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Environmental Impact Assessment (EIA) Study for the Proposed Construction and Operation of a Wastewater Treatment Plant (WWTP) and Associated Infrastructures in Omaruru Town, Erongo Region

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STATEMENT OF INDEPENDENCE AND DISCLAIMER

Mafuta Environmental Consultants CC hereby declare that, we:

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

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

Martha L. Shimooshili: Managing Member & Lead Environmental Assessment Practitioner

Signature: .....

Date: 10 September 2024

EXECUTIVE SUMMARY

Project Background and Locality

The Municipality of Omaruru (the *Municipality* or *the Proponent*) proposes to construct and operate a Wastewater Treatment Plant (*WWT Plant* or *the Plant*) and associated infrastructures in Omaruru Town, Erongo Region. The WWT Plant would be located near the proposed landfill west of the town, approximately 2km west of the existing oxidation ponds north-western side of the Town. The WWT Plant will have overflow ponds (size to be confirmed during the detailed design). Furthermore, some of the oxidation ponds in the Town will be decommissioned, while some will be upgraded for continued operations (by upgrading and lining them first to bring them up to standard) and used as temporal holding ponds before treatment at the WWT Plant. The surface area covered by the proposed Plant and its infrastructure is 2 hectares (Ha), which includes 1 hectare for overflow ponds, future expansion of the WWT Plant and a proposed ground-mounted solar (Photovoltaic (PV)) plant.

Project Need and Desirability

The proposed Wastewater Treatment Plant will contribute to basic services provision such as additional water provision for other uses (irrigation and industrial use purposes) in the Town and possibly Erongo Region and country at large. It is also crucial to acknowledge the importance of environmental health and its protection through proper wastewater management. Wastewater treatment is done to reduce the loss of usable water contained in wastewater. Thus, this is done to remove contaminants in wastewater, so that the water can be either used for other purposes, such as irrigation, industrial or upon its treatment to acceptable standards, discharged back into the environment. The wastewater is also treated so that it can be safely discharged into the environment, as per acceptable standards (a permit is applied for from the relevant national water regulatory body). The Division responsible for this permit issuance is the Policy and Water Law Administration Division of the Department of Water Affairs at the Ministry of Agriculture, Water and Land Reform (MAWLR).

In terms of the project specific need in Omaruru, the Municipality has been managing its wastewater, using the existing ponds in Town. The existing oxidation pond catering for the southern part of the town is located approximately 100m from the Omaruru River and there is a possibility of contamination. In addition, the management of sewage using ponds has not been an effective method as the ponds are unlined to prevent or minimize the infiltration of sewage into the ground and eventually groundwater and the loss of usable water through evaporation and ground infiltration from ponds. It is for this reason that the Municipality opted to construct and operate a WWT Plant. The treatment process is done to remove contaminants in wastewater such as biochemical oxygen demands, nitrates and phosphates, pathogens,

metals, total suspended solids (TSS), total dissolved solids (TDS), etc. The wastewater is treated so that the water can be used for the purposes listed above or as deemed appropriate.

Project Description

The proposed wastewater treatment method to be used for the Omaruru WWT Plant is the new technology Trickling Filter system. A trickling filter is a bed of solid media for bacteria to attach on its surfaces. Wastewater is irrigated on the solid media. This technique is also called a biological filter to emphasise that the filtration process is not mechanical straining of solids, but removal of organic substances by use of bacterial action. For this method, wastewater has to undergo primary treatment before trickling filtration; otherwise solids will block the filter. Veolia Water Technologies South Africa (the leader in trickling filter technology in Southern Africa) states that this technology is employed both in small-scale package plants and full-scale wastewater treatment plants to treat domestic sewage that are high in organic matter, biological oxygen demand, chemical oxygen demand and other pollutants.

Benefits of Trickling Filtration (Filter) Method

The trickling filter system is considered more affordable and robust, less sludge is produced, and operations require lower energy input. Furthermore, the system requires minimal routine maintenance, simpler technology, minimal operator intervention is necessary for continuous operation, and recovery faster after power outages.

The project will be undertaken in four phases, i.e., planning & design phase (under which the EIA study is also conducted), construction, operational & maintenance. The description of project activities to be undertaken as well as services and resources required for the construction and operational phases are provided herein under chapter 2.

It is envisaged that the proposed WWT Plant will continue as long as the need for wastewater treatment persists, decommissioning is not anticipated. However, in the event that the Proponent will consider the closure of the Plant, a decommissioning Plan will need to be developed for the WWT Plant when the time comes.

Project Alternatives

The project has been weighed in terms of the following alternative types:

- **The No-Go (No Proposed Project) Alternative:** The “No-Go” alternative is the option of not proceeding with the activity, which typically implies a continuation of the current site state. Should the proposed Plant construction idea be discontinued, the status quo of the site will continue. In addition, none of the potential impacts identified would occur. Without the construction and eventual operations of the proposed Plant, Omaruru Town would continue facing the challenge of poor wastewater management at the sewer

ponds and most activities in the Town will continue rely on groundwater supply only. With this said, more pressure will be exerted on the existing fresh water supplied by the municipal boreholes for both domestic and construction/renovation works. The WWT Plant establishment would also create some temporary employment and business opportunities and alleviating water supply pressure off the boreholes (groundwater supply). Therefore, should the Plant not be constructed, these opportunities would not be there. For these reasons and by considering the proposed project, the 'no-go' option is not considered the preferred alternative.

- **Location of the Proposed Project:** There has not been another site/location considered for the Plant. The site was selected based on the following factors:
    - Distance from Town centre - the Plant would be located far from movements in Town and homes, thus, to be constructed and operated in an area demarcated for this type of facility (it is noted that the Town's solid waste site will be established near the Plant).
    - Land suitability - there is already a plan to establish a facility of similar use, i.e., a solid waste management site to be established near the Plant.
    - Land ownership - the proposed site is still within the Town (municipal) boundaries, thus no need to apply for a new land rights from anyone else, should the site be outside the Town boundaries.
    - Topography - the site is relatively flat which will make the construction of structures like buildings much easier, compared to uneven locations where modifications would be required to level the ground surface.
    - Services infrastructure - There is an existing access road close to the site and this would mean easy access by the Plant's related vehicles. The site is within the Town's boundaries which makes it easy to be connected to the water, power and sewer lines, thus, supplying the Plant's operations.

For this reason, the current site location is considered more feasible for the proposed Plant.

- **Alternative Land Uses:** This type of alternative is weighed in terms of what other development or activity could have been considered for the site. There could be other land uses that the Municipality would have considered for this site. However, due to the fact that the Plant is needed to cater for the water needs (as mentioned above); the Municipality has not considered any other alternative development on the site. Therefore, the WWT Plant is the preferred land use on this site.
- **Wastewater Treatment Method Alternative:** Depending on the wastewater treatment objective, size, site conditions and capacity, some of the commonly used treatment

methods include ion exchange, aerobic and anaerobic biological process, flocculation and sedimentation water treatment, filtration, and membrane separation. Further treatment methods include oxidation and disinfection, clarification water treatment, water disinfection, evaporation and crystallization and membrane bioreactors and sludge treatment and handling.

Out of the above methods, the proposed Plant will treat the existing (sewage) wastewater using the new filtration trickling method. This method was selected and found to be the viable one because of the size of the population to be served by the Plant.

Environmental (Biological, Physical and Social) Baseline

The current environmental conditions of Omaruru Town have been reviewed and presented in this Report. The biophysical environmental components relevant to this assessment include biodiversity (fauna and flora), climate, landscape and topography, geology, soils, water resources and air and wind. The social environment entails the demography, economic activities, heritage and archaeology as well as services and infrastructure.

Applicable Legal Framework (requirements)

The chapter outlines the list of acts, regulations, policies, ordinances that govern the proposed project and its associated activities. These policies have been briefly explained and their implication on the respective project activities have been provided herein under the Chapter 5.

Public Consultation and Participation Process

Regulation 21 of the EIA Regulations details steps to be taken during a public consultation process and these have been used in guiding this process. Communication with Interested & Affected Parties (I&APs) about the proposed WWT Plant was done as follows:

- A list of pre-identified stakeholders and registered I&APs was developed and updated throughout the EIA process. A total of seventy-seven (77) I&APs were registered by the Environmental Consultants.
- A Background Information Document (BID) containing brief (first-hand) information on the proposed WWT Plant was compiled.
- Project Environmental Assessment notices were placed in the *New Era* and *Windhoek Observer* newspapers dated 21 & 27 June 2024, briefly explaining the activity and its locality, inviting members of the public to register as I&APs and submit comments.

The newspaper adverts also contained the information on the scheduled public meeting. The first round of public consultation period ran from 21 June to 15 July 2024, i.e. before the compilation and circulation of the environmental report for public review and comments. Upon request by some I&APs, the comments period was extended to 23 July 2024 to allow more time for comments.

- After the first adverts (on 21 June 2024) were placed in the newspapers, the BID was shared via email with all pre-identified I&APs whose email addresses were available, by 01 July 2024. The BID was further shared with all I&APs who requested for it after seeing the adverts in the newspapers. Those new I&APs were also added to the list.
- Public notices (A3 size) in English were placed at strategic places in Omaruru. The notices contained brief information on the proposed project, EIA process and how members of the public can register as I&APs as well as submit comments.
- A public consultation meeting was scheduled and held on Thursday, 11 July 2024 in Omaruru (Central Hotel Conference Hall). The meeting was attended by twenty-seven (27) people. The meeting minutes were taken.

The consultation period ran from 21 June 2024 to 15 July 2024 to allow the submission of comments after the consultation meeting. Comments received during the consultation meetings were as summarized above and indicated in the meeting minutes. It was indicated in the meeting that the comments period was too short, therefore, the period was extended to 23 July 2024 to allow I&APs more time to submit their comments after the consultation meeting.

Feedback from the First Round of Consultation

Comments were received by the Environmental Consultant during the public consultation meeting and via email. These comments are summarized as follows and responses provided thereto in the Comments & Response document.

- Design of pipeline plans
- The connection of the Shell Fuel Service to the system
- Potential damage to pipelines at Rivendell, Central Hotel and Erongo Wholesale
- Poor performance of existing pipelines
- Land displacement and or loss of private land owing to servitudes for the pipelines
- The duration of public consultation and participation
- What is included under ‘’associated infrastructures’’ in the BID and if the current construction of pipelines are part of the EIA
- Responsibility of the WWT Plant operations
- The employment of people during construction and operational phase
- Cumulative impact on the air quality and community health

- Dumping of dried sludge from the WWT Plant
- The absence of the design engineers in the consultation meeting
- The location of the WWT Plant
- Provision of design layout and route
- A risk analysis for the Plant's operations
- Galvanized piped in the environment
- Odour from the WWT Plant
- Pollution from hydrocarbons to the Omaruru River.

Feedback from the Second Round of Consultation: Review of the Draft Scoping report

The draft environmental Scoping Report and EMP were circulated to the registered stakeholders and I&APs for review and comments on the 23rd of August 2024 to the 02nd of September 2024. The comments received on the draft report were recorded and incorporated into the Report and EMP.

Potential project Impacts (Positive and Adverse (Negative))

The following potential impacts has been identified and assessed herein.

Positive impacts (benefits)	Adverse (negative impacts
-Socio-economic development through temporary job (employment) creation in the Town during the construction phase - during the construction phase and few people required for the operational and maintenance. -The WWT Plant will ensure that there is no more loss of usable water through evaporation from ponds. This means the water contained in the wastewater will be recovered through the treatment and used for other purposes in the Town such as irrigation and industrial uses, thus, relieving pressure off the current water supply source (boreholes) for all activities in Omaruru. Therefore, there is an opportunity of recovering resources such as recycled water in the wastewater (e.g., biogas, recycled water.	-Soil and water pollution: improper handling of wastewater may lead to surrounding soil pollution and water resources systems. -General environmental pollution through mishandling of site waste leads to environmental pollution. -Loss of biodiversity through the removal of vegetation that may be found within the site footprints. -Noise (nuisance): noise generated by machinery and vehicles may lead to nuisance to locals. -Air pollution by potential dust and gas emissions from construction and operational activities. -Odour: Some by-products of anaerobic digestion such as hydrogen sulfide (H2S) used in wastewater treatment facilities, may give off a strong, nauseating smell. This may affect the nearest locals.

Positive impacts (benefits)	Adverse (negative impacts
-If effectively implemented in the future, there is an opportunity for biogas recovery from the treatment process of anaerobic. This would be achieved by capturing methane and other gases produced during the treatment of organic waste. The biogas can be used as fuel to generate electricity and heat, often through gas engines or turbines. The gas can supply the WWT Plant itself or provide energy for other uses in the Town. -Improved wastewater management in the Town during the operational phase, thus preventing the amount of wastewater that would otherwise be uncontrollably released into the environment untreated. This would improve the local public and environment health.	-Vehicular traffic: potential increase in local traffic due to construction activities on site and subsequent operational activities. -Occupational and community health and safety: poor work site management, improper handling of site materials and equipment may cause health and safety risks. -Archaeological or cultural heritage impact through uncovering of unknown objects on site (when doing earthworks). -Social nuisance and property disturbance by project related workers, especially during the construction phase. The presence of strangers (out-of-area construction contractors) in the area may lead to sexual relations between them and the locals, which may encourage unprotected sex leading to unwanted pregnancies and sexually transmitted diseases. Some constructors may steal or damage and intrude private properties belonging to the locals. -High energy consumption required by the Plant could affect municipal electricity or power supply services, thus, contributing to climate change. -Accidental fire outbreaks from project activities.

Based on the assessment of impacts, it is evident that the identified potential negative impacts are rated as medium significant. Therefore, to reduce the significance from medium to low by effectively implementing recommended management and mitigation measures. Furthermore, to ensure the effectiveness of the measures and maintain low significance over time, the implementation of measures will need to be continuously monitored. This would mean conducting daily inspection and monthly reporting during construction and bi-annually reporting during operational & maintenance phase.

Conclusions and Recommendations

The aim of this environmental assessment was to identify potential impacts associated with the proposed Wastewater Treatment Plant in Omaruru and assess these impacts. The public was consulted as required by the EMA and its 2012 EIA Regulations (Section 21 to 24). The stakeholders and public was informed via the two newspapers used for this assessment; site/public notices placed in Omaruru and other existing means (channels) of conveying information in the Town. It was through these means of information sharing and communication that the public was notified of a one-on-one interaction (public meeting). During the consultation meeting, the public (I&APs) raised their comments and concerns on the proposed Plant in the Town. The concerns and comments received from the public and the local community members formed the basis for this Report and the EMP.

The conclusions reached and recommendations provided are presented below.

Conclusions

The potential (positive and negative) impacts stemming from the proposed construction and operation of the WWT Plant for the Municipality were identified. The potential negative impacts were assessed and mitigation measures provided thereof to avoid and/or minimize their significance on the environment. The potential impacts were found to be of medium and low rating significance. For impacts that cannot be avoided completely, their impact significance can be reduced by effective implementation of recommended management and mitigation measures. Furthermore, to maintain the low rating, monitoring of the potential impacts by the Proponent (an Environmental Control Officer (ECO)) is highly recommended. Monitoring will not only be carried out to maintain the low rating of impacts' significance but to also ensure that all potential impacts identified in this study and other unforeseen impacts that might arise during project implementation are timely identified and addressed accordingly.

Apart from the project information provided by the Proponent, the findings of the impact assessment conducted, i.e. concerns and comments received from the general public also formed the basis of this assessment and eventual reporting. Therefore, based on these inputs, it can be concluded that that the proposed Plant may be granted an Environmental Clearance Certificate. The ECC issuance will be on condition that the recommendations provided in the EMP are implemented and governing legal requirements are adhered to.

The information contained herein and findings of this scoping assessment were deemed sufficient and conclude that no further detailed assessments are required for the WWT Plant.

Subsequently, the long-term benefits (positive impact) of the Plant will overweigh the negatives impacts. The primary long-term benefits of the Plant as mentioned under the introductory chapter includes:

- The proposed WWT Plant will contribute to basic services provision such as water recovered from the treatment process instead of usable water in wastewater getting lost through evaporation from oxidation ponds and infiltration (which is an environmental risk). Thus, this is done to remove contaminants in wastewater, so that the water can be either used for other purposes, such as irrigation, dust suppression or upon treating it to acceptable standards, discharged back into the environment.
- Waste management improvement to retain environmental health and its protection through proper wastewater management.

Consequently, these benefits will be a win-win for both the Municipality and the environment, in terms of water supply and environmental health protection, respectively.

Recommendations

It is recommended that an ECC be issued for the proposed Wastewater Treatment Plant, subject to the following:

- All management and mitigation measures provided in the EMP should be implemented and monitored accordingly.
- The Municipality should strive for continuous improvement and implement new measures (by continuously updating the EMP as deem necessary) to ensure effective environmental management, sustainability and protection throughout the project life span.
- All required permits, licenses and approvals for the proposed Plant and associated listed activities should be obtained as required.
- The Proponent, their employees and their contractors involved in the project activities from the planning & design throughout to operational & maintenance phases complies with the legal requirements governing this type of project and its associated activities.
- All the necessary environmental and social (occupational health and safety) precautions provided should be adhered to

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LIST OF ABBREVIATIONS

Abbreviation	Meaning
°C	Degree Celsius
AQI	Air Quality Index
BID	Background Information Document
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
CV	Curriculum Vitae
DEAF	Department of Environmental Affairs and Forestry
DWA	Department of Water Affairs
EA	Environmental Assessment
EAP	Environmental Assessment Practitioner
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
ErongoRED	Erongo Regional Electricity Distributor Company
GG	Government Gazette

Abbreviation	Meaning
GN	Government Notice
HDPE	High-density polyethylene
HIV/AIDS	Human Immunodeficiency Viruses and Acquired Immune Deficiency Syndrome
HPP	Harambee Prosperity Plan
I&APs	Interested and Affected Parties
MAWLR	Ministry of Agriculture, Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism
m^3/d and m^3/h	Cubic meter per day and cubic meter per hour
mg/l	Milligram per liter
mWC	Meter of Water Colum (Pressure Unit)
NDP	National Development Plan
OD	Oxidation ditch
OHS	Occupation, Health and Safety
PE_{max}	Maximum population equivalent
PPE	Personal Protective Equipment
Reg	Regulation
S	Section
SABS	South African Bureau of Standards
SANS	South African National Standards
TCE	Trinitias Consulting Engineers
TDS	Total Dissolved Solids
TP as P	Total Phosphates as Phosphate
TSS	Total Suspended Solis
UNEP	United Nations Environment Programme
WWTP or WWT Plant	Wastewater Treatment Plant

1 INTRODUCTION

Wastewater treatment is an important process of considerable significance for environmental, economic and social aspects of sustainability. The treatments are done to reduce the loss of usable water in this wastewater. The process is done to remove contaminants in wastewater, so that the water can be used for other purposes in the environment, such as irrigation for instance. These contaminants are biochemical oxygen demands (BOD), nitrates and phosphates, pathogens, metals, total suspended solids (TSS), total dissolved solids (TDS), etc.

Wastewater is described by Hydrotech (undated) as "*used water originating from domestic, industrial, agricultural, and medical or transport activities. Used water becomes wastewater upon the change of its quality, composition and/or temperature. However, wastewater does not include water released from ponds or reservoirs for fish farming". Wastewater can be classified into three groups, namely; sewage water, industrial wastewater and municipal wastewater." Wastewater can be divided into two major groups, namely; sewage and industrial.*

The objective of most wastewater treatment is to maintain or improve the quality of the receiving water. Hence, there has been a trend over time to tighten the requirements from the initial simple removal of gross debris, through biological treatment for BOD and Suspended Solids (SS) removal, more recently to removal of dissolved nutrients. As well as this qualitative change of new processes being introduced, the existing processes are increasingly required to give better performance, with acceptable levels for BOD, SS, and ammonia having been reduced continuously over time (Moran, 2018).

Furthermore, in drier parts of the world, wastewater may be used for crop irrigation, indirectly for production of drinking water by aquifer recharge, or even sometimes processed directly into drinking water. In some cases, the treated water can be used in industries or it can be highly treated and used for domestic use, including drinking.

According to Artiola *et al.,* (2004), wastewater treatment plants produce wastes that contain many potential contaminants. The solid residues of wastewater treatment plants, called biosolids, typically contain common fertilizers and may also contain heavy metals and synthetic organic compounds found in household products. Due to the fact that biosolids usually contain macronutrients, micronutrients, and organic matter, they are routinely applied to agricultural lands as fertilizer and soil amendments. Biosolids application to land is limited by the concentrations of potential pollutants (heavy metals) that vary among treatment plants.

Subsequently, from about 1900 to early 1970s, treatment objectives were concerned with: (i) the removal of suspended and floatable material from waste water, (ii) the treatment of biodegradable organics (BOD removal) and (iii) the elimination of disease-causing pathogenic micro-organisms. From the early 1970s to about 1990s, wastewater treatment focused on aesthetic and environmental concerns (Rajassulochana and Preethy, 2016).

1.1 Project Background and Location

Municipality of Omaruru (hereinafter referred to as the *Municipality* or the *Proponent*) proposes to construct and operate a Wastewater Treatment Plant (*WWT Plant* or *the Plant*) and associated infrastructures in Omaruru Town, Erongo Region. The WWT Plant would be located near the proposed landfill west of the town, approximately 2km west of the existing oxidation ponds north west of the Town as shown in Figure 1-1. The Plant will have overflow ponds (size to be confirmed during the detailed design). Furthermore, some of the oxidation ponds in the Town will be decommissioned, while some will be upgraded for continued operations (by upgrading and lining them first to bring them up to standard) and used as temporal holding ponds before treatment at the WWT Plant. The surface area covered by the proposed Plant and its infrastructure is 2 hectares (Ha), which includes 1 hectare for overflow ponds, future expansion of the Plant and a proposed ground-mounted solar (Photovoltaic (PV)) plant.

Figure 1-1: Locality map of the proposed construction and operation of a Wastewater Treatment Plant in Omaruru Town, Erongo Region

1.2 The Need and Desirability of the Project

Namibia's Vision 2030, National Development Plans (NDPs) and Harambee Prosperity Plan (HPP) both recognize a need for and place significant value on economic growth and employment creation.

The proposed Wastewater Treatment Plant will contribute to these priorities at a local and regional level, in terms of basic services provision such as additional water source. This water can be used for other uses such as irrigation, dust suppression and industrial purposes in the Town and possibly region and country at large. It is also crucial to acknowledge the importance of environmental health and its protection through proper wastewater management. Wastewater treatment is done to reduce the loss of usable water contained in wastewater. Thus, this is done to remove contaminants in wastewater, so that the water can be either used for other purposes, such as irrigation or upon its treatment to acceptable standards, discharged back into the environment.

In addition to the above, wastewater is treated so that it can be safely discharged into the environment, as per acceptable standards (a permit is applied for from the relevant national water regulatory body). The Division responsible for this permit issuance is the Policy and Water Law Administration Division of the Department of Water Affairs at the Ministry of Agriculture, Water and Land Reform (MAWLR).

In terms of the project specific need in Omaruru, the Municipality has been managing its wastewater, using the existing ponds in Town. The existing oxidation pond catering for the southern part of the town is located approximately 100m from the Omaruru River and there is a possibility of contamination. In addition, the management of sewage using ponds has not been an effective method as the ponds are unlined to prevent or minimize the infiltration of sewage into the ground and eventually groundwater and the loss of usable water through evaporation and ground infiltration from ponds. It is for this reason that the Municipality opted to construct and operate a Plant. The treatment process is done to remove contaminants in wastewater such as biochemical oxygen demands, nitrates and phosphates, pathogens, metals, total suspended solids (TSS), total dissolved solids (TDS), etc. The wastewater is treated so that the water can be used for the purposes listed above or as deemed appropriate.

1.3 Need for an Environmental Clearance Certificate (ECC)

The construction and operation of waste treatment facilities are one of the listed activities in the Environmental Impact Assessment (EIA) Regulations (2012) of the Environmental Management Act (EMA) No. 7 of 2007 that may not be undertaken without an Environmental Clearance Certificate (ECC). The listed and relevant activities to the proposed project are:

- *Listed Activity 2.1 the construction of facilities for waste sites, treatment of waste and disposal of waste.*
- *Listed Activity 8.6 the construction of industrial and domestic wastewater treatment plants and related pipeline systems*.

The purpose of the EIA Study and subsequent issuance of the ECC is therefore to ensure that the project activities are undertaken in an environmentally & socially friendly and sustainably manner. This would be ensured through the effective implementations of recommended environmental management and mitigation measures to address adverse identified impacts while maximizing the positive impacts.

Subsequently, an application for the ECC was launched with the Ministry of Environment, Forestry and Tourism (MEFT)'s Department of Environmental Affairs and Forestry (DEAF) by Serja Consultants. Upon screening of the Background Information Document (BID), MEFT requires a Scoping Report and Environmental Management Plan (EMP) (Appendix A) and other associated documents (such as proof of consultation, municipality consent letter, etc.) in an application for the ECC. The required documents will be submitted to the MEFT's for evaluation and consideration of the ECC

1.4 Appointed Independent Environmental Consultant

As mentioned in the preceding subheadings that the Plant and its associated activities are listed in the EMA and the 2012 EIA Regulations, an Environmental assessment is required to apply for an ECC from the Ministry of Environment, Forestry and Tourism (MEFT). Therefore, to comply with the environmental law requirements and ensure environmental management and protection, the Proponent through the consulting engineer (TCE) appointed Mafuta Environmental Consultants CC, Independent Environmental Consultants to undertake the EIA Study, which includes public consultation and apply for the ECC.

The EIA process and subsequent documents compilation was led by Mrs. Martha L. Shimooshili (Lead Environmental Assessment Practitioner (EAP)) and assisted by Ms. Fredrika Shagama (EAP and Hydrogeologist) and Mrs. Kornelia Iipinge-Silishebo (Water Resources Management specialist and project administrator). The CV's of the lead and assistant EAPs are attached as Appendix B.

1.5 Report Contents

This Report has been compiled as a required output of an environmental assessment process after the ECC application has been launched with MEFT. The Scoping Report, together with the EMP and all its appendices will be submitted to the DEAF. The Report therefore covers the following chapters, in addition to the introductory chapter:

- Description of project activities - (Chapter 2).

- Project alternatives considered (that were found to be environmentally friendly and technically feasible) - Chapter 3).
- The legal requirements governing the project and its related activities (Chapter 4).
- The environmental and social conditions of the project site area - Chapter 5.
- The public consultation process undertaken to engage the public (stakeholders and interested & affected parties) on the proposed project - Chapter 6.
- The list of project impacts identified, their assessment (Chapter 7). The chapter presents both the positive and negative (adverse) as well as cumulative impacts, assessment methodology and the assessment of the negative impacts. The mitigation measures are provided in the EMP.
- The recommendations and conclusions to the EIA are presented under Chapter 8.
- The list of references consulted for the assessment are provided in Chapter 9.

Based on the information provided by the project consulting engineer (Trinitas Consulting Engineers) and Proponent, description of the project activities is presented under the next chapter.

2 DESCRIPTION OF PROJECT ACTIVITIES

There are different wastewater treatment methods in the world involving certain processes and activities. This, however, depends on the preferred treatment method (technique) and site conditions where the process would be undertaken.

2.1 Wastewater Treatment Method

The proposed wastewater treatment method to be used for the Omaruru Plant is the new technology Trickling Filter system. The description of the trickling filtration technique, process input and outputs are briefly presented below:

2.1.1 The New Trickling Filtration Technique

2.1.1.1 Process Description

A trickling filter is a bed of solid media for bacteria to attach on its surfaces. Wastewater is irrigated on the solid media. This technique is also called a biological filter to emphasize that the filtration process is not mechanical straining of solids, but removal of organic substances by use of bacterial action (United Nations Environment Programme (UNEP), undated). A simple schematic diagram of a trickling filter is shown in Figure 2-1 below.

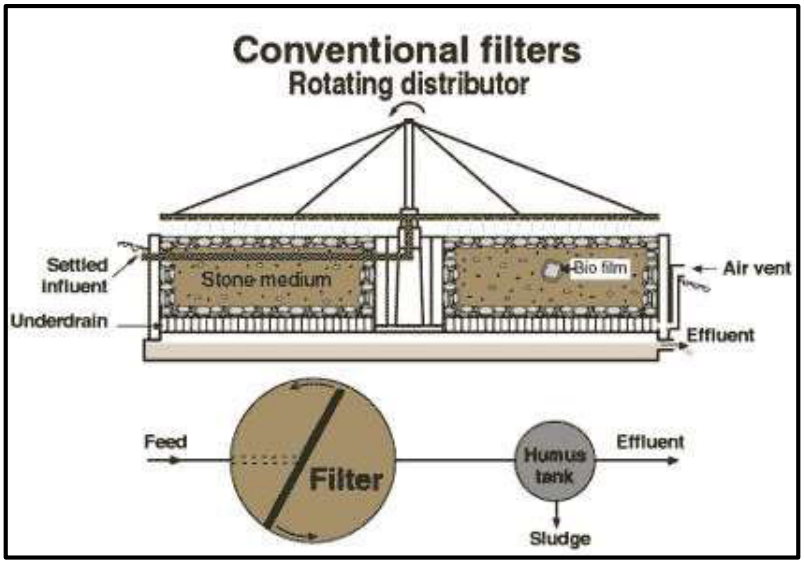


Figure 2-1: Schematic diagram of a trickling or biological filter (edited after UNEP, undated)

Wastewater has to undergo primary treatment before trickling filtration; otherwise solids will block the filter (UNEP, undated). Veolia Water Technologies South Africa (the leader in trickling filter technology in Southern Africa) states that this technology is employed both in small-scale package plants and full-scale wastewater treatment plants to treat domestic sewage that are

high in organic matter, biological oxygen demand, chemical oxygen demand and other pollutants.

Explaining their (Veolia) modular trickling filter technology, the water treatment systems using trickling filters can afford non-urban communities the technology to comply with stringent environmental, health and legal implications. In a single package the plant can treat domestic sewage for up to 500 residents, thus making trickling filter ideal for mine camps, special projects and small settlements. In modular trickling filter plants, an anaerobic reactor that is powered by cultivated micro-organisms works in conjunction with an anoxic reactor. This is followed by a second aerobic reactor process which breaks down organic matter into more easily-removed substances. These remaining solids are settled and removed using water clarification or filtration (Veolia, 2017). Chlorine and ultraviolet treatment are sometimes used to further disinfect water for human consumption.

2.1.1.2 Process Inputs

The wastewater to be treated will be generated by the residents of Omaruru and collected at the different pump stations and pumped to the Plant. The treated water will be stored in a ground tank based on the Engineer's specification and will then be transported via water network to the end users.

Training from a Treatment specialist will be given to the Municipality's maintenance team on how to maintain and trouble shoot issues at the Plant.

According to Ostoich et al., (2017), wastewater treatment plants with a population equivalent (PE) less than 2,000 (<2,000) are regarded as small-scale whereas for these with a PE ranging between 2,000 and 10,000 are referred to as medium-sized.

Omaruru Constituency has a population of 13,3221 (pending the verified figure of the 2023 Population and Housing Census) and the Town (urban area) has a population of 8,500. Therefore, the proposed WWP Plant is considered a large-scaled operation as it is over 10,000 by 2,000 people.

2.1.1.3 Process Outputs

After treatment, the final effluent will comply with and have a quality equal or better than specified for the wastewater treatment guidelines standards under Annexure 2 of the Water Resources Management Act 11 of 2013 (Regulations 5, 68(2) and 69): re-use applications for different treatment.

[1]https://www.citypopulation.de/en/namibia/admin/erongo/09OM__omaruru/

The effluent will be treated for irrigation purposes in the Town and or surrounding areas where it may be required.

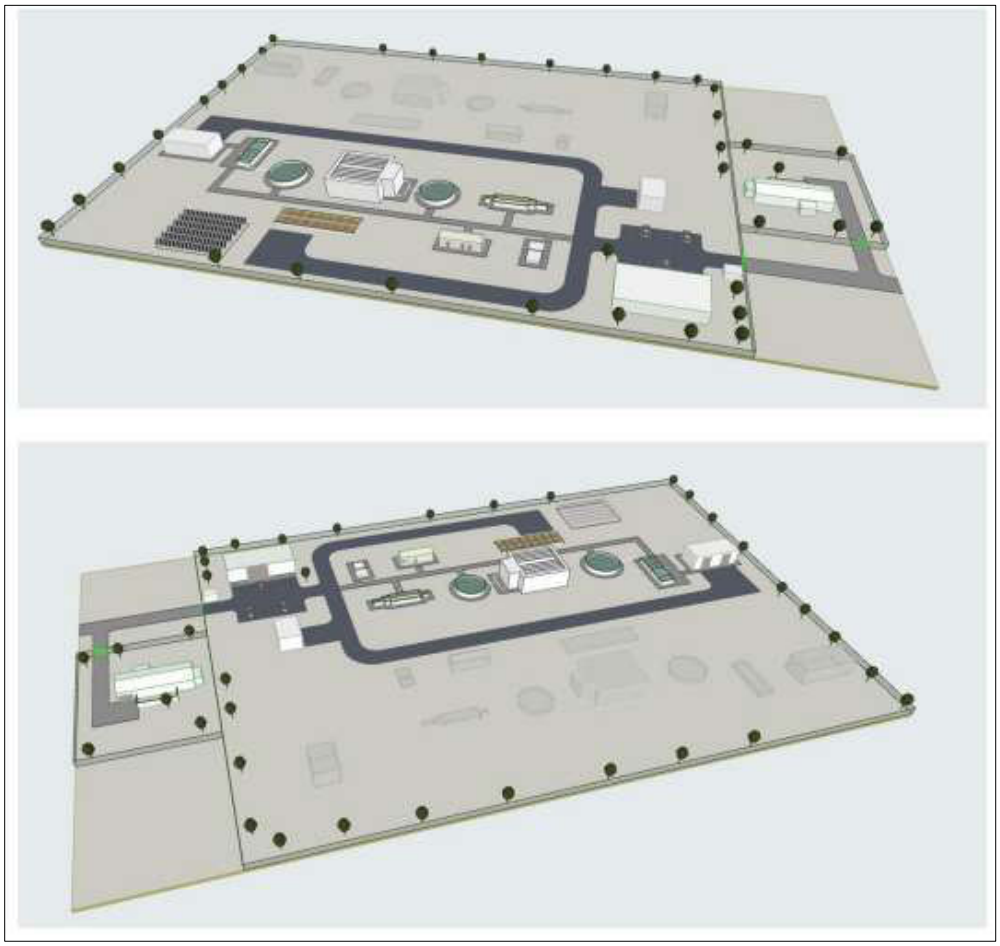
2.2 Planning and Design Phase

The planning phase is aimed at presenting key concepts of the project alongside a general overview of the study area. It also presents the legal framework to be considered, and a preliminary assessment of the main aspects affecting the feasibility of the proposed WWT Plant. It is during this phase that the technical and financial feasibility assessment of the project is done by identifying risks and proposing mitigation measures where possible. It is also vital to highlight 'fatal flaws' wherever mitigation measures are unavailable or impractical with regards to the available finances and time.

The EIA Study forms part of the planning and design phase, whereby it makes provision for concerns and suggestions to be considered and incorporated into the final preliminary layouts of the project designs before they are finalized for implementation.

The inputs and suggestions from the EIA Study, specifically the public consultation and assessment by the Environmental Consultant will aid in ensuring that the project designs and layouts meet the site conditions in terms of biophysical and social requirements. Hence, protecting the environment from harm and or minimizing environmental risks as well as promoting long-term sustainability and management.

The proposed Plant layout (concept drawings) were provided by the Engineering Consultant and are as shown in Figure 2-2. These drawings are also attached hereto as Appendix C.



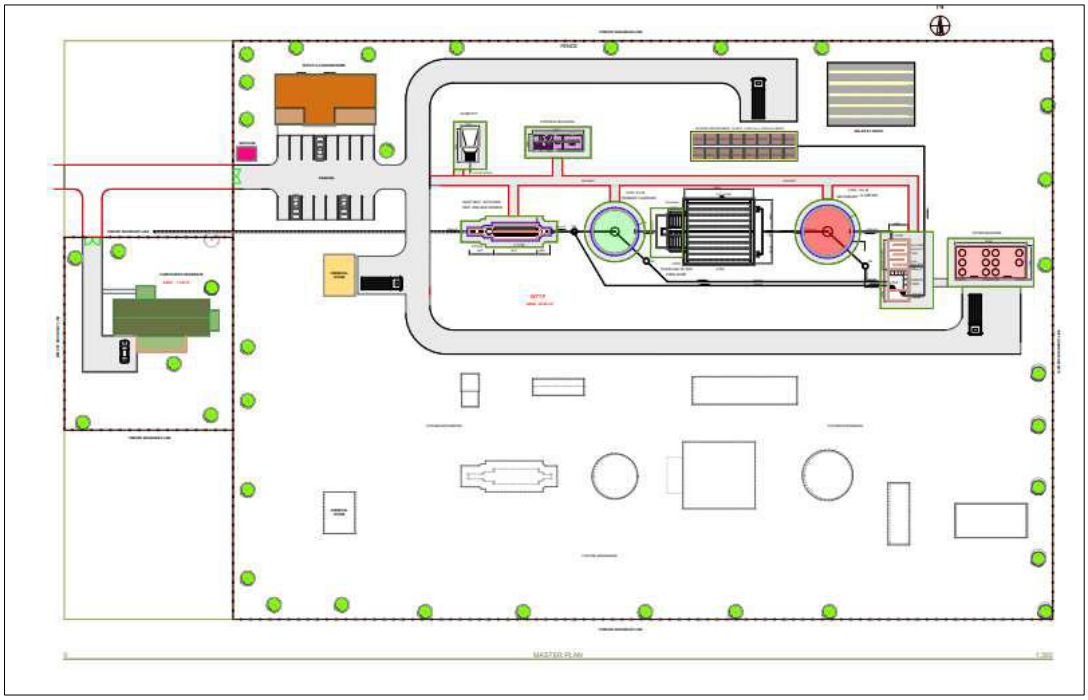


Figure 2-2: The project site concept drawings (Trinitas Consulting Engineers, 2024)

2.3 Site Establishment and Construction Phase

During the construction phase, earth works will be carried out in certain areas of the project site in order to install the necessary Plant services infrastructure. This will require soil excavation, possible removal of vegetation within the site footprint. There will be some movement of heavy construction vehicle and equipment. The following activities will take place, in terms of infrastructure and services provision:

- Installation of: potable water pipelines, electrical cables for power supply, Plant equipment and machinery according to locally and internationally approved standards, and Sewage and effluent disposal pipelines.
- Construction of: administration and technical offices as well as ablutions and other onsite amenities required for the Plant's operations.
- Materials loading and offloading zones on site.

Temporary employment opportunities will be created. The number of people to be employed during this phase is 100 people while only 7 people will be required during the operational and maintenance phase.

The Proponent will construct a security boundary wall (most probably using corrugated iron sheets for construction period and electric fence for operational phase). The wall will also provide access control to the construction site and eventually operational works.

Construction waste that can be disposed of at the municipality's solid waste management site will be kept on-site during construction and taken there on a regular basis.

Waste that cannot be dumped at the municipal waste site such as hazardous waste will be transported to the relevant and approved waste facilities in the country.

Construction of the Plant and its related structures will take approximately 16 to 18 months.

2.4 Resources and Services Infrastructure: Construction Phase

2.4.1 Human Resources

The construction of the Plant will require about 100 people who will be temporarily employed (both skilled, semi-skilled and unskilled). Priority for employment will be given to the locals for any project related job that they are qualified for or capable of carrying out.

2.4.2 Accommodation for Construction workers (Contractors)

The project workforce (workers) for the work activities will be accommodated in Omaruru Town's existing accommodation facilities (for out of town skilled workers). Local workers from the Town will be commuting from their homes. Therefore, no onsite accommodation will be required.

Workers who will be onsite during the nights are shift workers. Not only shift workers, but site security guards that will also be commuting from their homes to site as per their work shift schedules.

2.4.3 Vehicles and machinery

Light, medium, and heavy vehicles will be required for different project activities. The heavy vehicles will include water truck, loaders, bulldozers, dump and flat-black trucks, excavators, etc. These trucks will be needed to transport and or move project materials, goods, services and equipment to and from site (as needed). Support vehicles such as light vehicles such as 4x4 pick-up trucks and small buses will be used to transport workers around, to and from site (as and when required). Medium vehicles such as excavators will be used to carry out earthworks and other related activities, where necessary. These project equipment, machinery and vehicles will be stored at a designated area within the project site boundaries.

2.4.4 Water Supply

A certain amount of water will be required for concrete works and other related project activities and human consumption (drinking water) onsite. Some water may be needed for project activities such as dust suppression, if necessary, but the exact volume of water required is not known at this stage. The required water will be sourced from the existing Municipal supply line.

2.4.5 Fuel Supply

Diesel will be used for machinery and equipment and fuel generator to ensure an interrupted fuel supply to the project. The fuel will be brought to site in fuel tankers and containers in rare cases from the fuel stations in the Town. However, an option to temporarily store fuel in a 2,000 liter tank installed onsite (above ground) will be considered.

2.4.6 Site Access and Security

The Plant will be accessed via a new access road connecting to the current used to access the chicken farm on the west of the Town and north of the Omaruru River. The same access roads will therefore be used to access the Plant site area during the construction and eventually operation phases.

The construction contractor will construct a security boundary wall (most probably using corrugated iron sheets for construction period and electric fence for operational phase). The wall will provide access control to the construction site and for operational works. There will be 24/7 security presence working on shifts throughout the project cycle, i.e., from the construction phase throughout the operational phase.

2.4.7 Occupational Health and safety

The site employees and visitors will be supplied with appropriate and adequate personal protective equipment (PPE) while onsite. The site will also be equipped with one fully furnished First Aid kit. At least 3 people will be trained on how to administer first aid to others.

2.4.8 Accidental Fire outbreaks

A minimum of four well-serviced fire extinguishers will be availed onsite and two people trained on how to fight and or manage basic accidental fire outbreaks.

2.4.9 Waste Management (Solid waste)

- Solid waste: All waste generated from the project activities will be sorted, stored on site in designated waste containers and transported to the Town's dumping site.
- Human waste (sewage): The appointed contractor will avail portable toilets for the workers and project related visitors. The toilets will need to be emptied according to the manufacturer's instruction.
- Hazardous waste: There hazardous waste that may be generated from handling and use of fuels and oils onsite (to power generators and machinery) will be properly captured and temporarily stored in designated drums onsite and then transported to the nearest appropriate hazardous waste management facility (in Windhoek). Therefore, no hazardous waste will be disposed of in any other waste management facility in the project area or anywhere else part form designated facilities.

2.4.10 Decommissioning of Construction Activities

Decommissioning referred to herein is for the decommissioning of the construction works and sites at the end of the construction phase. The decommissioning phase will particularly entail the following:

- Dismantling and removal of all infrastructures and structures that will no longer be required for the operational and maintenance phase. These structures include storage tanks, onsite temporary offices, temporary ablution facilities (portable toilets and septic tanks) and other supporting structures erected for construction purposes. These will be transported to designated storage facilities offsite.
- Removal of all project related vehicles, machinery, and equipment from site to designated parking and storage sites off site, respectively.
- Carrying away the waste storage containers and disposal of waste to designated and approved waste management sites.
- Closure of all access roads that may have been created for the construction phase and no longer required for operational phase.
- Levelling of stockpiled topsoil and where possible, backfilling of all pits and trenches excavated as part of the construction works.

2.5 Operational & Maintenance

Once in operation, the wastewater (effluent) from the Municipal wastewater system will be temporarily held in the newly upgraded and equipped ponds awaiting further conveying to the Plant. The wastewater will be treated in the Plant as per intended methods and techniques.

The Plant system will handle the treatment of 1,200,000 litres per day to generate about 932,000 litres of treated water per day.

The slurry (effluent) from the ponds will be treated in the newly constructed Plant to the quality that is equal or better than the specified acceptable as per the national standards.

Furthermore, for consideration to be discharged into the environment, a discharge permit from the Policy and Water Law Administration Division of the Department of Water Affairs (DWA) at the MAWLR will be required so that the treated water can be safely used in the environment.

The post-treatment use of wastewater can be for crop irrigation (maize and wheat), watering parks and industrial use in the Town and or surrounding areas where it may be needed

The operations of the Plant will be daily, i.e., 24 hours, 7 days. Training will be given to the Municipality's maintenance team by the Wastewater Treatment specialist to handle maintenance of the Plant during operations. The specialist will also be visiting and inspecting the operations on a regular basis (monthly). The Municipality will avail at least 2 people that will be effectively and sufficiently trained for and to ensure that they are available and can reach

the site quickly as required. If necessary, external assistance of a specialized maintenance contractor will be sought to ensure smooth and efficient operations of the Plant.

2.5.1 Description of the Wastewater Treatment Process

The description of the process as provided by the Engineering Consultant is as presented below.

As provided by the responsible suppliers, civil works includes an inlet box with static (mechanical screen), septic tank, trickling filter structure, settling- and chlorine contact tank, all as per the site drawings. The Proponent or the Construction Contractor will provide all mechanical and electrical equipment and his scope of works will begin at the inlet box with the final water to be discharged into a steel ground reservoir of 400m^3 or 400,000 litres and an elevated tank of a capacity 100m^3 or 100,000 litres. Latter tanks are a substantial distance from the treatment plant and the Contractor must also give all mechanical equipment, i.e. final water transfer pumps, piping, valves and elevated tanks to discharge into. The tank stand, trenching and backfilling will be done by others. This will be described in more detail herein under. The final water will be reused for gardening purposes.

For the envisaged application considerable fluctuations in both load and flow can be expected due to tourists showering mainly in the mornings and evenings with only little effluent discharge in-between. An effluent treatment plant to serve such a fluctuating load requires extreme flexibility if a biological treatment plant is employed. The Proponent therefore specifically requests that attached growth biofilters, viz trickling filters be employed, since latter would be the most appropriate technology currently available to treat the effluent to the required environmental standards.

The following unit processes and equipment as shortly described should serve as guideline only and each Contractor will be responsible for the detail design, supply and installation of specific equipment needed for his process to fully function and provide a final water quality as specified:

- **Inlet Box:** This box must be fitted with a mechanical screen that is manually raked. The bars will be spaced 20mm and will end in a drip-tray on top for dewatering of screenings. The installation must come complete with pipework connecting the Inlet Box to the septic tank;
- **Primary Treatment (anaerobic reactor = septic tank):** The raw sewage, is pumped to the septic tank (provided by others), where large solids and particles settle out. This tank must be fitted with all necessary internal pipework for proper functioning, under this contract. Solids and sludge will settle out and be digested in the first compartment of this tank, while the second compartment will mainly contain grey water.

- **Trickling Filter Recycle/Feed**: After primary treatment, the effluent will be discharged into a pump sump from where it will be recirculated by a set of open impeller submersible pumps (duty/standby required) through the trickling filter. The Contractor will provide suitable pumps (for his process).

  During times of no inflow to the plant, there will be no discharge from the septic tank into this sump. The pumps will then continue recirculating water from the trickling filter basin through the media, ensuring that the biomass on the media is kept wet (and alive). The pumps are fitted with a low-level protection switch. If the period of non-inflow to the plant is very long, it can be expected that water will be lost through evaporation and the level in this sump will drop. To then prevent the pump(s) from running dry, they will be switched off at a certain low-level.

  Should the plant receive inflow again, the level in the sump will rise and the level switch will switch the pump(s) on automatically. This also ensures that no operator will be required to switch the plant on or off.

- **New Trickling Filter**: New-generation trickling filter technology must be employed. A trickling filter system needs to be provided that will consist of a bed of highly permeable plastic media, which serves as host for micro-organisms to attach to and grow on, and form a biological film. The wastewater is sprayed over and percolates through the media. Organic material in the wastewater is absorbed by the micro-organisms growing as a biological film in the top layers, while nitrification takes place in the lower layers of the media. In the outer portion of the film, aerobic organisms degrade organic material, whereas anaerobic organisms exist deeper into the biological film, i.e. near the surface of the media. The Contractor will take cognisance of the different media required for carbonaceous material removal vs. nitrification.

- **Secondary Settling Tank**: The hydraulics of the trickling filter plant must be such that, only if there is inflow into the plant, will water from the trickling filter basin overflow (hydraulic) into the secondary settling tank. This tank will be a static clarifier, where sludge is separated from the wastewater by gravity sedimentation. The sludge is then returned (gravity flow) periodically to the septic tank (discharged into the inlet box).

  The concrete structure (provided by others) will be fitted with all mechanical items, viz. inlet stilling box and submerged draw-off pipe to collect clarified water for discharge into the chlorine contact tank.

Sludge is periodically withdrawn from the bottom of the settling tank. To achieve this, an electrically actuated valve must be provided. The valve's opening time and frequency will be controlled by a timer for the duration and interval of sludge extraction. Typically, the timer will be set to allow settled sludge to be extracted from the clarifier once per hour for 3 minutes and returned to the inlet box. The interval and duration of sludge extraction will be adjusted by the process engineer during commissioning and again after continuous, stable operation of the plant (approximately 6 months after commissioning).

- **Disinfection**: Clarified water from the settling tank will be discharged into a chlorine contact tank, provided by others.

  Provision will be made for disinfection using liquid chlorine, sodium hypochlorite. The latter will be dosed from the containers as provided by the suppliers, but the Contractor will not allow for two off dosing pumps (duty / standby). The dosing pumps will start automatically, when flow is detected in the line from the clarifier to the chlorine contact tank.

- **Final Water Discharge:** Final water pumps will be provided to pump the treated effluent to two different locations. An elevated, irrigation water tank, which will be installed on a tank stand provided by others, will be installed at each location. This complete system will consist of:
    - Two off (duty/standby) pumps, each with a capacity of 5 m³/h and head of 40 mWC, complete with inlet and outlet manifold and all valves
    - 1,000 m of 50 oxidation ditch (OD), Class 10 HDPE piping. The trench for the pipe will be excavated and backfilled by others. The Contractor will only lay the pipe inside the trench under this contract
    - 2 off Float valves (one for each tank)
    - 1 off Outlet connection with isolating valve and blank flange
    - Pressure sensor to switch pumps off when storage tanks are full.
- **Sludge Removal:** This will be done by tanker from outside and no equipment for sludge removal needs to be given by the appointed Contractor to handle this.

2.5.2 Wastewater Treatment Process Inputs

The wastewater to be treated will be sourced from the municipal waste (sewage) system. The treated water will be stored in a sump. Training from the Treatment specialist will be given to the Municipality's maintenance team on how to manage this water.

The Plant would be operated to serve a maximum population equivalent (PEmax.) of over 12,000 people (section 2.1.1.2 above). Thus, Omaruru Plant is referred to as large-scale sized type.

2.5.2.1 Basic Design Parameters: Capacity

The basic design parameters for the proposed Plant are as follows:

- People served: 12,000 PE(max)
- Hydraulic load = 1,200 cubic meters per day (1,200m^3/d)
- Average dry weather flow = 50 cubic meters per hour (50m^3/h).
- Peak flow (buffered) = 75m^3/hr.

2.5.2.2 Basic Design Parameters: Inflow - Raw Sewage Quality

The raw sewage quality for the inflow will have the following parameters (concentration):

- Chemical Oxygen Demand = 1,000milligrams per liter (mg/l).
- Biological Oxygen Demand = 5,400mg/l.
- Ammonia Nitrogen, NH4-N = 260mg/l.
- Total Phosphates (TP as P) = 25mg/l

2.5.3 Wastewater Treatment Process Outputs

After treatment, the final effluent will be complaint with and have a quality equal or better than specified for the General Standards as laid out in the water quality guidelines standards under Annexure 1, Annexure 2 and Annexure 3 of the Water Resources Management Act (No 11 of 2013) and the 2023 Water Regulations. Annexure 1 (Regulations 4, 6 and 37) is on water quality guidelines and standards for potable water, while Annexure 2 (Regulations 5, 68(2) and 69) of the Water Act is on the Re-use applications for different water treatments (for mining an industrial uses). Annexure 3 (Regulation 6(1)) is on the classification of waterworks for the purification or treatment of water for human consumption or food processing.

After the first six (6) months in operation, the Construction Contractor will return to site to sample the Plant's raw and final effluent (standard wastewater suite). This will be done to prove that the Plant produces a final effluent in accordance with the specifications that can be safely discharged back into the environment.

The treated effluent will then be used for the irrigation purposes, industrial uses, and other appropriate post-treatment water. If there will be treated water in excess, the Municipality will supply some of this water to the surrounding communities or nearest areas where it may be required for gardening or irrigation.

Lastly, the dried sludge from the wastewater treatment process will be temporarily stored onsite, packed in bags and sold as fertilizer to interested consumers across Omaruru and the whole of Namibia, as is it practiced by the Municipality of Swakopmund.

2.5.4 Operational Health and Safety (OHS)

Emergency procedures are essential to the operation of the Plant. Therefore, a qualified occupational health and safety (OHS) professional will be deployed on site to ensure a safe working environment.

The responsibilities of the OHS professional will include ensuring that:

- All employees (involved in the operational and maintenance) are well inducted on health and safety of the Plant operations.
- All employees are well-equipped with appropriate personal protective equipment (PPE) while handling / operating or maintaining Plant machinery and/or equipment.

2.6 Resources and Services Infrastructure: Operations Phase

2.6.1 Human Resources and Accommodation

2.6.1.1 Human Resource according to the Water Resources Management Act

The workers to be employed at the Plant during the operational phase should undergo a fair selection process and according to the requirements of Annexure 4 (Regulations 7(1) and 9(1)) of the Water Resource Management Act No. 11 of 2013: ‘*’Classification of persons (excluding unskilled labourers), according to educational qualifications and experience to be employed for the operation of a water treatment facility and a waterwork*’’. Furthermore, the employed people to work at the WWT Plant should meet the requirements of Annexure 5 (regulations 7(2) and 9(1)): ‘’minimum number of persons to be employed for the operation of a water treatment facility and a waterwork’’.

The snapshot of the criteria of human resources requirements at the Plant from the 2023 Water Regulations of the Water Resource Management Act No. 11 of 2013 are shown in Figure 2-3.

ANNEXURE 4
(Regulations 7(1) and 9(1))

CLASSIFICATION OF PERSONS (EXCLUDING UNSKILLED LABOURERS) ACCORDING TO EDUCATIONAL QUALIFICATIONS AND EXPERIENCE TO BE EMPLOYED FOR THE OPERATION OF A WATER TREATMENT FACILITY AND A WATERWORK

Minimum Requirements:

Educational	Years appropriate experience					
	CALSS					
	Trainee	I	II	III	IV	V
GRADE 8	0	-	-	-	-	-
GRADE 8 plus water treatment related course	0	6	-	-	-	-
GRADE 10 plus relevant Trade Certificate	0	4	4	-	-	-
GRADE 12 plus relevant Trade Certificate	0	2	3	-	-	-
GRADE 12 plus water related NQA accredited courst	0	1	2	3	-	-
3 YEARS B.Sc, specialising in water treatment facility and waterwork					1	5
Professional Engineer-in-Training (completion of a recognised Engineering Degree is a pre-requisite)					1	5
Professional Engineer specialising in water treatment facility and waterwork						3

ANNEXURE 5
(Regulations 7(2) and 9(1))

MINIMUM NUMBER OF PERSONS TO BE EMPLOYED FOR THE OPERATION OF A WATER TREATMENT FACILITY AND A WATERWORK

Work Class	Class and number of persons as operators	Class of Person as supervisor	Class of Person for inspection quarterly [2]
D	1 x Trainee	I	II
C	1 x Trainee 1 x 1	II	III
B	1 x Trainee 2 x I 1 x II	III	IV
A	1 x Trainee 2 x I 1 x II 1 x III 1 x IV	IV	V

Note:

1) These are the minimum requirements for the operation of the various classes of water treatment facilities and waterworks and does not include maintenance or laboratory staff.

2) If the owner of a water treatment facility or a waterwork has no person of a class referred to above employed at the facility or waterwork, the owner must appoint a consultant with the required qualifications as prescribed in Annexure 4 in respect of that particular class of person, to visit the facility or work when necessary.

Please note, for safety reasons there must be a minimum of two people on site at any one time.

Figure 2-3: The criteria of human resources requirements at the WWT Plant (Government of the Republic of Namibia, 2023)

2.6.1.2 General and Project-specific Human Resource Requirement

Two people from Omaruru Municipality will be trained to undertake the Plant maintenance. The number of people to be doing other Plant related activities such as machinery operation, administration and other related works is not yet known. If skills will be available, these employees will have to be from Omaruru. All semi-skilled and non-skilled works are to be given to the locals. Operational and maintenance phase workers / employees are expected to commute from their homes on a daily basis. Other workers that will be onsite during the nights are technical shift workers. Not only the Plant's technical shift workers, but site security guards that will also be commuting from their homes to site as per their work shift schedules.

2.6.2 Operational Health and Safety

Emergency procedures are essential to the operation of the Plant. Therefore, a qualified occupational health and safety (OHS) professional will be deployed on site to ensure a safe working environment.

The responsibilities of the OHS professional will include ensuring that:

- All employees (involved in the operational and maintenance) are well inducted on health and safety of the Plant operations.
- All employees are well-equipped with appropriate personal protective equipment (PPE) while handling / operating or maintaining Plant machinery and/or equipment and other accessories.

2.6.3 Waste Management

All waste generated on site will be classified and stored according to type. As required, the waste will be transported to their respective nearest sites. The slurry generated from the treatment process will be stored on site and disposed of in accordance to acceptable environmental standards (upon the issuance of effluent discharge permit by DWA).

2.6.4 Site Access

The same access roads utilized during construction will be used to access the Plant site during operation phases. A road upgrade will be done to ensure that access to the site is up to standard for operations.

2.6.5 Water Supply

Water will be required to run the operations (for cooling machinery, where needed) as well as human use (drinking water and ablution facilities) onsite. The water requirements (volumes) are not known at this stage. The required water will be sourced from the Municipality supply line.

2.6.6 Power supply

The electricity for operations will be supplied by the Erongo Regional Electricity Distributor Company (ErongoRED) by connecting the Plant to the existing power grid. Prior to this, consultations and agreements will need to be done and reached between the Proponent and service provider (ErongoRED) who supply Omaruru Town. As a backup plan, generators will also be installed and kept on site so that they can be used in cases of power outages (emergencies).

2.7 Decommissioning (Closure) Phase

It is envisaged that the proposed Plant will continue as long as the need for wastewater treatment persists, decommissioning is not anticipated. However, in the event that the Proponent will consider the closure of the Plant, recommendations of the potential impacts will be provided in the EMP.

3 PROJECT ALTERNATIVES

According to the Environmental Management Act No. 7 of (2007) and its 2012 EIA Regulations, alternatives are defined as: “different means of meeting the general purpose and requirements of the activity”. This chapter will highlight the different ways in which the project can be undertaken and to identify the alternative that will be the most practical but least damaging to the environment.

Once the alternatives have been established, these are examined by asking the following three questions:

- What alternatives are technically and economically feasible?
- What are the environmental effects associated with the feasible alternatives?
- What is the rationale for selecting the preferred alternative?

The alternatives considered for the proposed development are discussed in the following subchapters.

3.1 Project Alternatives

3.1.1 The No-Go (No Proposed Project) Alternative

The “No-Go” alternative is the option of not proceeding with the activity, which typically implies a continuation of the current site state. Should the proposed Plant construction idea be discontinued, the status quo of the site will continue. In addition, none of the potential impacts identified would occur. Without the construction and eventual operations of the proposed Plant, Omaruru Town would continue facing the challenge of poor wastewater management at the sewer ponds and most activities in the Town will continue rely on groundwater supply only. With this said, more pressure will be exerted on the existing fresh water supplied by the municipal boreholes for both domestic and construction/renovation works. The Plant establishment would also create some temporary employment and business opportunities and alleviating water supply pressure off the boreholes (groundwater supply). Therefore, should the Plant not be constructed, these opportunities would not be there.

For these reasons and by considering the proposed project, the ‘no-go’ option is not considered the preferred alternative.

3.1.2 Location of the Proposed Project

There has not been another site/location considered for the proposed Plant. The site was selected based on the following factors:

- Distance from Town centre - the Plant would be located far from movements in Town and homes, thus, to be constructed and operated in an area demarcated for this type of facility (it is noted that the Town's solid waste site will be established near the Plant).
- Land suitability - there is already a plan to establish a facility of similar use, i.e., a solid waste management site to be established near the Plant.
- Land ownership - the proposed site is still within the Town (municipal) boundaries, thus no need to apply for a new land rights from anyone else, should the site be outside the Town boundaries.
- Topography - the site is relatively flat which will make the construction of structures like buildings much easier, compared to uneven locations where modifications would be required to level the ground surface.
- Services infrastructure - There is an existing access road close to the site and this would mean easy access by the Plant's related vehicles. The site is within the Town's boundaries which makes it easy to be connected to the water, power and sewer lines, thus, supplying the Plant's operations.

For this reason, the current site location is considered more feasible for the proposed Plant.

3.1.3 Alternative Land Uses

This type of alternative is weighed in terms of what other development or activity could have been considered for the site. There could be other land uses that the Municipality would have considered for this site. However, due to the fact that the Plant is needed to cater for the water needs (as mentioned above); the Municipality has not considered any other alternative development on the site. Therefore, the Plant is the preferred land use on this site.

3.1.4 Wastewater Treatment Method Alternative

According to Rajasulochana and Preethy (2016), methods of wastewater treatment were first developed in response to the adverse conditions caused by the discharge of wastewater to the environment and the concern for public health. Further, as cities became larger, limited land was available for wastewater treatment and disposal, principally by irrigation and intermittent filtration. Also, as populations grew, the quantity of wastewater generated rose rapidly and the deteriorating quality of this huge amount of wastewater exceeded the self-purification capacity of the streams and river bodies. Therefore, other methods of treatment were developed to accelerate the forces of nature under controlled conditions in treatment facilities of comparatively smaller size.

Although cleanup is necessary to prevent any further discharge of contaminated wastes into the environment, a cost effective technology needs to be developed for industry to use. Traditionally methods employed for wastewater remediation consist of removal of metals by filtration, flocculation, activated charcoal and ion exchange resins.

Depending on the wastewater treatment objective, size, site conditions and capacity, some of the commonly used treatment methods include ion exchange, aerobic and anaerobic biological process, flocculation and sedimentation water treatment, filtration, and membrane separation. Further treatment methods include oxidation and disinfection, clarification water treatment, water disinfection, evaporation and crystallization and membrane bioreactors and sludge treatment and handling.

Out of the above methods, the proposed Plant will treat the existing (sewage) wastewater using the new filtration trickling method. This method was selected and found to be the viable one because of the size of the population to be served by the Plant.

Added to that, Veolia Water Technologies South Africa (2017) stated that industrial companies and municipalities use trickling filter technology for the following reasons to:

- Upgrade sewage for re-use in irrigation, dust suppression and other tasks.
- Upgrade sewage to near potable standards so it can be made suitable for human consumption. However, it is not confirmed that the proposed Plant will produce water for drinking purpose.
- Ensure that discharge water is compliant with environmental standards.

3.1.4.1 Benefits of Trickling Filtration (Filter) Method

According to Veolia Water Technologies South Africa (2017), in addition to being more affordable and robust, trickling filter has numerous benefits such as the following:

- Less sludge is produced,
- Operation requires lower energy input,
- The system requires minimal routine maintenance and recovers faster after power outages,
- Simpler technology is employed, and
- Minimal operator intervention is necessary for continuous operation.

It is for these given reasons and benefits that the trickling filter method is the preferred and most viable wastewater treatment method for Omaruru Town's WWT Plant.

4 ENVIRONMENTAL BASELINE

The proposed project will be undertaken in specific biophysical environmental and social conditions. Understanding the pre-project conditions of the environment will assist in presenting what was the project environment was before and would be after project's operations. This also helps the Environmental Consultant in identifying the sensitive environmental features that may require protection through the recommendation and effective implementation of mitigation measures or management action measures.

The baseline information presented below has been sourced from different reports of studies conducted near the project area and/or Erongo Region at large. The rest of the information has then been obtained by the Environmental Consultant upon site visit conducted on 10 and 11 July 2024 and presented as shared by the local community members. The summary of selected biophysical and social baseline information pertaining to the proposed site area is given below. Most of the baseline information provided under this chapter has been sourced from the Omaruru Town's Comprehensive EMP recently compiled for the groundwater abstraction activities by Popeti Consultants (2024).

4.1 Biophysical Environment

4.1.1 Fauna

The hyper-arid Namibian coastal ecosystem is home to a significant and unique array of biological and ecological diversity, including uniquely adapted plants and animals, rich estuarine fauna and a high diversity of migratory shore and seabirds. Namibia's coastal zones are considered as refuge for several of endangered species (Erongo Regional Council, 2015).

In terms of local fauna, the neighbouring farms to the site and Omaruru River are homes to both domestic and wildlife. The common wildlife on farms around Omaruru include Hartmann Mountain Zebra, zebra, oryx, kudu, impala, wildebeest, eland, giraffe, waterbuck, klipspringer, warthogs, leopards as well as baboons.

Livestock farming is practised in the surrounding areas comprises of goats, sheep, cattle and horses as common livestock.

4.1.2 Flora

The Omaruru Town is within the Thornbush Shrubland of the Acacia Tree and shrub Savanna. This vegetation type is largely characterized by large, open expanses of grasslands dotted with Acacia trees. The trees are tallest in areas of deeper sands in the east, with plant growth becoming progressively shrubby further west where the soils are shallower and the landscape is mostly hilly and rocky (Mendelsohn *et al* 2002). The common plants included *Faidherbia albida* (apple ring thorn tree), *Catophractes alexandri*, (Trumpet thorn) *Boscia albitrunca (*shepherd tree*)*, *Boscia foetida (*stink shepherd tree*)*, thorn bushes, *Vachellia/Senegalia melifera* (Black thorn), *Combretum imberbe* (Leadwood), *Cordia sinensis* (orange glueberry) and other species of *Vachellia* as well as grasses (Popeti Consultants, 2024). Some of the observed vegetation on and around the site are young *Vachellia reficiens* shrubs and trees as well as stink bush or sweta bush (*Pechuel-loeschea*) as shown in Figure 4-1.

Figure 4-1: Typical vegetation on and around the project site

The project site is characterized by sparse shrubland as shown on the map in Figure 4-2.

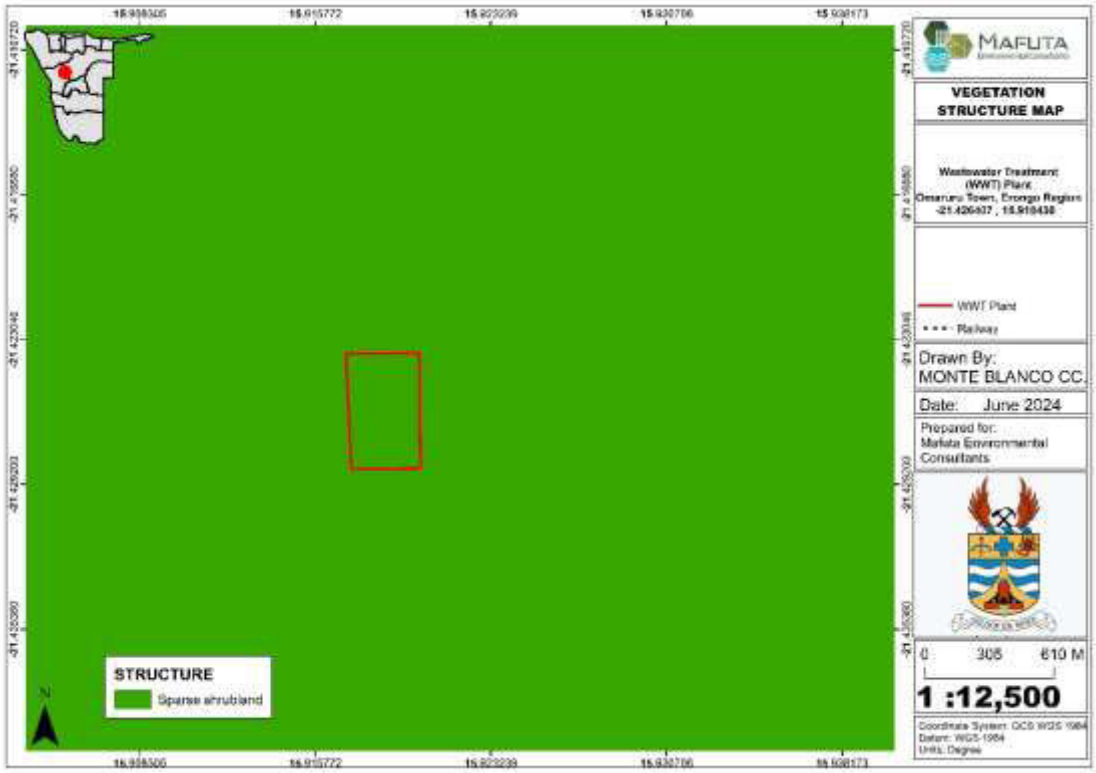


Figure 4-2: Typical vegetation on and around the project site

4.1.3 Climate

The mean annual rainfall is between 300 to 400mm, and the potential annual evaporation is 3,000 to 3,200mm, which characterize the area as hot steppe (Consulting Engineers Salzgitter et al., 1993).

According to World Weather Online (2023)'s annual rainfall graph for the 14-year period, the highest rainfall of about 420mm (in February 2009), followed by 350mm in February 2012 and 339mm in January 2011. The highest average rainfall is 139mm in February when it rains for 11 days, followed by March and January with an average rainfall of 104mm and 92mm, respectively.

In terms of temperatures, Omaruru area experiences maximum temperatures of 34-35°C in October/December and minimum temperature of 10°C in June/July. The average temperatures are 10 and 32°C in June/July and October/December, respectively (World Weather Online, 2023).

4.1.4 Landscape and Topography

The Omaruru area is within the Central-Western Plains as shown on the map in Figure 4-3. The landscape that stretches back from the coast, and this broad area of plains extends inland for about 450km in places. The plains were largely formed by erosion cutting back into higher ground and carving out the catchment areas of several major rivers, which include the Khan, Omaruru, Swakop and Ugab Rivers (Mendelsohn et al., 2002). The elevations of the project site are within the ranges of 951 to 1,216m above sea level (masl) and 1,216 to 1,453masl.

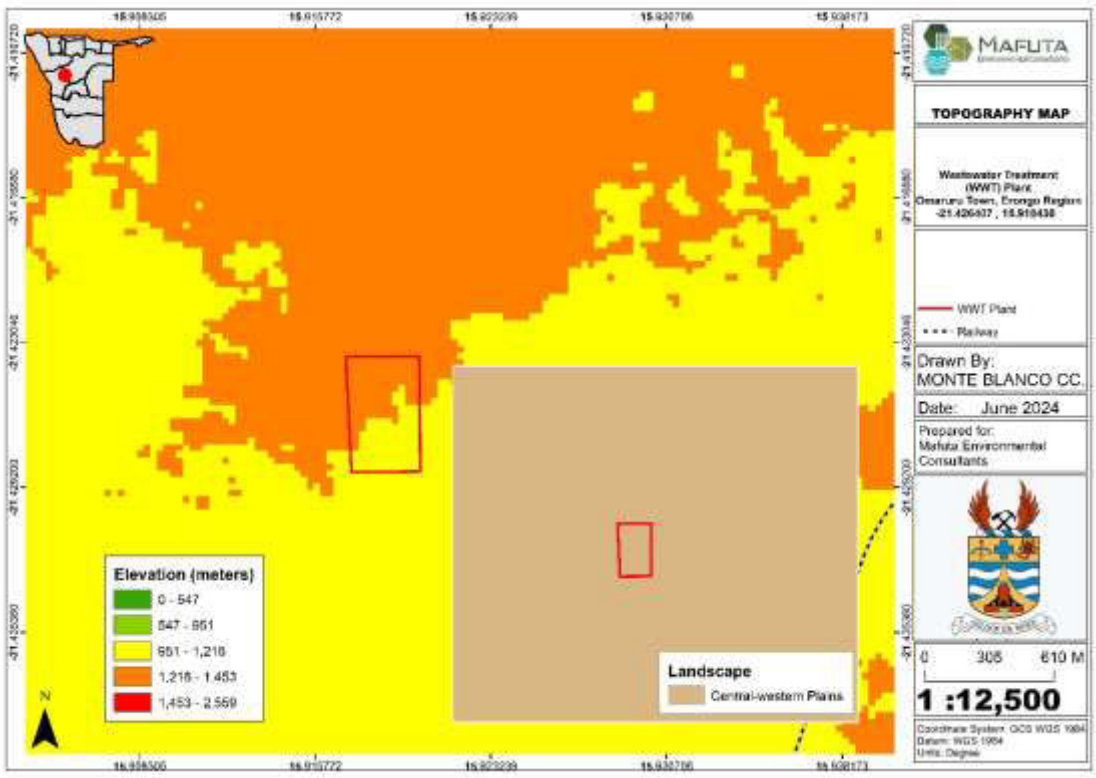


Figure 4-3: The landscape and topography on and around the project site

4.1.5 Geology and Soils

Omaruru falls within the metasedimentary rocks of the Damara which is represented by the Kuiseb and Karibib Formations as well as sounding Damara Granites. Furthermore, according to Consulting Engineers Salzgitter et al (1993), the country rock in the area consists of metamorphic rocks of the Damara Sequence intruded by Salem Granite. The quartzites, mica-schists and marbles are intensively folded and fractured. The alluvium in the bed of the Omaruru River comprises mica-rich silt, sand, gravel and clay. The project site geology is shown in Figure 4-4, comprising mica schist, minor quartzite, graphitic schist and marble.

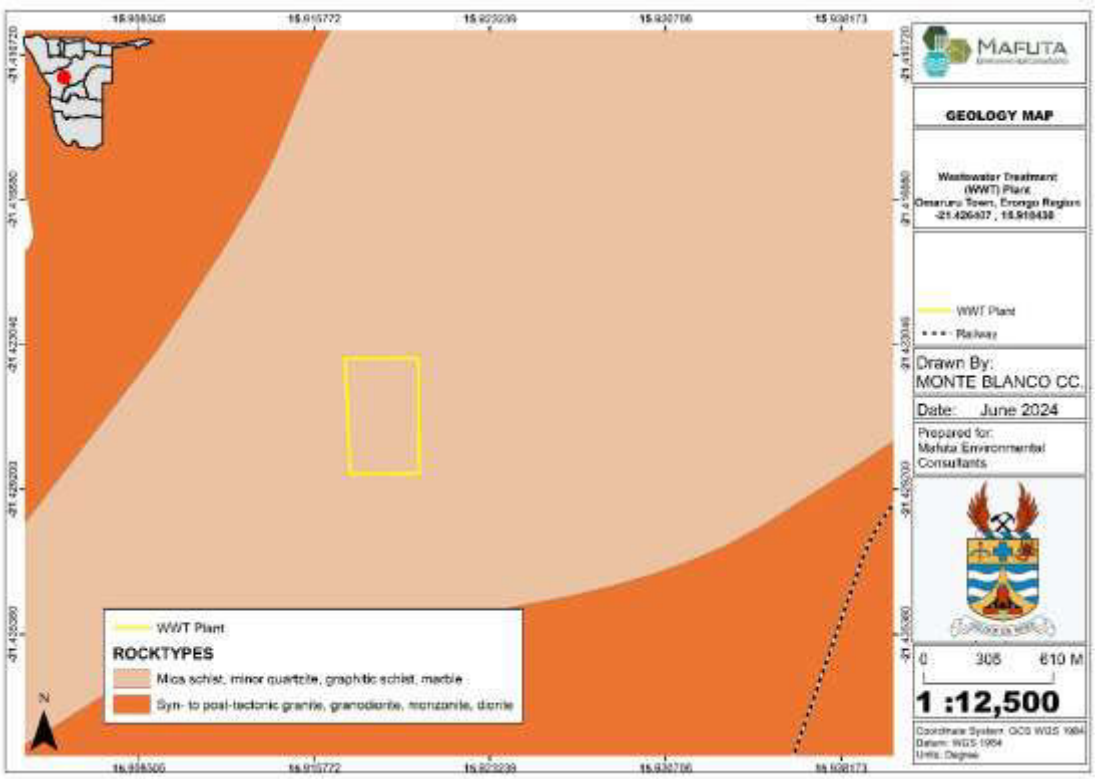


Figure 4-4: The geology of the project site

In terms of soil type, Omaruru area is mainly covered by eutric regosols - Figure 4-5. These are medium or fined textured soil type of actively eroding landscape, the thin layers lying directly above the rock surfaces from which they formed. Although not as shallow as the Leptosols, these soils never reach depths of more than 50cm. The central regions of the country are dominated by Regosols, which are especially susceptible to erosion where there is any degree of slope. The vegetation cover on these thin soils is generally sparse because they cannot provide most plants with sufficient water or nutrients. The areas with Eutric Regosols can support low-density stock farming or wildlife (Mendelsohn *et al*, 2002).

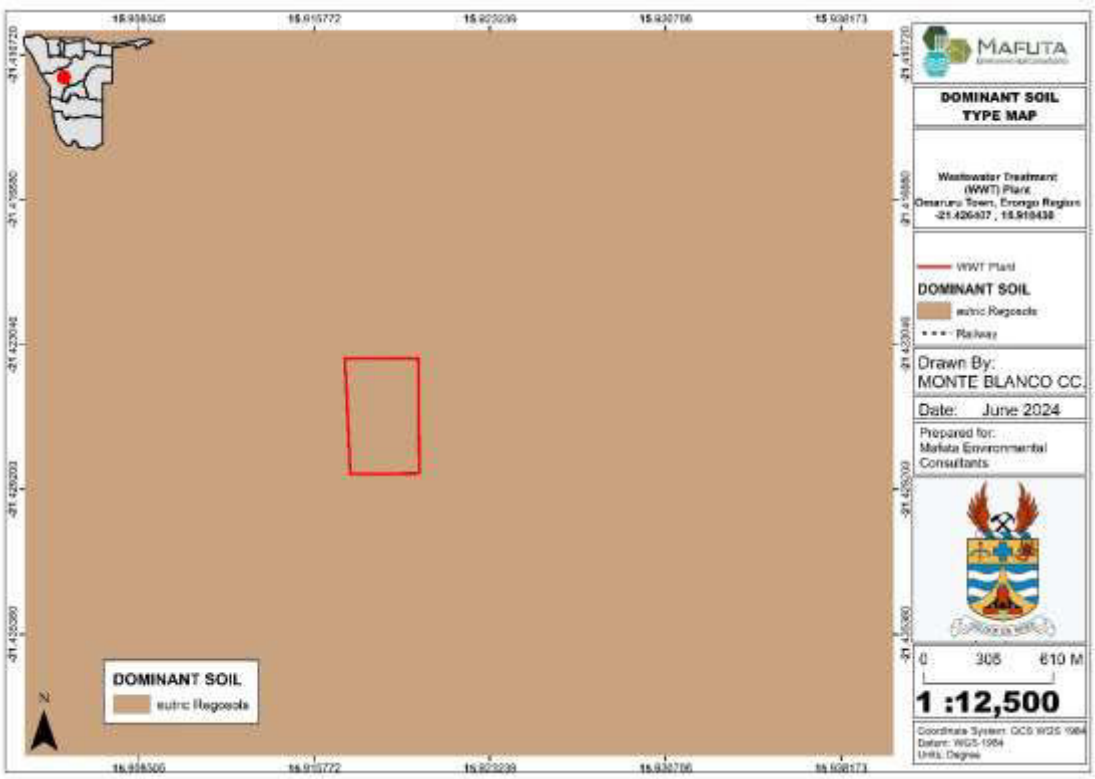


Figure 4-5: The dominant soil type of the project site

Typical soil found within the Omaruru are light brown gravel sandy soils covered by medium grass cover and young shrubs on some areas - Figure 4-6. In some areas the soil comprises gravel and rock scree.

Figure 4-6: The observed soils onsite with some stink bush and young camelthorn shrubs

4.1.6 Water Resources: Hydrology and Hydrogeology

4.1.6.1 Surface water (Hydrology)

Omaruru River Basin encompasses an area of approximately 19,625 km^2 in central west Namibia. The headwaters extend to the area north of the Etjo Mountains, ephemeral surface runoff and groundwater flow is generally directed south-westward until they reach the Atlantic Ocean. Annual rainfall decreases steadily from 380mm at the headwaters to <50 mm at the River mouth implying that majority of runoff is generated in the upper headwaters[2].

4.1.6.2 Groundwater (Hydrogeology)

Groundwater recharge in such an alluvial aquifer heavily depends on precipitation causing seasonal floods in the river itself as well as in the tributaries. Therefore the seasonal flood events in the river and its tributaries are vital for the replenishment of the aquifer and its long-term sustainability. The project site is situated on rock bodies with little groundwater potential as shown on the geohydrology map in Figure 4-7. The low potential is attributed to the type of rock units underlying the site and their non-fractured/faulted nature limit the storage, transmission, and flow of groundwater. Therefore, the rock units underlying the site are not good aquifers. However, they would act as good aquitards to contain and or deter the spreading of potential contamination from the site.

Groundwater levels are regulated mostly by flood recharge, evapotranspiration and groundwater abstraction and to a lower extent by groundwater through-flow from the alluvium upstream. Sub-basin parameters such as rainfall, basin size, alluvial aquifer compartment length, width and depth were derived to estimate surface runoff produced per sub-basin, transmission losses and first estimate of groundwater recharge to the alluvial aquifer.

Based on the groundwater level records of the Department of Water Affairs from six monitoring in the Omaruru Municipal Compartment 1 boreholes (WW16301, WW16302, WW1603, WW16358, WW16359 and WW16360) between 1975 and 2013, the boreholes have water levels ranging between 2 and 11m below ground.

[2]https://gwd.org.za/index.php/abstract/quantifying-groundwater-resources-alluvial-aquifers-omaruru-river-simplifying-decision

Figure 4-7: The geohydrology of the project site

According to Popeti Consultants (2024), Omaruru Aquifer is subdivided into two compartments, one called the Municipal Compartment the second one called the Omburu Compartment, i.e., Compartment 1 and Compartment 2, respectively. The two compartments are separated by a bedrock high preventing some of the groundwater from flowing downstream from the Omburu Compartment to the Municipal Compartment (Department of Water Affairs (DWA), 2002).

The Omaruru Aquifer has a total length of 35km between Omaruru and Omburu-South. The catchment area above Omburu-South covers 1,316km^2, whereas the total catchment area upstream of Omaruru is 2,514km^2.

With regards to borehole yields, on average, boreholes drilled in that area have a very low yield in the range of 1.5 – 3m^3/hr. Boreholes with a higher yield are exclusively located in the sediments of the Omaruru River itself. These sediments consist of sand and gravel and the boreholes have a yield in the range of 3 – 15m^3/h. Some of them have a yield of more than 20 m^3/hr. According to the information available at MAWLR, 118 boreholes are drilled in the Omaruru River having an average yield of ~11 m^3/hr. The depth of these boreholes ranges from 5m to 80m below ground level (Popeti Consultants, 2024).

In terms of groundwater quality, Omaruru Aquifer has good quality (Class A of Namibian standard at the time or suitable for human consumption / very safe water) and is the target aquifer for water production purposes. The groundwater quality of Omaruru is classified based

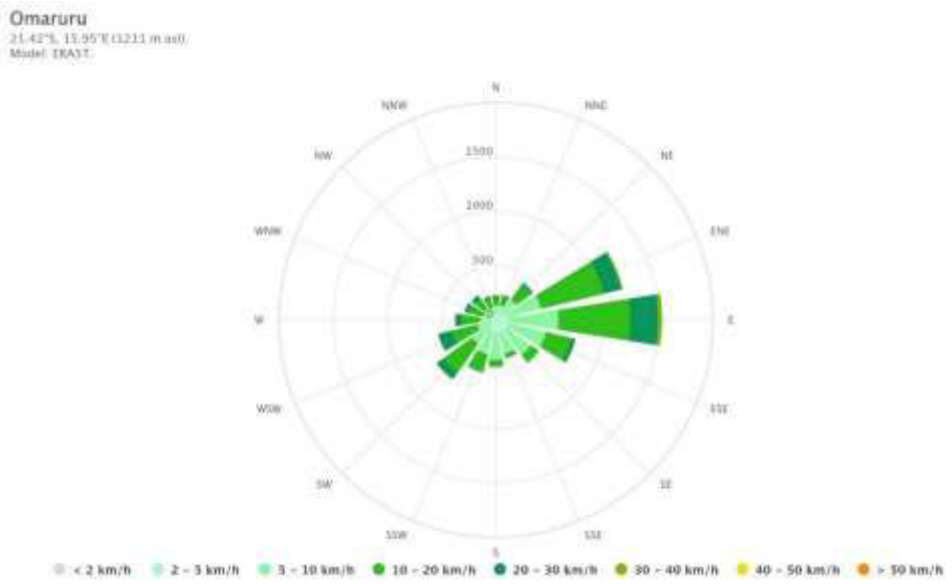
on the total dissolved solids (TDS). The municipal boreholes along the Omaruru River and immediate surroundings lies on areas with TDS ranging between 81 and 1,000miligram per litre (mg/l). Thus, according to the 2023 Regulations on Water Quality Guidelines and Standards for Potable Water, the ideal and acceptable standard limit for TDS in groundwater is < 1,000 and <2,000mg/l, respectively. Therefore, the groundwater quality of Omaruru Town is good for human consumption.

4.1.7 Air Quality and Wind Direction

The current air pollution level in and around Omaruru area is moderate according to IQ Air, 2024). The air quality index (AQI) is 82 US AQI, and the main pollutant is the atmospheric particulate matter (PM) 2.5 (IQ Air, 2024). PM are microscopic solid or liquid matter suspended in the air with a diameter of 2.5 micrometres (µm) or less. The PM2.5 concentration in the area is 26.1 µg/m³ which is currently 5.2 times the World Health Organization's annual air quality guideline value (IQ Air, 2023) of 5 µg/m³ (IQ Air, 2024).

The major current atmospheric dust emissions in the area are primarily generated by vehicles travelling through the area and on local gravel roads. Furthermore, there is a burning of waste at the Town's dumpsite on the north-eastern side of Town which contributes to air pollution.

In terms of wind direction, the wind rose for Omaruru from the Meteoblue modelled climate is shown in Figure 4-8 and indicates that the wind is dominantly blowing from west to east and southwest to northeast with the speed between 5 and 30km/h (Meteoblue, 2024). The wind speed chart shows that the wind blows all year round with a speed ranging between 20 and 30km/hour for more than 10 days, while the wind speed within the range of 10 to 20km/hr is experienced for 5 to days throughout the year. The wind rose and speed chart are shown in Figure 4-8 below.



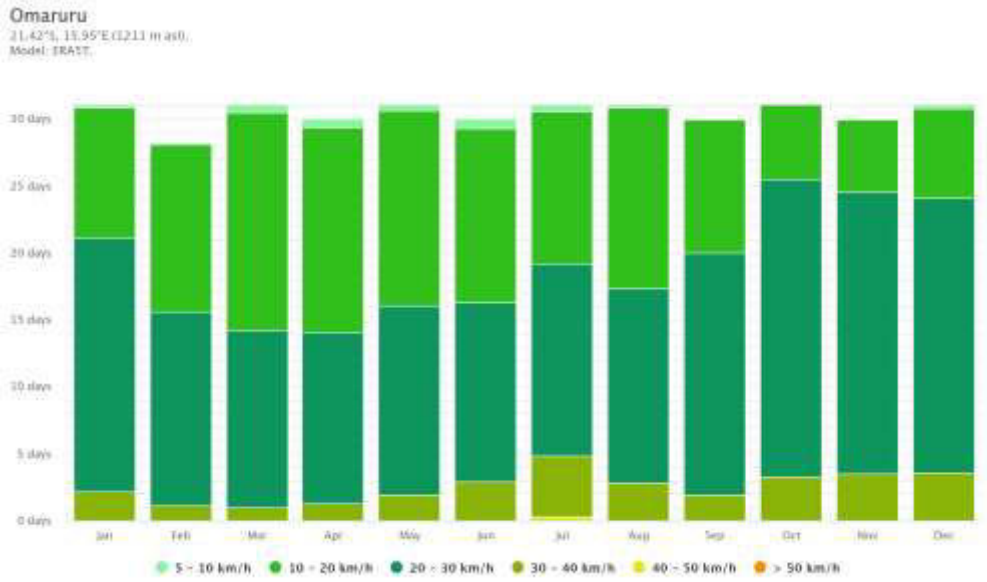


Figure 4-8: The wind rose and speed chart for Omaruru (Meteoblue, 2024)

4.2 Social Environment

4.2.1 Demography

The Erongo Region has a population of 150,809 people, accounting to a 7.1% of the country's total population of Namibia of 2,104,900 in 2011. Omaruru Town is in the Omaruru Constituency and in 2011, the Constituency had a population of 8,577 (4,131 females and 4,446 males) of which 6,300 accounted for the urban population and the rural population was 2,277 (Namibia Statistics Agency, 2014). Omaruru Constituency has a population of 13,322[3], and pending the verified figure of the 2023 Population and Housing Census, the Town itself (urban area) has a population of 10,670 by 2023/2024.

4.2.2 Economic Activities

The economy of the Erongo Region mainly depends on mining, fishing, agriculture, and tourism. The fishing industry is the third largest economic sector contributed about 6.6% to the Gross Domestic Product (GDP). The Region's whole eastern part and certain western parts are characterized by livestock farming on commercial farms in the districts of Karibib, Usakos and Omaruru, and in the communal areas (Erongo Regional Council, 2015).

[3]https://www.citypopulation.de/en/namibia/admin/erongo/09OM__omaruru/

The Population & Housing Census in 2011 indicated that the labour force in Omaruru Constituency was 74% (15+ years), with the employed at 64%, and unemployed at 34%. The main source of income in the Constituency were from farming (3%), wages and salaries (67%), cash remittance (7%), business (non-farming) amounting to 9% and pension at 10% (Namibia Statistics Agency, 2014).

4.2.2.1 Farming

According to Erongo Regional Council (2015), from the 2000 statistics, the Region accommodated more than 110,000 goats, nearly 36,000 heard of cattle, and about 50,000 sheep. Cattle from commercial and communal farmers can be marketed to the national abattoir and processing facility, Meatco.

From a local perspective, the economic activities practiced in the Omaruru area are crop production comprising Lucerne, oats, maize and vegetables), farming (livestock and game) and tourism. The farming involves livestock and tourism is centred on eco-tourism, game drive and trophy hunting.

4.2.2.2 Exploration and Mining

The mining activities are undertaken near mining towns of Arandis and settlements such as Uis, Omatjete where commonalities such as nuclear fuels (Uranium), Dimension Stone (marble and granite), Base & Rare Metals (Copper), Precious Metals (Gold) and Industrial Minerals, etc. are mined. These mineral licenses may be or may not be operational at the moment.

4.2.2.3 Tourism

The Erongo Region and Omaruru area offer some of the most spectacular and popular tourist destinations as well as a variety eco-, wildlife, cultural and adventure tourism opportunities.

4.2.2.4 Land Uses

The Omaruru Town is surrounded by commercial farms within the vicinity of the Omaruru River. The typical activities on these farms include are crop production, livestock (goats, cattle, and sheep) and game farming. Cattle from commercial and communal farmers can be marketed to the national abattoir and processing facility such as Meatco. One of the lucrative economic activities practiced in most commercial farms around Omaruru are eco-tourism, game drives and trophy hunting.

4.2.3 Heritage and Archaeology

This section has been sourced from TARO Consultants (2023) and presents a brief baseline of the Omaruru Town archaeology and heritage. The archaeology of the Erongo Region has been well documented, available archaeological records indicate that early humans in Central Namibia, Erongo Region dates back from the Early Stone Age period, more than one million years ago as evidenced by hominin fossils. Stone Age archaeology is prevalent in the larger geographical area. The geospatial data on the distribution of archaeological sites show that sites are concentrated mainly in the central highlands

Omaruru Town was established in 1863 by Wilhelm Zeraua, the first chief of the White Flag clan of the OvaHerero people. In 1871, Anders Ohlsson and Axel Eriksson established a brewery at Omaruru. Eriksson had also established a trading post, which flourished and by 1878 he employed about forty white inhabitants. Eriksson's business was based upon long-distance trading between southern Angola and Cape Colony, which necessitated the establishment of regional trade routes. The town grew around a mission built in 1872 by Gottlieb Viehe, now a museum, and was attacked in 1904 during the Herero Wars. Franke Tower was later erected to commemorate the relief by Hauptmann Victor Franke's troops of the local garrison that was beleaguered by Herero tribesmen who had risen against the German colonial presence.

Furthermore, Omaruru's history is also closely linked to the history of the Herero and the Rhenish Mission. The Rhenish Mission erected buildings around the town in 1872, where missionary Gottlieb Viehe translated the bible into the Herero language, which led to the Christianisation of many Herero. The big Herero uprising in 1904 also affected Omaruru. However, after only a week the rebellion was put down and the German soldiers were freed. In 1908 a surveillance tower was erected, which was named after Captain Viktor Franke, who commanded the liberating troop.

Moreover, studies on the Holocene Later Stone Age (LSA) in Namibia predominantly rely on the archaeological evidence found in rock-shelters, despite a wealth of open-air surface assemblages. A total of 73 stratified rock-shelter sites in Namibia provide chronological information. The majority are located on the western margins of the Great Escarpment, closely corresponding to the distribution of Namibian rock art sites. Studies of stratified sites in coastal or inland settings are very rare. The maps below are depicting the different periods of archaeological records in Namibia as they were extracted from the Atlas of Namibia database.

During the site visit, there were no observed significant archaeological or heritage sites at the project site. However, potential subsurface resources might be inadvertently uncovered site works such as earthworks during site preparation.

4.2.4 Services and Infrastructure

The Erongo Region has good coverage of services and infrastructure. This includes a good road network from the central areas of the country and many access roads, tarred and untarred. The power is supplied either through ErongoRED in the coastal and central western areas of the Region.

There is also a good water reticulation system in both towns/settlements and rural (farm) areas. The water is mainly supplied through water supply schemes operated by NamWater either through boreholes (direct borehole or treated water) such as Omaruru Delta Aquifer Scheme for Omaruru Town and private boreholes on farms. The summary of current services infrastructure in and around Omaruru include:

- Water supply: Water is supplied from moderate and low yielding solar powered boreholes on farms and the Omaruru Town is supplied by the Municipality from its nine boreholes.
- Power supply: The broader areas such as towns (including Omaruru Town) and settlements are supplied by ErongoRed electricity provider. ErongoRed powers the Municipality boreholes and associated infrastructure. Some areas (including farms) use also rely on ErongoRed, on solar energy and generators for power.
- Waste management: The solid waste collected from homes and busineses is collected through waste removal contractors and disposed of at the Town's dumpsite. Wastewater is collected through the reticulation systems and disposed of at the existing sewer (oxidation) ponds in the Town, namely the municipal (Omaruru) ponds, Ozondje ponds and the S. I. !Gobs Senior Secondary School ponds.
- Road network: The Omaruru Town is connected to other areas such as Karibib, Otjiwarongo and Uis via C36 (Karibib to Uis via Omaruru) and C33 (Omaruru-Otjiwarongo). The municipal boreholes and nearby farms are accessed via a gravel road (D2328).
- Telecommunication services: The Omaruru Town is well connected to the rest of the country and world via local network service providers. The main providers of this service in the area are Mobile Telecommunications Company (MTC Namibia).and Telecom Namibia.

The proposed wastewater treatment plants are governed by certain legislations that the project Proponent needs to comply with throughout the project's lifecycle phase. The legal requirements relevant to the proposed Plant are presented under the next chapter.

5 APPLICABLE LEGAL REQUIREMENTS

A review of applicable and relevant Namibian legislation, policies and guidelines to the proposed development are given in this chapter. This review serves to inform the project Proponent, Interested and Affected Parties and the decision makers at the DEAF of the requirements and expectations, as laid out in terms of these instruments, to be fulfilled to establish the proposed WWT Plant's construction and operational activities.

5.1 The Environmental Management Act (EMA) No. 7 of 2007 and its 2012 EIA Regulations

This is the main Act that guides the environmental assessment process in Namibia. This scoping assessment was carried out according to this Act and its 2012 EIA Regulations (GG No. 4878 GN No. 30).

The EMA has stipulated requirements to complete the required documentation to obtain an Environmental Clearance Certificate (ECC) for permission to undertake certain listed activities. These activities are listed under the following Regulations:

- Listed activity 2.1 the construction of facilities for waste sites, treatment of waste and disposal of waste.
- Listed activity 8.6 the construction of industrial and domestic wastewater treatment plants and related pipeline systems.
- Listed activity 9.2 Any process or activity which requires a permit, license or other form of authorization, or the modification of or changes to existing facilities for any process or activity which requires an amendment of an existing permit, license or authorization or which requires a new permit license or authorization in terms of a law governing the generation or release of emissions, pollution, effluent or waste.

Implication: The EMA and its regulations should inform and guide the EIA process.

5.2 Water Resources Management Act (No 11 of 2013) and its 2023 Water Regulations

Act provides for the management, protection, development, use and conservation of water resources; and provides for the regulation and monitoring of water services and to provide for incidental matters. The objects of this Act are to:

Ensure that the water resources of Namibia are managed, developed, used, conserved and protected in a manner consistent with, or conducive to, the fundamental principles set out in Section 66 - protection of aquifers, Subsection 1 (d) (iii) provide for preventing the contamination of the aquifer and water pollution control (Section 68).

Implication or responsibility to the Act: The protection (both quality and quantity/abstraction) of water resources should be a priority. Therefore:

- The Proponent should ensure that the permit/license for effluent (wastewater) discharge into the environment (including its use for renovation works and irrigation) is applied for from the Directorate of Water Resources Management (Policy and Water Law Administration Division) of the MAWLR.

Furthermore, the after treatment, the final effluent will be complaint with and have a quality equal or better than specified for the General Standards as laid out in the water quality guidelines standards under Annexure 1, Annexure 2 and Annexure 3 of the Water Resources Management Act (No 11 of 2013) and the 2023 Water Regulations. These annexures requirements are as follows:

- Annexure 1 (Regulations 4, 6 and 37) is on water quality guidelines and standards for potable water
- Annexure 2 (Regulations 5, 68(2) and 69) of the Water Act is on the re-use applications for different water treatments (for mining an industrial uses).
- Annexure 3 (Regulation 6(1)) is on the classification of waterworks for the purification or treatment of water for human consumption or food processing.

In addition to that the, Water Regulations also require that the workers to be employed at the Plant during the operational phase should undergo a fair selection process and according to the requirements of the following annexures:

- Annexure 4 (Regulations 7(1) and 9(1)) of the Water Resource Management Act No. 11 of 2013: ‘’Classification of persons (excluding unskilled labourers), according to educational qualifications and experience to be employed for the operation of a water treatment facility and a waterwork’’.
- The employed people to work at the WWT Plant should meet the requirements of Annexure 5 (regulations 7(2) and 9(1)): ‘’minimum number of persons to be employed for the operation of a water treatment facility and a waterwork’’.

Other legal obligations that are relevant to the proposed Plant and related activities are presented in Table 5-1.

Table 5-1: Applicable national and international legislations governing the proposed project activities

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
The Constitution of the Republic of Namibia, 1990 as amended	The Constitution of the Republic of Namibia (1990 as amended) addresses matters relating to environmental protection and sustainable development. Article 91(c) defines the functions of the Ombudsman to include: *"…the duty to investigate complaints concerning the over-utilisation of living natural resources, the irrational exploitation of non-renewable resources, the degradation and destruction of ecosystems and failure to protect the beauty and character of Namibia…"* *Article 95(l) commits the state to actively promoting and maintaining the welfare of the people by adopting policies aimed at the:* *"…Natural resources situated in the soil and on the subsoil, the internal waters, in the sea, in the continental shelf, and in the exclusive economic zone are property of the State."*	By implementing the environmental management plan, the establishment will be in conformant to the constitution in terms of environmental management and sustainability. Ecological sustainability will be main priority for the proposed development.
Environmental Assessment Policy of Namibia 1994	The policy provides a definition to the term "Environment" broadly interpreted to include biophysical, social, economic, cultural, historical and political components and provides reference to the inclusion of alternatives in all projects, policies, programmes and plans.	This EIA outlines the environmental consequences of this project and considers this definition of Environment.

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
The Regional Councils Act (No. 22 of 1992)	This Act sets out the conditions under which Regional Councils must be elected and administer each delineated region. From a land use and project planning point of view, their duties include, as described in section 28 “to undertake the planning of the development of the region for which it has been established with a view to physical, social and economic characteristics, urbanisation patterns, natural resources, economic development potential, infrastructure, land utilisation pattern and sensitivity of the natural environment.	The relevant Regional Councils are considered to be Interested &Affected Parties and must be consulted during the Environmental Assessment (EA) process. The project site area falls under the Erongo Regional Council, therefore they should be consulted.
Forestry Act No. 12 of 2001	The Act provides for the management and use of forests and related products / resources. It offers protection to any living tree, bush or shrub growing within 100 metres of a river, stream or watercourse on land that is not a surveyed erven of a local authority area. In such instances, a licence would be required to cut and remove any such vegetation. These provisions are only guidelines.	Should there be trees within the actual footprint of the site that need to be removed; the Proponent through their construction contractor should notify the Omaruru Forestry Office. The number and/or type of trees to be removed to allow construction works should also be submitted to the local Forestry Office and Should these trees be of a protected species, the permit to remove them should be applied from this office.
Soil Conservation Act (No 76 of 1969)	The Act makes provision for the prevention and control of soil erosion and the protection, improvement and conservation of soil, vegetation and water supply sources and resources, through directives declared by the Minister.	Duty of care must be applied to soil conservation and management measures must be included in the EMP.

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
Petroleum Products and Energy Act (No. 13 of 1990) Regulations (2001)	Regulation 3(2)(b) states that "No person shall possess [sic] or store any fuel except under authority of a licence or a certificate, excluding a person who possesses or stores such fuel in a quantity of 600 litres or less in any container kept at a place outside a local authority area"	The Proponent through their construction contractor should obtain the necessary authorisation from the MME for the storage of fuel on-site in excess of 600 litres. This entails the application of consumer installation certificate.
Hazardous Substance Ordinance, No. 14 of 1974	The ordinance provides for the control of toxic substances. It covers manufacture, sale, use, disposal and dumping as well as import and export. Although the environmental aspects are not explicitly stated, the ordinance provides for the importing, storage, and handling.	The Proponent should handle and manage the storage and use of hazardous substances on site so that they do not harm or compromise the site environment
National Solid Waste Management Strategy	The Strategy ensures that the future directions, regulations, funding and action plans to improve solid waste management are properly co-ordinated and consistent with national policy, and to facilitate co-operation between stakeholders Waste disposal is the main problem with the current solid waste management in Namibia. The top priority is to reduce risks to the environment and public health from current waste disposal sites and illegal dumping in many areas of Namibia.	The construction and operations of wastewater treatment plants can potentially generate significant amount of solid waste (stockpiles, soil remains, rubbles) that might need proper management by contractors to avoid pollution. Waste management plans should be generated and implemented prior the commencement of civil works and during project operations. Contractors and Municipality should reduce the risk of solid waste to the environment and surroundings of the project area.

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
National Heritage Act No. 27 of 2004	To provide for the protection and conservation of places and objects of heritage significance and the registration of such places and objects; to establish a National Heritage Council; to establish a National Heritage Register; and to provide for incidental matters	The Proponent should ensure compliance with this Acts' requirements. The necessary management measures and related permitting requirements must be taken. This done by consulting with the National Heritage Council of Namibia.
The National Monuments Act (No. 28 of 1969)	The Act enables the proclamation of national monuments and protects archaeological sites.	
Soil Conservation Act (No 76 of 1969)	The Act makes provision for the prevention and control of soil erosion and the protection, improvement and conservation of soil, vegetation and water supply sources and resources, through directives declared by the Minister.	Duty of care must be applied to soil conservation and management measures must be included in the EMP.
Public Health Act (No. 36 of 1919)	Section 119 states that “no person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health.”	The Proponent and all its employees should ensure compliance with the provisions of these legal instruments.
Public and Environmental Health Act No. 1 of 2015	The Act serves to protect the public from nuisance and states that no person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health.	
Health and Safety Regulations GN 156/1997 (GG 1617)	Details various requirements regarding health and safety of labourers.	

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
Atmospheric Pollution Prevention Ordinance (No.11 of 1976)	This ordinance provides for the prevention of air pollution.	Measures should be instituted to ensure that dust emanating from construction activities and operations is kept at acceptable levels. The Proponent will also need to ensure that odour from the operational phase of the Plant is contained by implementing odour controlling measures.
Road Traffic and Transport Act, No. 22 of 1999	The Act provides for the establishment of the Transportation Commission of Namibia; for the control of traffic on public roads, the licensing of drivers, the registration and licensing of vehicles, the control and regulation of road transport across Namibia's borders; and for matters incidental thereto. Should the Proponent wish to undertake activities involving road transportation or access onto existing roads, the relevant permits will be required.	Mitigation measures should be provided for, if the roads and traffic impact cannot be avoided. If required, the relevant permits must therefore be applied for.
Labour Act (No. 6 of 1992)	Ministry of Labour, Industrial Relations and Employment Creation is aimed at ensuring harmonious labour relations through promoting social justice, occupational health and safety and enhanced labour market services for the benefit of all Namibians. This ministry insures effective implementation of the Labour Act no. 6 of 1992.	The Proponent should ensure that the project construction and operations and maintenance, do not compromise the safety and welfare of workers.

Public consultation is a vital component of any EIA and it has been done for this project as per Section 21 to 24 of the EIA Regulations. The public consultation process followed for this EIA is presented under the next chapter.

6 PUBLIC CONSULTATION AND PARTICIPATION PROCESS

Public consultation is an important aspect of an Environmental Assessment (EA) process. This process entails the sharing of information through the recommended means by the EMA as well as other means that are considered efficient to get the notifications to the general public. The consultation provides potential Interested and Affected Parties (I&APs) with an opportunity to comment on and raise any issues relevant to the project for consideration as part of the assessment process.

The consultation process has been undertaken in accordance with the Environmental Management Act No. 7 of 2007 and its 2012 EIA Regulations: Section 21-24 (Public Consultation).

The public consultation process assisted the Environmental Consultant in identifying all potential impacts and also aided in the process of identifying possible mitigation measures. Potential impacts that may stem from the proposed development were pre-identified prior to the consultation process and additional impacts were identified upon public feedback (through comments and concerns). Public Consultation with I&APs allows for a transparent decision-making with regards to the ECC.

6.1 Registered Interested and Affected Parties

The relevant and applicable national, regional and traditional authorities and other interested members of the public were identified and consulted by the Consultant. The (pre-identified) I&APs were contacted directly and some were registered as I&APs upon their request and from the public meeting attendance register. The newspaper adverts of the proposed project were placed in two national newspapers (*New Era and Windhoek Observer* newspapers). The project advertisement / announcement ran for two consecutive weeks as per the EIA Regulations. The summary of pre-identified and registered I&AP groups is listed below:

- Ministry of Agriculture, Water and Land Reform
- Ministry of Education, Arts and Culture
- Ministry of Works and Transport
- Ministry of Health and Social Services
- Ministry of Urban and Rural Development
- Ministry of Education, Arts and Culture
- Erongo Regional Council (Omaruru Constituency office)
- Shack Dwellers' Federation of Namibia
- Namibian Chamber of Environment (NCE)

- Namibian Environment and Wildlife Society
- National Botanical Research Institute
- National Heritage Council of Namibia
- Local and general community members of the public and others.

6.2 Public Consultation Activities

Regulation 21 of the EIA Regulations details steps to be taken during a public consultation process and these have been used in guiding this process. Communication with I&APs about the proposed WWT Plant was done through the following means and in this order:

- A list of pre-identified stakeholders and registered I&APs was developed and updated throughout the EIA process. A total of seventy-seven (77) I&APs were registered by the Environmental Consultants.
- A Background Information Document (BID) containing brief (first-hand) information on the proposed Plant was compiled.
- Project Environmental Assessment notices were placed in the *New Era* and *Windhoek Observer* newspapers dated 21 & 27 June 2024 - Appendix D, briefly explaining the activity and its locality, inviting members of the public to register as I&APs and submit comments. The adverts also contained the information on the scheduled public meeting. The first round of public consultation period ran from 21 June 2024 to 15 July 2024, i.e. before the compilation and circulation of the environmental report for public review and comments. Upon request by some I&APs, the comments period was extended to 23 July 2024 to allow more time for comments.
- After the first adverts (on 21 June 2024) were placed in the newspapers, the BID was shared via email with all pre-identified I&APs whose email addresses were available, by 01 July 2024. The BID was further shared with all I&APs who requested for it after seeing the adverts in the newspapers. Those new I&APs were also added to the list.
- Public notices (A3 size) in English were placed at strategic places in Omaruru, including the Municipality notice board as shown in Figure 6-1. The notices contained brief information on the proposed project, EIA process and how members of the public can register as I&APs as well as submit comments. The original site/public notice is also attached to the document as Appendix E.

Figure 6-1: One of the A3 size Public notices (posters) at the Municipality notice board

- A public consultation meeting was scheduled and held on Thursday, 11 July 2024 in Omaruru (at Central Hotel Conference Hall) as shown on photos in Figure 6-2. The meeting was attended by twenty-seven (27) people and meeting minutes were taken. The minutes from the consultation meeting and attendance register are attached as Appendix F.

Figure 6-2: Public consultation meeting at Central Hotel in Omaruru on 11 July 2024

6.3 Feedback from the First Round of Public Consultation

In addition to issues raised during the public meeting, there some comments received by via email. These comments are summarized in Table 6-1 below and provided with responses in the Comments & Response document appended here to as Appendix G.

Table 6-1: Summary of key issues and comments received during the consultation period

Aspect	Summary of impact or concern
Design of pipeline plans	A digital file of the plans or copies of the plans needs to be made available for stakeholders/I&APs to view and comment on.
The connection of the Shell Fuel Service to the system	Concern on the depths of the trenches to be dug along the sidewalk or streets instead of across the main street to the vacant plot. Another concern on what would happen if excavation works hit a bedrock.
Potential damage to pipelines at Rivendell, Central Hotel and Erongo Wholesale	Concern about pipeline damages owing to heavy Omaruru River floods. A pipe at the surface would be subject to powerful forces at these three retaining wall points.
Poor performance of existing pipelines	Poor performance of existing pipelines owing to poor design, thus, their inadequate carrying capacity, and eventual inadequate capacity of the pump stations. There is also a lack of maintenance by the Municipality. Therefore, the new designs should be verified to ensure the past does not repeat itself.
Land (or portions) displacement and or loss of private land owing to servitudes for the pipelines	There is a need for the Municipality to properly consult, engage and discuss with landowners on the riverside. The fact that at this late stage in the process the Municipality has failed to secure the easements from the landowners shows a shocking lack of planning.
The duration of public consultation and participation	The amount of time allocated to I&APs in the meeting was short which is concerning, if the procedure is supposed to be legitimate and afford I&APs to provide inputs.
What is included under ‘’associated infrastructures’’ in the BID and if the current construction of pipelines are part of the EIA	The term “…and associated Infrastructures” should be clearly defined. It should also be confirmed if these “associated infrastructure” includes the current construction of pipelines.
Responsibility of the Plant operations	The concern over the disposal of semi or untreated sewage into the Omaruru River, like the Windhoek Wastewater Treatment plant does into the Elisenheim River.
The employment of people during construction and operational phase	There is no positive about the job creation because it was mentioned that few people will be permanently employed once the plant is completed. What happens to the operators of the current trucks? Are they being dismissed, and thus conveniently “overlooked"? And if they are “reshuffled” within the Municipality this will surely come at an extra cost, thus being an increased burden on the Rate payers.

Aspect	Summary of impact or concern
Cumulative impact on the air quality and community health	The heavy smoke from the current dumping site of Omaruru in the north-eastern part of town. Thus, the Plant would add to air pollution issues, thus increased health risks.
Dumping of dried sludge from the Plant	The sludge should be packed in bags and sold as fertilizer to consumers across Omaruru and the whole of Namibia, as it is done by the Municipality of Swakopmund.
The absence of the design engineers in the consultation meeting	The community was not satisfied that the technical engineer was not available to explain the process from point A to point B to clarify the safety of the system to the community.
The location of the Treatment Plant	The height of location of the site where the Plant will be constructed is a concern as the water needs to be pumped to reach the Plant. It would be more suitable and safe to have an area with a natural down flow.
Provision of design layout and route	Provision of the design layout and route selected in either/or DWG (correctly geo-referenced) and or in Google Earth (KMZ/KML) format to I&APs so that they can have a visual identification of the locality of pipe routes, ponds and where all ty-in's would be located.
A risk analysis for the Plant's operations	A risk analysis of the operation of the Plant would be very helpful, including the probability and the mitigation plan of the identified risks.
Galvanized piped in the environment	Galvanized pipes that are now being used for the new system is an environmental threat. It will be corroded in no time the chemicals in the sewerage and leakages will take place in the sand area next to the river.
Odour from the Plant	Concern over potential odour emanating from the site to the nearby communities.
Pollution from hydrocarbons to the Omaruru River	The potential spillage of hydrocarbons into the Omaruru River.

The consultation period ran from 21 June 2024 to 15 July 2024 to allow the submission of comments after the consultation meeting. Comments received during the consultation meetings were as summarized above and indicated in the meeting minutes. It was indicated in the meeting that the comments period was too short, therefore, the period was extended to 23 July 2024 to allow I&APs more time to submit their comments after the consultation meeting.

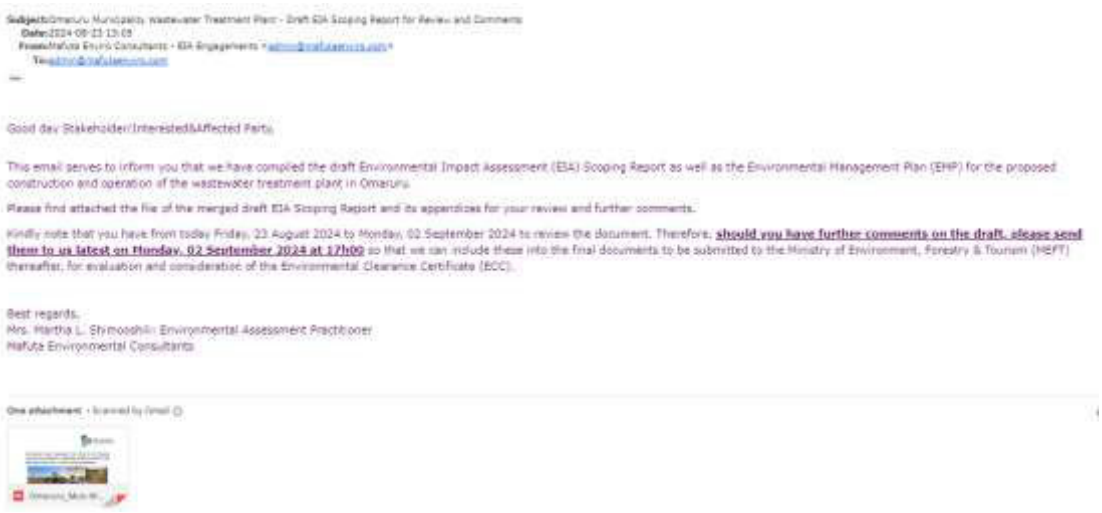
6.4 Feedback from the Second Round of Public Consultation (Draft Report Review)

The Draft Scoping Report will be circulated to all registered I&APs for review for a period not less than seven (7) days. Therefore, the draft documents will be circulated for ten (10) days. Should there be any comments, these will be documented in an additional appendix (Comments & Response Trail Document) to the Final Scoping Report.

Moreover, once the documents are finalized, I&APs will also have another fourteen (14) day period to view the documents and submit their comments directly to the Office of the Environmental Commissioner on the ECC Portal. The link to the website will be provided to all registered I&APs once it is made available by MEFT.

6.5 Response to Reviewing of the Draft Scoping Report

The draft environmental Scoping Report and EMP were circulated to the registered stakeholders and I&APs for review and comments on the 23rd of August 2024 to the 02nd of September 2024 - Figure 6-3.


Good day Stakeholder/Interested/Affected Party,

This email serves to inform you that we have compiled the draft Environmental Impact Assessment (EIA) Scoping Report as well as the Environmental Management Plan (EMP) for the proposed construction and operation of the wastewater treatment plant in Omaruru.

Please find attached the file of the merged draft EIA Scoping Report and its appendices for your review and further comments.

Kindly note that you have from today Friday, 23 August 2024 to Monday, 02 September 2024 to review the document. Therefore, **should you have further comments on the draft, please send them to us latest on Monday, 02 September 2024 at 17h00** so that we can include these into the final documents to be submitted to the Ministry of Environment, Forestry & Tourism (MEFT) thereafter, for evaluation and consideration of the Environmental Clearance Certificate (ECC).

Best regards,
Mrs. Martha L. Shimooshili Environmental Assessment Practitioner
Hafuta Environmental Consultants

Figure 6-3: Copy of email for the circulation of the draft scoping report to stakeholders and I&APs on 23 August 2024

The comments received on the report are recorded under Appendix H. These were incorporated into the Report and EMP.

7 POTENTIAL IMPACT IDENTIFICATION AND ASSESSMENT

7.1 Identification of Potential Impacts

Wastewater treatment plants are associated with different environmental impacts, whether positive or negative. The main aim of an environmental assessment is to assess the negative impacts of the proposed project. This is done to ensure that the negative impacts are adequately addressed so that an impact's significance is brought under control, while maximizing the positive impacts. The potential positive and negative impacts that have been identified from the proposed Plant activities are as follows:

7.1.1 Potential Positive Impacts (Benefits)

- Socio-economic development through temporary job (employment) creation in the Town during the construction phase - during the construction phase and few people required for the operational and maintenance.
- The Plant will ensure that there is no more loss of usable water through evaporation from ponds. This means the water contained in the wastewater will be recovered through the treatment and used for other purposes in the Town such as irrigation and industrial uses, thus, relieving pressure off the current water supply source (boreholes) for all activities in Omaruru. Therefore, there is an opportunity of recovering resources such as recycled water in the wastewater (e.g., biogas, recycled water).
- If effectively implemented in the future, there is an opportunity for biogas recovery from the treatment process of anaerobic. This would be achieved by capturing methane and other gases produced during the treatment of organic waste. The biogas can be used as fuel to generate electricity and heat, often through gas engines or turbines. The gas can supply the Plant itself or provide energy for other uses in the Town.
- Improved wastewater management in the Town during the operational phase, thus preventing the amount of wastewater that would otherwise be uncontrollably released into the environment untreated. This would improve the local public and environment health.

7.1.2 Potential Negative Impacts

- Soil and water pollution: improper handling of wastewater may lead to surrounding soil pollution and water resources systems.
- General environmental pollution through mishandling of site waste leads to environmental pollution.

- Loss of biodiversity through the removal of vegetation that may be found within the site footprints.
- Noise (nuisance): noise generated by machinery and vehicles may lead to nuisance to locals.
- Air pollution by potential dust and gas emissions from construction and operational activities.
- Odour: Some by-products of anaerobic digestion such as hydrogen sulfide (H2S) used in wastewater treatment facilities, may give off a strong, nauseating smell. This may affect the nearest locals.
- Vehicular traffic: potential increase in local traffic due to construction activities on site and subsequent operational activities.
- Occupational and community health and safety: poor work site management, improper handling of site materials and equipment may cause health and safety risks.
- Archaeological or cultural heritage impact through uncovering of unknown objects on site (when doing earthworks).
- Social nuisance and property disturbance by project related workers, especially during the construction phase. The presence of strangers (out-of-area construction contractors) in the area may lead to sexual relations between them and the locals, which may encourage unprotected sex leading to unwanted pregnancies and sexually transmitted diseases. Some constructors may steal or damage and intrude private properties belonging to the locals.
- High energy consumption required by the Plant could affect municipal electricity or power supply services, thus, contributing to climate change.
- Accidental fire outbreaks from project activities.

7.2 Methodology for the Impact Assessment

The impact assessment method used for this project was adopted from previous environmental reports that were compiled by the authors and as well as published reports online through research on the suitable project assessment methodology.

The identified impacts were assessed in terms of probability (likelihood of occurring), scale/extent (spatial scale), magnitude (severity) and duration (temporal scale) as presented in Table 7-1. To enable a scientific approach to the determination of the environmental significance, a numerical value is linked to each rating scale. This methodology ensures uniformity and that potential impacts can be addressed in a standard manner so that a wide range of impacts are comparable. It is assumed that an assessment of the significance of a potential impact is a good indicator of the risk associated with such an impact. The following process will be applied to each potential impact:

- Provision of a brief explanation of the impact;
- Assessment of the pre-mitigation significance of the impact; and
- Description of recommended mitigation measures.

The recommended mitigation measures prescribed for each of the potential impacts contribute towards the attainment of environmentally sustainable operational conditions of the project for various features of the biophysical and social environment. The following criteria (Table 7-1) were applied in this impact assessment.

Table 7-1: Impact assessment criteria

Nature	Description	Rating
Extent (Spatial scale)	An indication of the physical and spatial scale of the impact.	**Low (1)**: Impact is localized within the site boundary: Site only. **Low/Medium (2)**: Impact is beyond the site boundary: Local. **Medium (3)**: Impacts felt within adjacent biophysical and social environments: Regional. **Medium/High (4)**: Impact widespread far beyond site boundary: Regional **High (5)**: Impact extend National or over international boundaries.
Duration	The timeframe, over which the impact is expected to occur, measured in relation to the lifetime of the project.	**Low (1)**: Immediate mitigating measures, immediate progress **Low/Medium (2)**: Impact is quickly reversible, short term impacts (0-5 years) **Medium (3)**: Reversible over time; medium term (5-15 years).

Nature	Description	Rating
		Medium/High (4): Impact is long-term. **High (5):** Long term; beyond closure; permanent; irreplaceable or irretrievable commitment of resources
Intensity, Magnitude / Severity (Qualitative criteria)	The degree or magnitude to which the impact alters the functioning of an element of the environment. The magnitude of alteration can either be positive or negative	**Medium/low (4)**: Low deterioration, slight noticeable alteration in habitat and biodiversity. Little loss in species numbers. **Low (2)**: Minor deterioration, nuisance or irritation, minor change in species / habitat / diversity or resource, no or very little quality deterioration.
Probability of occurrence	Probability describes the likelihood of the impacts actually occurring. This determination is based on previous experience with similar projects and/or based on professional judgment	**Low (1)**: Improbable; low likelihood; seldom. No known risk or vulnerability to natural or induced hazards. **Medium/low (2):** Likely to occur from time to time. Low risk or vulnerability to natural or induced hazards. **Medium (3)**: Possible, distinct possibility, frequent. Low to medium risk or vulnerability to natural or induced hazards. **Medium/High (4**): Probable if mitigating measures are not implemented. Medium risk of vulnerability to natural or induced hazards. **High (5)**: Definite (regardless of preventative measures), highly likely, continuous. High risk or vulnerability to natural or induced hazards.

Impact significance is determined through a synthesis of the above impact characteristics. The significance of the impact "without mitigation" is the main determinant of the nature and degree of mitigation required. As stated in the introduction to this chapter, for this assessment, the significance of the impact without prescribed mitigation actions was measured.

Once the above factors (Table 7-1) have been ranked for each potential impact, the impact significance of each is assessed using the following formula:

SP = (magnitude + duration + scale) x probability

The maximum value per potential impact is 100 significance points (SP). Potential impacts were rated as high, moderate or low significance, based on the following significance rating scale (Table 7-2).

Table 7-2: Significance rating scale

Significance	*Environmental Significance Points*	*Colour Code*
High (positive)	>60	H
Medium (positive)	30 to 60	M
Low (positive)	<30	L
Neutral	0	N
Low (negative)	>-30	L
Medium (negative)	-30 to -60	M
High (negative)	>-60	H

For an impact with a significance rating of high, mitigation measures are recommended to reduce the impact to a low or medium significance rating, provided that the impact with a medium significance rating can be sufficiently controlled with the recommended mitigation measures. To maintain a low or medium significance rating, monitoring is recommended for a period of time to enable the confirmation of the significance of the impact as low or medium and under control.

The assessment of the project phases is done for both pre-mitigation (before implementing any mitigation) and post-mitigation (after mitigations are implemented).

The risk/impact assessment is driven by three factors and these are:

- **Source:** the cause or source of the contamination or risk. It can also defined as a contaminant or hazard that has the potential to cause harm or pollution.
- **Pathway:** the route taken by the source to reach a given receptor or a route through which the receptor can be affected by potential hazard.

- **Receptor:** something that could be adversely affected by a contaminant or hazard, i.e., biological and socio-economic indicators. A receptor can be a person, animal, plant, eco-system, property or a controlled water source. For instance, if contamination is to cause harm or impact, it must reach a receptor.

A pollutant linkage occurs when a source, pathway and receptor exist together (Booth, 2011). The objective with the mitigation measures is to firstly avoid the risk and if the risk cannot be avoided, mitigation measures to minimize the impact are recommended. Once the mitigation measures have been applied, the identified risk will be of low significance.

7.3 Assessment of Potential Negative Impacts

This subchapter presented the assessment of potential negative impacts associated with the proposed Plant's construction and operational phases' activities. These impacts are; soil and water pollution, general environmental pollution, loss of biodiversity (fauna and flora), noise (nuisance), air pollution, odour, vehicular traffic, health and safety, archaeological or cultural heritage and social nuisance and property disturbance.

The potential negative impacts associated with any kind of development can occur if the planning and design of such development facility is not properly done. At times, the planning and designs are properly done and environmental management measures provided to avoid and/or minimize these impacts. However, if these construction and operational management measures are not effectively implemented, these potential impacts would be inevitable.

The management and mitigation measures recommended for the potential (adverse) impacts anticipated from the project activities are provided in the Draft EMP – Appendix A.

7.3.1 Impact on Water Resources

Wastewater treatment plants are known to be one of the contributing sources of water pollution through their operations. Water resources are generally impacted by project activities in two ways, i.e. either through pollution (water quality) or over-abstraction (water quantity) or at times both in the construction and operational phases. The proposed Plant will probably only impact the water resources in terms of pollution, because the Plant will be used to treat wastewater, but not use freshwater for its actual operations. Fresh water from the Town’s existing freshwater supply (boreholes) would only be required for domestic use by onsite workers and maybe in a small quantity, to cool off operational machinery and equipment. Hence, the impact on water quantity (abstraction) associated with the Plant’s activities is very low.

The potential of local groundwater getting polluted by the Plant's operation would only occur through the mishandling of wet construction waste and eventual wastewater. During the rainy season, this waste may be washed into nearby surface water bodies such as Omaruru River and/or infiltrate into the ground and pollute groundwater. The change in water quality can impact aquatic ecosystems (in the River), thus, affecting flora and fauna, potentially leading to algal blooms or shifts in species composition.

In addition to the above, potential groundwater pollution from the Plant's activities, groundwater within the proposed site is hosted in compacted (unfractured) rock units or rock bodies with little groundwater potential. Although the ground surface of the site is covered by unconsolidated to semi-consolidated sediments (sand and gravel), nature of these bed rocks (rock units) would restrict or hinder (slow down) the rapid spreading of pollutants to groundwater and over a large area due to their compact nature compared to sand and gravel. Thus, these less permeable (compacted) rocks or aquitards can help protect aquifers from pollution by limiting the migration of pollutants, and thus, can also trap contaminants within their layers.

Moreover, the extent of the pollution would however depend on the volume of pollutants spilled. Pollution would be a major concern if spilled in or along the Omaruru River banks, where the productive porous aquifers are. These aquifers are considered porous and due to their high permeability, liquid pollutants from the ground surface can enter the groundwater system fairly easily and rapidly spread down the aquifers. Subsequently, the impact of the Plant on water quality is of medium significance if no mitigation measures are implemented, however, once this is done, the rating will be reduced to low. The impact is assessed in Table 7-3 below.

Table 7-3: Assessment of the impacts of the Plant activities on water resources

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	M: -3	M -6	M / H - 4	M - 48
Post mitigation	L - 1	L/M - 2	L - 2	L/M - 2	L - 10

7.3.2 Surrounding Soils

Site excavation works to enable construction and movement of heavy vehicles and machinery can potentially result in soil disturbance and compaction leaving site soils vulnerable to erosion. In terms of pollution, potential soil pollution during the project activities would be caused by spills and leaks of hydrocarbons, wastewater and other materials used and generated on site. During the operational phase, the main source of soil pollution would be accidental spillage or leakage / mishandling of wastewater. Furthermore, poor disposal of sludge from the waterworks could potentially affect soil quality and sediment, thus, influencing land use and agricultural activities downstream of the site.

The impact can be rated as medium significant, if no mitigation measures are implemented. However, upon implementation of measures, the impact will be of low significance as assessed in Table 7-4.

Table 7-4: Assessment of the impacts on site soils

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M -3	M: - 3	M -6	M / H - 4	M - 48
Post mitigation	L/M - 2	L/M - 2	L/M - 4	L/M - 2	L - 16

7.3.3 Waste Management

All construction works for wastewater treatment projects and their eventual operations are usually associated with generation of waste of all kinds (general solid waste, construction, sewage and hazardous). Improper handling, storage and disposal of wastes may lead to environmental degradation/pollution. If these are not disposed of in a responsible manner, it will result in the pollution of the site and the surrounding environment.

Waste generation is an ongoing activity for any development, and this can be rated as medium significant if no mitigation measures are implemented. The impact will be reduced to low significance rating upon implementing the mitigation measures. The impact is assessed is also provided in Table 7-5 below.

Table 7-5: Assessment of waste generation impact

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	L/M - 2	M - 6	M/H - 4	M – 44
Post mitigation	L - 1	L - 1	L - 2	L/M - 2	L - 8

7.3.4 Biodiversity: Fauna and Flora

The project activities such as movement of construction vehicles could potentially affect local animals in the area near the site. If no strict mitigation measures are provided, the project workers may secretly snare, steal or kill local animals. There is possibility of encountering small soil animal onsite and their habitats may be destroyed during site earthworks, thus resulting in the loss of such species. Pre-mitigation measures, the impact significance on fauna can be considered medium. With the implementation of appropriate mitigation measures, significance rating will be reduced to low. The assessment of this impact is presented in Table 7-6.

Table 7-6: Assessment of the impacts on biodiversity (fauna)

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L/M - 2	L/M - 2	M - 6	M - 3	M – 30
Post mitigation	L - 1	L/M - 2	L - 2	L/M - 2	L - 10

The site and its surrounding are covered by trees and shrubs (medium to high vegetation cover). The Plants' construction and operational works will not require complete removal of site vegetation. The only vegetation to be removed are those that are within the planned site footprints, and only when it is necessary. The common vegetation on site are the camel thorn trees (protected species), and these will not be removed without a permit from Omaruru Forestry Office. The rest of the vegetation on and around the site will be left to preserve the floral community on site. Therefore, the impact significance is low. The assessment of the project activities on the local vegetation is presented in Table 7-7.

Table 7-7: Assessment of the impacts on biodiversity (flora)

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	L/M - 2	M - 6	M/H - 4	M – 44
Post mitigation	L/M - 2	L/M - 2	L/M - 4	L/M - 2	L - 16

7.3.5 Noise

The construction works and vehicles may be a nuisance to surrounding neighbours, such as the houses and properties near the site. Excessive noise can also be a health risk to site workers when not equipped with appropriate protective gear. The noise from the project activities during construction will be limited to a certain extent and site only, and construction activities will only last for so long during working hours and five days in a week for 18 months. Therefore, the noise level is bound to be limited to the site only, and therefore, the impact likelihood is minimal. Without any mitigation, the impact is rated as of medium to low significance. This impact is assessed in Table 7-8 below.

Table 7-8: Assessment of the impacts of the noise from the Plant operations

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L/M - 2	L/M - 2	M - 6	M - 3	M – 30
Post mitigation	L - 1	L/M - 2	L - 2	L/M -2	L - 10

7.3.6 Air Quality (Dust and Emissions)

Dust emanating from the movement of heavy vehicles travelling on gravel roads when transporting construction equipment (time-to-time) may compromise the air quality in the site area. Construction works are associated with dust, especially in dry months of the year. Dust emanating from traffic travelling on the gravel roads to site during construction and operational phases will lead to decrease in the air quality around the site.

The potential sources of dust generation for this project will be from unsealed access roads. Since construction works will only be done five days a week for a period of 18 months. The generation of dust by vehicles can thus be considered moderate and during construction phase only, and therefore of low to medium significance without any mitigation measures. The medium significance of this impact can be reduced to a low significance rating by properly implementing mitigation measures. As per assessment in Table 7-9 below, pre-mitigation measures, the impact is of medium significance, but upon implementation, the impact will be of low significance.

Table 7-9: Assessment of the impact on surrounding air quality

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	L/M - 2	M - 6	M/H - 4	M – 44
Post mitigation	L - 1	L/M - 2	L - 2	L/M -2	L - 10

7.3.7 Odour

Foul odors are an unfortunate reality at wastewater treatment plants. If left uncontrolled, nuisance odors can waft into public spaces and residential areas located around the plants (Cormier, 2017). Factors such as wind velocity or direction and temperature inversions determine how far emissions can drift from the source. Wastewater treatment plants can emit gases such as ammonia or methane which can contribute to odor issues.

Odours from wastewater treatment plants can trigger complaints from the neighbouring communities (receptors). These complaints can escalate that they could negatively impact the Plant's reputation.

Cormier (2017) stated that odours are typically worse at higher temperatures, thus, it is not surprising that the management of wastewater treatment plants usually receives more odor complaints during the warmer months of the year. The odour from these treatment plants is a potential nuisance for nearby receptors, i.e. nearest neighbours to the site or in the vicinity of the Plant. When air transports an odour from the source, dispersion of the odour occurs.

Furthermore, odour is a local issue, which is hardly quantifiable; the impact greatly depends on the subjective perception of populations neighbouring the source (treatment plants). It is, therefore, difficult to evaluate the maximum distance over which odour travels. However, odour problems are generally concentrated within 500m of the source (Gerber *et al.*, undated). Although generally not causing any public-health concern, odour can represent a strong local problem that is frequently reported by wastewater treatment plants' neighbours as the most disturbing environmental impact. Therefore, the Proponent will need to implement what works for the site environment.

In terms of local and surrounding receptors, the impact would be felt by houses and properties to the immediate east and northeast of the Plant site because the local predominant direction of wind flow is from west to east and southwest to northeast. Without any mitigation measures and/or proper Plant designs, the impact can be considered to be of medium significance. However, upon effective implementation of mitigation measures, the impact will be significantly reduced to low. The impact is assessed Table 7-10.

Table 7-10: Assessment of the impacts of odour

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	M - 3	M/H - 8	M/H - 4	M – 56
Post mitigation	L/M - 2	L/M - 2	L/M - 4	L/M - 2	L - 16

7.3.8 Vehicular Traffic Safety

The project works may potentially put pressure on existing local roads when construction materials and operational phase goods are delivered to and from the site. The construction of the Plant, particularly will potentially increase traffic in the area within proximity of the site and access roads. An increase in traffic would potentially lead to road accidents, especially by slow moving heavy trucks that will be frequenting the area mainly during the construction phase. However, only so many times a week or even in month that the Plant's construction works will be done and materials and equipment will be transported from and to site, respectively. Thus, pre-mitigation, the impact can be rated low to medium and with the implementation of mitigation measures, the significance will be low. The impact is assessed in Table 7-11 below.

Table 7-11: Assessment of the impacts of project activities on local roads

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	L/M - 2	M - 6	M/H - 4	M – 44
Post mitigation	L/M - 2	L/M - 2	L - 2	L/M - 2	L - 12

7.3.9 Occupational Health and Safety

Workers involved in the construction and operations phases may be exposed to health and safety risks, when they are not properly inducted or trained on how to use certain machinery or equipment. Health concerns are potentially associated with the operational phase of the Plant as well, especially when the workers are exposed to dust and very noisy machines without any personal protective gear. Added to that, there are occupational health and safety risks in construction projects where elevated structures such as buildings are erected or operated and maintained. The following risks are associated with working at heights:

- Falls from height: The most obvious risk is falling from a height, which can lead to severe injuries such as fractures, head trauma, spinal cord injuries, or even death. The severity of injuries often correlates with the height of the fall and the nature of the landing surface.

- Falls through openings: Workers may also be at risk of falling through unprotected openings or skylights. This can occur if proper barriers or covers are not in place.
- Falling objects onto workers: Tools, equipment, or materials can fall (accidental drops) from elevated positions, posing a risk to both the worker at height and others below.
- Loss of balance by workers: Working at heights can involve unstable or narrow surfaces, such as scaffolding or ladders, which can lead to loss of balance and subsequent falls.
- Extreme weather conditions: Weather conditions like strong winds and rain can significantly increase the risk of accidents.
- Psychological stress: The fear of heights can impact a worker's concentration and performance, thus, increasing the likelihood of mistakes or accidents.
- Fatigue and overexertion: Working at heights often requires physical exertion and can lead to fatigue, which impairs judgment and coordination.
- Improper use of safety equipment: Failure to properly use or maintain personal protective equipment (PPE) like harnesses, helmets, and guardrails can greatly increase the risk of injury.

The impact can be rated as medium to slightly high significant if no mitigation measures are implemented, but upon implementation, the impact will be of low significance. This impact is assessed in Table 7-12 below.

Table 7-12: Assessment of project activities on occupational health and safety

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	M - 3	M/H - 8	M/H - 4	M – 56
Post mitigation	L/M - 2	L/M - 2	L - 2	L/M - 2	L - 12

7.3.10 Community Health and Safety

Community health and safety associated with the construction activities if transported projected loads are not well secured and tightened to vehicles (trucks) during transport to and from site. This could pose a great risk to people and animals along the roads. Furthermore, community health and safety may be compromised when the site is not fenced off during construction and also during the operational phase such that local children may try to access the site and play with dangerous materials and equipment. Health and safety risk may not only affect people but local animals that may graze or wander near the site. This is especially true if for instance waste is poorly managed onsite, plastic and papers may be consumed by animals which can be detrimental to their health.

In addition to that, health and safety risks associated with construction works, is unsecured storage of heavy vehicles, equipment and fuel storage area. This may result in harm or injury to the site personnel, residents (locals) and animals. There is also a potential risk to both people and animals within the site area if construction trenches or holes are not backfilled or secured, thus posing a risk of people or animals falling into these open structures leading to injuries.

Another potential health risk stemming from the proposed Plant site is dust from construction vehicles and activities as well as the nuisance of odour during the operational phase. The storage of project hazardous waste and materials on site in relation to the local community, especially if children wander around the unfenced site out of curiosity and stumble on hazardous equipment, leading to serious injuries. The impact can be rated as medium to slightly high significance if no mitigation measures are implemented, but upon implementation, the impact will be of low significance. This impact is assessed in Table 7-13 below.

Table 7-13: Assessment of the project activities on community health and safety

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	L/M - 2	M - 6	M/H - 4	M – 44
Post mitigation	L/M - 2	L/M - 2	L - 2	L/M - 2	L - 12

7.3.11 Archaeological Impact

Subsurface archaeological and cultural heritage resources may be impacted through inadvertent destruction or damage during earthworks. These may include the inadvertent excavation of subsurface graves, artefacts or other archaeological objects.

In terms of site-specific archaeology, there was no information provided nor observed surface sites about heritage nor site of cultural values onsite. However, this does not mean rule out the possibility of finding some of these objects during the construction phase. Therefore, pre-mitigation measures will need to be implemented to minimize the impact significance from medium to low rating. The assessment of the impact is shown in Table 7-14 below.

Table 7-14: Assessment of impact on heritage and archaeological resources

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	M - 3	M - 6	M / H - 3	M -36
Post mitigation	L - 1	L / M - 2	L - 2	L / M -2	L - 10

7.3.12 Social Impact: Influx of job seekers into the Area

Influx of out-of-area people into the project area, particularly during the construction phase may lead to social annoyance of the local community. This is a concern because given the current unemployment rate of youth in Namibia, people from other areas in the regions would learn of the Plant's operations and be forced to go look for work opportunities in Omaruru. Different people may come with different ways of living to the area, which could interfere with the local norms, culture and values.

Subsequently, the influx would lead into social crashes between the locals and outsiders (out-of-area job seekers). If it does happen, the influx of people into the Town may also lead to sexual relations between contractors and the locals. This would contribute to the spreading of sexual transmitted diseases (i.e. HIV/AIDS) when engaging in unprotected sexual intercourse.

Pre-implementation of mitigation measures, the impact is rated as of medium significance. However, upon mitigation (post-mitigation), the significance will change from medium to low rating. The impact is assessed in Table 7-15 below.

Table 7-15: Assessment of influx of outsiders into the project area

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	M - 3	M/H - 8	M/H - 4	M – 56
Post mitigation	L/M - 2	L/M - 2	L - 2	L/M - 2	L - 12

7.3.13 Social Impact: Damage or Disturbance to Properties

The presence of out-of-area construction workers may lead to social annoyance to the local community. This could particularly be a concern when these construction workers trespass or damage private or community properties. The private properties could be homes, yards/fences, vegetation or domestic animals (livestock) or any valuable properties. Damage or disturbance to properties is not only for the neighboring properties, but properties belonging to the Municipality too. The unauthorized entry to private properties may cause social crashes between the local community (affected property owners) and the Proponent (as the being responsible for the overall works and project contractors).

Pre-implementation of mitigation measures, the impact is rated as of medium significance. However, upon mitigation (post-mitigation), the significance will change from medium to low rating. The impact is assessed in Table 7-16 below.

Table 7-16: Assessment of social impact – damage of private and communal properties

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	M - 3	M - 6	M - 3	M – 36
Post mitigation	L/M - 2	L/M - 2	L - 2	L/M - 2	L - 12

7.3.14 Energy Consumption and Climate Change

Wastewater treatment plants consume significant amounts of energy, thus, high energy consumption required by the Plant could affect current municipal electricity or power supply services. This will require the municipality to increase electricity use, which could contribute to greenhouse gas emission, thus impact climate (impact of climate change). Without any alternative source of energy to partly or wholly supply the Plant, the impact can be rated as medium to slightly high significant. However, this type wastewater treatment uses less energy compared to other types of treatment techniques. Therefore, the anticipated impact on energy resources is low. Besides that, there are plans to establish a solar plant for the Plant, thus, reducing the reliance on the Town's energy supply. Regardless, upon considering and implementing the mitigation measures (establishing a renewable energy system such as the planned photovoltaic (PV) / solar plant for the project), the impact significance will be reduced from medium to low rating. The assessment of this impact is provided in Table 7-17.

Table 7-17: Assessment of the impacts of the proposed Plant on energy consumption

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	L/M - 2	M - 6	M/H - 4	M – 44
Post mitigation	L/M - 1	L/M - 2	L - 2	L/M - 2	L - 10

7.3.15 Accidental fire outbreaks

The use of heavy equipment, and presence of hydrocarbons (fuels, oils and grease) needed for construction activities onsite, there is a potential risk of accidental fire outbreaks. This could pose a safety risk to the project personnel (workers) and locals as well as nearby vegetation. This is not only a risk to people but also to properties such as nearby fences, and structures. Without any measures, the impact significance can be rated medium to slightly high. However, upon implementing mitigation measures, the impact significance will be reduced from medium to low rating. The assessment of this impact is provided in Table 7-18 below.

Table 7-18: Assessment of the impacts of accidental fire outbreaks

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	M - 3	M - 3	M - 6	M / H - 4	M – 48
Post mitigation	L/M - 2	L/M - 2	L - 2	L/M - 2	L - 12

7.4 Conclusion on the Impact Assessment

Based on the assessment of impacts, it is evident that the identified potential negative impacts are rated as medium significant. Therefore, to reduce the significance from medium to low by effectively implementing recommended management and mitigation measures. Furthermore, to ensure the effectiveness of the measures and maintain low significance over time, the implementation of measures will need to be continuously monitored. This would mean conducting daily inspection and monthly reporting during construction and bi-annually reporting during operational & maintenance phase.

8 CONCLUSIONS AND RECOMMENDATIONS

The aim of this environmental assessment was to identify potential impacts associated with the proposed construction and operation of the Wastewater Treatment Plant in Omaruru and assess these impacts. The public was consulted as required by the EMA and its 2012 EIA Regulations (Section 21 to 24). The stakeholders and public were informed via the two newspapers used for this assessment; site/public notices placed in Omaruru and other existing means (channels) of conveying information in the Town. It was through these means of information sharing and communication that the public was notified of a one-on-one interaction (public meeting). During the consultation meeting, the public (I&APs) raised their comments and concerns on the proposed Plant in the Town. The concerns and comments received from the public and the local community members formed the basis for this Report and the EMP.

The conclusions reached and recommendations provided are presented below.

8.1 Conclusions

The potential (positive and negative) impacts stemming from the proposed WWT Plant for the Municipality were identified. The potential negative impacts were assessed and mitigation measures provided thereof to avoid and/or minimize their significance on the environment. The potential impacts were found to be of medium and low rating significance. For impacts that cannot be avoided completely, their impact significance can be reduced by effective implementation of recommended management and mitigation measures. Furthermore, to maintain the low rating, monitoring of the potential impacts by the Proponent (an Environmental Control Officer (ECO)) is highly recommended. Monitoring will not only be carried out to maintain the low rating of impacts' significance but to also ensure that all potential impacts identified in this study and other unforeseen impacts that might arise during project implementation are timely identified and addressed accordingly.

Apart from the project information provided by the Proponent, the findings of the impact assessment conducted, i.e. concerns and comments received from the general public also formed the basis of this assessment and eventual reporting. Therefore, based on these inputs, it can be concluded that the proposed Plant may be granted an Environmental Clearance Certificate. The ECC issuance will be on condition that the recommendations provided in the EMP are implemented and governing legal requirements are adhered to.

The information contained herein and findings of this scoping assessment were deemed sufficient and conclude that no further detailed assessments are required for the Plant.

Subsequently, the long-term benefits (positive impact) of the Plant will overweigh the negatives impacts. The primary long-term benefits of the Plant as mentioned under the introductory chapter includes:

- The proposed WWT Plant will contribute to basic services provision such as water recovered from the treatment process instead of usable water in wastewater getting lost through evaporation from oxidation ponds and infiltration (which is an environmental risk). Thus, this is done to remove contaminants in wastewater, so that the water can be either used for other purposes, such as irrigation or upon treatment to acceptable standards, discharged back into the environment.
- Waste management improvement to retain environmental health and its protection through proper wastewater management.

Consequently, these benefits will be a win-win for both the Municipality and the environment, in terms of water supply and environmental health protection, respectively.

8.2 Recommendations

It is recommended that an ECC be issued for the proposed Wastewater Treatment Plant, subject to the following:

- All management and mitigation measures provided in the EMP should be implemented and monitored accordingly.
- The Municipality should strive for continuous improvement and implement new measures (by continuously updating the EMP as deemed necessary) to ensure effective environmental management, sustainability and protection throughout the project life span.
- All required permits, licenses and approvals for the proposed Plant and associated listed activities should be obtained as required.
- The Proponent, their employees and their contractors involved in the project activities from the planning & design throughout to operational & maintenance phases complies with the legal requirements governing this type of project and its associated activities.
- All the necessary environmental and social (occupational health and safety) precautions provided should be adhered to.

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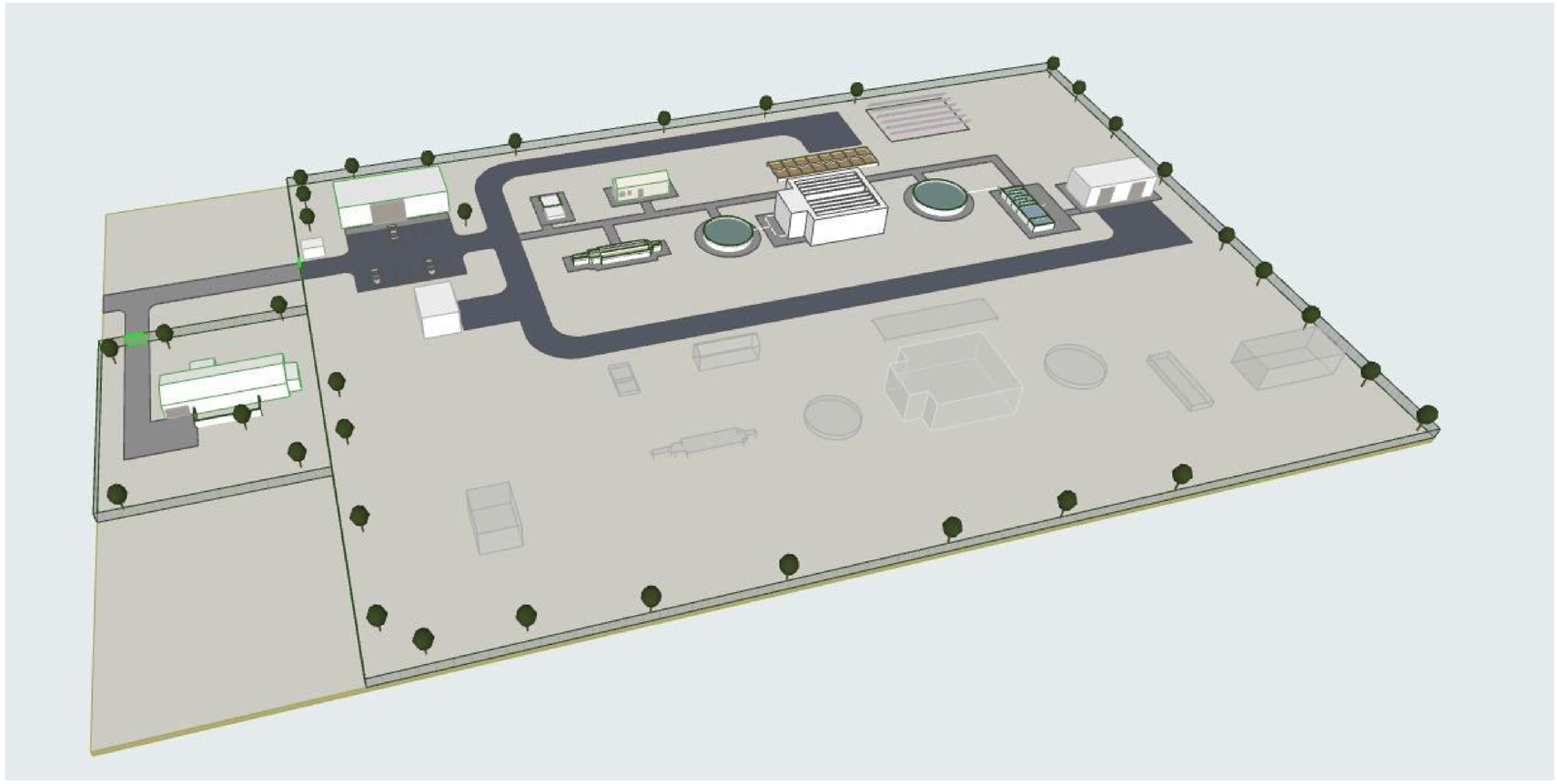
APPENDIX C: CONCEPT DRAWINGS OF THE WASTEWATER TREATMENT PLANT



NOTES :

1. ALL DIMENSIONS TO BE VERIFIED ON SITE AND ANY DISCREPENCIES TO BE REPORTED TO THE ARCHITECT IMMEDIATELY.
2. ALL WORK TO BE DONE IN ACCORDANCE WITH SABS 0142
3. All work to be carried out strictly ion accordance with national building regulations and local authority regulations.

DESCRIPTIONS
All dimensions are given in millimeters. Do not scale from this drawing.
ALL MEASUREMENTS, LEVELS AND DRAWINGS TO BE CHECKED ON SITE BEFORE ANY BUILDING COMMENCES.
FOUNDATIONS
MIN. 20MPA STRENGTH 700X3000MM CONCRETE STRIP FOUNDATION FOR 220MM WALLS.500X 300MM FOR 110MM WALLS.
ALL AREAS IN FOUNDATIONS TO BE TREATED WITH ANT POISONING.
BRICK REINFORCEMENT IN EVERY COURSE OF BRICKWORK.
12MPA STRENGTH SAND, CEMENT STANDARD BRICK LAID IN ENGLISH BOND.

SUPERSTRUCTURE
BRICK REINFORCEMENT IN EVERY THIRD COURSE.
TWO CONTINUOUS COURSES OF BRICKWORK ABOVE LINTELS.
NUTEC FIBRECEM WINDOW CLLS INTERNALLY AND EXTERNALLY.
PRECAST, PRESTRESSED CONCRETE LINTELS ABOVE ALL OPENINGS. SEE SECTIONS.
WISPECO STANDARD ALUMINIUM WINDOW FRAMES. SEE CODES ON PLAN.
WALLS PLASTERED BOTH SIDES INTERNALLY AND EXTERNALLY, FLOAT COAT PLASTER TROWELED TO A SMOOTH FINISH TO INTERNAL WALLS.
ALL WALLS PAINTED WITH NEO DUR PVA ACCORDING TO MANUFACTURERS SPECIFICATIONS.

ROOF CONSTRUCTION
ROOF PITCH OF 3° to determine the fall of 0.6MM IBR ROOF SHEETS ON 76X50MM S.A. PINE PURLINS AT MAX. 1200MM ON 152X38MM S.A PINE TRUSSES AT MAX. 1200MM TIED DOWN ONTO 114X38MM S.A. PINE WALLPLATES WITH HOOP IRON TIES PROJECTING AT LEAST 600MM INTO BRICK. ALL TRUSSES TO BE TREATED.
INSULATION-SISALATION 410 ROOF SHEETS TO BE PAINTED WITH NEO ROOF PAINT TO MANUFACTURERS SPECIFICATIONS.
225X10MM FIBRE CEMENT FASCIAS TO BE PAINTED

CONCRETE SLABS
MIN 25MPA STRENGTH MIN 100MM THICK CONCRETE SLABS IN LIEU OF SCREED ON 50MM SAND ON 200MM WELL COMPACTED IMPORTED FILL FREE OF ORGANIC MATERIALS. ALL SLABS AND CONCRETE WORK TO BE READ IN CONJUNCTION WITH ENGINEER'S DRAWINGS

SITE INFORMATION	AREA:	STATUS:
1. ALL ACCESS TO BE FROM ***		EXIST NEW
2. COVERAGE DETAILS		
SITE AREA ****	***m²	
NEW BUILDINGS		
1x no. BLOCK	***m²	

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DRAWING DESCRIPTION
DRAWINGS - CONCEPT

ITEMS TO NOTE:	DATE:	NO:
ALL WALL JUNCTIONS ARE AT 90 DEGREES		
First issue to PA	2024.06.17	A

PROJECT TITLE:
OMARURU MUNICIPALITY WASTE WATER TREATMENT PLANT - CARETAKER HOUSE

CONCEPT DRAWINGS

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SCALE:	DRAWN:	CHECKED:	DATE:
1: as Shown	G.S	A.C	Jun 2024

DRAWING TITLE:
Master Plan

Cad Ref:

Size:
A1

DRAWING NUMBER:
A-100

REVISION:
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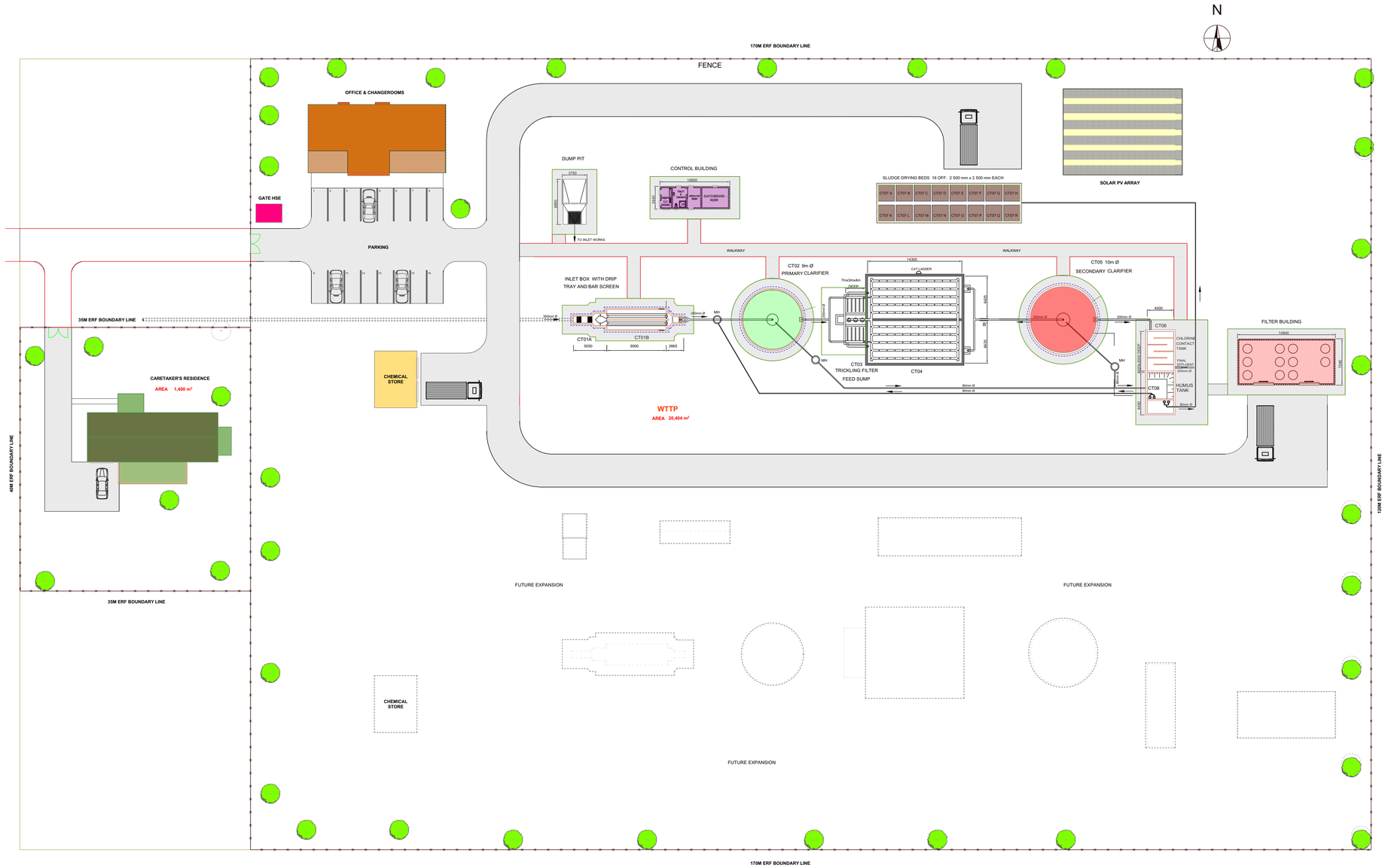

0. MASTER PLAN 1:350

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CONCRETE SLABS
MIN 25MPA STRENGTH MIN 100MM THICK CONCRETE SLABS IN LIEU OF SCREED ON 50MM SAND ON 200MM WELL COMPACTED IMPORTED FILL FREE OF ORGANIC MATERIALS. ALL SLABS AND CONCRETE WORK TO BE READ IN CONJUNCTION WITH ENGINEER'S DRAWINGS

SITE INFORMATION	AREA:	STATUS:
1. ALL ACCESS TO BE FROM ***		EXIST NEW
2. COVERAGE DETAILS		
SITE AREA ****	***m²	
NEW BUILDINGS		
1x no. BLOCK	***m²	

Copyright of this drawing vests in the owner / Desig

DRAWING DESCRIPTION
DRAWINGS - CONCEPT

ITEMS TO NOTE:	DATE:	NO:
ALL WALL JUNCTIONS ARE AT 90 DEGREES		
First issue to PA	2024.06.17	A

PROJECT TITLE:
OMARURU MUNICIPALITY WASTE WATER TREATMENT PLANT - CARETAKER HOUSE

CONCEPT DRAWINGS

CLIENT:
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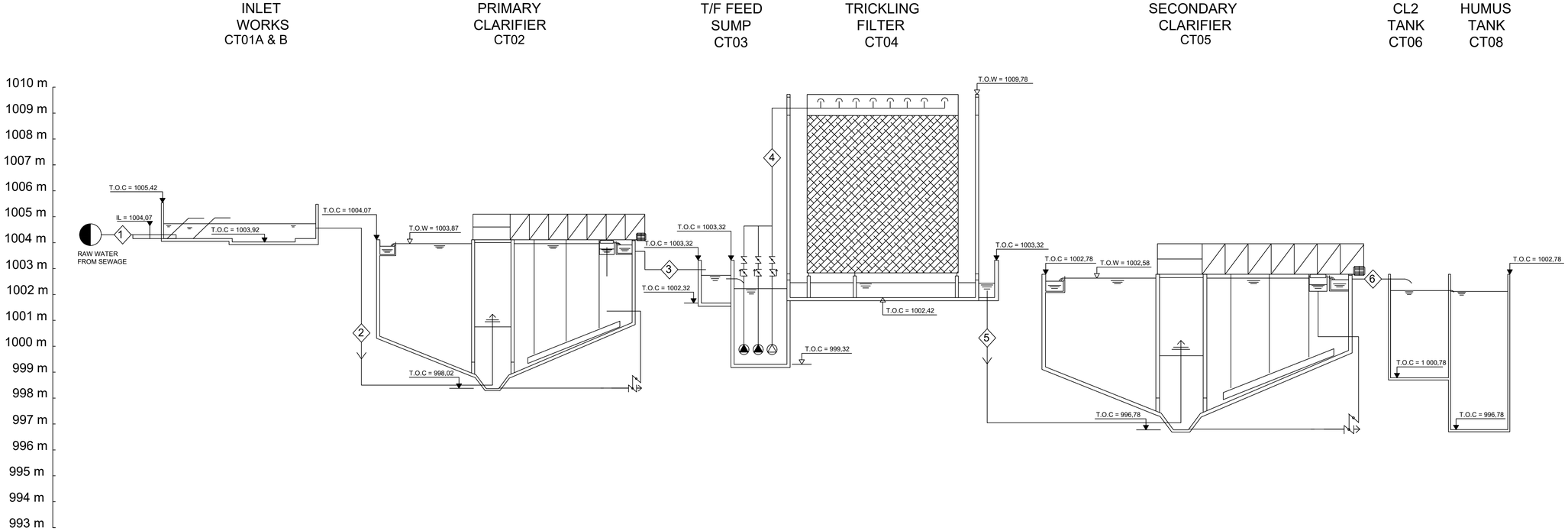
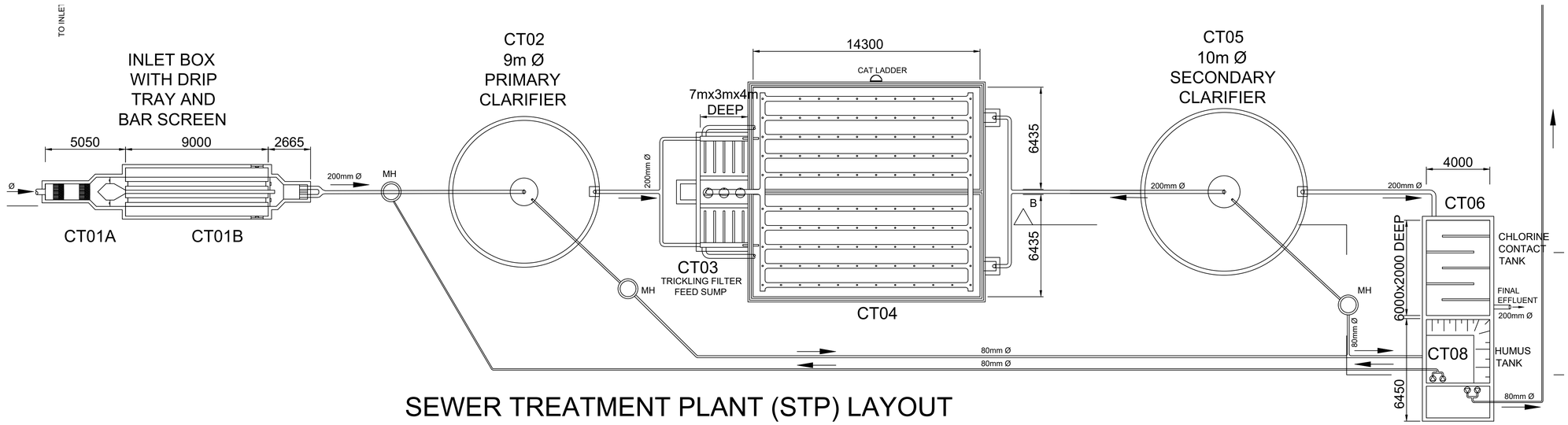
SCALE:	DRAWN:	CHECKED:	DATE:
1: as Shown	G.S	A.C	Jun 2024

DRAWING TITLE: Master Plan
Cad Ref:
Size: A1

DRAWING NUMBER: A-100
REVISION: A

Copyright reserved / Do not scale dimensions / All discrepancies and errors/queries are to be reported to and clarified by the Designer





SEWER TREATMENT PLANT (STP) LAYOUT

FOR APPROVAL

CLIENT/EMPLOYER STAMP

APPROVED BY:	
DATE:	
COMMENTS:	

General/design Notes

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Discipline:	CIVIL & STRUCTURAL
DESIGN DETAILS:	
Designed By:	TS
Drawn By:	AG
Checked By:	RM: IE2019-25
Date:	09 JULY 2024

CLIENT:
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PROJECT DESCRIPTION:
REHABILITATION OF THE OMARURU TOWN SEWERAGE SYSTEM.

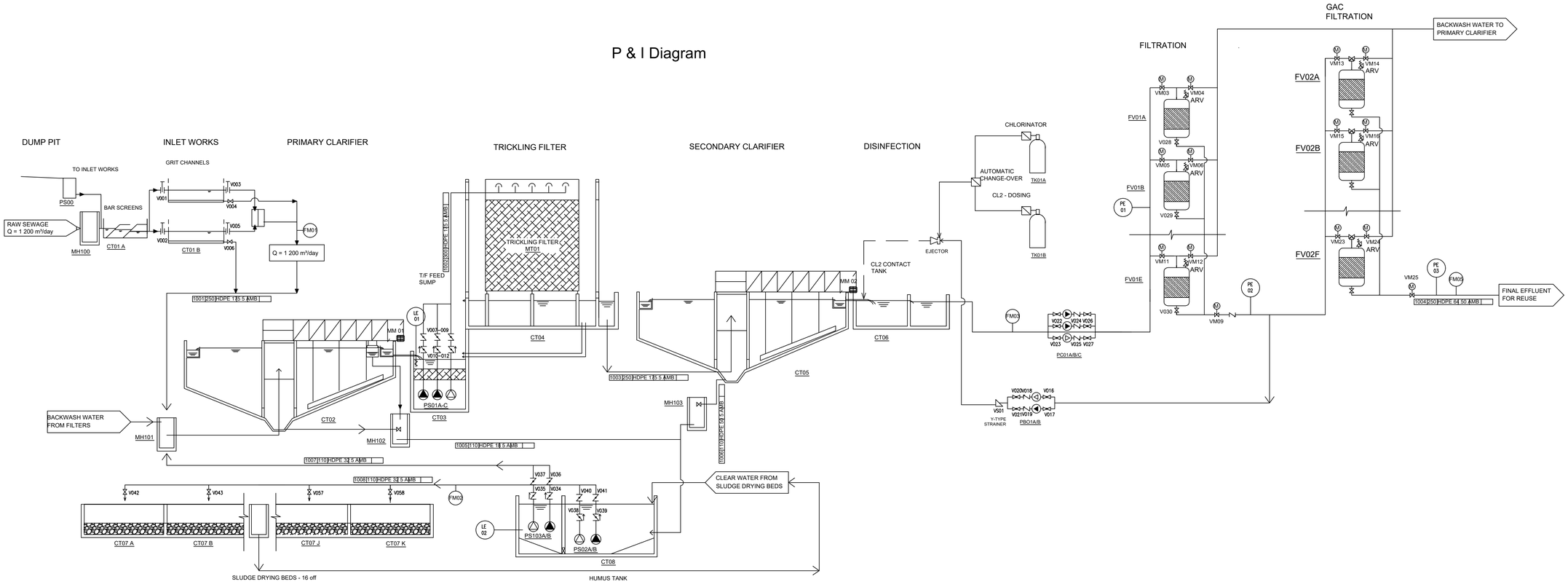
PROJECT SITE
OMARURU TOWN

Revisions & Amendments

No.	Description	Date

Drawing No: TCE/J2005/M2-002	Revision: -	PURPOSE	
Drawing Title: STP HYDRAULIC PROFILE		Information:	-
		Approval:	-
		Bidding:	X
Scale: AS SHOWN	A1	Construction:	
		As Built:	-

P & I Diagram



CT01
INLET WOKS - 1 OFF
FLOW (max) - 1 200 m³/d
Bar screens - 25/10 mm
Grit Channel - 200 m³/h max

CT07 A-T
SLUDGE DRYING
BEDS - 16 OFF
SIZE (area) - 12.5 m²

PS01 A/B/C
TF FEED/RECYCLE
PUMPS - 3 OFF
TYPE - SUBMERSIBLE
CAPACITY - 189 m³/h
HEAD - 12 mWC
POWER - 11 kW (Inst)

CT02
PRIMARY
CLARIFIER - 1 OFF
SIZE - 9 m dia
FLOW - 1 200 m³/d ADWF

MM 01
ROTATING BRIDGE
MOTOR - 1 OFF
POWER - 0,75 kW (inst)

CT02
TF FEED
SUMP - 1 OFF
VOLUME - 60 m³ Total
- 45 m³ Effective

CT04
TRICKLING FILTER
BASIN - 1 OFF
VOLUME - 170 m³ Total
- 122 m³ Effective

MT01
TRICKLING
FILTER - 1 OFF
PACKING - 1 130 m³
CAPACITY - 1 200 m³/day

CT08
HUMUS TANK - 1 OFF
VOLUME - 120 m³ Total
- 100 m³ Effective

PS02 A/B
DESLUDGE
PUMPS - 2 OFF
TYPE - SUBMERSIBLE
CAPACITY - 25 m³/h
HEAD - 4,0 mWC
POWER - 1.5 kW (Inst)

PS03 A/B
SLUDGE RETURN
PUMPS - 2 OFF
TYPE - SUBMERSIBLE
CAPACITY - 25 m³/h
HEAD - 4,0 mWC
POWER - 1.5 kW (Inst)

CT05
SECONDARY
SETTLER - 1 OFF
SIZE - 10 m dia

MM02
ROTATING BRIDGE
MOTOR - 1 OFF
POWER - 0,75 kW (Inst)

CT06
CHLORINE CONTACT
TANK - 1 OFF
CAPACITY - 36 m³ Effective

TK01A/B
CL2 GAS
CYLINDERS - 2 OFF
WEIGHT - 70 kg

PB01 A/B
CL2 BOOSTER
PUMPS - 2 OFF
TYPE - CENTRIFUGAL
CAPACITY - 2,5 m³/h
HEAD - 50 mWC
POWER - 0,35 kW (Inst)

FV01 A-E
SAND FILTER - 5 OFF
DIAMETER - 1 400 mm
BED DEPTH - 1 000 mm
GRAIN SIZE - 1.2 mm
OPERATING
PRESSURE - 6 BAR

PC01 A/B/C
FINAL WATER
PUMPS - 2 OFF (1 DUTY/1 STDBY)
TYPE - CENTRIFUGAL
CAPACITY - 75 m³/h
HEAD - 55 mWC
POWER - 15 kW (Inst)

FV02 A-F
GAC FILTER - 5 OFF
DIAMETER - 1 400 mm
BED DEPTH - 1 500 mm
OPERATING
PRESSURE - 6 BAR

NOTES:

1. LINE NUMBER LEGEND

T005|80 HDPE 32.5 AMB
LINE No | PIPE (PVC) | LINE MTL. | TEMP. °C | OPP. PRESSURE mWC | FLOW m/hr - LIQUID | FLOW m/hr - GAS

2. VALVE SIZED OD (mm)

FOR APPROVAL

CLIENT/EMPLOYER STAMP

APPROVED BY:	
DATE:	
COMMENTS:	

General/design Notes

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PROJECT DESCRIPTION:
REHABILITATION OF THE OMARURU TOWN SEWERAGE SYSTEM.

PROJECT SITE
OMARURU TOWN

Revisions & Amendments

No.	Description	Date

Drawing No.: TCE/J2005/M2–007	Revision: -	PURPOSE
Drawing Title: P & I DIAGRAM		Information: -
		Approval: -
		Bidding: X
Scale: AS SHOWN	A1	Construction: -
		As Built: -