface and groundwater. The potential of unconventional sources has become recognizable in recent years and therefore cannot be overlooked in the water supply conundrum. These potential sources are described in detail and evaluated in subsequent sections.

5.2.1 River systems

5.2.1.1 Ephemeral systems

The interior part of Namibia is characterised of ephemeral rivers. Flows in these rivers are restricted to the wet season of the year, but also erratic due to the arid nature of the climate. Present utilization of interior rivers as a water source is reliant on built-up impounding structures that captures wet season flows to provide supply through the longer drier season of the year. Meanwhile, impounded sources are highly vulnerable to recurrent drought conditions and high evaporation rates and thus presents further risks as a long-term water supply source, requiring complementary alternatives.

The north central regions receive surface flows, much from the upper reaches of the Cuvelai system in Angola and minimally from local precipitation. The frequency and volumes of flows are erratic although high flow events are problematic due to the undulating nature of the landscape causing widespread flooding. Harvesting these flows has been widely piloted as flood mitigation but also source of water for other purposes such as livestock drinking. The construction of earth dams increased in recent years to serve this purpose. However, feasibility of this alternative is limited due to the erratic nature of the flows and vulnerability to factors such as evaporation and thus not sustainable over long-term to meet growing demand.

5.2.1.2 Perennial systems

Namibia has access to perennial river systems; however, these are located on the peripheries of the country's borders and shared with neighbouring States. Nevertheless, where these perennial rivers are accessible, they provide a secure source of water supply for associated demand requirements. It is further worth noting that these are subject to international protocols on usage of a shared resource and subsequent agreements. The proposed development falls within this alternative from a perennial river, thus for this reason, this alternative is not described and evaluated further.

5.2.2 Groundwater systems

Groundwater is a critical resource to the vast interior of the Namibian landscape. Several urban and vast rural areas tap groundwater sources for various purposes. The potential of groundwater sources varies across the country subject to the geological characteristics and thus the quantity and quality to supply. Moreover, climatic characteristics has implication on sustainability of this water source.

The limitation of groundwater to secure long-term supply of potable water to the north central regions lays on potential location of high yielding aquifers. The Oshakati and much of surrounding regions are on the margins of the generally low to moderate groundwater potential, and the former more prominent. This therefore outlines that it is infeasible to source water envisaged to supply high demand from groundwater of the area. Further to the limited potential, the water quality in the area is known to be unsuitable for domestic usage.

The potential to secure and supply water to the north central regions comes from the recently discovered high yielding Ohangwena Aquifer II. This aquifer is described to hold significant quantities of water to sustain supply over the long term; however, this source is part of the water supply solution to the growing demand in the north central regions. This source cannot be considered an alternative to this proposed project, but a complementary source. It is therefore evident that there are no other known high yielding aquifers that may be considered an alternative to the present proposed development in the longer term.

5.2.3 Unconventional water supply

The potential of unconventional water sources in contemporary water supply conundrums is recognized, with two alternatives become prominent in Namibia. These unconventional sources become attractive as more, and more of conventional sources become stretched to their maximum potential. Moreover, supply from these sources supports the global sustainability agenda.

The most prominent unconventional sources include recycling and reuse, and desalination. In the northern areas of the country, there is minimal prior research vested into their feasibility. While previous small-scale desalination of groundwater in northern Namibian was piloted, this alternative is infeasible to sustain growing demand of the north central regions although may serve localised needs if developed.

On the other hand, feasibility to develop and replicate wastewater reclamation from the central areas of the country into the north central regions is unexplored. The Oshakati Town Council (OTC) has indicated future intent to carry out recycling and potential reclamation of generated wastewater. While this has potential to provide an opportunity, the feasibility of this plan to supply water to growing demand can only be considered in the long term than immediate needs that this proposed development envisages to meet.

Resolution of feasible alternative	*There is no other feasible alternative to secure water for the north central areas besides harnessing the existing perennial supply from the Kunene River through existing infrastructure to the OWWs.*

5.3 Alternative Locations of Structures

This alternative explores if there are alternative sites for locating the entire proposed development or components of the proposed project development.

5.3.1 Alternate Siting of the Entire Project

The underscoring principle of the proposed development is to extend the existing capacity of the OWWs, thus largely benefiting from use of existing infrastructure. Specification of the ToR spell that the new WTP hinges on replicating the existing WTP in quality of water produced however with increased capacity. The following factors underscore the proposed project concept and locating in proximity to the existing WTP;

a) The existing premises provided ample space that can be utilised for the extensions works. Locating the extensions within the premises enhance utilization of the available space within the premises.
b) Use of existing pipelines in the distribution of final treated water from the new WTP. This entails that no new extensive distribution network need be constructed except minimal connections within the existing premises.
c) Connecting and use of the existing power supply point to accommodate extended infrastructure. The new WTP will benefit from the existing power supply point within the existing premises and thus does not require construction of new power supply lines except minimal extension works onsite.
d) Integrate bulk storages of water treatment chemicals used in both WTP's. It is envisaged that no new chemical storehouse needs to be constructed as the existing storage provides adequate space to house the extended quantities of chemicals needed for operation of the new WTP.
e) Use of existing office building for administration purposes of both WTP's. The existing administration buildings are adequate to serve the operations of the two plants.
f) Use of existing workshops for extended operations. The existing workshops can accommodate requirements for the existing plant and the new WTP.
g) Connecting of the access roads within the exiting premises to that accessing various locations of the new infrastructure. There will is less needed to construct new access roads to the new WTP except minimal linkage within the existing premises.

h) Lessen requirements for a full staff complement to operate the new WTP. The location next to the existing plant lessens the need for an entirely full new operational structure for the new plant but merely complement the existing structure.

i) Enable ease of integrated instrumentation and automation for both plants.

Resolution of feasible alternative	*Cognizant of the underlining principle, locating the project away from the existing premises defeats the project development concept and thus the primary component (the WTP) of new development is required closely linked to the existing infrastructure.*

5.3.2 Satellite Location of Components of the OWPPEP

Locating the proposed project next to the existing plant serves the principle for the proposed project concept development. This alternative examines the potential location of some components of the project away from the existing project.

5.3.2.1 Alternate site for the new WTP

It has been emphasised that the proposed project development concept is aimed at enhancing the current capacity of the OWWs and thus a requirement to locate the WTP in proximity to the existing plant, as they both will serve a single purpose. Locating the new WTP away defeats the proposed project development concept and may have immense implications on required project financial investment.

It is further emphasised that the existing premises provides adequate space for locating the new WTP and given other derivable benefits from this location, it is a priority that the existing premises are utilized to full potential prior consideration for a new location elsewhere.

Resolution of feasible alternative	*Locating of the new WTP in current premises serves the proposed development concept and further will ensure utilization of the current premises to full potential, which comprise waterwork footprint*

5.3.2.2 Alternative site for pump stations

The pump stations and associated pipe works serves to connect the new WTP to the raw water source and distribution structures of the final treated water. These structures are not independent of main structures such as the WTP or RWSD that they may be located away. Ultimately, pump stations can only be located where the main structures such as raw water storage and the new WTP are located.

5.3.2.3 Alternatives to Onsite Raw Water Storages

Under this alternative, the planning and design phase proposed and considered options towards securing adequate raw water supply for the overall new throughput requirements. The following options were considered;

a) Evaluation of the existing fore dam (i.e., RWSD)

The existing RWSD remained a priority to securing water for the overall throughput requirements of the extended treatment capacity. An assessment of the capacity of the existing RWSD (referred in Section 4.4.1.1) established that over the required critical security of supply (i.e., a two-week period of operation without the canal supply), the dam serves a mere maximum of 1.5 days. Thus, it is evident, the need for consideration of options to expand security of onsite storage.

b) Refurbishment and extension of the existing RWSD

The existing fore dam is affected by two factors; siltation and invading vegetation reducing its potential capacity to secure more volumes for the existing and extended waterworks. Although there are continuous onsite efforts on removal of accumulated silt and vegetation, these seem less significant in managing these issues. Therefore, it is further proposed to refurbish the existing dam through extensive removal of accumulated silt but also deepening the dam to its established design depth (i.e., 3m) reduced to an average of 2.15 m (Annexure B). These refurbishments are envisaged to extend the supply by another 1.5 day of secure raw water storage and supply. Relative to the required 1.5 m^3 million required for 14 days of canal redundancy for maintenance, the extensions will reduce this requirement to 1.1 m^3 million.

In addition to refurbishment, the existing RWSD is proposed for expansion in areas marked (Figure 4-9) to achieve an additional 3 to 4 days of secure supply of the throughput requirements. These additional works are envisaged to further secure an additional 432 000m^3 to the 324 000m^3 and thus a total security of 756 000m^3. While there remains inadequate capacity to secure supply of raw water over the entire critical period of operations, the 7 days security has been proposed as reasonable guaranteeing safety of operations in the immediate for the development. The need for security of the additional 7 days raw water security remains a requirement to meet sustainable operations of the proposed two WTPs.

c) Development of a new RWSD

To secure raw water for the critical operation period of the year, there remains a need for development of a new raw water storage dam. The Local Authority (i.e., OTC) availed an adjacent area referred as Portion A of farm Oshakati town and townlands shown in Figure 4-2. This portion comprise 71.55 hectares of land. This area is a wetland or locally referred an *Oshana*. The area receives flood water that discharges from the northern highlands of Angola and flows through the network of drainages pathways towards the Etosha pan as the lowest point of the system. Moreover, this Oshana is bordered by settlements of Oshoopala in the north, Ehenye in the east and town market to the west and Oneshila to the southeast.

The planning and design phase considered several options for siting a new RWSD on the land availed by the Town Council. Feasible alternatives for consideration and to take through the stakeholder consultations process were limited to those provided in Table 5-1 below, while their outlook is included to this report as Annexure F.

Table 5-1 Review of designs options for a new RWSD

Parameter considered	**Alternative 1**	**Alternative 3**
Land Availability	Available	Available
Land description	Wetland with susceptibility to annual flooding (i.e., Inside the flood lines)	Wetland with susceptibility to annual flooding (i.e., Inside the flood lines)
Required development area	38.1 of 71.55 hectares	22.5 of 71.55 hectares
Environmental sensitivity	The area serves ecosystem services such as; - storm water capturing - high floods routing - ecological role in hosting fishery and other small organisms during wet season - vegetation as microhabitats - Wetland area is however not pristine	The area serves ecosystem services such as; - storm water capturing - high floods routing - ecological role in hosting fishery and other small organisms during the wet season - vegetation as microhabitats - Wetland area is however not pristine

Social and environmental implication from development	- Engulfs portion of Oshoopala settlement and thus potential need for relocation and resettlement - Impedes the drainage of the channel feeding the Oshana - High potential to induce intense flooding	- Averts relocation of any portion of adjacent settlement. - Minimally interferers with flow of the channel feeding the Oshana - Potential of flooding not imminent to normal events.
Public opinion and concerns during consultations	Not preferable for development	Preferable for development with mitigation of flooding
Results from flood modelling and potential mitigation study (Annexure A)	Intensity of flooding very high due to proposed design and likely to cause structural and extensive social and economic concerns and losses.	Low intensity or normal flood events are mitigable; however, there suggested mitigation cannot manage rare events of 1:50 and 1:100 years. Potential mitigation measures would be expansive and costly to the proposed development
Implication on existing Oshakati Flood master plan mitigation measures of the OTC	Significantly distorts the Oshakati flood masterplan	Limited distortion to some areas of the Oshakati flood master plan.
Evaluation of options	Infeasible	Feasible however subject to intense and costly mitigation. Moreover, with mitigation, flood event of 1:50 and 1:100 year remains unmitigable.

Resolution of feasible alternative	***i.*** *Implementation of alternative (b) focusing* ***on the refurbishment and expansion of the existing RWSD is recommended*** *as interim security measure of onsite raw water storage and supply.* ***ii.*** *The development of a new RWSD on land availed by the OTC is not recommended but re-engagement with the local authority to seek an alternate site.* ***The development of the new RWSD at another location is not included in this scope.***

5.4 Sludge Disposal Alternatives

There are emerging concerns on handling and disposal of water treatment sludge across various parts of the world. Research by the Water Research Commission (2017) of South Africa relays that the Department of Water Affairs and Forestry of Namibia compiled guidelines for the disposal of solids from water and wastewater treatment processes in 2012; however, such has not been regularly updated. Moreover, these guidelines are not widely known. Nonetheless, appropriate management of sludge from water treatment facilities is required across the world similar to wastewater systems. A lack of guidelines does not preclude obligations to ensure management of sludge to avert any concerns on public health and the environment.

The composition of water treatment residues depends on the raw water quality and the treatment process. In a conventional process such as that utilised for the existing WTP and as proposed for the new WTP, the WRC outlines the following compositions generally expected in tests conducted, associated potential impacts and severity where there are potential receptors.

Table 5-2 Content description of water treatment sludge residues

Parameter of interest	Description of compositions (WRC, 2017)	Associated Environmental Effects	Evaluation of Relativity to Expected Sludge
pH	Tests done by Titshall and Hughes (2005) found that the pH of sludge were neutral to alkaline (i.e. a pH range of 6 to 9), mainly in South African WTPs.	Significant difference in pH to the environment can have detrimental effects on the surrounding environment. Inversely, such has potential to improve problematic soils.	The chemicals used for improving raw water such as lime and caustic soda are likely to lead to alkaline type of sludge. This has potential for reuse to improve acidic soils or contaminated sites affected by industrial activities.
Trace metals	Heavy metal concentrations in sludge are generally lower than in sewage sludge. Large quantities of Iron and Aluminium hydrous oxides that may be found are also known to fix phosphorus in	Metals are potentially toxic to phytoplankton, zooplankton, and higher aquatic life (both plants and animals).	The application of aluminium chloralhydrate is likely to produce aluminium hydrous oxides. This is considered beneficial in immobilising nutrients such as phosphorus and thus

	soils, which are required by plant life for growth.		alleviate accumulation in wetland areas and cause problems of eutrophication.
Nutrients	The four most important nutrients in WTR are phosphorus, nitrogen, potassium, and sulphur, which are all essential elements	Increased migration into water bodies can likely lead to eutrophication.	The use of potassium permanganate will lead to the presence of potassium, which are essential elements, among other essential elements required by plants.
Organics	The organic carbon content of the sludge normally ranges from 0.5 to 16.7%.	These compounds are not removed in their concentrations in the water treatment process as they are low to negligible. These a assimilated in nature and thus have minimal impacts on the environment	Highly likely due to the treatment of raw water content such as algae and further from the backwashing of filters.

In light of the above evaluation (Table 5-2), the following alternatives to sludge management were considered as further outlined by the WRC;

5.4.1 Onsite and offsite Disposal

The alternative is widely favoured in South Africa, due to prevailing climate and availability of land. This practice involves keeping sludge onsite in lagoons until such time that it is acceptably dry for removal and disposal either onsite or offsite. This alternative requires that sludge lagoons are designed of impermeable bases and walls to prevent leaching to the subsurface until dry residues are removed for disposal.

Offsite disposal may involve a dedicated site or at an existing landfill site. While there may be some concerns of dedicated sites, proper site selection and preparation could alleviate such concerns.

As in neighbouring South Africa, this alternative is advantageous to Namibia due to several factors among them; climate, potential land availability and further low costs required for

operation and maintenance. While there are no guidelines for site selection in Namibia, the Minimum Requirements for Waste Disposal by Landfill Guidelines (1998) developed by the Department of Water Affairs and Forestry (South Africa) can be utilised to classify dry residue and subsequent site selection for disposal. Therefore, with proper siting of a dedicated site, or consent to deposit and dispose at the landfill site of the local authority, onsite-offsite disposal is the most feasible alternative for the proposed development project.

5.4.2 Disposal in Sewer Systems

Disposal of sludge in a wastewater drainage system is described as economically workable; however, it transfers treatment costs to wastewater treatment plant operators. It is therefore necessary that an agreement between the stakeholders is reached for workability of this alternative. However, a prominent concern and drawback is that many wastewater systems of many of African urban centres are already stretched due to increased domestic wastewater flows and thus this alternative will further overload such facilities and more so may not be equipped to handle the composition.

Due to associated pressures and inadequacies of treatment facilities, this alternative is infeasible to the proposed project.

5.4.3 Disposal to a Watercourse

Disposal of sludge directly into watercourses is not considered among best or sound environmental management practices and thus there are minimal cases to draw upon on the detailed implications. Moreover, as outlined in Table 5-2 above, risks to aquatic organisms are enhanced through such disposals. Due to the outlined drawback, this alternative is not considered feasible and sound environmental management practice.

5.4.4 Alternative uses of sludge

The National Waste Management Strategy developed by the MEFT provides a guiding approach to managing solids waste. While this strategy targets handling waste management activities of local authorities, it further provides a guide broadly to overall solid waste management in the country. Waste disposal is the least preferred alternative in the integrated waste management hierarchy, overlain by to avoid, minimise, and potentially reuse and recover.

While the higher order measures (avoid and minimise) may be challenging to achieve, recycling and reuse provide feasible measures that may achieve the former. Around the world, research has gone into uses of dry sludge in alternative ways. Studies in the UK concluded that such alternatives are feasible (WRC, 2017). These alternatives include brick making or cement production. Moreover, land applications further provide another option.

5.4.4.1 Reuse in cement and brick making

Several factors may determine feasibility such as meeting specifications for use in products such as bricks or cement due to required characteristic of the product such as strength. Moreover, it is further unknown if there exists desirability for any industry to re-use this material. There remain gaps of regulations in such uses and thus piloting of this alternative can provide a good understanding of the feasibility.

5.4.4.2 Land application of sludge

Land application of dry sludge to soils include that for agricultural use, land reclamation, and application to landfill sites.

a) *In agriculture* - lime contained in such residue can elevate pH for acidic soils, increase porosity for better drainage. Aluminium coagulant residues improve soils physical characteristics however may inhibits plant growth by adsorbing phosphorus.
b) *In land reclamation* - the application can help with maintenance of pH at 6.5, disabling the uptake of metals in plants. Moreover, aluminium coagulant can prevent runoff of phosphorus into water bodies.
c) *Land filing sites* - the dry residue can be mixed with topsoil and used as landfill cover material. The mixing creates a clayish material suitable for this intended purpose.

This alternative does not serve to provide a solution to handling of dry sludge, however, can be a complementary measure to long-term management of sludge in alignment with waste management hierarchy of the Waste Management Strategy.

Resolution of feasible alternative	*The **onsite and offsite disposal approach is the recommended** approach for management of the water treatment sludge. Sludge from the treatment plant is discharged and retained/stored in sludge ponds for a duration to dryness.*

	Dry sludge will be removed from the ponds and disposed at a dedicated site. Potential reuse though land application at landfill sites or where available contaminated sites and pilot reuse are recommended as complementary measures to align with the waste management hierarchy of the waste management strategy.

5.5 Project No-Go Alternative

The no-go alternative implies that the proposed development to extend the OWW is foregone for the *status quo*. Foregoing the proposed project has several implications that can be disadvantageous and however may provide advantages. The following are some implications of a foregone opportunity to proceed with the proposed project;

- Growing demand for water for social and economic activities in the north central areas of the Namibia is unmet in the immediate and long-term future.
- Access to potable water in remotest area of benefiting regions of Oshana, Ohangwena and Oshikoto remains an ongoing challenge affecting social systems.
- The national development goals to improve sanitation services in both rural and urban areas are undermined.
- Increased poverty levels due to lack of access to potable water
- Potential conflicts due to limited water resources.
- Forgone financial investment opportunity in the present that may not be recoverable.

The advantages of forgoing the proposed project are as follows;

- The areas envisaged for siting envisaged structures for the proposed development remain undeveloped and serve present purpose that included shorter routes for adjacent communities to the central business district.
- No interference to storm water holding areas for the settlements in proximity

Decision of feasible alternative	*The no-go alternative offers minimal benefits in terms of social and economic outcomes and therefore can be termed **not viable** and regressive in the sustainable development spectrum.*

5.6 Project "Go-ahead" Alternative

The go-ahead alternative means implementation of the proposed project within the scope of provisions and recommendation that have been made to consider various aspects. The

advantages of implementing the project are numerous socially, economically, and marginally environmental. The proposed project will provide water for domestic use and other uses such as livestock leading to improved livelihoods in remote where infrastructure could be extended. This is highly beneficial at simultaneously reducing poverty, and thus contribute to the developmental agenda of Vision 2030 and subsequent medium-term developmental plans. Once implemented, this enhances the Proponents mandate to offer a higher standard of service in potable water supply.

Decision of feasible alternative	*The go-ahead alternative is the **preferable alternative** in line with application of sustainable development approach to the proposed project.*

Chapter 6

6. Biophysical and Socio-Economic Environment

6.1 Climate

At continental scale, the Oshana region falls within the tropical climate zone; characterized by summer rainfall, great variance in temperature and prone to droughts and very high evaporation rates. Mendelson et al (2000) thoroughly describes the climate of north central Namibia as semi-arid.

6.1.1 Temperatures, Relative Humidity and Precipitation

The average temperature of Oshakati ranges from a high of 36 degrees Celsius in October, the hottest month of the year, and declines to a minimum of just above 10 degrees Celsius in winter (Figure 6-1). The temperature trend over the entire year directly translates to the characteristic relative humidity that starts to rise from October through to April (Figure 6-2). Therefore, the region is characterized by summer rainfall that begins in October to April coinciding as months of higher humidity. Described as semi-arid and tropical translates that rainfall is highly variable from one year to another. The Oshakati area falls within the rainfall range of 400 to 600 mm per annum (Figure 6-4).

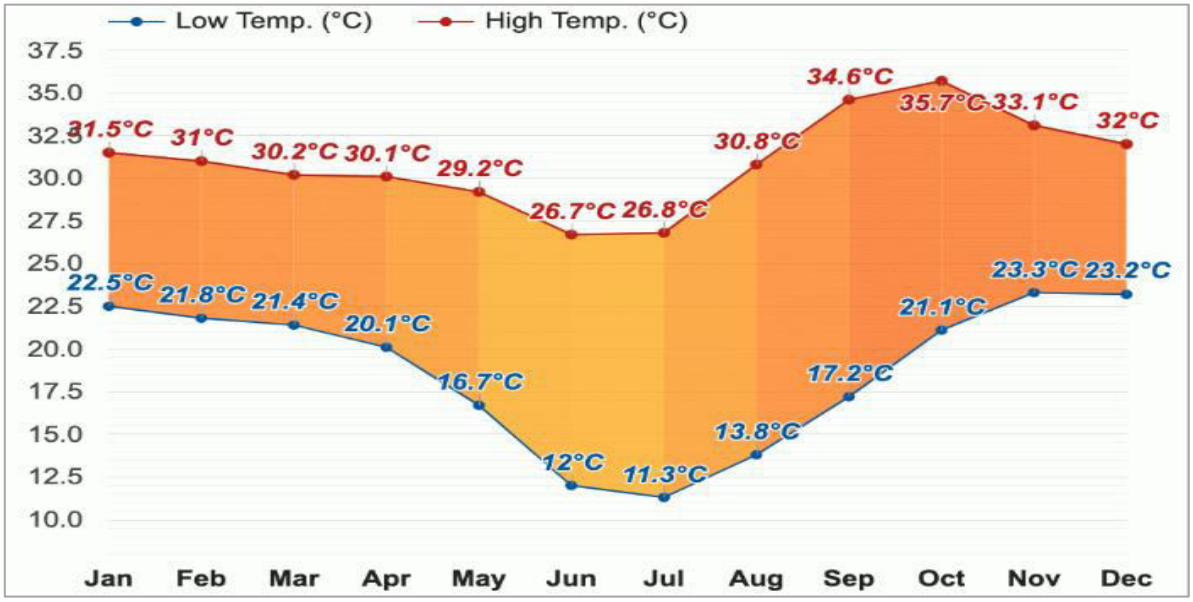


Table 6-1 Average temperature for Oshakati

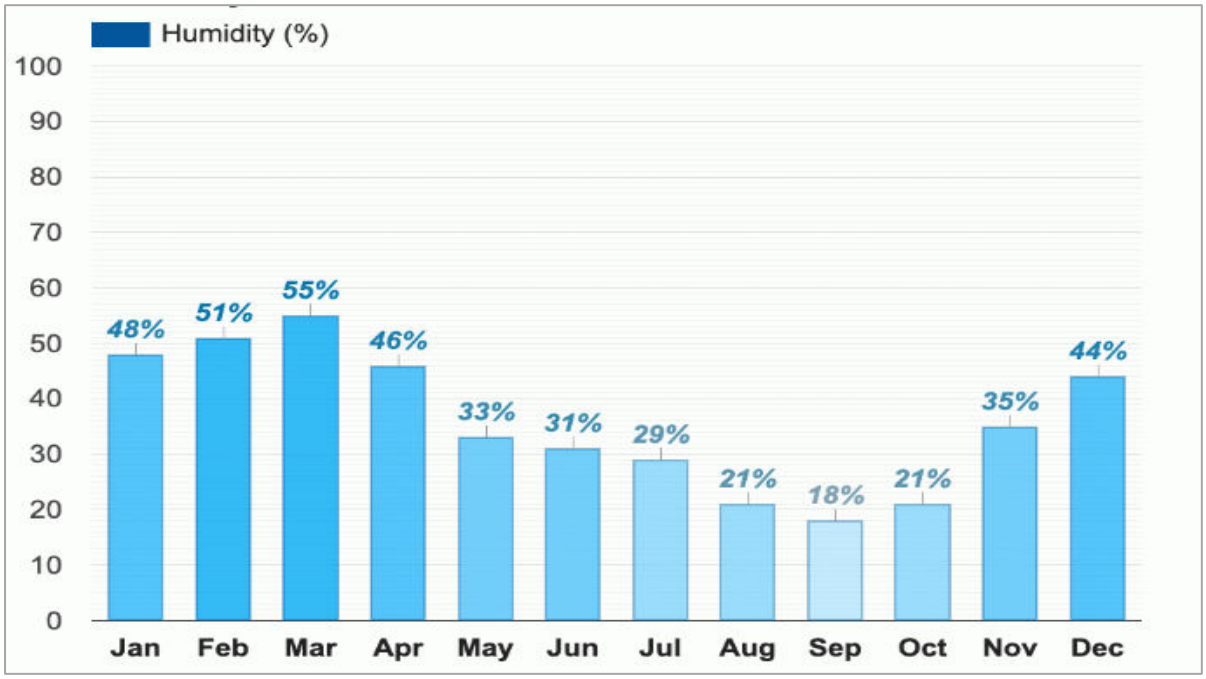


Table 6-2 Average annual humidity for Oshakati

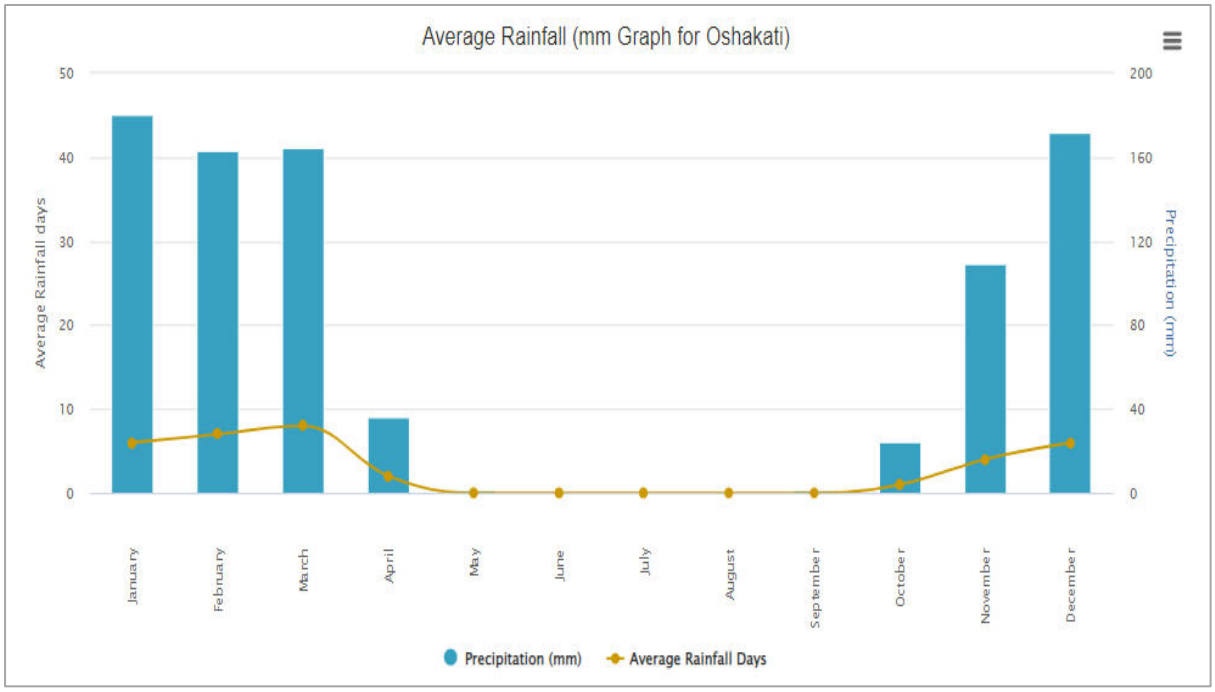


Table 6-3 Average rainfall pattern for Oshakati

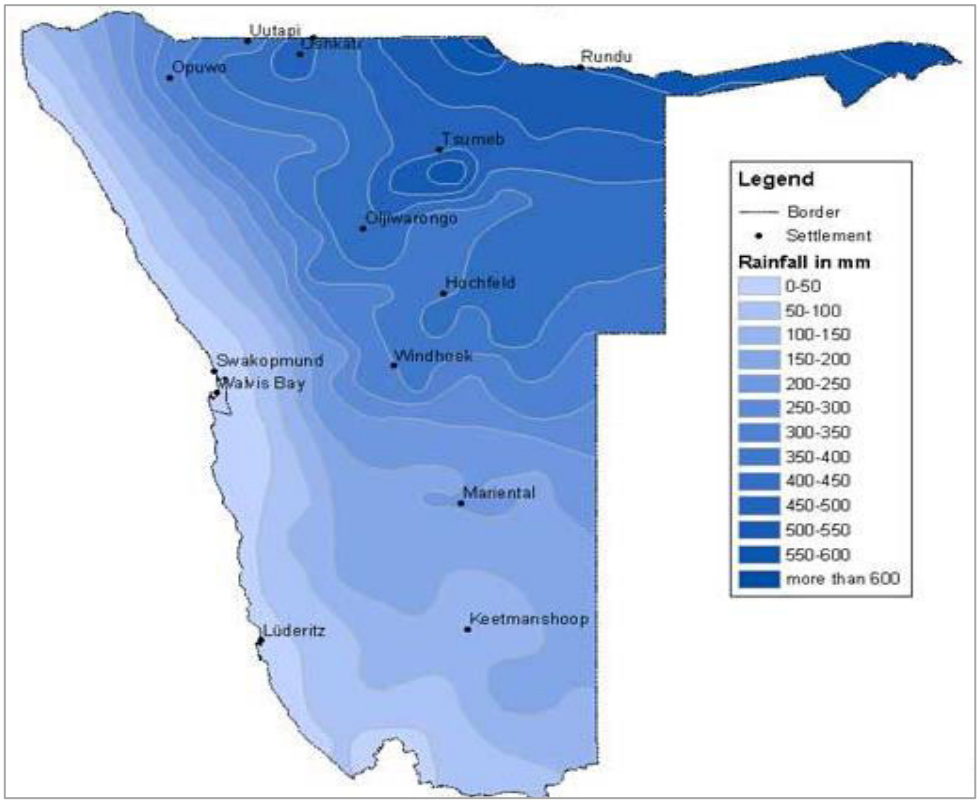


Table 6-4 Annual average rainfall for Namibia

6.1.2 Wind Speed and Direction

Dominant winds for the area of Oshakati are north-easterly and easterly (Figure 6-5). Wind speeds may reach up to 13km/h of which months with the highest are from July to September.

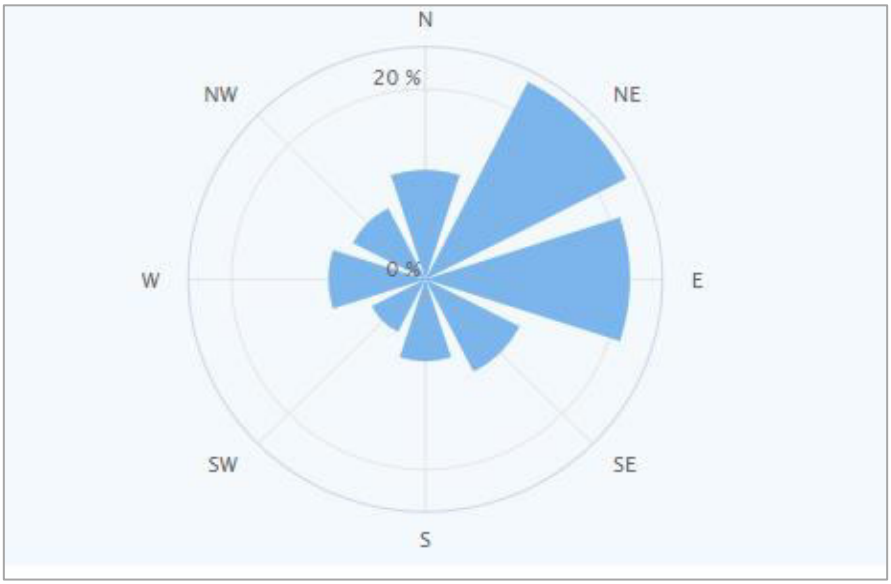


Table 6-5 Wind direction and speed for Oshakati

6.2 Geology and Soils

6.2.1 Geology

The project area is within the Cuvelai-Etosha basin, a part of the larger sedimentary rocks of the Kalahari basin that extends Angola, Botswana and Namibia (Christelis and Struckmeir, 2011). These sedimentary rocks comprise mainly sand, gravel and calcrete. These are believed to have been deposited in the late Precambrian age on top of the mid-Proterozoic crystalline basement covers of up to 8 000m thickness (Amutenya, 2020). The stratigraphy comprises the Kalahari rocks of recent age overlaying the Karoo sequence (300 – 150 mya), underlain by the Mulden group (650 – 600 mya) further underlain by the Otavi Group, also underlain by the Nosib ground, and lastly underlain by pre-Damara basement (Mendelson et al, 2000). The basement floor comprises gneissic and granitic rocks (Figure 6-6).

Table 6-6 Stratigraphy for the Cuvelai-Etosha Basin

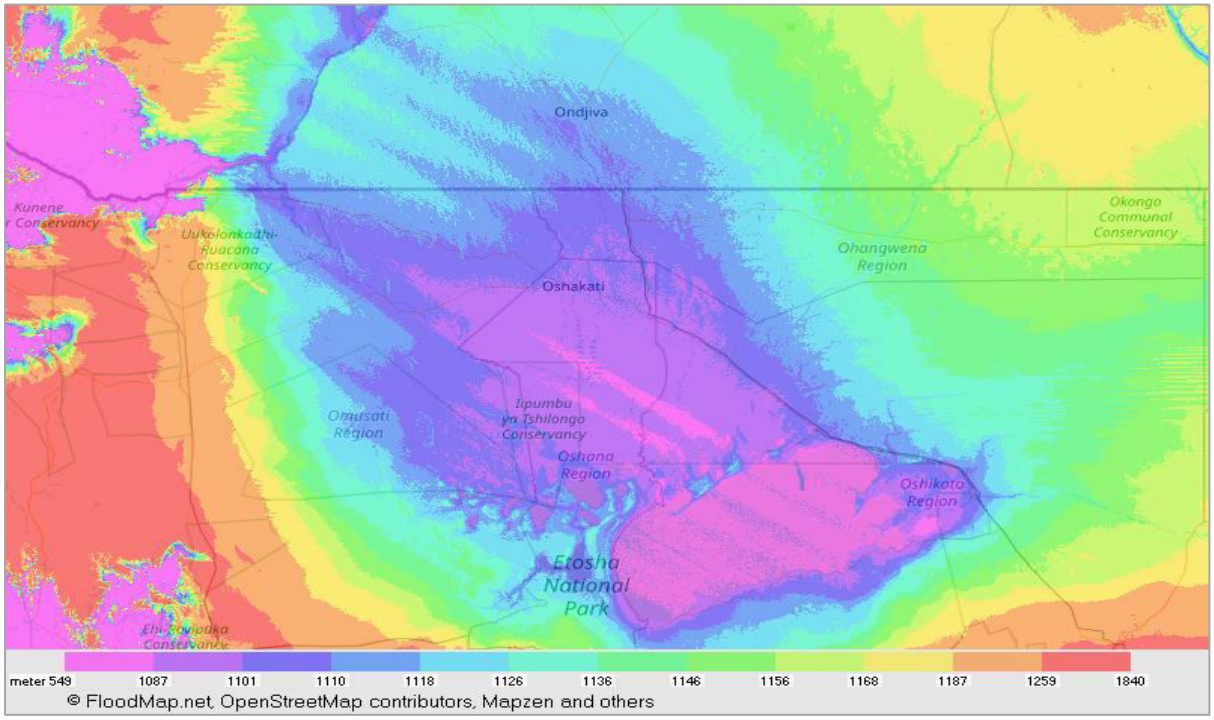
6.2.2 Soils

The soil type occurrences in the Cuvelai-Etosha basin are classified and described by Mendelson et al. (2000) into nine soil types; sands and clays of aeolian and fluviatile origin, that shows poor water-holding capacity and a low nutrient but high salt content. These fine clays and silts are described as deposited by water while the sands by wind, and thus much of the sands remain in places of their deposition or form higher grounds while clays and silt occupy much of the depressions (i.e., pans). In and around Oshakati, clay sodic sands in pans (i.e., Oshana's) and

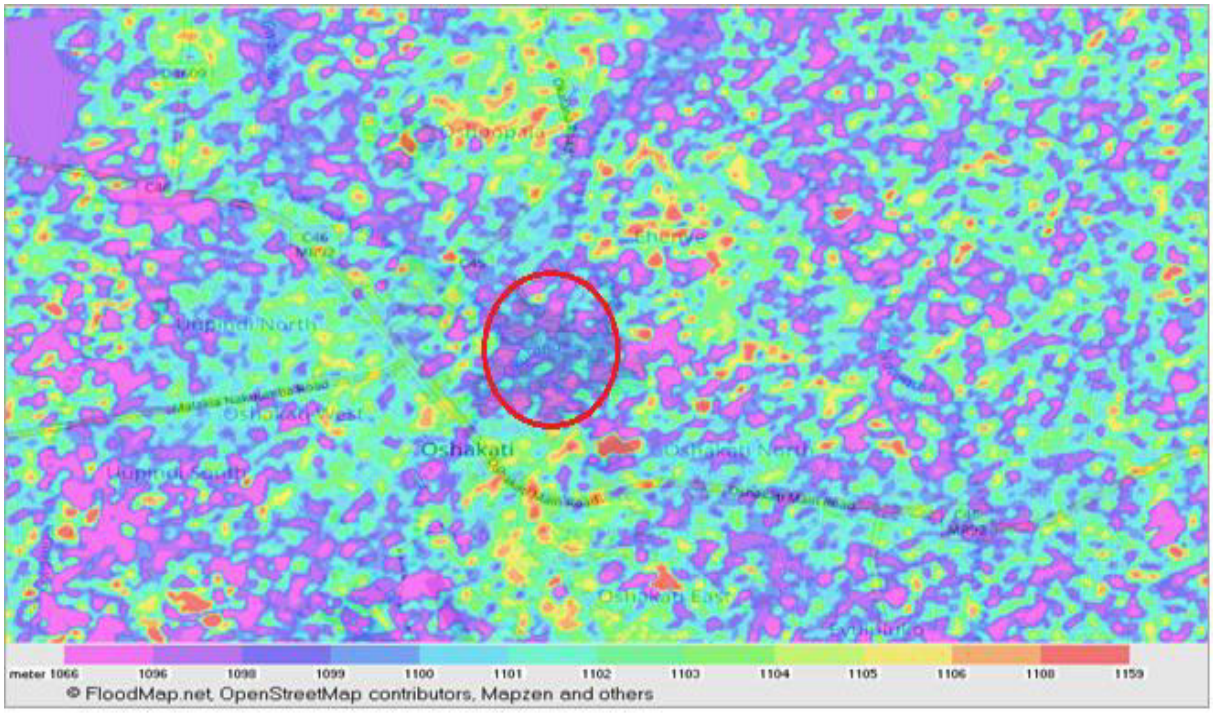
sodic sands higher grounds characterize the area. The soils of the pans are characterized of high salt content, left behind due to evaporation and residue of salts remaining. Thus, it is resultant that minimal to no meaningful crop agriculture undertaken in these soils, and furthermore, vegetation growth is limited to certain tolerant species.

6.3 Landscape Topography

The north central areas of Namibia are characterized of a flat topography, with limited noticeable elevated land features. This part of the Cuvelai-Etosha Basin forms the lower southern proximities, with topographical relief elevated from Angola, and oppositely reducing southwards towards the Etosha Pan (Figure 6-7 (a)). The highest elevation across the Cuvelai delta is approximate at 1 200 m reducing to lowest approximate of 1 080 m above sea level. A closer look on topography relief indicates wide occurrence of depressions over the vast landscape, leaving outcrops of island features and that significantly influence hydrological characteristics of the area (Figure 6-7 (b)).



(a)



(b)

Table 6-7 Overall topography of the Cuvelai-Etosha Basin

6.4 Hydrology and Hydrogeology

6.4.1 Hydrology

The physical topographical nature of the Cuvelai-Etosha Basin translates to depict surface drainage. The drainage has highland origins in northern proximities across the border in Angola, a branching of numerous channels that connects as they drain flowing south-to-south-easterly towards the Etosha pan. Mendelson et al. (2000) compares this seemingly fan-like structure as a delta as it enters Namibia. Moreover, the vast flat terrain of the Cuvelai-Etosha basin translates to numerous depressions (i.e., low points in Figure 6-7b) that are fed by precipitation generated flows southwards. These depressions fill-up and either feed other depressions or channels or may hold water for an extended duration. Such characteristics holds an important role in natural flood mitigation.

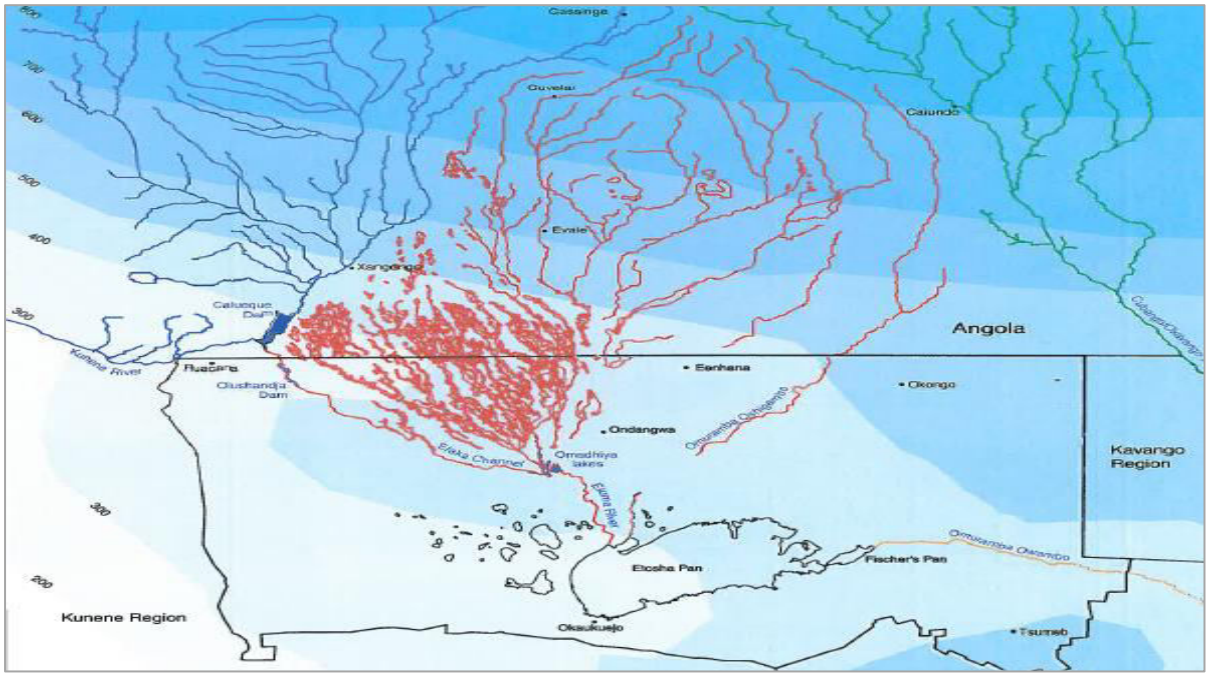


Table 6-8 Surface drainage of the Cuvelai-Etosha Basin

6.4.1.1 Prior Flooding Vulnerability Assessment in Oshakati

It is a common feature that most of the depressions that characterise the Cuvelai -Basin are shallow (i.e., pans) and easily fill-up to connect to other depressions or may overflow to adjacent areas. Flooding in the Oshakati and extended surrounding areas is an expected annual phenomenon due to the nature of the landscape. However, these depressions by extent play an important role in collecting locally generated surface flow (i.e., storm water) from rainfall and floodwaters from upland and gently passing it on downstream.

In response to the high floods of 2009, the Ministry of Urban and Rural Development and the OTC commissioned flood modelling studies for the development of the Oshakati Flood Master Plan (2012). The results of this work showed that the vast extend of Oshakati is susceptible to flooding more so around the initially proposed area for the new RWSD to 1:50 and 1:100 flood events. A further impediment that exacerbates flood vulnerability was identified as (a) shallowness of the Oshana's, (b) the constraining structures along channels, thus retards flow leading to overspilling of banks into adjacent areas.

The Oshakati Flood Master Plan proposed diversion of southbound high floodwaters, westward away from the town to avert the risk of extensive flooding of areas. However, this plan further

maintains interior channels as conduits for lesser flood flows and locally generated storm water (Figure 6-16).

6.4.1.2 Update Flood Modelling Study

In consideration and evaluation of the alternatives designs for the initially planned new RWSD, it was necessary that a flood analysis be undertaken to establish flow dynamics and guide the planning and design phase of this proposed project. The flood risk assessment modelling study report is an annexure to this report (Annexure A). The flood modelling was premised on the following objectives;

- Establish the natural flood drainage of various discharges from upland, with emphasis, the critical high flow regimes resulting in 1:50 and 1:100 year flood events.
- Establish flow velocities and retardation of flood water
- Establish the significance of local rainfall
- Establish implications of two (2) feasible RWSD alternative designs to flood vulnerability of adjacent areas.
- Propose mitigation measures where feasible to implementation preferable alternative for the new RWSD.

a) Modelling of Scenarios

i. 1:50 Year Flooding Risk Modelling

The 1:50 year flood modelling reaffirms the Oshakati Master Plan modelling scenarios with the entire Oshana filling up and high potential of overspills to the adjacent areas. The flow in Figure 6-9 below was constrained to the channel and Oshana, however without containment; it is expected that this water will over spill to flood adjacent areas.

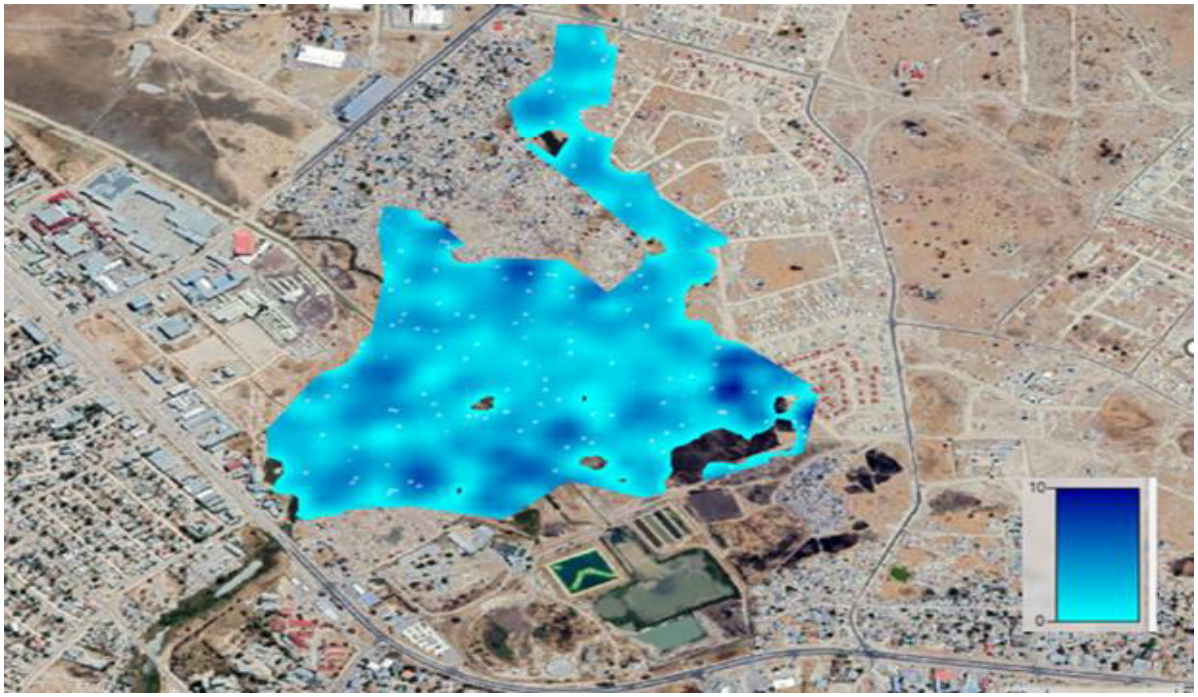


Table 6-9 1:50 Year flood modelling results

ii. 1:100 Year Flooding Risk

This is the more intense event of the two scenarios that further provides similar results to that of the flood master plan modelling scenarios. The adjacent areas are worse affected by this rare event (Figure 6-10). Moreover, as constrained, vast areas could be flooded due to this flood event if unconstrained to the feeding channel and the Oshana.

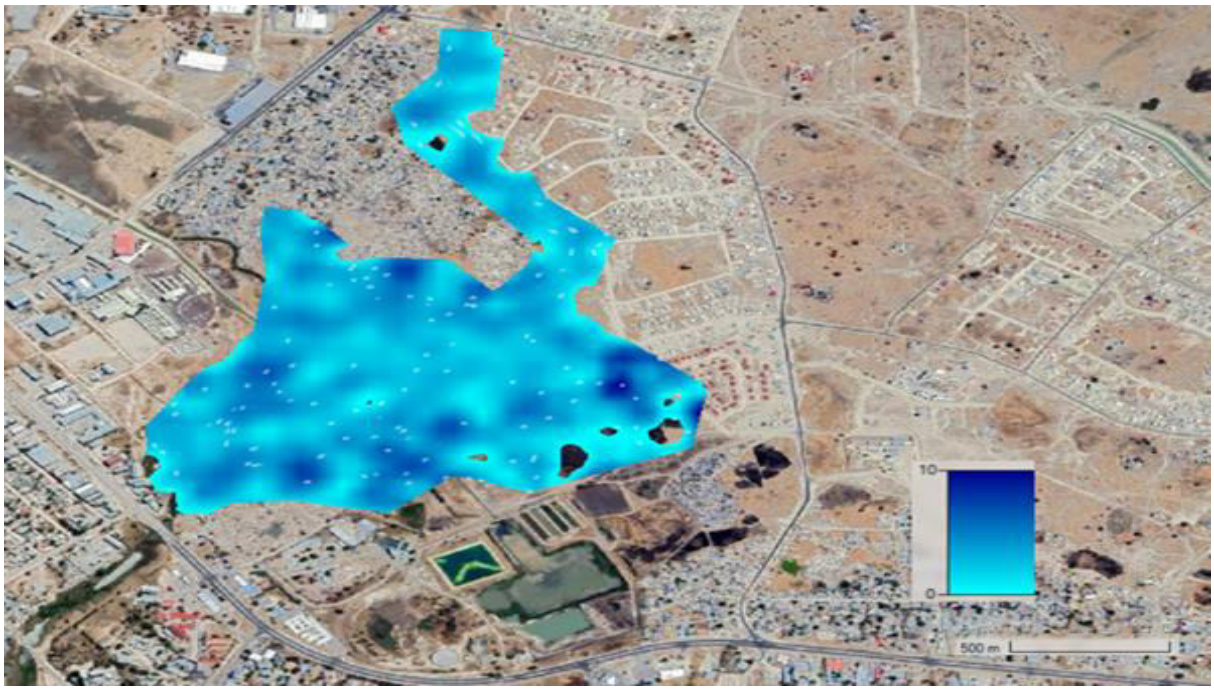


Table 6-10 1:100 yea Flood modelling results

b) Summary of modelling results and recommendations

Modelling results provide the following conclusions;

- The significance of local rainfall and generated storm water presents minimal risk to flooding in adjacent areas with or without development since much of the water is retained in depressions and more so flows into the Oshana where large quantities can be retained.
- The Oshana in northern proximity of the existing premises plays an important ecosystem service including the most significant of these routing of flood discharges from the upper land of CEB system.
- The eastern areas of the existing premises play a minimal role in flood routing, mainly a recipient of overspills from the Oshana in years of high flood events.

6.4.2 Hydrogeology

Groundwater is an important water source in the vast rural settings of Namibia. Moreover, several local authorities rely primarily on this water source. The Cuvelai-Etosha basin has falls within the Kalahari sequence. These rocks generally comprise mostly primary aquifers in lithologies comprising unconsolidated to semi-consolidated sand and gravel, and locally calcrete (Christelis, G. & Struckmeier, 2011). Mendelson et al (2000) indicates occurrence of yields of 1-5 m^3/hr in rural drilled boreholes for water supply. Moreover, excavation to access shallow seated water bodies is common practice in remote north central regions.

There are areas of high yielding aquifers that can supply vast quantities of water such as the recent discovered Ohangwena aquifer II, a deep-seated aquifer below the Kalahari formations. The project area falls within an area characterized of generally low and locally moderate groundwater potential, simultaneously affected by poor/saline quality (Figure 6-11). However, due to the adjacency to a wetland, water levels as expected are shallow within the range of 0.5m to 2m below ground surface, relative to proximity to a watercourse (Results of the geotechnical study, 2022).

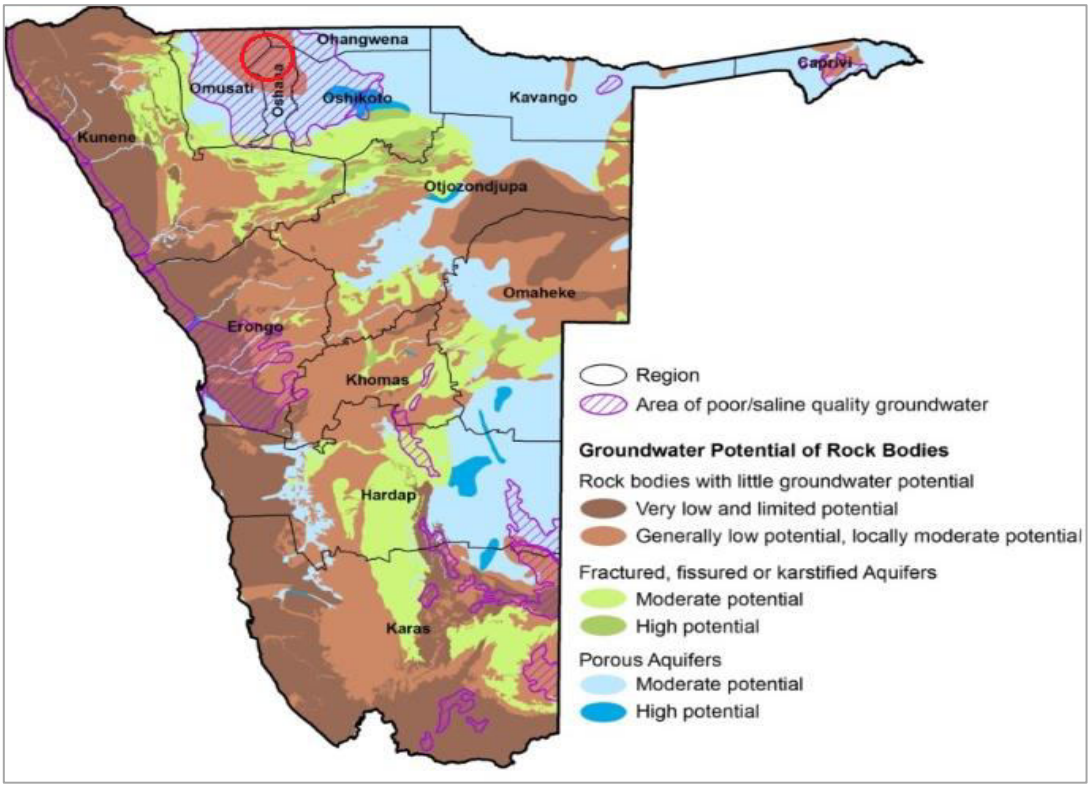


Table 6-11 Groundwater potential in Namibia

There is minimal boreholes information in the study area to decipher yields rates for any potential use; this is due to general characteristics poor quality. The extensive water supply network of the Proponent and that of Directorate of Water Supply and Sanitation Coordination (DWSSC) are evidence to the limited potential of local aquifers on quantity and quality grounds (Figure 6-12).

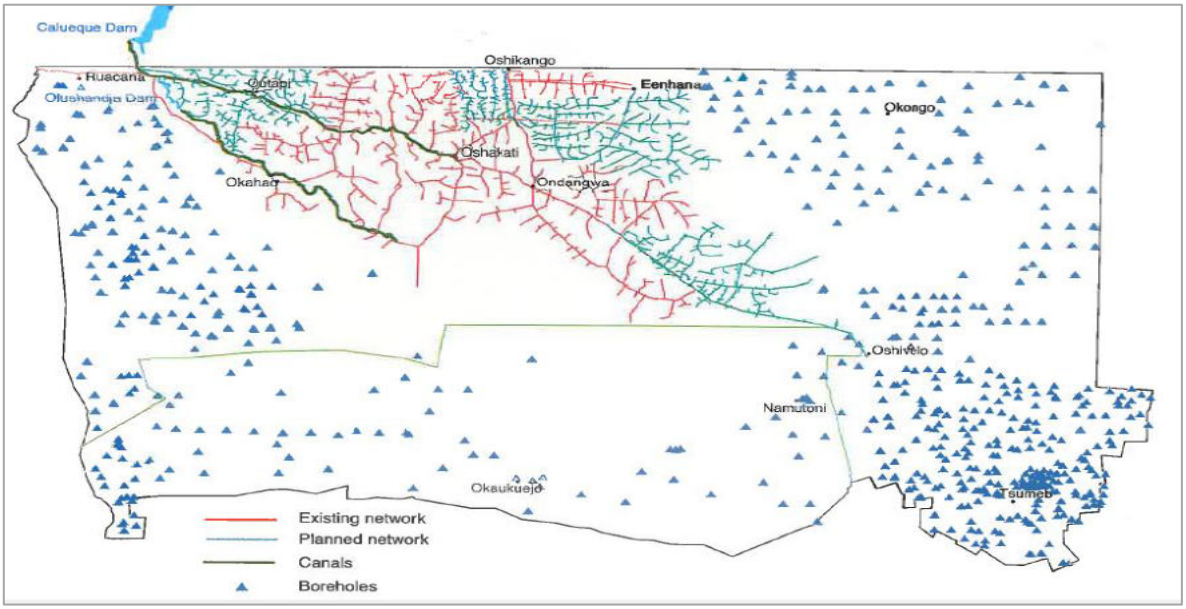


Table 6-12 Borehole spread in the Cuvelai-Etosha basin

6.5 Biodiversity

6.5.1 Flora

The characteristic vegetation in the Cuvelai-Etosha basin is classified by Mendelson into six groups, each further differentiated into classes based on soil types. The Oshakati area is grouped under the Cuvelai vegetation group further classed into oshana – Kalahari mosaic, and oshanas. The project area is characterized of lesser vegetation however classed under mosaic of wetland, and grasses. The characteristics floral characteristics of specific sites for proposed development is described in subsections below;

6.5.1.1 Proposed new WTP Site

On the proposed site for the new WTP inside the current NamWater premises, this within the existing footprint of the waterworks and thus disturbed. However, the site is characterised of sparse seasonal regenerated vegetation and slight bushes (Figure 6-13) that disappear at the height of the dry season. Macrofloral species (*Hyphaene petersiana* and Eucalyptus *spp*) are restricted to the peripheries of the site out of reach of the proposed construction activities.

Table 6-13 Proposed new WTP Site outlook

6.5.1.2 Proposed Sludge Lagoons Site

The proposed site for the new sludge lagoons is also within the footprint of the existing waterworks with ponds use to dispose mud dredged from the existing RWSD (Figure 6-14). The site is significantly disturbed, used by the local community as informal route towards town centre and is unsanitary due to haphazard use for open defecation.

Table 6-14 Proposed new sludge lagoons site

6.5.1.3 Extensions of the Existing RWSD

The area envisaged for the expansion of the existing RWSD are further within the footprint of the existing waterworks. Inside the premises, area for expansion hosts seasonal grasses that disappear during the dry seasons of the year. The area is already part of the existing RWSD. The area adjacent to the proposed new lagoons also is presently used for disposal of dredged mud from the existing RWSD and thus also bear minimal vegetation.

6.5.2 Fauna

The entire area holds less significance in occurrence of faunal life of conservation significance except minimal microfauna to the level of insects. There is noticeable constant human movement on the area, and this could be the cause of lesser faunal occurrence.

6.6 Land Use

As the project location is within an urban setting, the entire townlands are zoned in accordance with the town-planning scheme (Figure 4-3). The current NamWater premises are appropriately zoned for civic land use, while immediate adjacent areas to the north and east are not zoned for any uses, except the south-western corner zoned for office space.

Meanwhile, the Oshakati flood master plan indicates plans to alter and utilise the northern portion (Portion A) as conduit for conveying northern received minimal flood discharge and local storm water to downstream areas. The proposed structural development within the current scope of the report has minimal influences to this vital plan for the town (Figure 6-15).

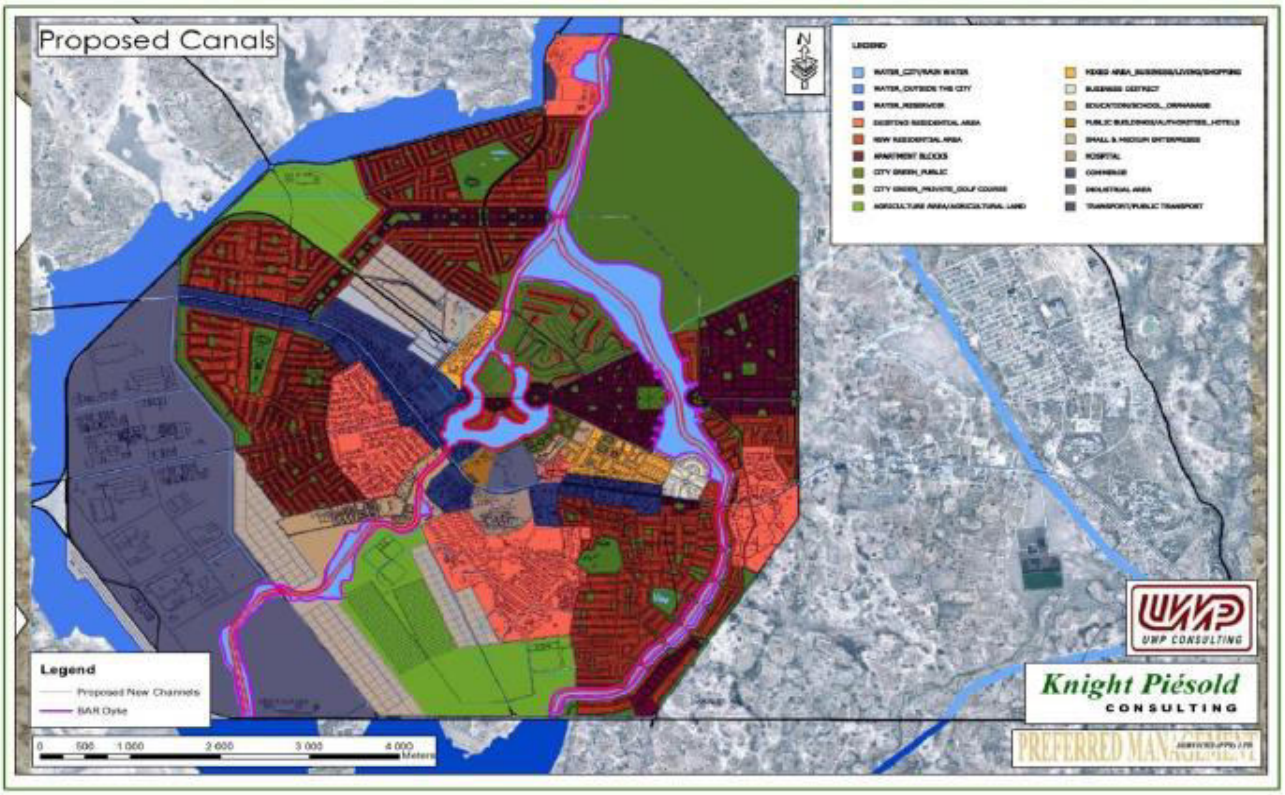


Table 6-15 Conceptual master plan for Oshakati

6.7 Socio- Economics Conditions

6.7.1 Regional and local Administration

Namibia is a unitary State and thus the Oshana Region is one of the 14 regions. Regional administration falls at the second level of a three-tier governance system established in the constitution. The region is headed by a Governor appointed by the Office of the President as the link between central government (i.e., first level of governance). The Regional Council (RC) administers affairs of the region through a Council composed of Councillors elected by the residents of Constituencies in the region. Each RC appoints a Chief Regional Officer responsible for carrying out the Council's decisions and directing the daily administration affairs. Overall, RCs are the administration centre of regions and in this case the Oshana Regional Council.

The third level of government is the Local Authority (LA), structured like the RC, consisting of a Council that comprises Councillors elected by residents of constituencies within a LA. The Council appoints a Major and Deputy Major tasked with formulation of policies, promoting employment, and monitoring the implementation of the Council's policies. The Council further elects a Management Committee (MC) responsible carrying out its decisions. In turn, the MC appoint a Chief Executive Officer responsible for carrying out the Council's decisions and administering the LAs daily affairs. The Oshakati Town Council hosts this governance level in terms of the proposed project. Issues of land delivery, approval of land use plans as well as provision of urban services within the local authority area lays with the OTC.

In terms of land administration beyond the LA into communal land areas, these are administered through respective Traditional Authorities (TA) in collaboration with Regional Land Boards and the RCs.

Various Ministries through regional offices hold mandate and provide specific services to administer such affairs. Such mandate may focus on natural resources or public affairs such as health, labour and gender among others.

6.7.2 Demographics

The 2011 population census indicates that the population of Oshana stood at 176 674, with the number of females to males exceeding by 16 444, at 96 559. The population density of the region is 20.4 persons per square kilometre, the second highest in the country at a growth rate of just 0.9%. The pronounced age group is 15 – 59 years at 59 %, followed by 5 – 14 years.

The Oshakati town where the proposed development is to be located, consists of two constituencies (Oshakati east and West) with a total population of close to 36 541 people.

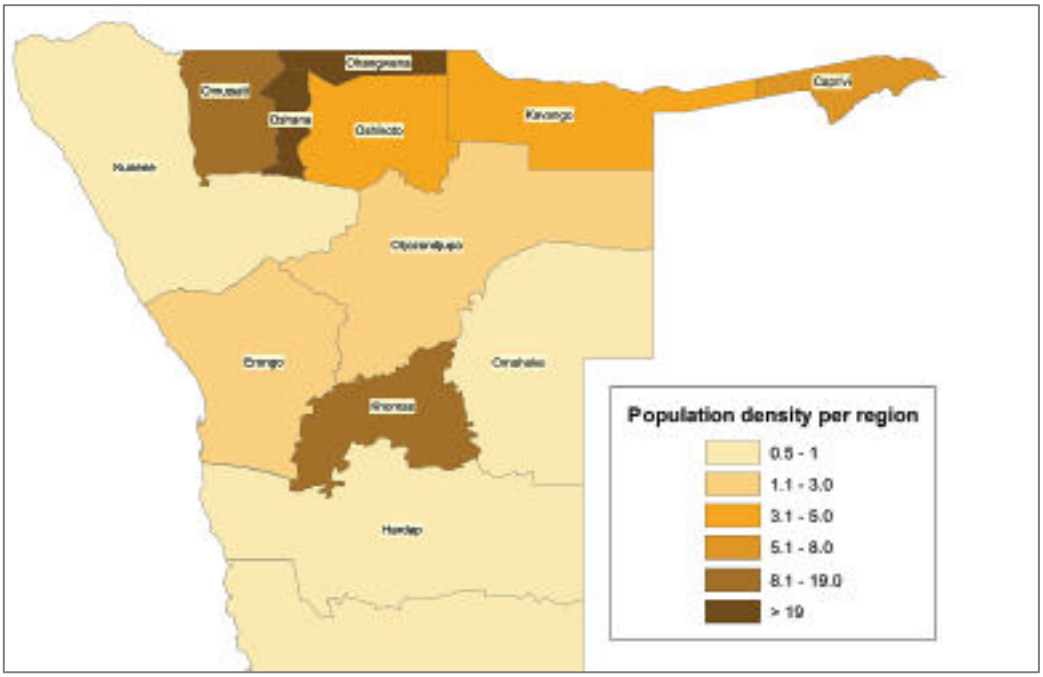


Table 6-16 Population density across Regions of Namibia

6.7.3 Household Composition

The average household size comprises 4.5 persons with a significant number of households headed by woman at 54%, relative to 46 % for males.

6.7.4 Education and Literacy Levels

The literacy rate in the Oshana region stands a high at 95 % for the adult age group from 15 years and above. School enrolment stood at average of 69% for the age group from 5 – 24 years, with urban at 63.8% and rural areas at 72.7%.

6.7.5 Employment and Incomes Sources

The economic active group is from 15 – 59 years and comprise 61.1% of the active labour force. The common sources of income for households are wages and salaries from employment at 40%, followed by old age pension and non-agriculture business activities. Agriculture is the fourth source of income in the region.

In terms of skilled employment, agricultural/fishery workers make up the largest occupation group (25.3%), followed by service workers (16.3%), and then professionals (12.1%).

The 2011 census further report that around 45% of the unemployed population had completed their primary education, 24.9% had completed secondary school and 1.7 % had completed their tertiary education. This is an indication that unskilled labour is pronounced low-end income opportunities.

6.7.6 Access to Water and Sanitation

Overall, access to safe water stands at 83 %, with urban areas more pronounced at 93.3% of households, relative to 74% in rural areas. Only 84.1% of the households has access to safe water for cooking and drinking. Such provides the greatest need of this proposed project to improve access to the safe water in the rural areas whereas also further urban access.

It is recorded that 46.4% of total surveyed households in Oshana had no toilet facilities, followed by private flush connected to sewer (16%) and pit latrines with ventilation (11.6%). The need for improvement in sanitation services is evidently significant more especially in rural areas where 66.6% of households in that setting do not having a toilet facility of any sort and thus practice of open defection.

6.7.7 Health

Oshana Region hosts one of the three intermediate hospitals in the country that provide advanced health services, the Oshakati Intermediate hospital.

The HIV prevalence in the region is relatively significant with 16.1 % in 660-tested individuals found positive and furthermore significant in women for half that population sample.

There is significant awareness of the other ailments such as tuberculosis but lesser on breast and prostate cancer among households.

The number of people living with disabilities is higher in the rural areas (6.1%) relative to 4% in urban areas.

6.7.8 Energy sources

The common energy source for household cooking is wood/charcoal from wood at 49% of 37 284 households. This is followed by use of electricity at 23.6 % and gas at 13.7%. However, for lighting, the commonly used energy source is candles used by 40.7% of the households.

6.7.9 Cultural and Heritage

The proposed development area does not appear among the listed heritage sites of the National Heritage Council of Namibia. However, during stakeholder consultations, it was advised that caution need be taken when carrying out excavations as there remains possibility of buried unexploded mines.

Chapter 7

7. Impact Identification and Evaluation

7.1 Introduction

Potential impacts are identifiable from details of an envisaged project's activities in the different phases of its implementation and anticipating likely results from interaction with ecological and social-cultural aspects. Identification of the potential sources of impacts and impact pathways is effectively comprehensive where;

a) There is a good understanding of baseline conditions and potential receptors.
b) Understanding of the spatial and temporal extent of the project area of influence.
c) There is a sound implemented participatory approach of stakeholders, including authorities, experts, and the general public.
d) There is a well-grounded knowledge and experience of the project team from comparable projects or developments.

All above factors played an important role in identifying potential aspects and impacts thereof for the proposed project activities.

7.2 Impacts Evaluation Methodology

Matrices are a common tool applied in the evaluation of impacts of proposed developments. These present a set of measurement standards or parameters upon which to determine if a certain impact has significance and to what level of significance such impacts exerts from a certain activity. Parameters used in the evaluation include the extent, intensity, probability, and significance of a potential impact on the environment, society and economics and whether such effects are positive (beneficial) or negative (detrimental). The following table describes a weighting of each parameter.

Table 7-1 Impact Evaluation Matrix and Rating

CRITERIA	DESCRIPTION			
EXTENT	***National (4)*** The whole country	***Regional (3)*** Oshana Region and neighbouring regions	***Local (2)*** Within a radius of 2 km of the development site.	***Site (1)*** Within the development site
DURATION	***Permanent (4)*** Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient	***Long-term (3)*** The impact will continue/last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter.	***Medium-term (2)*** The impact will last for the period of the project phase, where after it will be entirely negated	***Short-term (1)*** The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase
INTENSITY	***Very High (4)*** Natural, cultural, and social functions and processes are altered to extent that they permanently cease	***High (3)*** Natural, cultural, and social functions and processes are altered to extent that they temporarily cease	***Moderate (2)*** Affected environment is altered, but natural, cultural, and social functions and processes continue albeit in a modified way	***Low (1)*** Impact affects the environment in such a way that natural, cultural, and social functions and processes are not affected
PROBABILITY	***Definite (4)*** Impact will certainly occur	***Highly Probable (3)*** Most likely that the impact will occur	***Possible (2)*** The impact may occur	***Improbable (1)*** Likelihood of the impact materializing is very low
SIGNIFICANCE	Is determined through a synthesis of impact characteristics. Significance is also an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.			

Low impact	A low impact has no permanent impact of significance. Mitigation measures are feasible and are readily instituted as part of a standing design, construction, or operating procedure.
Medium impact	Mitigation is possible with additional design and construction inputs.
High impact	The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment.
Very high impact	Permanent and important impacts. The design of the site may be affected. Intensive remediation is needed during construction and/or operational phases. Any activity which results in a "very high impact" is likely to be a fatal flaw.
Status	Denotes the perceived effect of the impact on the affected area.
Positive (+ve)	Beneficial impact
Negative (-ve)	Deleterious or adverse impact.
Neutral (/)	Impact is neither beneficial nor adverse
It is important to note that the status of an impact is assigned based on the status quo. Therefore, not all negative impacts are equally significant.	
Significance Rating Scale	Points 1-4 Insignificant/Low
	Points 5-8 Significant /Moderate
	Points 9-12 Very significant/High.
	Points 13-16 Highly significant /Very high

7.3 Identification and Description of Impacts

7.3.1 Pre-construction

7.3.1.1 Beneficial Environmental and Socio-Economic Impacts

a) Utilization existing premises to full potential

Locating of the new WTP in the existing premises and southward extensions to the RWSD is advantageous to the proposed project as this ensures that these premises are utilised to full potential. The current premises hosts several facilities however, there remains significant space that are unutilised. The envisaged area for the new WTP is a vast area that can be put to effective use through the proposed siting of this important development structure there.

As described previously, all the sites are disturbed and are of lesser value in the current state for other uses than the envisaged project.

b) Increase access to potable water and improve sanitation

The overall aim of extension to the OWW is to improve access to potable water for communities in urban and rural areas of north central regions of Namibia. Realization of the project is therefore envisaged to increase security and access to safe drinking water to areas where such is limited or non-existent, specifically rural areas. Moreover, in areas already supplied with piped water, the implementation of the project will further enhance security of supply in the short and long-term.

Access to potable water further goes a long way in improving sanitation in both rural and urban centres and such is beneficial to enhance the welfare of communities. The availability of water allows to link sanitation facilities in informal settlements to mainstream. Waterborne diseases are prevented from improved access to potable water.

Beyond mere availability of safe drinking water, access to adequate water enables communities in rural and urban areas to start minimal agricultural activities that can alleviate daily struggles and support livelihoods.

7.3.1.2 Potential Adverse Environmental and social Impacts

a) Potential need for increased abstraction from the Kunene River for the extended OWW

The increased throughput to the extended OWW could potentially require increased abstraction from the Kunene River and thus exert pressure on the availability of adequate water in the system to meet other needs such as environmental flows, hydropower generation and provision of clean water in the host country.

b) Increase occurrence of localised flooding of adjacent settlements

Expansion of the existing RWSD could increase the vulnerability of closely located settlements as overland flows may not find pathways to storm water provisions and thus accumulate to cause localised flooding. Such has potential implication of disrupting the livelihoods of the people water may enter homes causing damage to and further act as carriers for spreading diseases. The most vulnerable groups such as the elderly, woman and children may be affected.

c) Uncertainty over security of conveyance and storage of adequate raw water to the extended OWWs.

The proposed extensions to the OWW necessitates increased demand for raw water from the canal and from onsite storage dam. The state of the canal has declined over many years, while the current RWSD has been verified as inadequate to meet required daily operations over critical periods of operations. If this critical infrastructure fails to secure water for the proposed and existing WTP, this will lend redundancy to proposed project.

Further to above, should structural inadequacies be ignored, it is highly likely that increased increasing conveyance of the canal will only result in wastage of water.

d) Increased need for additional power (i.e., Energy) supply from the supplier's capacity.

The extension of the Oshakati Waterworks will require additional supply of power to the existing waterworks to ensure that the new extension structures are operational. It is possible that the power supplier will not be able to increase capacity for the new developments or alternatively, require the supplier to divert supply from other needing areas, raising competition in allocation that may advantage the project than others.

e) Potential contamination from water treatment sludge

Discharge of sludge has potential to impacts ecosystem if not well managed. Leaching into groundwater systems or overland deposition in watercourse may pose concerns and ultimate effect on aquatic organisms.

7.3.2 Construction Phase

7.3.2.1 Beneficial Environmental and Socio-Economic Impacts

a) Employment opportunities for the local communities

The various phases of the project will require skilled and unskilled labour. It is anticipated that temporal employment opportunities such as short-term unskilled labour to clear sites, excavate trenches, loading, offloading, onsite packing of material, and security, will benefit the local communities especially from the nearby settlements.

Skilled members of the community within the Oshakati Town at large will benefit from direct qualifying employment to in the various phases to contractor, subcontractors and the Proponent. This has potential to improve livelihoods of locals and beyond north central regions, providing a source of income.

b) Increased opportunities for local subcontractors

The construction phase will oversee implementation of various activities, and such may present opportunities to local contractors. Such opportunities exist in various areas such as supply of local materials, trenching, waste management and guarding of site.

c) Enhance local business and town development

The implementation of the proposed project activities has potential to bring increased sales to businesses in the town and more so beyond Oshakati. Such increased sales will come in various ways that will include sourcing of locally available construction material from local businesses, use of facilities such as fuel stations in town and for trucks transporting other construction material from other areas in the country. The enhanced buying abilities of construction workers will have positive spinoff for local retail shops in food and other amenities. These have implication for growth of the local economy, with potential to attract other bigger scale investments.

7.3.2.2 Potential Adverse Environmental and social Impacts

d) Potential contamination of soils and water (surface and subsurface)

Alteration of the composition of soils, surface and groundwater is resultant is of activities with potential to introduce foreign substances into such systems. The following can be considered to have impacts on these resources;

i. Storage and use of chemicals/hazardous substance onsite

Delivery, storage and use of chemicals or hazardous substances presents potential for spillages or leakages, which may accumulate on soils, migrating to surfaces watercourses and also infiltrating beyond topsoil layers into groundwater systems to cause alteration of their composition. This impact may occur resultant of exposed surfaces of storehouses where they are kept or exposed surfaces where these activities are being carried out.

Particular instances are chemical storehouses for hazardous substances, fuelling points, workshop for servicing of vehicles and machinery, areas where machinery are utilised and areas where used containers of hazardous substances or chemical are stored post usage and prior disposal. Examples of such chemical include fuels, paints, thinners, thickeners and lubricants.

e) Generation of domestic wastewater (i.e., effluent)

Construction activities will oversee an increased number of people onsite leading to increased effluent from sanitation facilities. The use of existing facilities has potential of overloading existing sewer system. While the use of mobile toilet also presents possibility of overflows, spillages, and leakages. If these are uncontained, such may overflow and runoff into surface watercourses or infiltrate into groundwater systems.

f) Emission of excess smoke, noxious and greenhouse gases

In the construction and decommission phases of the proposed project, several activities have potential to impact ambient air and the atmosphere through the release of smoke, noxious gases and greenhouses gasses. Vehicles and trucks that transport and deliver construction materials to site, operation of machinery and earthmoving vehicles for bulk earthworks will release hydrocarbons that contribute to greenhouse emissions and cumulatively contribute to the global warming problem. Furthermore, the release of noxious emissions has potential

health implications for those exposed for prolonged periods. Included in this category of emissions are carbon dioxide, carbon monoxide, carbon dioxide, and nitrogen oxides.

g) Potential Loss of biodiversity (fauna and flora)

The construction activities are likely to cause loss and disturbance to microhabitats. Much of the existing premises and area envisaged for expansion of RWSD are a disturbed site, and thus minimal disturbance or loss of floral or faunal species is envisaged. Moreover, it is described that no faunal or floral species of conservation interest were detectable in these areas. In all consideration, microorganisms such as insects will be impacted by activities on the area.

h) Soil structure disturbance/compaction

Disturbance to construction activities, soils in the area may be altered through heavy vehicles used onsite. Such alteration may come in the form of compaction of areas that are away from the construction areas. The movement of earthmoving vehicles in the area to clear sites carry out bulk earthworks, and digging of trenches, deposition of excavated earth materials pauses potential impact of disturbing or compacting soils. However, it is worth noting that much of the soils in this area are less supportive to any potential agricultural uses due to their nature and quality. Nonetheless, compacted areas allow for increased runoff that may cause water to accumulate in some areas and thus pose a risk or generate runoff, increasing surface flows, and an eventual flood risk.

i) Generation of various solid waste to the surroundings

The generation of waste is attributable to the following forms;

i. Generation of construction waste

The flow and usage of construction materials comprises the prime of construction phase, resultantly waste such as cement packaging, boxes, plastics covering, rubber, metal pieces, drums, and wood will be generated. If this various waste is unmanaged, low weight waste will can be windblown around the site and offsite, causing litter and a nuisance.

It is envisaged that such work requires excessive batching of concrete and thus a batching plant will be setup for the concrete works. Its operation is expected to result in spillages generated in mixing, transportation and pouring of concrete. Further to above, excess, or

damaged material such as bricks, concrete blocks, and cement may alter the landscape if unmanaged.

ii. Generation of domestic and other general waste

The presence of workers onsite either as temporal day workers or living onsite has potential to generate domestic waste. Such domestic waste comes from kitchen areas in form of food packaging's, actuals food waste, packaging of sanitary materials among others from living quarters. Moreover, offices are likely to produce waste such as papers and boxes and potential redundant office furniture or equipment. If this waste is unmanaged, in like manner to construction waste has potential to litter the site, release irritant odours and smell and become a safety hazard to workers and potentially members of the public.

j) Loss of landscape aesthetic value

The various works including excavations, creation of embankments and walls of the dam, alter the outlook of the landscape. The alteration of the landscape has potential to become an eyesore to some community members of the public and thus loss of aesthetic value. Moreover, this impact is exacerbated as the locality is in an urban setting and as such has potential to lessen appearance of the town and reduce attractiveness. This impact is supported by public concerns raised during public consultation process, that the outlook of the existing premises needs improvement for a better outlook, especially in an urban environment.

k) Potential hazards to the safety, health and welfare of construction workers and public

Healthy, safety and wellbeing come in several aspects ascribed to the phases of the project. These are considered in the following;

i. Healthy and safety of the workers from construction activities

Construction, operation and decommission phases of the project exposes workers to various risks ascribed to the type of work performed. Such work may include; handling chemicals, working around earth moving vehicles, operating power equipment, working on heights, working in dust exposed areas, noise, constrained spaces, irritants or burns from corrosive substances, injury and in some cases fatal accidents. It is therefore critical that workers are protected from these hazards, by anticipating their occurrence and ensuring measures are in place as safeguards.

ii. Potential hazards to the health and safety of the public

Although the existing premises of the proponent are access controlled, and thus no random entry and exit members of the public, the construction and decommission phases could result in opening up other areas for ease of access and activities as such could members of the public could enter sites accidental or by negligence and thus exposed to activities with potential hazards. Exposure to such activities could result in harm through injury or worse a fatality.

iii. Welfare of construction workers

It is important that workers welfare and wellbeing is preserved during the construction and decommission phases where applicable. Although it is highlighted that onsite accommodation is not preferred due location in an urban environment where such is easily available, it may be necessary that limited provision for accommodation is provided for special circumstances. Provision of accommodation triggers the need to provide basic services such as access to clean water, areas for cooking of meals, shower, and toilet facilities. Provision of these services is a basic requirement for workers onsite irrespective of areas of accommodation.

l) Increased immigration of job seekers

It is anticipated that opportunities from the construction, operation and maintenance of the new waterworks will draw job seekers from areas beyond the Oshakati Town in search of opportunities. Such movement has several associated impacts;

- Disturbance of social order within communities due to potential increase in crime activities resultant of increased number of people.
- Overcrowding in surrounding informal settlements has potential to facilitate the spread of contagious diseases such as hepatitis and Covid-19. Moreover, the impact of HIV/AIDS remains a high risk as people move from various areas to concentrate in one area to seek betterment of life. Such has potential far-reaching implications at a national level.

- Moreover, Namibia has experiences increasing rate of gender-based violence cases and thus it is likely with concentrated number of people in settlement areas, the number of such cases may elevate.

m) Disturbance to the towns traffic flow

The construction phase will foresee an increased number of vehicles from small to large vehicles to site and around the town. Such vehicles are envisaged to carry out a series of activities including the delivery, loading and transportation of various material including waste of various types offsite. The increased movement of small and heavy vehicles poses a safety risk both onsite and within the town. Additional to safety hazard is the potential to cause inconveniences to the movement of vehicles within town and disrupting normalcy of residents' daily livelihoods.

n) Disturbance to heritage/cultural sites or potential for hazards

Construction phase activities such as excavation, trenching and digging has potential to unearth object of historical or cultural value or likely materials of danger. In community meetings, a member of the public cautioned that there is possible buried unexploded mines in the area, from pre-independence era.

o) Generation of noise and vibrations to the surroundings

The construction and decommission phase will oversee many of the activities that has potential to produce noise and vibrations to the surrounding environment. Such has potential to disturb livelihoods of adjacent communities through altering their sleeping patterns, become a source of irritation to some members of the community in the surrounding and a health hazard at unsafe exposure levels. The respective recommended limit by the WHO for noise exposure during daytime is 70 dB (A) (Onjefu et al., 2019). The mentioned level of 70 dB is identified for all areas to prevent hearing loss.

p) Generation of dust onsite and to surroundings

The initial and height of the construction and decommission activities involving the movement of earth moving machinery, and trucks has implication of generating immense dust into the surroundings, resultant hazard to the health of the workers, and communities that are

exposed. Further to above, biodiversity within proximity such as plants may be covered and thus affected. Dust further poses a nuisance to structures where such may accumulate over time, and thus requiring constant unexpected renovations.

q) Wastage of natural resources

Water and energy are a limited resource in Namibia and thus it is unwise to allow practices that waste such resources where availed. It is therefore, foreseen without any control, a resource such as water can be misused such as having running taps onsite and unattended leakages. Moreover, unnecessary lighting also wastes power resources and has financial implications.

In the broader context, impacts related to resources wastage has cumulative impacts relating those that may not be felt at point of occurrence but elsewhere and at later timescale. In terms of power usage, this refers to the requirements for enhancing generation to meet unrealistic demand created due to wastage. Similarly in water, the need to abstract more water from the system to meet phantom demand. Such affects resources availability for other demanding uses and further jeopardises environmental integrity.

r) Theft and/or vandalism to construction materials and structures

Storage of construction material onsite presents potential for theft of these materials. The implication of such losses are delays in project activities and more so incurs financial losses. It is, therefore, necessary that construction materials are secure onsite. Moreover, where the site is accessible easily, potential vandalism could occur, and such needs be prevented they impact planning and implementation of activities and completion.

s) Conflicts and grievance onsite or from public

It is an unavoidable that conflicts and grievances will arise onsite either through construction workers, contractors, and subcontractors or from surrounding communities relating to certain components or activities of the development. It is necessary that is a clear and transparent process to handle and address them prior potentially hindering project activities, whilst ensure broader project support.

t) Potential risk of fire accident/incidents

The risk of a fire hazard is part of many development projects. Activities that may start fires are part of the construction, operation and decommission phase. These may include welding and cutting of metals. Moreover, storage of substances that are highly flammable such as petrochemicals especially in large quantities increases the risk of fires. The occurrence of fires despite the origin can be devastating to a site and welfare of those onsite. It is necessary that these are anticipated early, and necessary measures taken for prevention and preparedness.

7.3.3 Operation Phase

7.3.3.1 Beneficial Environmental and Socioeconomic Impacts

a) Improve potable water supply services to the north central regions of the country

The mandate of the Proponent is to ensure bulk water supply to the nation. This mandate is engrained in their strategic objectives and therefore, operation of the completed extended waterworks, is a greater achievement to the strategic objectives, fulfilling their mandate and further contribute to national development agenda of medium and long-term term planning framework. This further provides elevated governance status profile of government agencies.

b) Unintended creation of ecosystems

The existing RWSD although constructed for primary purpose of raw water storage, it further serves as a human made ecosystem for biodiversity such as fish and birdlife. It is further foreseen that expansion of the existing dam will increase the number of birdlife that finds habitats in some section parts of the dam and more so vegetation. The role of vegetation in water treatment although neglected plays a role.

c) Potential opportunities in sludge handling and management

Random disposal of dry sludge residues raises social and environmental concerns, however the availability of sustained supply of sludge presents potential opportunities that can be harnessed for pilot projects as solution to some environmental and social challenges. Operation of the plant will sustain supply of sludge that can support alternative uses as described in Chapter 5 of this report.

7.3.3.2 Adverse Environmental and Socioeconomic Impacts

d) Increased recurrence of localized flooding of adjacent areas

The expanded RWSD could continually pose a source of increased flow of storm water due to elevated embankments into the adjacent settlements, exposing residents to the risk of localized flooding and damage to properties. Moreover, such localized flooding could be severe for the vulnerable members of the society.

e) Ageing and deterioration of structures

The continuous operation of the facilities presents potential to incur faults and deterioration due to aging of the infrastructure over time but also increase inefficiency.

f) Need for continuous improvement in water treatment sludge management

The desludging of the lagoons will continually produce dry residues requiring disposal, although at certain intervals of the deign lifespan of the WTP. This continual desludging necessitates mechanism for long-term disposal solution.

g) Climate change effects on operation of the waterworks

The potential effects of climate change on operation of the extended structures presents cumulatively long-term societal and environmental challenges. The most notable climate change effect on the project scope are potential change precipitation patterns. This change poses several facets to the long-term sustainability of the proposed development, included are;

- A reduction in rainfall threatens long-term supply of water from the source and has potential calamitous effects on the operation of the waterworks through reduced availability of water to treat. Such has inclined societal and economic implication that underscores the objective of the proposed development.
- Inversely, effects that increase rainfall may pose adjacent areas susceptible to increased storm water accumulation, thus increased frequency of flooding and associated ills related to diseases and damage to properties.

7.3.4 Decommission phase

7.3.4.1 Beneficial Environmental and Socioeconomic Impacts

a) Potential reuse of some redundant structures

Redundancy of some waterworks infrastructure overtime presents opportunities for alternative uses. Structures such as the earth dam presents opportunities in areas such as aquaculture.

7.3.4.2 Adverse Environmental and Socioeconomic Impacts

b) Potential hazards of redundant structures

Lack of alternatives uses presents that such structures cannot be left idle without purpose and thus necessitate the removal. The presence poses may pose a hazard to the public that may be attracted to visit the structures if unmanaged.

c) Diminish landscape aesthetics

The presence of dormant structure without purpose over long-term and in deteriorated state presents diminishing aesthetic effect to the landscape and more so in urban environment.

7.3.5 Impact Significance Evaluation

Table 7-2 Impact significance table

Phase	Impact/Aspect	Receptor Environment=Env Social = So Economic = Eco	Impact type			Impact Evaluation				
			Adverse	Beneficial	Neutral	Extent	Duration	Intensity	Probability	Significance
Preconstruction (Planning and Design)	Utilization of the existing premises to full potential	Eco		+Ve		1	3	3	4	**11**
	Increased access to potable water and sanitation facilities for the people of north central Namibia	So & Eco		+Ve		3	3	3	3	**12**
	Potential need to increase raw water abstraction from the Kunene River to the extended OWW	Env	-VE			4	3	3	2	**12**
	Increase occurrence of localised flooding of adjacent areas		-VE			1	3	2	2	**8**
	Uncertain capacity of existing infrastructure to convey and secure adequate water supply to the extended OWW	Eco	-VE			4	3	2	2	**11**
	Increased need for additional power supply from the power supplier	So & Env	-VE			3	3	2	1	**9**
	Potential contamination/leaching from water treatment sludge storage		-VE			1	3	2	2	**8**
Construction	Employment opportunities for the local communities	So & Eco		+Ve		4	3	3	3	**13**
	Increased opportunities for local subcontractors	Eco & So		+Ve		4	2	2	2	**10**
	Enhance local business and town development	So & Eco		+Ve		3	3	3	3	**12**
	Impediments to stormwater flow paths	So	-VE			2	2	2	2	**8**
	Potential contamination of soils from storage and use of hazardous/chemicals substances	So & Env	-VE			1	3	2	2	**8**
	Generation of domestic wastewater	So & Env	-VE			1	2	2	2	**7**
	Emissions of excess smoke, noxious and greenhouse gases	So & Env	-VE			2	2	2	3	**9**
	Loss of biodiversity (fauna and flora species)	Env	-VE			1	1	1	1	**4**
	Soil structure disturbance/compaction	Env & So	-VE			2	2	2	2	**8**
	Generation of construction waste	So & Env	-VE			2	2	2	3	**9**
	Generation of domestic and other general waste	So & Env	-VE			2	2	2	3	**9**
	Loss of landscape visual aesthetic value	So & Eco	-VE			1	1	1	2	**5**

	Potential hazards to the health, safety, and welfare of workers	So & Eco	-VE			1	2	2	3	**8**
	Potential hazards to the health, safety, and welfare of the public		-VE			2	3	2	2	**9**
	Exacerbate immigration of job seekers	So	-VE			2	2	2	3	**9**
	Disturbance of town's traffic flow pattern	So	-VE			2	1	2	2	**7**
	Disturbance to heritage/cultural sites or potential hazards onsite	So	-VE			1	1	3	2	**7**
	Generate noise and vibrations to the surroundings	So	-VE			2	2	2	4	**10**
	Generation of dust onsite and to surroundings	So	-VE			2	2	2	3	**9**
	Wastage of natural resources (water and power resources)	Env	-VE			1	2	1	2	**6**
	Theft of construction materials and potential vandalism to property on site	Eco	-VE			1	1	3	2	**7**
	Conflicts/grievance from workers, contractors, subcontractor and general public	So	-VE		/	2	2	3	2	**9**
	Potential risk of fire incidents or accident	So & Eco	-VE			1	3	3	2	**9**
Operation	Improve potable water supply to the north central regions.	So & Eco		+VE		3	3	3	3	**12**
	Unintended creation of ecosystems	Env		+VE	/	1	3	1	2	**7**
	Potential opportunities to reuse sludge as long-term disposal	So & Eco		+VE	/	1	3	2	1	**7**
	The need for long term dry sludge disposal solution	So & Eco	-VE			2	3	2	2	**9**
	Increased recurrence of localised flooding of the adjacent areas	So	-VE			2	3	2	2	**9**
	Ageing and deterioration of infrastructure	Eco & So	-VE		/	1	3	2	3	**9**
	Climate change effects on operations of the waterworks	So & Env & Eco	-VE			3	3	2	2	**10**
Decommission	Potential reuse of redundant structures	So & Eco & Env		**+Ve**		1	4	3	2	**10**
	Potential hazards from presence of redundant structures onsite.	So & Env	-VE		/	2	2	2	2	**8**
	Diminish landscape aesthetic value	So	-VE			1	3	1	1	**6**

7.3.6 Interpretation of the Impacts Matrix Results

The results of the impact evaluation matrix provide a range of anticipated impacts that are of medium to high significance nature. The medium significance impacts (i.e., 5-6 may require minimal passive intervention such as mere monitoring. However, medium impacts and those relatively close to high impacts (i.e., 7-8) and those falling within high impacts (i.e., 9-12) requires active intervention measures put in place to lessen resultant outcomes. Very high impacts (i.e., 13-16) necessitates change in one or more of the project components prior the approval of the entire final project implementation plan. The best practice environmental practice accepts a range of measures for mitigation that include active interventions through administrative, human and engineering controls to alleviate potential severity in case of adverse impacts.

7.3.7 Impacts Mitigation/Enhancement

7.3.7.1 Pre-construction

a) Utilization of existing premises to full potential

Enhancement Measures:

- The Proponent approves the proposed plan on location of the envisaged structures.
- Reservations and preparation of the areas for the subsequent construction phase as may be required.

b) Increased access to potable water and improve sanitation

Enhancement measures:

- Realization of the proposed project will go a long way in improving access to safe water and sanitation facilities more critically in rural areas. It is therefore important that the planning and design requirements be achieved for approval of the project for implementation.
- Final plans and design are submitted to the local authority for approval
- Security of additional land for expansion of existing RWSD is acquired.

c) Increase occurrence of localized flooding of adjacent areas

Mitigation measures:

- A safe and adequate barrier distance is maintained between the adjacent communities and the expanded RWSD area.

- Provision for storm water collection and channelling are engrained in designs for embankment of extended RWSD, away from adjacent settlements.

d) Potential leaching/contamination from water treatment sludge storage

Mitigation measures:

- Sludge lagoons to be designed of impermeable base and walls to prevent leakage to the surface.
- Sludge lagoons designs to provide adequate capacity allowing sludge to dry while maintaining continuous operations of the new WTP.
- Lagoons designs to further consider controls against overflows to the environment.

e) Increase the need for additional power supply from the supplier

Mitigation measures:

- Establish power requirements and acquire confirmation of capacity of the supplier to meet additional input requirements.

f) Potential need to increase abstraction from the Kunene River for the extended OWW

Mitigation measures:

- Establish demand throughput requirements and verify that operations are within the allocated abstraction rates currently agreed upon between the two countries (i.e., Angola and Namibia).

g) Uncertainty over capacity of existing infrastructure to convey and secure adequate water for the extended OWWs

Mitigation measures:

- It is necessary that measures be initiated to refurbish the state of the canal to deliver the required quantities for security in the long term.
- The construction of a new RWSD remains a critical component to the proposed development and thus engage processes to facilitate construction of this important structure.
- Finalise plans and designs for the expansion of the existing RWSD

7.3.7.2 Construction Phase

h) Impediment/disturbance to storm water flow paths

Mitigation measures:

- Maintain storm water collection areas as may be provided in expansion designs for the RWSD.

i) Potential disturbance to soils structure (i.e., compaction)

Mitigation measures:

- The construction footprint shall be as far as possible be reduced to demarcated areas.
- Post signage in areas that are to be avoided from construction activities.
- Conduct inductions and awareness to workers on avoidance of demarcated areas.
- It is required that regular inspections of areas are carried out to detect onsite ensure adherence to measures.

j) Generation of domestic wastewater (i.e., effluent)

Mitigation measures

- The use of mobile toilet units is recommended during the construction and decommission phase to prevent sewer system overload. These mobile units shall be managed as follows;
  - All toilet units are to be secured to the surface in positions placed.
  - All mobile toilet units are to be positioned in non-flooding or water logging areas and to be sited at least 40m away from watercourse or drainage channels.
  - Effluent shall not be allowed to overflow from mobile toilet facilities
  - All mobile toilet units to be inspected regularly for integrity.
  - Mobile toilets shall be clearly marked for both genders (Figure 7-1)
  - Use of open areas as toilet is prohibited of all construction workers or visitors to site.
  - Extraction and transportation of effluent to disposal areas to be carried out with utmost care to avoid spillages.

- It is important that removal of effluent from site by a contractor or subcontractor is always supervised as practically possible to ensure adherence to safe transfer of effluent.
- Transportation of the extracted effluent to disposal site to be done safely.

- There are no areas for disposal of such effluent within proximity and thus the use of local authority facilities is unavoidable. However, the OTC is to be informed and where necessary consent obtained to discharge of effluent at the existing towns wastewater treatment facility.
- Maintain a regular schedule of extraction and disposal of effluent from the site.
- In case of a spillages, the following procedure to take effect;
  - Assess source of spillage or leakage and seek to isolate the cause where possible.
  - Swiftly fill/complete an incident report slip on the observation and submit to SHEO/SM for swift response actions to stop the leakage or spillage.
  - Where such spillages are from scheduled extraction of effluent onsite, it is required that all extraction activities are to be conducted with spillage containment container readily available onsite. This shall be a holding bucket with adequate capacity to contain up to 200 liters and safely sealable (Figure 7-1).
  - Should excessive spillages be experienced during extraction, this activity shall be halted indefinitely until such time that the cause of spillage can be rectified. The faulty mobile unit is to be isolated from usage for site workers and marked accordingly.

	
Gender signange	Specialised needs provision
	
Illustration of spillage containment containers	Illustration of mobile toilets

Table 7-3 Signage illustration and proposed facilities

k) *Onsite chemicals and hazardous substances storage and use and management of contaminated sites/materials*

Mitigation measures for hazardous substances storage and use

- The chemical storehouse is to be located away from storm water drains.
- Appropriate signage should be placed to indicate activities allowed and not allowed in proximity to the storage area. Such will include any activities with potential to ignite a fire.
- The floor area of the chemical storehouse should be built of impermeable base or bunding surface.
- A Material Safety Data Sheet (MSDS) is developed and placed at a convenient point in the storehouse. This MSDS shall constantly be updated as may be required due to operations of the storehouse.
- Records should be kept of chemical inflow and outflow from storehouse, with details of type of chemical brought and quantities into the storehouse, the names of persons accessing the storehouse, quantities taken and purpose of collection.
- Inspections are to be conducted regularly of the storage area for any signs of leakages or spills.
- The storehouse to contain a spill containment kit (among items included are gloves, disposable bags, absorbent pads/blanket, and absorbent socks, danger cones and or hazard warning tape and bucket or marked waste bin).
- In case of spillages, the following procedure to take effect;
  - The source of the spill / leak shall be isolated, to be contain discharging. Halting discharge shall include the cause of spillage or leakage; this may include replacement of caps to prevent further discharge of the chemical.
  - Condon/mark the area of coverage of the spill with danger cones.
  - Apply appropriate spill containment material for the spill such as an absorbent to clean up spillages.
  - Fill/complete an incident report slip on the observation and submit to supervisor/SHEO/SM.
  - Investigation of the cause of the spill and take necessary corrective action to avoid recurrence.

- Consolidate all information on the incident and report (i.e., Spillages of over 200 litres are required to be reported to the regulatory authority (i.e., Ministry of Mines and Energy)).
- All materials used in handling the spillage to be disposed at the contaminated soil site.

- It is necessary that all workers that access the storehouse and use chemicals designated are aware of the spill containment Standard Operating Procedure (SoP).

Table 7-4 Illutration of singnage for storgae area and activities prohibited and required

Mitigation measures for bulk fuel storage:

- In case of bulk storage of fuels onsite, the following shall apply;
  - these shall be stored in steel tank(s) supplied and maintained by the fuel suppliers.
  - Where such a tank is above ground, it shall be contained in a bund or protection walls that can contain 150% of the stored quantities.
  - Where below ground such shall further be in concrete containment structures entirely with enough capacity to hold up to 150% volume in storage tank.
- All small to medium sized vehicles are to use demarcated areas onsite or town facilities for fueling.
- All large vehicles to be serviced by fuel bowsers however with spill and leakage containment provisions such as drip trays.
- Prolonged storage of large quantities of fuels onsite should be minimized as far possible (i.e., above structural provisional containment quantities).

- Drip trays should be available and utilized where there is potential for spillages or in case of leakages from machinery or vehicles.
- Delivery of fuels onsite shall be supervised at all times.
- Fueling activities to ensure adherence to safe transfer practices to avoids spillages.
- Fuel attendants are to be trained on safe fueling practices of vehicles and machinery.
- No fueling points located within 50m of a water course/channel.
- Servicing of vehicles shall be carried out in designated areas with impermeable surfaces.
- Used oil shall be stored onsite in demarcated areas.
- To avoids disposal of used oil, it shall be necessary to engage and cooperate with certified local oil recyclers for collection and reuse.
- All designated workers shall be made aware of the spillage handling procedures for chemicals.

Mitigation measures for containment of contaminated materials and redundant containers:

- The potential for contamination exists, it is required that an area is demarcated for handling and storage of contaminated soils or materials. The planning and use of this areas shall be as follows;
  - The area shall not be located close to watercourse/channel or near storm water drains. The site should be at least 40-50m away from the outlined features and not in a flood plain.
  - The demarcated site is to be layered with impermeable plastic sheets or concrete surfaces and provide for containment of any runoff where it may occur.
  - Ensure the demarcated site is condoned/fenced off from other onsite activities with gate access.
- All contaminated soils are to be excavated and removed from incident site and carefully deposited to the demarcated area.
- Minimal treatment shall be applied to contaminated soil, which involves exposing contaminated soil to air and sun to allow for natural remediation allowing natural reduction of concentration of contaminant. Soils exposed for considerable time to air, and sun should be transported for disposal at the landfill site.
- No contaminated soil or material are to be disposed offsite that has not been allowed minimal remediation onsite as per refereed above procedure.

- Transportation of any contaminated soils to disposal sites shall be carried out safely to avoid any spillages.
- The contaminated soil storage site shall be monitored to avoid disturbances from other construction activities.
- Regular walkabout inspection shall be carried out to establish compliance and proactively detect signs of unreported spillages onsite.
- All records relating to incidents of spillages or contamination shall be regularly audited to ensure long project compliance.

l) Potential risk of fire accidents or incidents

Mitigation measures

The risks of fire starting are unforeseen and thus it is required onsite that;

- All areas are to be equipped with appropriate firefighting equipment's at convenient points.
- Schedule regular servicing of fire equipment has to ensure readiness when required.
- Compose and appoint a firefighting team and ensure training in basic firefighting skills.
- Conduct regular awareness and training on fire risks and mitigation.
- Familiarize all workers onsite of the appointed firefighting team.
- Provide emergency numbers of the local fire department at all places for convenience.
- Demarcate a fire assembly point and provide awareness to all site personnel.
- No fire is to be started onsite except in demarcated areas if necessary.
- Conduct fire emergency response drills for general workers and firefighting team.
- All visitors to site shall be made aware of the fire emergency points and protocol
- In case of a fire, the following procedure is to apply;
    - a fire alarm or designated siren system shall be triggered.
    - All supervisors to ensure that all personnel make way to the assembly point.
    - Supervisors are to verify with a list of names if all subordinates are present at the assembly point.
    - No persons shall leave the assembly point until instructed or it has been confirmed safe to do so.

m) Disturbance to town traffic flow

Mitigation measures:

To ensure minimal disruption to traffic flows around town, the following measures shall apply;

- Develop a delivery and loading schedule of large vehicles during off-peak traffic hours i.e., 09h00 to 11h00, and 14h30 to 16h00.
- All construction vehicles are required to use approved roads and entrance to construction site. The use of the existing access road to the existing premises for construction vehicles shall not be allowed except if deemed necessary and circumstantial.
- Access roads to be cleared of any debris that may be deposited due to construction works.
- All construction vehicles around the construction site shall provide for safe passage of pedestrians and local traffic to ensure minimal disruption as may be necessary in the immediate surroundings.
- In case of delivery of abnormal loads, it shall be required to liaison with the OTC and Traffic Law enforcement Department where necessary to arrange escort assistance.
- Use of busier main roads and private location streets for large trucks and machinery is to be avoided at all times.
- Inspection to ensure no obstacles and adherence to traffic control measures onsite and offsite route usage
- All designated drivers of contractor and subcontractor are to be made aware of required conduct onsite and surroundings.
- A logbook shall be kept registering and recording traffic related complaints.
- Review of complaints logbook, investigation, redressal and keeping records. It targeted that less than five complaints for Heavy vehicles in private residential roads are recorded annually and that in residential/private streets 2-3 complaints for small vehicles per month are recorded for construction works.

n) Employment opportunities for local communities

Enhancement measures:

- Entrench conditions towards hiring of local persons or subcontractors in tendering documents.
- Entrench conditions to promote the hiring of marginalized and people with living disabilities on qualifying positions.
- Unskilled labour to be sourced from local residents, through local office of the Proponent and further with consultations of local governance offices i.e., Constituency offices.
- Hiring of skilled labour to afford advantage to locals and marginalized persons.
- It shall be necessary that periodical verifications are carried out on level of local participation in the project.
- Review of complaints logbook on matters of participation of locals and take up where necessary.
- As a part of the conditions towards appointment, the Contractor and subcontractors are aware of the ESMP and requirements thereof.
- Where locally available, construction material shall be sourced to support local businesses.

o) Generation of dust onsite and to surroundings

Mitigation measures

Generation of dust from construction activities is a given impacts and thus the following shall apply to mitigate;

- Speed limit of vehicles onsite shall be limited to 30-40km/h.
- Where a certain activity is expected to generate significant amount of dust, such areas shall be barricaded with nets or other sufficient materials to reduce escaping dust to the surroundings.
- As practically possible, certain activities with intense dust generation are to be scheduled on days with calm weather conditions.
- Speed reducing structure such as humps shall be erected in certain section of access roads onsite.
- Significant dust generating surfaces such as roads with high usage are to be regularly sprinkled with water for dust suppression.
- Transportation of dust producing materials offsite or onsite to utilize covers to minimize escape of particles to the surroundings as practically possible.
- A complaints logbook shall be established and maintained onsite for records.

- Inspection of sites shall be carried out to ensure compliance and application of dust control measures.
- The complaints logbook shall be periodically reviewed to establish resolution of complaints and where unresolved, take forth for redressal.

p) Disturbance to heritage/cultural sites or potential of hazards on site

Mitigation measures

- The present site is not known to have any potential materials or objects of historic or heritage value. However, it is necessary that where any such object is encountered, the following procedure is to be applied of heritage objects;
  - On discovery of items or materials of strange occurrence, persons responsible for discovery shall halt activity and inform their supervisor of the discovery or suspicion of strange material or object.
  - The supervisor shall communicate to the Site Manager and SHEO of the discovery.
  - Relevant authorities shall be informed of the find for guidance.
  - Construction activities shall be considered after it is safe to proceed on instructions from the Site Manager.
- Since it is uncertain that the provided information on pre-independence disposal of explosive mines on the site, it is necessary that verification with authorities such as law enforcement is carried out prior construction activities involving bulk excavation.

q) Emission of excess smoke, noxious and greenhouse gases

Mitigation measures:

- No equipment or machinery shall be kept running unnecessary when not required for use. These includes all vehicles, generators, compactors, compressors, welding torches.
- All vehicles and machinery are to be maintained in good working conditions through regular scheduled servicing.
- All machines observed to release excessive smoke are switched off instantly and necessary repairs be implemented before they are to be used.
- Keep and review logbook of incidents of running equipment not in use and ensure corrective actions are applied.

- Conduct site walkabout to monitor adherence

r) Generation of noise and vibrations

Mitigation measures:

- All construction works to be conducted during normal working hours (07h00 – 17h00 during working days of the week and 07h00 – 13h00 during weekends).
- Machinery with excessive noise shall not be used until such a time that faults are repaired, or alternative are availed for usage.
- All machinery should be kept in good working conditions to prevent incidents of producing excessive noise.
- Care should be taken when unloading or loading vehicles to avoid un-necessary noise. All deliveries to be conducted during normal working hours (07h00 – 17h00 during working days of the week, 07h00 – 13h00 during weekends).
- When unloading materials, these are not to be dropped but safely lowered to surfaces.
- Appropriate Personal Protective Equipment (PPE) for noise and vibration shall be provided to affected workers onsite.
- Site workers to report incidents of excessive noise to supervisors
- Where practical, erecting of noise barriers to contain and shield excessive noise to surrounding areas shall be considered.
- All incidents of complaints of noise are to be recorded inclusive of non-compliance to usage of PPE.
- The complaints logbook shall be periodically audited of compliance to reasonable noise generation through complaints logbook.
- Select points for monitoring of noise level within the construction site and immediate offsite surroundings.

s) Potential hazards to the health, safety, and welfare of workers

Mitigation measures:

- Provide all construction workers with appropriate and necessary PPE.
- Ensure that workers take the necessary time to rest, eat, and hydrate so that they remain alert and focused throughout the days.

- Ensure that all equipment's are maintained in good working order to prevent risk of injuries due to malfunctioning.
- Hold regular safety meetings to ensure that safety protocols remain fresh in the employees' minds. Discuss safety incidents in the meetings to alert others of potential safety hazards and close calls.
- Conduct regular safety Inspections around the site
- Keep records of safety incidents and resolutions actions taken.
- Erect signboards and use of danger tapes in various areas to warn of potential hazards.
- Where necessary provision made for persons with special needs such as those with disabilities to access areas or facilities.
- Establish and have in place agreement with an emergency service provider for emergencies.
- Maintain good housekeeping of all construction areas.
- Keep record of all health and safety incidents onsite.
- Ensure that emergency care numbers are always available onsite and pasted on notice boards and other conspicuous places, further indicating contact persons (first aid representatives on duty).
- Ensure that the safety officer has valid first aid training and that all designated support officers have basic first aid training
- Familiarize workers with demarcated emergency assembly areas.
- In case of an emergency incident, the following procedure shall apply;
    - Where the incident is minor and the affected persons remains conscious to act, it shall be required they isolate from the cause of the incident at onset.
    - Should the affected persons be unconscious or immobilized due to the incident, the close contact persons shall isolate the affected persons from the danger or cause of the incident to a safe space.
    - The affected or person in close contact to immediately contact the first aid representative for first aid response to the incident.
    - The affected or person in close contact to further contact the supervisor to report the incident.

- The first aid officer shall examine the incident and accordingly accord necessary response for first aid treatment or activate the Emergency Management System.

Mitigation measures on the welfare of the construction workers:

- Identify and agree on location should it be required to provide onsite temporal accommodation for the workers. Accommodation of workers onsite is a last resort where such cannot utilize offsite accommodation facilities. However, where such is required, an area shall be located reasonably away from the construction sites.
- The workers shall be provided with access to clean drinking water.
- Cleaning services for facilities shall be arranged or schedule put in place to maintain hygienic conditions.
- Provide adequate and separate sanitation facilities for both male and females on site and clearly marked out with signage for male and female genders.
- Encourage regular health check-ups for onsite personnel
- No social gatherings are to be allowed onsite at all times.
- No excessive noise is allowed onsite beyond 10h00
- Movement on and offsite to be restricted between 20h00 and 06h00 during weekdays and from 10h00 to 06h00 in weekends.
- No fires are allowed in un-demarcated areas.
- Workers living onsite shall not bring their families to live with them at provided accommodation for constructions workers.

t) *Public health and Safety from construction activities*

Mitigation measures

- Access to the construction site shall always be controlled through an access gate with manned security presence.
- Construction site to be entirely condoned off from public by fencing/barricades
- All visitors to site to undergo induction on environmental and safety requirements.
- Ensure that records are kept of visitors to site.

u) *Potential theft of construction materials and or vandalism to property on site*

Mitigation measures

- An area shall be Identified and agreed upon for demarcation and designation for construction or designate as a secure materials storage area.
- The construction site shall be guarded by 24-hour security services to ensure safety of the site.
- Inventory records shall be maintained of all materials delivered and stored onsite and subsequent retrieval records for use.
- Access to the storehouse shall be designated to specific persons and controlled.
- No members of the public shall be allowed onsite without appropriate permissions.
- Visitors are required to report at designated reception point and to provide proof of appointment to site.

v) Generation of construction waste

Mitigation measures

- Identification and demarcation of waste collection points for different types of construction waste.
- The following waste to be provided for; metals, building rubble, concrete, and damaged bricks, plastics, rubber and wood.
- Construction areas are to be kept free of waste through adherence to use of demarcated areas/points for storage of waste.
- Carry out regular inspection of areas to ensure adherence to good housekeeping practices in various construction areas.
- Construction waste such as building rubble, planks and rubber, offcuts with no reuse are to be transported to appropriate waste disposal site and disposed accordingly at the local authority waste disposal area as per required protocols.
- Identify and approach local waste recyclers for opportunities to collect waste such as metals and recyclables.
- Uncured concrete shall be returned to the batching plant.
- Works involving batching plant concrete and pouring of concrete shall be supervised to minimize wastage. No concrete mixing on the ground surface to be allowed.
- Batching plant shall be restricted to a demarcated area and its operations.

- No burying or burning of redundant construction packaging materials or allow to scatter onsite. All waste of packaging to be appropriately disposed in demarcated areas for disposal as per waste disposal protocols.
- The use of waste container skips for collection and storage of construction waste onsite is highly recommended.
- Concrete blocks and bricks that are residues of the construction works to be crushed and stored in demarcated containers or areas for potential reuse as infill material onsite or offsite or transportation to waste disposal site.

w) Domestic and general waste management

Mitigation measures

- Demarcate adequate points for collection of domestic waste
- Collected domestic waste are to be handled in line with existing local authority waste collection system (containers with lids and weekly schedule preparation for collection).
- As far as practically possible, implement waste management hierarchy through promoting avoidance, minimization, differentiation of waste into tins, bottles, papers, kitchen waste, and office waste for potential recycling or reuse. Where encountered waste of electronics shall be differentiated to provide opportunities to waste recyclers or reuse.
- Where there is excess domestic waste and required to transport own waste to the waste disposal site, this shall be done in line with waste disposal measures of the local authority
- Where available, identify and engage local waste recyclers for opportunities to collect differentiated recyclable waste.

x) Wastage of natural resources (water and power resources)

Mitigation measures:

- Carry out inspection to identify and monitor areas of possible wastage of water and power (leakages, open taps, unnecessary lighting during daytime)
- All incidents involving wastage of water or power are to be recorded and addressed.
- Site workers to be inducted on measures of avoidance of wastage such as;

- Securing taps when not in use.
- Encourage taking of shorter showering time.
- No starting gardens and their watering.

y) Enhanced local business economy and town development

Enhancement measures

- Encourage sourcing and use of local businesses for construction materials and others available locally.

z) Conflicts/grievance from workers, contractors, subcontractor, and general public

Mitigation measures

- Provide awareness to all onsite workers of the grievance registration, handling, and redress process.
  - Ensure availability of GRM and associated forms in conspicuous places onsite.
- All aggrieved persons be encouraged to submit written grievances to an appropriate office.
- All grievances are to be handled and resolved as quickly as possible at local level as per provisions of the grievance redress process.
- Review of grievances logbook and establish closeout cases and those needing further take up for resolution.

aa) Potential loss of landscape visual aesthetic from development

Mitigation measures

Due to intense construction phase, it will be required at the end of construction phase that activities are carried out to improve the outlook of the site into operation phase but also ensure remnants unusable materials managed. The following activities shall be implemented;

- Area clean-up of any remnants of construction activities
- Landscaping of embankments and other surfaces to remove roughness on edges and angles.
- Ripping of areas to loosen soils and allow natural vegetation regrowth
- All excess excavated material onsite after the construction activities to be levelled and used as infill for areas where necessary.

- All potential waste of various types is removed from site and disposed according to waste disposal practices established.
- All contaminated soils to be contained in established area and subsequent removal from site to the town's disposal site.
- Careful removal of temporal facilities such as temporal accommodation, mobile toilets to prevent impacts to human health and safety, and environment. Including excavation of all concrete made for temporal structures and crushing for use as infill to other areas or transportation to landfill site.
- Inspection of areas to ensure it is clear of any remnants of waste, redundant materials, chemicals.

7.3.7.3 Operation Phase

a) *Need for continuous improvement in water treatment sludge management*

- Obtain permit for handling of water treatment sludge onsite.
- Regular monitoring of sludge lagoons area and surrounding to detect any sign of overtops.
- The removal of sludge residues shall be monitored as far as practically possible.
- Transportation of dry sludge offsite to ensure sealing/covering of tops to prevent escaping of particles to the surroundings.

b) Render improved water supply service delivery

Enhancement measures

- Continuous engagement with other water sector stakeholders (DWSSC) and regional councils to facilitate further supply of water to extended area specifically remote areas.
- Monitor demand to continuously improve supply operations.
- Continually monitor compliance with the national water quality standards

c) Potential increased recurrence of localize flooding of the adjacent areas

Mitigation measures

- Continual monitoring of storm water flow paths adjacent to communities for blockages
- Where necessary carry out clearance of debris and blockages in flow paths to alleviate accumulation of storm water and unwanted diversions.

d) Unintended creation of an ecosystem

Mitigation and enhancement measures

- Regular monitoring to identify floral species within the dam, with specific interest to identify problematic species for continual removal.
- Management of floral invasion to retain manageable floral presence within the dam to serve ecosystem services.

e) Ageing and deterioration of structures

Enhancement measures

To prolong the design span of the plant it is important that;

- Schedule regular operational maintenance of the WTP and associated infrastructure for defect and initiate repairs where necessary.

f) Potential opportunities from reuse of dry sludge as long-term disposal

Enhancement measures

- Initiate and continually explore opportunities for reuse of dry sludge residues for alternative such as landfilling cover or spreading at contaminated sites for soil improvement.

g) Climate change effects on operation of the waterworks

Mitigation measures

- Initiate and carryout a disaster and climate risk assessment and establish potential long-term mitigation measures
- Raise public awareness on water conservation and water protection actions
- Raise awareness on climate induce disaster and impacts on water availability for supply
- Participate in basin level planning and management of shared watercourses
- Support the flood monitoring and flood early warning systems.

7.3.7.4 Decommission Phase

a) Potential value from reutilization of redundant structures

It is important that as first approach to site rehabilitation for dormant structures is to explore opportunities for alternative reuse of the structure through stakeholder consultations. Such may find alternative to uses of some of the constructed structures. This alleviates establishing new impacts from the requirements for rehabilitation.

b) Potential hazards from redundant structures

Where alternative use of structures is impractical, it will trigger rehabilitation of the area. The overall aim of the rehabilitation shall comprise to retain the area to conditions closely mimicking pre-construction or outlook of the adjacent landscape. Important are the following objective;

- Stability of slopes to prevent erosions
- Safety of humans in the surroundings
- Improvement of site outlook
- Allow natural recovery of the site

To achieve the above objectives the following shall be carried out;

- Removal of all infrastructure and site clean-up (New WTP, pump stations, and sludge lagoons and RWSD, all linear infrastructure)
- All demolition works to be carried out by experienced contractors
- All sites of infrastructures are to be condoned off for demolition of concrete works.
- Removal of movable components of the WTP, Pump stations, sludge lagoons that will include including cabling, pumps, feeding pipes, power substation/transformers.
- All metals to be removed where possible and separately stored for opportunities of recycling by local recyclers.
- All concrete from structures to be crushed and safely deposited and stored in demarcated area for transportation to disposal site or infill for other areas onsite
- All concrete surfaces to be excavated, crushed, and hauled of the area into storage area and used as infill or for disposal at appropriate landfill site.
- All embankments to be levelled to mimic surroundings landscape
- All sites of new WTP, RWSD, Sludge lagoons and pump stations and roads to be landscaped and ripped to loosen ground surfaces and facilitate natural vegetation regrowth.

- All works to be carried out to prevent negative implication on human health, safety and environment of the workers, and surrounding communities as per established protocols on the EMP.
- Monitor the execution of rehabilitation to safeguard people and environment

7.3.8 Impacts Significance Re- Evaluation

The table below is derived to establish feasible mitigation and control measures towards alleviating the significate of negative impacts, whilst enhance the beneficial impacts.

Table 7-5 Re-evaluation of Impacts significance with mitigation

Phase	Impact/Aspect	Receptor Environment=Env Social = So Economic = Eco	Impact Evaluation						
			Impact Type	Pre mitigation Significance	Extent	Duration	Intensity	Probability	Post Mitigation Significance
Preconstruction (Planning and Design)	Utilization of the existing premises to full potential	Eco	+Ve	**11**	1	3	4	4	**12**
	Increased access to potable water and sanitation facilities for the people of north central Namibia	So & Eco	+Ve	**12**	3	3	3	4	**13**
	Potential need to increase raw water abstraction from the Kunene River to the extended OWW	Env	-Ve	**12**	1	1	1	1	**4**
	Increase occurrence of localised flooding of adjacent areas		-VE	**8**	1	1	1	1	**4**
	Uncertain capacity of existing infrastructure to convey and secure adequate water supply to the extended OWW	Eco	-Ve	**11**	2	1	1	1	**5**
	Increased need for additional power supply from the power supplier	So & Env	-Ve	**9**	1	1	1	1	**4**
	Potential contamination/leaching from water treatment sludge storage		-Ve	**8**	1	1	1	1	**4**
Construction	Employment opportunities for the local communities	So & Eco	+Ve	**13**	4	3	3	4	**14**
	Increased opportunities for local subcontractors	Eco & So	+Ve	**10**	4	3	2	3	**12**
	Enhance local business and town development	So & Eco	+Ve	**12**	3	3	3	4	**12**
	Impediments to storm water flow paths	So	-VE	**8**	1	1	1	1	**4**
	Potential contamination of soils from storage and use of hazardous/chemicals substances	So & Env	-Ve	**8**	1	1	1	1	**4**

	Generation of domestic wastewater	So & Env	-Ve	7	1	1	1	1	4
	Emissions of excess smoke, noxious and greenhouse gases	So & Env	-Ve	9	1	1	1	1	4
	Soil structure disturbance/compaction	Env & So	-Ve	8	1	1	1	1	4
	Generation of construction waste	So & Env	-Ve	9	1	1	1	1	4
	Generation of domestic and other general waste	So & Env	-Ve	9	1	1	1	1	4
	Loss of landscape visual aesthetic value	So & Eco	-Ve	5	1	1	1	1	4
	Potential hazards to the health, safety, and welfare of workers	So & Eco	-Ve	8	1	1	1	1	4
	Potential hazards to the health, safety, and welfare of the public		-VE	9	1	1	1		4
	Exacerbate immigration of job seekers	So	-VE	9	1	1	1	1	4
	Disturbance of town's traffic flow pattern	So	-VE	7	1	2	1	1	5
	Disturbance to heritage/cultural sites or potential hazards onsite	So	-VE	7	1	1	1	1	4
	Generate noise and vibrations to the surroundings	So	-VE	10	1	1	1	1	4
	Generation of dust onsite and to surroundings	So	-VE	9	1	1	1	1	4
	Wastage of natural resources (water and power resources)	Env	-VE	6	1	1	1	1	4
	Theft of construction materials and potential vandalism to property on site	Eco	-VE	7	1	1	1	1	4
	Conflicts/grievance from workers, contractors, subcontractor and general public	So	-VE/	9	1	1	1	1	4
	Potential risk of fire incidents or accident	So & Eco	-VE	9	1	1	1	1	4
Operation	Improve potable water supply to the north central regions.	So & Eco	+VE	12	3	3	3	4	13
	Unintended creation of ecosystems	Env	+VE/	7	1	3	1	3	8
	Potential opportunities to reuse sludge as long-term disposal	So & Eco	+VE/	7	1	3	2	1	7
	The need for long term dry sludge disposal solution	So & Eco	-VE	9	2	1	1	1	5
	Increased recurrence of localised flooding of the adjacent areas	So	-VE	9	1	1	1	1	4
	Ageing and deterioration of infrastructure	Eco & So	-VE/	9	1	1	1	1	4

	Climate change effects on operations of the waterworks	So & Env & Eco	-Ve	**10**	1	1	1	1	**4**
Decommission	Potential reuse of redundant structures	So & Eco & Env	**+Ve**	**10**	1	4	3	3	**11**
	Potential hazards from presence of redundant structures onsite.	So & Env	-Ve/	**8**	1	1	1	1	**4**
	Diminish landscape aesthetic value	So	**-Ve**	**6**	1	1	1	1	**4**

Chapter 8
8. Environmental and Social Management Plan

8.1 Introduction

In accordance with national legislation and AfDB's ISS, a detailed Environmental and Social Management Plan (ESMP) has been developed to outline a guiding plan of action based on mitigation measure proposed in the impact's mitigation (Subsection 7.3.6) based on significance re-evaluation table (Subsection 7.3.5). The ESMP is aimed at ensuring that all proposed mitigation and control measures are implemented within the scope of this project to supress negative impacts to acceptable levels whilst enhance positive outcomes from the project.

8.2 Objective of ESMPs

Environmental and Social Management Plans (ESMPs) are developed to set a framework upon which to manage identified significant impacts from envisaged activities. An ESMP outlines measures towards safeguarding environment and communities from adverse impacts whilst enhancing positive outcomes throughout the various project phases, from planning to closure. An ESMP aims to provide the following;

i. Information on the potential negative impacts associated with the envisaged activities.
ii. Present measures to avoid, lessen and mitigate identified negative impacts and enhance measures for positive impacts.
iii. Describe the significance of compliance to legal and policy requirements.
iv. Guidelines for the management and compliance monitoring of the identified environmental issues.
v. Define the roles and responsibilities for the implementation of environmental management and mitigation measures.
vi. Explain procedures for environmental reporting to the relevant competent and regulatory authorities.
vii. Present procedures for potential decommissioning and necessary environmental remediation.
viii. Provide guidance for the submission of grievances to appropriate authorities.
ix. Recommendations for implementation of management actions

8.3 Administration of the ESMP

8.3.1 Roles and Responsibilities

The Proponent retains the overall responsibility to ensure that this ESMP is implemented to the latter and required actions carried out as proposed. Nevertheless, it is obligatory that all persons wielding roles and responsibilities ensure that management measures contained in this plan are implemented and adhered in their area of responsibility. To ensure comprehensive implementation of this plan, the following roles and responsibilities are prerequisites;

8.3.1.1 Ministry of Environment, Forestry and Tourism- Department of Environmental Affairs and Forestry (MEFT-DEAF).

The Environmental Management Act (No. 7 of 2007) empowers the Environmental Commissioner in the Ministry of Environment, Forestry and Tourism (MEFT) as the designated authority responsible for approval of ESMP's. Once approved, an ESMP is a legally binding document and carries obligation for implementation by the Proponent to the latter. The Office of the Environmental Commissioner (OEC) has the authority to enforce legal action after carrying out inspections, issuance of compliance orders and resultant continued non-compliance by a Proponent.

8.3.1.2 Ministry of Agriculture, Water and Forestry

The role of the MAWLR is to promote, develop, manage, and utilize agriculture, water and land resources. Through its Department of Water Affairs, it implements the requirements of the Water Act and proactively the Water Resources Management Act that although yet into effect.

The following sections are implemented relating to requirement for treatment of water and wastewater;

> *Section 21(5) and 22(2), for compliance with the requirements of Section 21(1) and 21(2) of the Water Act (Act 54 of 1956) that purified water shall comply with the General Standard as laid out in Government Gazette Regulation R553 of 5 April 1962.*

Subsequently, *a permit/license for sludge treatment in lagoons will be required in compliance*. Furthermore, it is required to *proactively comply with the draft water quality standard of the Water Resources Management Act that will come into force in near future.*

8.3.1.3 Ministry of Mines and Energy

MME is the custodian of the diverse geological, mineral and energy resources, and to ensure their contribution to the country's socioeconomic development. Through its Directorate of Petroleum Affairs, enforces the petroleum and energy legislation through regulating the supply of petroleum products as controlled products.

In case of the project OWPPEP, *where storage of fuels onsite is envisaged, an application for a consumer Installation certificate will be required from this Ministry.*

8.3.1.4 Ministry of Labour and Employment Creation

The MoLEC is mandated with ensuring effective labour, employment and social protection services. Through its directorate of labour relations, it aims towards promoting harmonious labour and industrial relations by protecting the national workforce from unfair Labour practices and unsafe working conditions. The following divisions ensure enforcement the requirements of the Labour Act;

Division of Occupational Safety & Health ensures adherence and enforcing compliance to the provision of the Act in respect of Health, Safety and Welfare of Employees.

Labour Inspectorate ensure adherence and enforcing compliance to the provisions in respect of the basic conditions of employment and welfare of employees at workplaces, enforcement and execution of arbitration awards and implementation and enforcement of wage order and collective agreements.

In relation to the project, *this ministry will conduct inspections of health, safety, and health requirements in accordance with the Labour Act of 2007. Compliance to the labour act is requirement from the contractor and subcontractors.*

8.3.1.5 The Oshana Regional Council

The role of the Regional Council is relayed in Section 6.7.1 of Chapter 6 of this report. Through its Disaster Management Unit, the Council coordinates response plan in the region to natural disaster such as floods and droughts.

Is it required that the Regional Council, specifically *members of the Disaster Management Unit are sensitized on the proposed development and mitigation measures put in place and where possible consent to the use of the land is obtained.*

8.3.1.6 The Oshakati Town Council

The role of the LA has been described in 6.7.1 of Chapter 6 of this report. Through its Property Department, renders services related urban land acquisition and utilization thereof. The LA Act guides the Councils in their land delivery process. The requirements thereof, stipulate that;

- Build within the town requires building requirements.
- A notice of the building plans must be submitted to the Council's office for approval prior to construction

Contravention of the above requirements is an offence that is subject to provision of applicable by-laws to ensure compliance.

It is required for the proposed project that approval for the envisaged land use plan is approved.

8.3.1.7 The Proponent

The Proponent (NamWater) is the custodian of the ESMP, where rests the full obligation for implementation. The Proponent shall appoint/assign a delegate to coordinate and facilitate the implementation of the EMP on the institution's behalf. The appointee shall hold the position here referred as the Environmental Manager. Meanwhile, the project management unit of the proponent remains the overarching arm on the project implementation in accordance with terms of reference of the project concept.

8.3.1.8 Environmental Manager

The position of an Environmental Manager (EM) requires persons with appropriate years of experience and qualifications in environmental management, to guide and manage the implementation of the EMP. The Proponent's organizational structures comprise officials qualified in environmental management field, and therefore shall delegate an appropriate person to hold this role and execute its responsibility throughout the various phases of the

project to ensure accountability to the Proponent on implementation. The EM will be assisted by the Environmental Compliance Officer (ECO) in fulfilment of obligations placed upon them. The key responsibilities of the EM shall include;

- Ensure full implementation of all requirements of the EMP, inclusive of national legislative requirements and that of the financier, to ensure that the Proponent complies at all times with the entire scope of measures prescribed.
- Keep management constantly informed of the implementation of the EMP and all matters relating to monitoring, review, and update.
- Lobby and secure resources required for the implementation of the EMP.
- Keep and maintain a monitoring, review, and update schedule on the progress of implementing the EMP.
- Ensure stakeholders are updated and informed on implementation of EMP.
- Involvement in grievance redressal process to seek swifter resolution in the interest of project progress and satisfactory remedy to affected parties.
- Assist in the assessment and review of Contractor's performance related to management of environmental and social issues.
- Supervise the work of the ECO.
- Regularly liaise with the other parties involved in the implementation of the EMP to ensure compliance to approved plans and designs on prescribed environmental and social safeguards.

8.3.1.9 The Environmental Compliance Officer

The Environmental Compliance Officer (ECO) is the implementing position under the EM. This position is a requirement in the implementation of the EMP to ensure that all practical measures requiring implementation are carried out accordingly. The position like that of the EM requires specific knowledge in the field of environmental management to comprehensively ensure implementation of the EMP and compliance to established environmental requirements.

The ECO is under the Proponents structure, however in the pre-construction to construction phase, the Environmental Assessment Practitioner (EAP) will bear this role. The Proponent may still appoint an ECO within the institution, that will collaborate with the EAP through the

first phases of the development to commissioning of the completed infrastructure, easing the implementation of the EMP in the operation and long-term decommission phase, solely by the ECO. Specific responsibilities shall include;

- Monitor activities and processes onsite to ensure that established protocols and standards are adhered by contractors, subcontractors and other parties involved in the project.
- Verifying that all the required environmental licenses and permits have been obtained, as appropriate.
- Review established and maintained information record system about the project, such as incidents, corrective actions taken and their status.
- Liaise with relevant authorities and contractors regarding compliance to legislation.
- In collaboration with the safety, health and environment officer (SHEO), ensure compliance to health and safety standards and requirements.
- Conduct environmental inspections, audits and monitoring of environmental factors as established in EMP, and subsequent reporting.
- Providing recommendations for remedial action in the event of any non-compliance.
- Ensure that all employees of the contractor and subcontractors are trained on environmental matters as prescribed.
- Always ensure the availability of the Grievance Redress Mechanism (GRM), whilst facilitate and participate in the redressal process.
- Ensure a grievance logbook is established, maintained, updated and reviewed onsite. Such shall ensure confidentiality of the information submitted.
- Ensure that that the rehabilitation or decommissioning plan activities are carried out accordingly.
- Carry out investigation as so necessary of grievances towards the resolution process.

8.3.1.10 Engineering Consultant

The Engineering Consultant (EC) refers to the lead engineering consultant or delegate that oversee the project phases of pre-construction (i.e., planning and design), and supervision of construction to commissioning of the completed development. This role is key to the proposed project and ensuring that plans and designs embed the environmental and social

controls, and measures prescribed by environmental stakeholders. Specific responsibilities include;

- Oversee the planning, design, and supervision of construction as per appropriate prescriptive terms of reference.
- Coordinate overall entrenchment of environmental and social safeguard recommendations into the project development phase
- Ensure that contractor comply to required environmental and social measures in project implementation i.e., construction phase.
- Participate in grievance redress process to seek resolution.
- Maintain constant liaison with the site manager to ensure that all prescribed requirements are met.

8.3.1.11 Site Manager

The overall onsite coordination of activities in the preconstruction and construction rests on the Site Manager (SM). The SM reports to the EC. The EC or in other terms, the contractor's site supervisor, retains and rests all accountability of daily construction activities onsite, due to broader interaction with various components of the project, and stakeholders on and offsite. The role of SM will transition in the operational and potential decommission phase of the project to the Area Manager for Oshakati Cuvelai Office. Specific responsibilities are;

- Support the Safety, Health, and Environment Officer (SHEO) to ensure that all environmental and social standard operating procedures under the EMP are implemented.
- Ensure the implementation of Standard Operating Procedures (SoP) onsite by the contractor and their subcontractors.
- Ensure compliance to legislative and all required measures set out in the EMP and other necessary conditions.
- Ensure that any subcontractors or visitors to the site are made aware of the requirements always set in the EMP.
- Ensure environmental records are kept as required and continuously updated
- Participate in the grievance redressal process.
- Ensure that procedure related recording of incidences and redressal actions fore resolution are taken swiftly onsite.

- Support the SHEO to ensure that site incidents are recorded, appropriate measures taken, and progressive actions put in place to ensure non-recurrence.
- Any on-site decisions regarding environmental management are communicated to the EC in liaison with the SHE for decision-making.
- Conducting regular site inspections to ensure compliance.
- Engage external stakeholders to facilitate the carrying out proposed activities without hindrance to project implementation.

8.3.1.12 Safety, Health, and Environment Officer (SHEO)

The contractor will appoint the SHEO in the capacity as '*onsite ECO'* for the full duration of the contract to ensure carry the following responsibilities;

- Ensure the day-to-day onsite implementation of the EMP.
- Carry out training and awareness of environmental and safety requirements to all persons onsite (i.e., contractors and subcontractors) including day visitors where necessary.
- Review and outline SOP's closely with the EAP/ECO as required for various onsite environmental and social factors.
- Develop measures to enhance awareness of environmental protection.
- Carry out inspection of environmental and social factors to establish compliance.
- Device measures for corrective actions where there is non-compliance and ensure implementation.
- Maintain regular communication with the SM on environmental performance onsite and areas of non-conformance for corrective actions.
- Investigate and analyse areas of non-conformance to standards to determine reasons for non-compliance.
- Develop an action plan based on best solutions identified for environmental or safety breaches.
- Liaise with various institutions to ensure compliance with environmental legislative requirements.
- Collaborate with the SM to share environmental performance of the development to stakeholders.

- Ensure availability of the grievance redress forms at convenient places to all persons onsite.
- Ensure that environmental information and requirements are displayed at all point of convenience onsite.
- Review environmentally friendly trends in the industry for implementation.
- Coordinate the day-to-day local level grievance redress process closely with the SM and EC.
- Maintain constant communication with the EAP/ECO on implementation of the environmental management
- Ensure incident report forms are adequately available onsite at convenient points to all persons onsite.
- Produce reports on environmental performance as will be required at stipulated intervals.

8.3.1.13 Contractor and Subcontractors

Contractor hereby refers and comprises the entire staff working on behalf of the appointed main contractor for the construction of the proposed development, except the SM and SHEO, whose responsibilities are already outlined. Moreover, the subcontractors comprise those that will provide a certain service to the proposed project over a long or short duration, that in rendering service, their activities have environmental and social implications as contained in this EMP. Obligation to the contractor and subcontractors are as outlined as follows;

- Implement all requirements and provisions of the EMP as prescribed.
- To report any incidents of non-compliance to the SHEO and SM onsite.
- Ensure adherence to safety and health requirements in the working environment

8.4 EMP Administration Structure

The EMP will be administered through the structure composed of the established roles in subsection 5.1 of this document; outlined as the Proponent, the EM, ECO and EAP, the SM, the SHEO, contractor and subcontractors. Meanwhile, the MEFT-DEA carries out their overarching compliance role in accordance with the EMA (No. 7 of 2007) and EIA Regulations (G.N No 12 of 2012). The administration of the ESMP shall be as comprised in the structure of Figure 8-1.

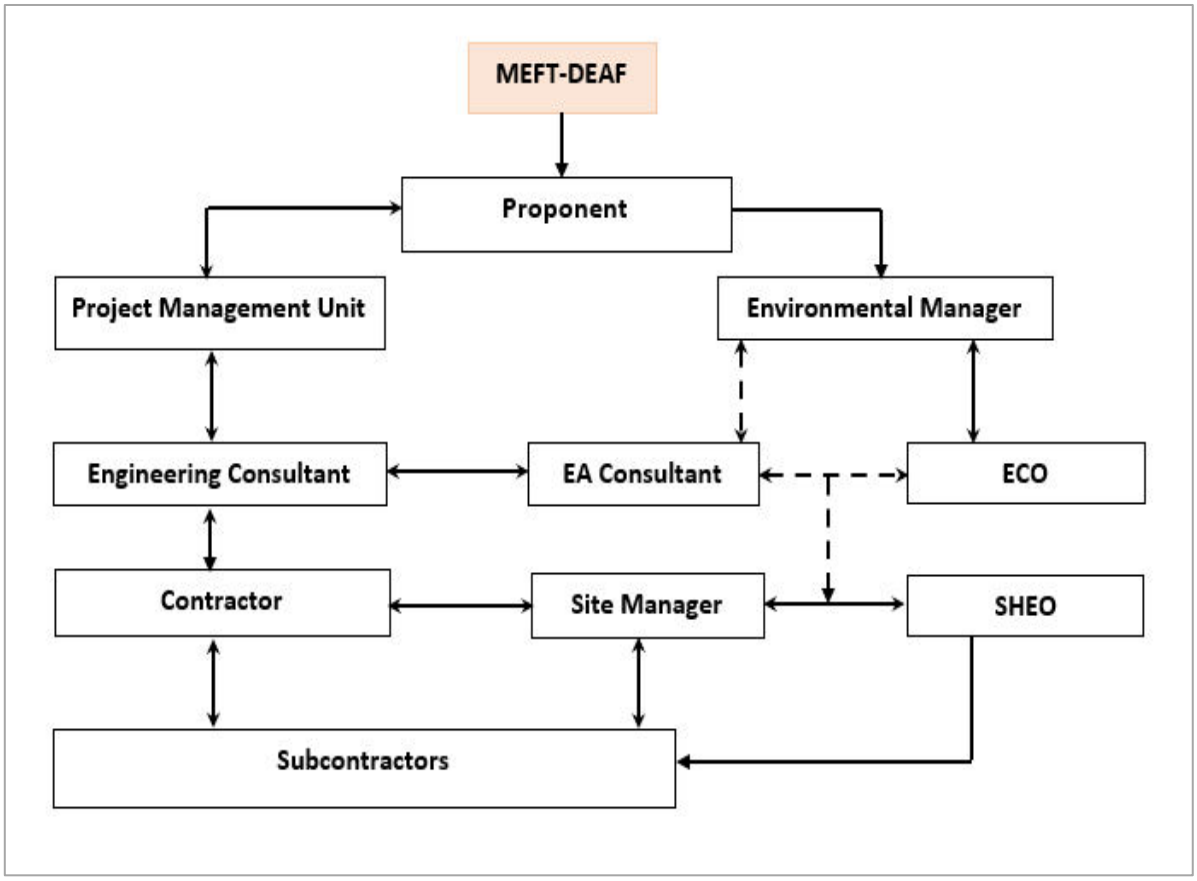


Table 8-1 Administrative Structure for the ESMP

8.5 Environmental Management Plan

The table below presents the required measures to mitigate the environmental, and social impacts from the implementation of the OPPEP.

Table 8-2 Impact mitigation and control measures for the OWPPEP

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
Pre- Construction					
Utilization of existing premises to full potential	-VE	The Proponent approves the proposed plan on location of the envisaged structures.	Once off	Proponent	No Cost
		Reservations and preparation of the areas for the subsequent construction phase as may be required.			
Improved access to potable water and sanitation facilities for the people of north central Namibia	-VE	Carry out all necessary processes to meet regulatory requirement for the realization of the project.	Preconstruction	EC & EAP Proponent	Included in Project
		Final plans and design are submitted to the local authority for approval	Preconstruction	EC	
		Security of additional land for expansion of existing RWSD is affirmed.	Once	Proponent	To be determined by the LA
Increase occurrence of localized flooding of adjacent areas	-VE	A safe and adequate barrier distance is maintained between the adjacent community's settlement and the expanded RWSD area.	Planning and design	EC	Included in Project
		Provision for stormwater collection and channelling are engrained in designs for embarkment of extended RWSD, away from adjacent settlements.			

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
Potential leaching/contamination from water treatment sludge storage	-Ve	Sludge lagoons to be designed of impermeable base and walls to prevent leakage to the surface.			
		Sludge lagoons designs to provide adequate capacity allowing sludge to dry while maintaining continuous operations of the new WTP.			
		Sludge lagoons designs to further consider controls against overflows to the environment.			
Increase the need for additional power supply from the supplier	-Ve	Establish power requirements and acquire confirmation of capacity of the supplier to meet additional input requirements.	Once off	EC	No cost
Potential need to increase abstraction from the Kunene River for the extended OWW	-Ve	Establish demand throughput requirements and verify that operations are within the allocated abstraction rates currently agreed upon between the two countries (i.e., Angola and Namibia).	Once off	EC & EAC	Included in Phase I Project Costs
Uncertain capacity of existing infrastructure to convey and secure adequate water for the extended OWW	-Ve	Initiate activities to improve the state of the canal to deliver adequate quantities of water to the site.	Operation	Proponent	To be determined in scope for the works
		Engage processes to acquired new location for the construction of the new RWSD.	Preconstruction	Proponent	To be determined in acquisition process

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		Finalise plans and designs for the expansion of the existing RWSD	Preconstruction	EC	Included in Phase I Project Costs
Construction Phase					
Impediment/disturbance to stormwater flow paths	-Ve	Maintain storm water collection and flow areas as may be provided in expansion designs for the RWSD.	Construction	Contractor	To be included in the construction scope
Potential disturbance to soils structure (i.e., compaction)	-Ve	The construction footprint shall be as far as possible be reduced to demarcated areas.	Construction	Contractor	To be included in the construction scope
		Post signage in areas to be avoided from construction activities			
		Conduct inductions and awareness to workers on avoidance of demarcated areas		SHEO	
		It is required that regular inspections of areas are caried out to detect onsite ensure adherence to measures.			
Generation of domestic wastewater	-Ve	Sanitation facilities onsite shall comprise mobile toilets units to prevent overload of the sewer reticulation of the existing premises.	Throughout construction	Contractor	To be included in the construction scope
		These mobile units shall be managed as follows; ○ All toilet units are to be secured to the surface in positions placed. ○ All mobile toilet units are to be positioned in non-flooding areas and are to be sited at least 40m away from watercourse or drainage channels.	Throughout construction	Contractor	To be included in the construction scope

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		○ Effluent shall not be allowed to overflow from mobile toilet facilities ○ All mobile toilet units to be inspected regularly for integrity. ○ Mobile toilets shall be clearly marked for both genders (See Figure 7-2) ○ Use of open areas as toilet is prohibited of all construction workers or visitors to site. ○ Extraction and transportation of effluent to disposal areas to be carried out with utmost care to avoid spillages. ○ It is important that removal of effluent from site by a contractor or subcontractor is to be supervised at all times as practically possible to avoid spillages.			
		Transportation of the extracted effluent to be done safely.			
		The OTC to be informed and where necessary consent obtained to discharge effluent at the existing towns wastewater treatment facility.			
		Maintain a regular schedule of extraction and disposal of effluent from the site.	Weekly	Contractor	
		In case of a spillages, the following procedure to take effect; ○ Assess source of spillage or leakage and seek to isolate the cause where possible. ○ Swiftly fill/complete an incident report slip on the observation and submit to SHEO/SM for swift response actions to stop the leakage or spillage. ○ Where such spillages are from scheduled extraction of effluent onsite, it is required that all extraction activities are to be conducted with spillage	Continuous	Contractor/Subcontractor	To be included in the construction scope

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		containment container readily available onsite. This shall be a holding bucket with adequate capacity to contain up to 200liters and safely sealable. Should excessive spillages be experienced during extraction, this activity shall be halted indefinitely until such time that the cause of spillage can be rectified. The faulty mobile unit is to be isolated from usage for site workers and marked accordingly.			
		Awareness of spillage containment procedure	Monthly	SHEO	
Onsite chemicals and hazardous substances storage and use, and management of contaminated substances	-Ve	Identify and demarcate a chemical storage area for construction activities.	Once off	EC, SM & Proponent	
		The following are required of the demarcated area for chemical storage; ○ The chemical storehouse is to be located away from stormwater drains. ○ Appropriate signage should be placed to indicate activities allowed and not allowed in proximity to the storage area. Such will include any activities with potential to ignite a fire. ○ The floor area of the chemical storehouse should be built of impermeable base or bunding surface. ○ A Material Safety Data Sheet (MSDS) should be kept and placed convenient point in the storehouse. This MSDS should be constantly updated as may be required due to operations of the storehouse. ○ Records should be kept of chemical inflow and outflow from storehouse, with details of type of chemical brought and quantities into the	Construction Phase	Contractor	To be included in the construction scope

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		storehouse, the names of persons accessing the storehouse, quantities taken and purpose of collection.			
		Conduct inspections of storage areas for any signs of leakages or spills.	Weekly	SHEO	
		The storehouse to contain a spill containment kit (among items included are gloves, disposable bags, absorbent pads/blanket, and absorbent socks, danger cones and or hazard warning tape and bucket or marked waste bin).	Once off	SM & SHEO	To be included in the construction scope
		In case of spillages, the following procedure to take effect; ○ The source of the spill / leak shall be isolated, to be contain discharging. Halting discharge shall include the cause of spillage or leakage, this may include replacement of caps to prevent further discharge of the chemical. ○ Condon/mark the area of coverage of the spill with danger cones. ○ Apply appropriate spill containment material for the spill such as an absorbent to clean up spillages. ○ Fill/complete an incident report slip on the observation and submit to supervisor/SHEO/SM. ○ Investigation of the cause of the spill and take necessary corrective action to avoid recurrence. ○ Consolidate all information on the incident and report (i.e., Spillages of over 200 litres are required to be reported to the regulatory authority (i.e., Ministry of Mines and Energy)). ○ All materials used in the disposed at the contaminated soil site.	Continuous	Contractors/sub contractors	

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		Ensure awareness of the spill containment SoP to all site workers	Monthly	SHEO	
		In case of bulk storage of fuels onsite, the following shall apply; ○ These fuels shall be stored in steel tank(s) supplied and maintained by the fuel suppliers. ○ Where such a tank is above ground, it shall be contained in a bund or protection walls that can contain 150% of the stored quantities. ○ Where below ground such shall further be in concrete structures with enough capacity to hold up to 150% volume in storage tank. ○ A license will be required for the storage from the MME.	Continuous	SM & Contractor	
		All small to medium sized vehicle (i.e., trucks) to be fuelled onsite at a demarcated area, alternatively use town facilities. These fuelling areas are to be constructed with impermeable surfaces and with spillage drains connecting to a sump		Contractor	
		All large vehicles such as earth moving machinery to be fuelled using a fuel bowser. Trucks to be fuelled in areas demarcated and lined with impermeable surfaces and with spillage drains connecting to a sump.			
		Minimise prolonged storage of large quantities (above containment quantities) of fuels onsite.			Included in construction phase costs
		The use of drip trays be applied at all times to prevent spillages or where there are leakages from machinery or vehicles.		Contractor/subcontractors	
		Supervision of fuel delivery and fuelling activities to ensure adherence to safe transfer practices to avoids spillages.		Contractor	

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		Fuel attendants to be trained on safe fuelling practices of vehicles and machinery	Once off and refresher where necessary	Contractor	
		No fuelling points located within 50m to a water courses/channel.	Once off	SM Contractor	
		Servicing of vehicles shall be carried out in designated areas with impermeable surfaces.	Continuous	Contractor	
		Used oil to be stored in demarcated areas for contaminated substances. Engage certified local oil recyclers for collection and reuse of waste oil.			
		Carryout awareness of the spillage handling procedures for chemicals and fuel.	Monthly	SHEO	
	-Ve	In case of managing contaminated material and sites; o Demarcate an area for handling and storage of contaminated soils.	Once off	SM, EC & Contractor	
		The planning and use of the demarcated area shall be as follows; o The area shall not be located close to watercourse/channel or near stormwater drains. The site should be at least 40-50m away from the outlined features and not in a flood plain. o The demarcated site is to be layered with impermeable plastic sheets or concrete surfaces. and provide for containment of any runoff where it may occur. o Ensure the demarcated site is condoned/fenced off from other onsite activities., with gate access.		Contractor	
		All contaminated soils are to be excavated and removed from incident site and carefully deposited to the demarcated area.	Continuous		
		Minimal treatment should be applied to the contaminated soil, involving allow the soil exposed to air and sun to allow for natural remediation allowing reduced concentration of the contaminant. Soils exposed for considerable time to air, and sun should be transported for disposal at the landfill site.	Continuous	SHEO	
		No contaminated soil to be disposed offsite that has not been minimally remediated. Transportation of contaminated soil should be carried out safely.	Continuous	SHEO	

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		The contaminated soil storage site shall be monitored to avoid disturbances from other construction activities.			
		Regular walkabout inspection shall be caried out to establish compliance and proactively detect signs of unreported spillages onsite.	Weekly	SHEO	
		Conduct audits of incidents records and ensure corrective actions are adequately addressing potential recurrence.	Quarterly	EAC ECO	
Potential risk of fire accidents or incidents	-Ve	All areas to be equipped with appropriate firefighting equipment's at convenient points.	Once off	SM Contractor	Included in operational costs
		Schedule regular servicing of fire equipment's to ensure readiness when required.	As required	SM & Contractor	
		Compose and appoint a firefighting team and train them in basic firefighting skills.	Once off	SM Contractor	
		Conduct regular awareness and training on fire risks and mitigation. Familiarise all workers onsite to the firefighting team.	Monthly	SHEO	
		The Oshakati Fire Brigade number (065) 22 9500 / 081 144 8222 must be displayed at all places for convenience.	Continuous	SHEO	
		Demarcate a fire assembly point, and provide awareness to all site personnel	Once off	SM, SHEO Contractor	
		No fire is allowed onsite except in demarcated areas.	Continuous	SM & Contractor	
		Conduct fire emergency response drills for general workers and fighting team.	Monthly	SM	
		All visitors to site shall be made aware of the fire emergency points and protocol	Continuous	SHEO	
		In case of a fire, the following procedure is to apply;	Continuous	SM & Contractor	

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		○ a fire alarm or designated siren system shall be triggered. ○ All supervisors to ensure that all personnel make way to the assembly point. ○ Supervisors are to verify with a list of names if all subordinates are present at the assembly point. ○ No persons shall leave the assembly point until instructed or it has been confirmed safe to do so.			
Disturbance to town traffic flow.	-Ve				
		Develop a delivery and loading schedule of large vehicles during off-peak traffic hours i.e., 09h00 to 11h00, and 14h30 to 16h00.	Monthly	Contractor	
		All construction vehicles are required to use approved roads and entrance to construction site. The use of the existing access road to the existing premises shall not be used by construction vehicles as main entrance.	Continuous	SM	
		Access roads to be cleared of any debris that may be deposited due to construction works.		Contractor	
		Provide for safe passage of pedestrians and local traffic to ensure minimal disruption		Contractor/Subcontractors	
		Liaise with OTC and law enforcement where necessary to arrange transportation of abnormal loads on national and local roads and request escort assistance where necessary.	As necessary	SM Contractor	

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		The use of busier main roads and private location streets for large trucks and machinery is to be avoided.	Continuous	Contractor	
		Inspection to ensure no obstacles and adherence to traffic control measures onsite and offsite route usage.	Weekly	SHEO SM	
		Establish logbook for recording of complaints.	Once off	SHEO	
		Review of complaints logbook, investigation, redressal and keeping records. There should be less than 5 complaints for Heavy vehicles in private and residential streets per year and 2-3 complaints for small vehicles per month.	Quarterly	EAC ECO	
Employment opportunities and opportunities for subcontract of locals' businesses	+Ve	Entrench conditions to require the hiring of local persons, contractors or subcontractors in tendering documents preparations.	Once off on preparation of tender documents.	EC EAP	
		Local subcontractors given advantage on certain works that may include waste collection, excavations, certain concrete mixing works, supply of certain locally available materials, fencing and security of areas.			
		Entrench conditions to promote the hiring of marginalized and people with disabilities in qualifying positions.			
		Unskilled labour to be sourced from local residents, through local governance offices i.e., Constituency office.	Continuous	Contractor/subcontractors	
		Hiring of skilled labour to afford advantage to locals.		Contractor/subcontractors	
		Carry out verifications of local's participation in the project.	Quarterly	EAC, ECO EM	

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		Review of complaints logbook on matters pertaining to the participation of locals and take action where necessary.		EA Consultant ECO EM	Costs are included in project
		The ESMP requirements are imbedded as part of the tender bid documentations in the process of appointing a contractor.	Once off on preparation of tender documents.	EC EAP Proponent	
Dust generation	-Ve	Speed limit of vehicle onsite to be limited to 30-40km/h. erect signage on speed limit	As necessary	Contractor/subcontractors	
		Barricading of some construction sites to contain excessive generated dust.			
		Schedule certain activities with intense dust generation on days with calm weather conditions.			
		Erect speed reducing structures on access roads onsite.	Once off	SM Contractor	
		Significant dust generating surfaces such as roads with high usage to be sprinkled with water for dust suppression.	As necessary	Contractor Site Manager	
		Transportation of dust producing materials offsite or onsite to utilise covers where necessary.		Contractor	
		Establish and maintain a complaints logbook	Once off	SHEO	
		Inspection of sites to ensure compliance and application of dust control measures such as:	Weekly		

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		○ Sprinkling water on all roads and construction zones. ○ Cement must be mixed with concrete mixture or in an enclosed area. ○ Trucks carrying construction materials such as sand and stones must be covered with tarps.			
		Review of complaints logbook for registered cases and resolution or take forth for resolution where unresolved satisfactorily.	Quarterly	EAP, ECO, EM	
Disturbance to heritage/cultural sites or potential of hazards on site	-Ve	Where object or item of strange discovery if encountered, the following procedure is to be applied of heritage objects; ○ On discovery of items or materials of strange occurrence, persons responsible for discovery shall halt activity and inform their supervisor of the discovery or suspicion of strange material or object. ○ The supervisor shall communicate to the Site Manager and SHEO of the discovery. ○ Relevant authorities shall be informed of the find for guidance. ○ Construction activities shall be considered after it is safe to proceed on instructions from the Site Manager.	Once off	SM & SHEO	
		Investigate potential claims of danger from unexploded mines in the area		Proponent	Included in project costs
Emission of excess smoke, noxious gases and greenhouse gases	-Ve	No equipment or machinery is kept running unnecessary when not required for use. These includes all vehicles, generators, compactors, compressors, welding torches.	Continuous	Contractors	

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		All vehicles and machinery to be maintained in good working conditions through regular servicing.		Contractor	
		All machines observed to release excessive smoke to be switched off and necessary repairs be implemented before reused.		Contractor	
		Conduct site walkabout to monitor adherence		SHEO	
		Keep and review logbook of incidents of running equipment not in use and ensure corrective actions are applied.		SHEO	
Generate noise and vibrations	-Ve	All construction works to be conducted during normal working hours (07h00 – 17h00 during working days of the week, 07h00 – 13h00 during weekends).	Continuous	Contractor/subcontractors SM	
		Machinery with excessive noise shall not be used until such a time that faults are repaired, or alternative are availed for usage.		Contractor/subcontractors	
		All machinery should be kept in good working conditions to prevent incidents of producing excessive noise.			
		Care should be taken when unloading or loading vehicles to avoid un-necessary noise. All deliveries to be conducted during normal working hours (07h00 – 17h00 during working days of the week, 07h00 – 13h00 during weekends).			
		Ensure that materials are not dropped but safely lowered to surfaces when unloading.			
		Appropriate Personal Protective Equipment (PPE) for noise and vibration provided to affected workers onsite.			

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		Where practical, erect barriers to contain and shield excessive noise to surrounding areas.			
		All incidents of complaints of noise to be recorded and addressed to satisfaction.	Weekly	SHEO SM	
		Select points for monitoring of noise level within the construction site and immediate offsite surroundings.			
		Site workers to report incidents of excessive noise to supervisors			
		Audit of compliance to reasonable noise generation through complaints logbook.	Quarterly	EAC ECO	Included in monitoring program costs
Potential hazards to the health, safety, and welfare of workers and public	-Ve	All construction workers be provided with appropriate and necessary PPE.	Continuous as necessary	Contractor/subcontractors	
		Ensure that workers take the necessary time to rest, eat, and hydrate so that they remain alert and focused throughout the day.	Continuous		
		Ensure that all equipment's are maintained in good working order to prevent risk of injuries due to malfunctioning.			
		Hold regular safety meetings to ensure that safety protocols remain fresh in the employees' minds. Discuss safety incidents in the meetings to alert others of potential safety hazards and close calls.	Monthly	SHEO	
		Conduct regular safety Inspections around the site	Weekly	SHEO	
		Keep records of safety incidents and resolutions actions taken.		SHEO	

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		Erect sign boards and use of danger tapes in various areas to warn of potential hazards.	Once off	Contractor SM	
		Where necessary provision should be made for persons with special needs such as those with disabilities to access areas or facilities.	As necessary	SM Contractor	
		Develop an adequate emergency response plan for potential accidents to site workers. Outlining process to take effect for various level of accidents onsite.	Once off	SM	
		Establish and have in place agreement with an emergency service provider for emergencies.	Continuous	SM	
		Maintain good housekeeping of all construction areas.		Contractor/subcontractor	
		Keep record of all recorded incidents		SHEO	
		Ensure that emergency care numbers are always available onsite and pasted on notice boards and other conspicuous places further indicating contact persons (first aid representatives on duty).	Weekly update as may be necessary	SM SHEO	Included in Project costs
		Ensure that the safety officer has valid first aid training and that all supervisors have basic first aid training	Continuous	SM	
		Familiarise workers with demarcated emergency assembly areas.	Monthly	SHEO Contractor	
		Access to the construction site is controlled through an access gate with manned security presence.	Continuous	SM	

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		Construction site to be entirely condoned off from public by fencing/barricades.	Once off	Contractor SM	
		All visitors to site to undergo induction on environmental and safety requirements	As necessary	SHEO	
		Ensure that records are kept of visitors to site.	Continuous	SM	
		It shall be a priority that housing of workers is a last resort where such cannot utilize offsite accommodation facilities.	Continuous	EC Contractor SM	
		Where necessary to provide accommodation, the following shall apply; o The workers shall be provided with access to clean drinking water. o Cleaning services for facilities shall be arranged or a schedule put in place to maintain hygienic conditions. o Provide adequate and separate sanitation facilities for both male and females on site and clearly marked out with signage. o Encourage regular health check-ups for onsite personnel o No social gatherings are to be allowed onsite at all times. o No excessive noise is allowed onsite beyond 10h00 o Movement on and offsite to be restricted between 22h00 and 06h00 during weekdays and from 22h00 to 06h00 in weekends. o No fires are allowed in un-demarcated areas. o Workers living onsite shall not bring their families to live with them at provided accommodation for constructions workers.		SM Proponent	

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
Potential theft of construction materials and or vandalism to property on site	-Ve	An area shall be Identified and agreed upon for demarcation and designation for construction or designate as a secure materials storage area.	Once off	EC, Contractor, SM	
		Ensure 24-hour security services to ensure safety of the site.	Continuous	SM	Costs included in project
		Maintain inventory records of all ins and outs of construction material onsite		Contractor	
		Access to the storehouse shall be designated to specific persons and controlled.			
		No members of the public allowed onsite without appropriate permissions.		SM	
		Visitors are required to report at the reception areas of the exiting premises, and to provide proof of appointment to site.		SM	
Generation of various waste	-Ve	Identification and demarcation of waste collection points for different types of construction waste. The following waste to be provided for; metals, building rubble, concrete, and damaged bricks, plastics, rubber and wood. All used oil or other hazardous substance drums to be stored at the contaminated soil area.	Once off	SM Contractor SHEO	
		All areas are kept free of waste through adherence to use of demarcated areas/points for storage of waste.	Continuous	Contractor	
		Carry out regular inspection of areas to ensure adherence to good housekeeping practices in various construction areas.	Weekly	SHEO	

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		Construction waste such as building rubble, planks and rubber with no reuse are to be transported to appropriate waste disposal site and disposed accordingly at landfill site as per required protocols.	Weekly as may be required	Contractor	
		Identify and approach local waste recyclers for opportunities to collect waste such as metals and recyclables.	Once off	Contractors	
		Return uncured concrete to the batching plant.	Continuous	Contractors/sub contractors	
		Supervision of batching plant, concrete works and pouring of concrete to minimise wastage. No concrete mixing on the ground surface to be allowed.			
		Restrict batching plant and operations to demarcated area.			
		No burying or burning of redundant construction packaging materials or allow to scatter onsite. All waste of packaging to be appropriately disposed in demarcated areas for disposal as per waste disposal protocols.			Operational costs
		The use of waste skip container for collection and storage of construction waste onsite is highly recommended.			
		Concrete blocks and bricks that are residues of the construction works to be crushed and stored in demarcated for potential reuse as infill material onsite or offsite or transportation to landfill if of no use.			
		Demarcate adequate points for collection of domestic waste.	Once off	SM SHEO	
		Collected domestic waste should be handled in line with existing local authority waste collection system (containers with lids and weekly schedule preparation for collection).	Continuous	Contractor	

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		As far as practically possible, implement waste management hierarchy through promoting avoidance, minimization, differentiation of waste into tins, bottles, papers, kitchen waste, office waste for potential recycling or reuse. Where encountered waste of electronics shall be differentiated to provide opportunities to waste recyclers or reuse.		SHEO SM	
		Where there is excess domestic waste, such is to be disposed at landfill site in line with waste disposal measures of the local authority.		Contractor	
		Approach local waste recyclers for opportunities to collect differentiated waste.	As necessary	SHEO	
Enhanced local business economy and town development	+Ve	Encourage sourcing and use of local businesses for construction and other non-construction related materials.	Continuous	SM EC	
Wastage of natural resources (water and power resources)	-Ve	Carry out inspection to identify and monitor areas of possible wastage of water and power (leakages, open taps, unnecessary lighting during daytime)		SHEO	
		Records incidents related to wastage of water and power.		All	
		Site workers to be inducted on measures of avoidance of wastage such as; o Securing taps when not in use. o Taking of shorter showering time. o No starting gardens and their watering.	Monthly	SHEO	
Conflicts/grievance from workers, contractors, subcontractor and general public	-Ve	Provide awareness to all onsite workers of the grievance registration, handling, and redress process.	Monthly to all workers Bi-weekly once to new employees	SHEO	Included in project costs

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
			Once every quarter for public through public platforms		
		Ensure availability of GRM and associated forms in conspicuous places onsite.	Continuous		
		All aggrieved persons be encouraged to submit written grievances to an appropriate office.		SHEO Contractors SM	
		All grievances always handled and resolved as quickly as possible at local level as per provisions of the grievance redress process.	Weekly	SM SHEO EC	
		Review of grievances logbook and establish closeout cases and those needing further take up for resolution.	Quarterly and as required	EAP ECO Grievance redress committee	
Potential loss of landscape visual aesthetic from development		The following activities shall be implemented; ○ Area clean-up of any remnants of construction activities ○ Landscaping of embarkments and other surfaces to remove roughness on edges and angles. ○ Ripping of areas to loosen soils and allow natural vegetation regrowth ○ All excess excavated material onsite after the construction activities to be levelled and used as infill for areas where necessary. ○ All potential waste of various types is removed from site and disposed according to waste disposal practices established.	End of construction	Contractor SM	

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		○ All contaminated soils to be contained in established area and subsequent removal from site to the town's disposal site. ○ Careful removal of temporal facilities such as temporal accommodation, mobile toilets to prevent impacts to human health and safety, and environment. Including excavation of all concrete made for temporal structures and crushing for use as infill to other areas or transportation to landfill site.			
Operation Phase					
Need for long terms dry sludge disposal solution	-Ve	Obtain permit for handling of water treatment sludge onsite.	Once of and renewal on expiry	Proponent	Operational costs
		Regular monitoring of sludge lagoons area and surrounding to detect any sign of faults	Weekly	SM	
		Removal of dry sludge shall be monitored as practically possible	Quarterly once disposal site is acquired	SM	
		Monitoring of sludge handling and disposal.	Quarterly	ECO	
		Transportation of dry sludge offsite to ensure sealing/covering of tops to prevent blow offs to the surroundings.	As necessary	SM	Costs only to be determined upon a site designated

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
Render improved water supply service delivery	+Ve	Continuous engagement with the relevant stakeholders (DWSSC) to facilitate further supply of water to remote areas.	As necessary	Proponent SM	In operational costs
		Monitor demand to continuously improve supply operations.	Operation Reviews	SM	
		Continually monitor compliance with the national water quality standards	Continuous as per requirements	SM	
Potential increased recurrence of localised flooding of the adjacent areas	-Ve	Continual monitoring of stormwater flow paths adjacent to communities for blockages	Annually	SM	
		Where necessary carry out clearance of debris and blockages in flow paths to alleviate accumulation of stormwater and unwanted diversions.			
Unintended creation of an ecosystem	+Ve	Regular monitoring to identify floral species within the dam, with specific interest to identify problematic species for removal	Bi-annual	ECO	5,000.00 for 30 years
		Management of floral invasion to retain manageable floral presence within the dam to serve ecosystem services.	Quarterly	SM	
Ageing and deterioration of infrastructures	-Ve	Schedule regular operational maintenance of the WTP and associated infrastructure for defect and initiate repairs where necessary.	Bi-annual	SM	In operational & maintenance costs
Potential opportunities from reuse of dry sludge	+Ve	Initiate and continually explore opportunities for reuse of dry sludge residues for alternative such as landfilling cover or spreading at contaminated sites for soil improvement	Continuous	ECO, SM	3,000.00 for trials for 2 years = 6,000.00

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
Climate change effects on operation of the waterworks	-VE	○ Initiate and carryout a disaster and climate risk assessment and establish potential long-term mitigation measures ○ Raise public awareness on water conservation and water protection actions ○ Raise awareness on climate induce disaster and impacts on water availability for supply ○ Participate in basin level planning and management of shared watercourses ○ Support the flood monitoring and early warning systems initiatives	Throughout Operation Phase	EM & ECO	In operational & maintenance costs
Decommission Phase					
Potential value from reutilization of redundant structures	-Ve	It is important that as first approach to site rehabilitation for dormant structures, is to explore opportunities for alternative reuse of the structure through stakeholder consultations. Such shall find alternative to uses of some of the constructed structures. This alleviates establishing new impacts from the requirements for rehabilitation. ○ Conduct stakeholder consultations to seek opportunities	End of structural lifespan	Proponent	3,000.00
Potential hazards from redundant structures		The overall aim of rehabilitation shall comprise to retain the area to conditions closely mimicking pre-construction or outlook of the adjacent landscape. Important are the following objective; ○ Stability of slopes to prevent erosions ○ Safety of humans in the surroundings ○ Improvement of site outlook			50,000.00 from year 25 of the design span to lapse totalling 250,000.00
		All demolition works to be carried out by experienced contractors.		Proponent	

Impact/Aspect	Impact type	Mitigations/Enhancement Measures	Frequency	Responsible Party/Institutions	Cost (USD)
		All infrastructures sites to be condoned off for demolition of concrete works.		Contractor	
		Removal of movable components of the WTP, Pump stations, sludge lagoons that will includes cabling, pumps, feeding pipes, power substation/transformers.			
		All metals to be removed where possible and separately stored for opportunities of recycling by local recyclers.			
		All concrete from structures to be crushed and safely deposited and stored in demarcated area for transportation to disposal site or infill for other areas onsite.			
		All concrete surfaces to be excavated, crushed, and hauled of the area into storage area and used as infill or for disposal at appropriate landfill site.			
		All embarkments to be levelled to mimic surroundings landscape.			
		All sites of new WTP, RWSD, Sludge lagoons and pumpstations and roads to be landscaped and ripped to loosen ground surfaces and facilitate natural vegetation regrowth.			
		All works to be carried out to prevent negative implication on human health, safety and environment of the workers, and surrounding communities as per established protocols on the EMP.			
		Monitor the execution of rehabilitation to safeguard people and environment		ECO, EM, SM	
				Total Costs	256,000.00

8.6 Monitoring/Compliance Plan

8.6.1 Monitoring Parameters

The following parameters are identified for monitoring in implementing the ESMP;

a) Construction footprint
b) Chemical storage areas operations
c) Overall activities related to fuelling onsite
d) Wastewater storage and handling practices onsite
e) Provision for firefighting equipment's
f) Contaminated site management
g) Waste management and housekeeping practices
h) Complaints logbooks
i) Issues related to participation of locals in the project, marginalised and those living with disabilities
j) Dust monitoring
k) Noise monitoring
l) Safety and health matters
m) Accessibility of the GRM and associate forms
n) Post construction site rehabilitation
o) Sludge storage and removal from site
p) Need for rehabilitation of built structures and subsequent rehabilitation
q) RWSD Dam Invasion and Siltation

The table below provides required monitoring program and compliance to requirements for the in the implementation of this environmental management plan.

Table 8-3 Environmental Monitoring Plan

Project Phase	**Aspect Monitored**	**Frequency**	**Target**	**Instrument**	**Responsible**	Budget (USD)
Construction	Regular inspection of areas to ensure adherence to SoP's and controls related to; ○ Wastewater storage and handling ○ Chemical storage area ○ Availability of firefighting equipment's ○ Dust mitigation practices ○ Waste storage areas and housekeeping practices	Weekly	○ No blockage to drainage/channels ○ Construction footprint is restricted to demarcated areas ○ Implementation of SoP's on chemical storage and use, waste management ○ Good housekeeping ○ Readiness for fire incidents ○ Provision for spillage containment	Visual observations by walkabouts and drives Camera photography	SHEO SM	1, 000 (Camera)
	Contaminated soil storage area	Weekly	Proper deposition of materials and markings	Hydrocarbon test kit Camera for photography	SHEO	1,500.00 (test kit)
	Conduct environmental compliance self-audits.	Monthly	Compliance to various requirements onsite.	Checklists	SHEO	No cost
	Monitor noise levels to comply accordingly with acceptable safe levels standards.	Bi-weekly	Noise levels within acceptable levels. PPE provided.	Sound Level Meter	SHEO	500.00
	Safety, health and welfare of the workers onsite	Weekly	PPE is provided and used appropriately Provision for resting and revitalization in the day.	Observations	EC SHEO	No cost

Project Phase	Aspect Monitored	Frequency	Target	Instrument	Responsible	Budget (USD)
			Provision for gender facilities and for specialised requirements for the disabled		SM	
	Participation of local and beneficiation of local companies	Quarterly	High level of local participation and beneficiation	Interviews and employment records	EAP, ECO, EM, EC	No Cost
	Audit environmental compliance and GRM application	Bi-Annual	Ensure compliance			15,00.00
Operation	Regular monitoring on operations of sludge lagoons.	Weekly to Quarterly	No signs of leakages or overtopping	Visual observation	SM ECO	No cost
	Regular monitoring to identify floral species within the dam, with specific interest to identify problematic species for removal.		Retain ecological services from beneficial floral presence.	Namibian Vegetation identification guide	ECO	10,000.00
	Redundant structures	Annually	All redundant structures are decommissioned as per alternative provided	Interviews Observations	ECO	10,000.00
	Bathymetry Surveys of the RWSD's.	Annual	RWSD is well maintained to provide required water security.	Boat Bathymetry survey equipment's	SM	10,000.00
					Total	**48,000.00**

8.6.2 Training and Awareness Needs

Implementation of the ESMP requires training in various aspects to ensure general compliance to carry out certain tasks. This section therefore identifies training required for effective implementation of the requirements of the ESMP.

Table 8-4 Training needs plan

Type of Training	Purpose	Trainee	Budget (USD)
Firefighting	Preparedness for fire incidents onsite	Appointed members of the firefighting team	5,000.00
Safety Health and Environment Training and Inductions	All site personnel are aware of safety, health and environment requirements	All workers	No Cost
First Aid	First respondents to any health emergencies onsite	Appointed safety officers SHEO	5,000.00
Fire Drills	Preparedness for incident response	All Onsite Personnel	No cost
Safe Fuelling of vehicles	Ensure sound fuelling practices		1,500.00
		Total	**11,500.00**

8.7 Compliance to ESMP

An EMP is a legally binding document under the requirements of the Environmental Management Act (No. 7 of 2007) and carries obligation for implementation. Consequently, compliance to the requirements set thereof is critical to the validity of the environmental clearance certificate if issued. Moreover, the ESMP may alleviate environmental and social liabilities if implemented.

8.7.1 Non-Compliance Reporting

8.7.1.1 Incident reporting

In accordance with the developed SoP's towards management of environmental, safety and health aspects, the following incidents should be reported by all persons onsite, including visitors to site. Incidents shall however not be restricted to these;

- Fire
- Excessive noise

- Excessive dust
- Leakages or spillages of effluent or chemicals onto the ground
- Safety protocol breach (working without PPE, working on heights without harness)
- Unwarranted road traffic hindrances
- Untidy areas
- Damaged materials
- Wastage of water or power
- Excessive smoke/gasses from machinery/vehicles

The grievance redress form, simplified into a slip shall be made available in visible places to facilitate recording of incidents by all, onsite. The slip shall record information on type of incident observed, description of the location of the observation, the date of observation was made and time and the name of recorder. These cards shall be submitted to the supervisor or directly to the SHEO or SM.

8.7.2 Managing Non-Compliance

As a legally binding document, incidents involving deviation shall invoke the following process;

- Immediate reporting of the incident to the SHEO and SM with a record of incident kept.
- SHEO in collaboration with the SM and EC to devise measures to be implemented immediately to cause a halt and safeguard the environment or health and safety of the people onsite and surroundings.
- The SHEO to investigate the incident and recommend further actions were required to the SM and EC to seek resolution at local level.
- Compile reports on incidents for reporting, audits records and as project documentation.

Incidents of non-compliance on the part of contractors to prescribed environmental specifications of the ESMP shall be handled as follows;

- A first written warning on first occurrence of non-compliance.
- Second written warning on repeat non-compliance to environmental, health and safety specifications/requirements. In addition to a written warning, a monetary penalty shall be incurred necessary to taking reasonable corrective actions to prevent recurrence. It shall be required that the contractor/subcontractor take all necessary measures to prevent any further recurrence of non-compliance.

- Where there is repeated non-compliance further to above steps, disciplinary action for the individual. In accordance with the Public Procurement Act (No. 15 of 2015) and NamWater's contract agreement, the Proponent may also institute legal actions against the Contractor, such as withholding the contract retention money until the transgression is rectified or terminating the entire contract for noncompliance.

8.8 Grievance Redress Mechanism

A grievance redress mechanism (GRM) an Annexure C to the report outlines the grievance redressal process applicable to registered grievances onsite. It is required that forms for registration of grievances are available at all convenient places to facilitate an easier registration process.

8.9 Information Disclosure and Consultation

Information disclosure remains a key component of the project implementation and therefore, information about progress of the project towards the overall objectives shall be shared constantly at appropriate platforms with stakeholder or interested parties to ensure transparency. The SHEO after consultation with the SM and EC, and where necessary with approval of the Proponent shall share such information as appropriately available. Such information shall provide overview of environmental and social performance on the project. Where necessary and required, consultation with stakeholders shall be held to provide information, and or prior notification of upcoming events about the project.

8.10 ESMP Review

This EMP must be used as an on-site reference document during all phases of the site development and operation. Where approved, the validity of the ESMP shall be determined by the duration of the ECC. However, to facilitate the review, the following are recommended for its review and update;

- Audits shall take place monthly for the SHEO and quarterly by the EAP and ECO, during the construction phase and bi-annually during the operation phase for the ECO in order to monitor compliance with the EMP and legislation.
- The compiled compliance audit reports shall be compiled into reports to authorities as may be required in accordance with prescribed requirements on issuance of the ECC

under the Environmental management Act (No. 7 of 2007) and EIA Regulations (GN. 30. 2012) and other requirements of the AfDB.

Chapter 9

9. Conclusion and Recommendations

9.1 Conclusion

The objective of this report was to comprehensively scope information towards the proposed project, with emphasis on (i) the legislative context to the proposed activities, (ii) define the characteristics associated with the setting proposed for implementation of the project, (iii) outline details of the envisaged activities, and (iv) gather to address stakeholder issues from onset of the development concept through subsequent phases. Furthermore, the report came to (iv) identify potential impacts associated with implementation of the various activities and the entire development and establish practical ways to mitigate or enhance significant impacts.

The report has detailed the background to the proposed development, outlining the motivation why this project is of high significance to the north central areas of Namibia. It has further described the environment in which it is to be implemented as well as prerequisite legislations that has specific requirements to this project. Key to meet legislation obligations has come from engaging interested and affected parties to capture and guide the development concept and thus enhancing successful planning of its implementation to meet key sustainability principles and acceptance to society. The key concerns initially raised were on potential relocation and resettlement, that are of negative implication on livelihoods of poverty-stricken communities in informal settlements. The component of the RWSD was discarded from the proposed area due to these concerns and further the outcomes of modelling flood implications.

The details above, are supported by views expressed by the outcomes of the public consultation process, where necessity of the project was pronounced by stakeholders and the benefits it brings to the region, the town and to local communities. Such acceptance by stakeholder of the proposed project even further led them to provide valuable proposal measures on how negative implications such as flooding can be alleviated without discarding the project concept or changing proposed location. Premised on these a comprehensive ESMP was developed. In this context, it can be concluded that the objective of this report has been achieved successfully.

9.2 Recommendation

This report provides comprehensive available information about the proposed project to the best of the of available knowledge. It is therefore recommended to the presiding Authority that this report and complementary environmental and social management plan, grievance redress mechanism and associated studies are considered towards an authorization of an environment clearance certificate to the Proponent. Where the authority issues such authorization, it shall be subject to full implementation of the ESMP as measures towards best environmental and social management practices and to achieving sustainable development principles. Deviance from the implementation shall render the Proponent non-compliant of the environmental contract and liable.

References

African Development Bank Group Policy on Good Governance (1999)

African Development Bank Group Integrated Safeguards System Materials; Policy statement and operational safeguard, Safeguards and Sustainability Series, Volume 1 - Issue 1 (2013)

African Development Group (2015) Integrated Safeguards System Materials; General Guidance on Implementation of OS 1. Safeguards and Sustainability Series, Volume 2, Issue 1

African Development Group (2015) The Independent Review Mechanism; Operating Rules and Procedures.

Amutenya, S. (2020). Improving groundwater recharge estimates and Groundwater management in the Cuvelai Etosha Basin. A mini-Thesis submitted in fulfilment of the requirements for M.SC. water resources management. University of Namibia.

Christelis, G. & Struckmeier, W. (2011): Groundwater in Namibia - an Explanation to the Hydrogeological Map.

Government of the Republic of Namibia and African Development Bank (2021) terms of reference for the request for proposal for the procurement of Engineering consultancy services for the Oshakati Purification Plant Extension

Government of the Republic of Namibia and Kingdom of the Netherlands (1992), Reformulation mission: Ogongo - Okalongo and Oshakati - Omakango water schemes Report.

Lund Consulting Engineers (LCE) commissioned by the Ministry of Agriculture, Water and Forestry (2014). A pre-feasibility into the augmentation of water supply to the central area of Namibia and Cuvelai; Part II the Cuvelai Area of Namibia

Mendeloson, J., el Obeid, S. & Roberts, C. (2000). A profile of central Namibia. Directorate of Environmental Affairs, Windhoek, Namibia.

Knight Piesold Consulting. 2012. Oshakati Town Flood Master Plan compiled for the Ministry of Urban and Rural Development & Oshakati Town Council. Oshakati, shana

The Environmental Management Act (No. 7 of 2007 (EMA)) and the EIA Regulations (GN no 30 of 2012).

The Permanent Joint Technical Commission of the Kunene River (PJTC Kunene). The Kunene River awareness Kit. http://www.kunene.riverawarenesskit.com/KUNENERAK_COM/INDEX.HTM

Government of the Republic of Namibia. Various Acts of Parliament and Policies.

Annexures

ANNEXURE A

FLOOD RISK ASSESSMENT FOR THE PROPOSED RWSD AREA; SPECIALIST STUDY

ANNEXURE B

Assessment of RWSD and Hydraulic Modelling of Ogongo-Oshakati Canal

ANNEXURE C

GRIEVANCE REDRESSAL MECHANISM

ANNEXURE D

Public Consultation/Participation Material

ANNEXURE E

Letters

ANNEXURE F

Alternative Designs to the New RWSD

ANNEXURE G

Curriculum Vitae of EAP