APP-002448

EXISTING WASTEWATER TREATMENT PLANT AT THE SHITUWA SECONDARY SCHOOL, OHANGWENA REGION

ENVIRONMENTAL MANAGEMENT PLAN

Prepared by:

Prepared for:

November 2023

Project:	**ENVIRONMENTAL MANAGEMENT PLAN FOR THE EXISTING WASTEWATER TREATMENT PLANT AT THE SHITUWA SECONDARY SCHOOL, OHANGWENA REGION**	
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Report Approval	 **André Faul** **Conservation Ecologist**	

I, Denchi Consulting Engineers, acting as representative of the Ohangwena Regional Council, hereby confirm that the project description contained in this report is a true reflection of the information which the Proponent provided to Geo Pollution Technologies. All material information in the possession of the Proponent that reasonably has or may have the potential of influencing any decision or the objectivity of this assessment is fairly represented in this report and the report is hereby approved.

Signed at Windhoek on the 16 day of November 2023.

Denchi Consulting Engineers (Pty) Ltd

2012/0230
Company Registration No.

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1 BACKGROUND AND INTRODUCTION

The Directorate of Education, Arts and Culture of the Ohangwena Regional Council (the Proponent) operates a wastewater treatment facility at the Shituwa Secondary School in the Endola Village, Ohangwena Region (Figure 1-1). Due to the lack of a formalised waterborne wastewater treatment network in the area, the school and its hostels require its own wastewater treatment plant to ensure sufficient treatment and safe disposal of black- and greywater originating from ablution blocks and kitchens. A wastewater treatment plant, utilising trickling filter technology and evaporation ponds, was thus constructed and is now operational at the school.

In order to comply with Namibian legislation the Proponent wishes to develop an environmental management plan (EMP) for the operations of the wastewater treatment plant. The EMP provides management options to ensure environmental impacts of the facility are minimised. The environment being defined in the Environmental Management Act as "land, water and air; all organic and inorganic matter and living organisms as well as biological diversity; the interacting natural systems that include components referred to in sub-paragraphs, the human environment insofar as it represents archaeological, aesthetic, cultural, historic, economic, paleontological or social values".

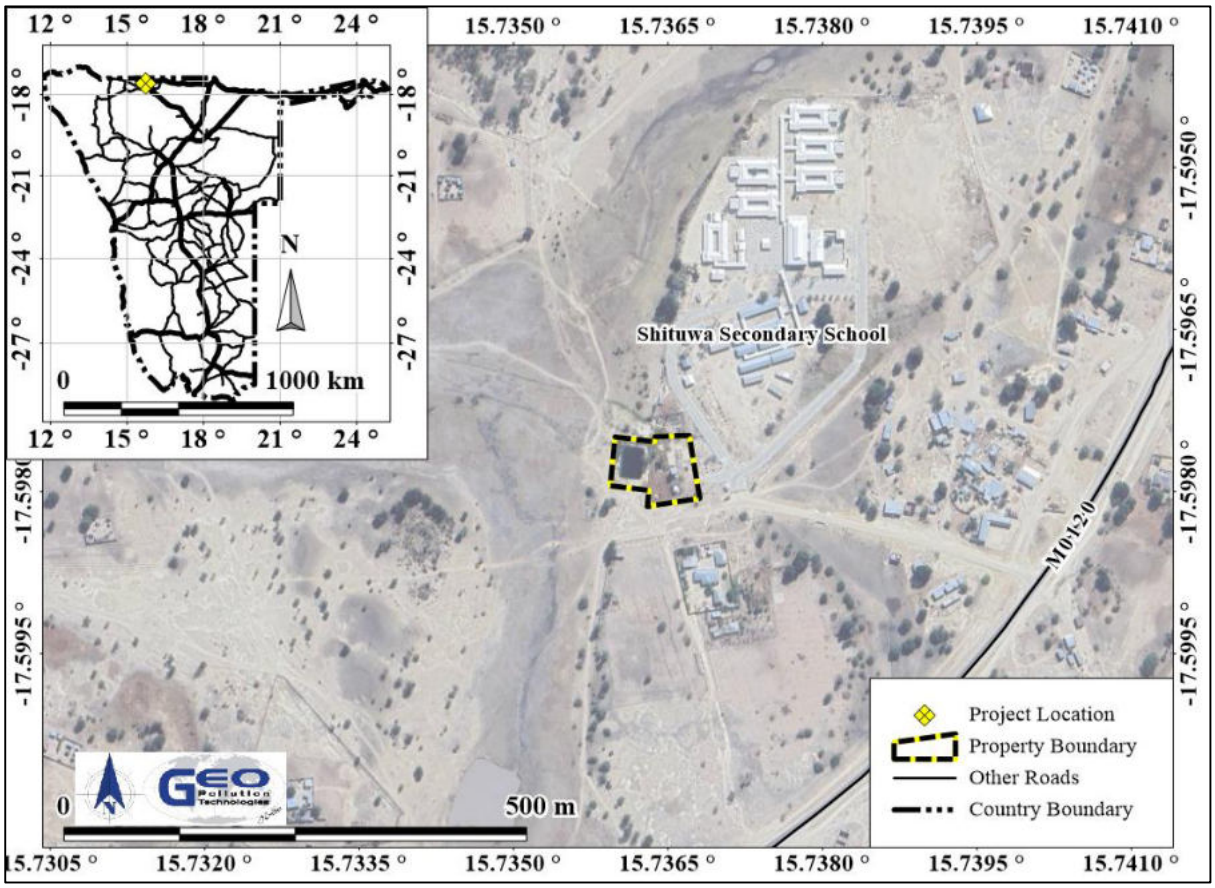

Figure 1-1 Project location

The EMP is thus a tool used to take pro-active action by addressing potential problems before they occur. This limits potential future corrective measures that may need to be implemented and allows for application of mitigation measures for unavoidable impacts. This document should be used as an on-site reference document during all phases (planning, maintenance and upgrades, operations and decommissioning) of the wastewater treatment plant. All monitoring and records kept should be included in a report to ensure compliance with the EMP. Parties responsible for transgression of the EMP should be held responsible for any rehabilitation that may need to be undertaken. A health, safety, environment and quality policy or similar could be used in conjunction with the EMP. Operators and responsible personnel must be taught the contents of these documents. Local authority or national regulations and guidelines must be adhered to and monitored regularly as outlined in the EMP.

The EMP will be used to apply for an environmental clearance certificate (ECC) in compliance with Namibia's Environmental Management Act (Act No 7 of 2007) (EMA).

Project Justification – Sewage, consisting of black- and greywater, has the potential to pollute the environment if not treated and disposed of properly. This presents risks to surface- and groundwater and thus ultimately also risks to human and environmental health. Since there is no nearby waterborne sewer network to which the school could connect, it was necessary to provide it with its own wastewater treatment plant. This allows for adequate treatment of wastewater originating from the school and hostels for final, safe disposal into an evaporation pond.

2 SCOPE

The scope of this EMP, in compliance with the requirements of EMA, is to:

- Provide a brief overview of all components and operations of the wastewater treatment plant.
- Summarise the legal and regulatory framework within which the plant operates.
- Provide a brief overview of the environment, i.e. the physical, biological, social and economic conditions, potentially impacted by the project.
- Identify potential impacts of the project on the environment.
- Identify a range of management actions which could mitigate the potential adverse impacts to acceptable levels.
- Provide sufficient information to the relevant competent authorities and the Ministry of Environment, Forestry and Tourism (MEFT) to make informed decisions regarding the development.

3 METHODOLOGY

The following methods were used to prepare the EMP:

1. Baseline information about the site and its surroundings was obtained from existing secondary information.
2. Potential environmental impacts emanating from the operations, maintenance and upgrades, and decommissioning of the facility were considered and possible enhancement measures were listed for positive impacts while preventative and mitigation measures were provided for negative impacts as part of the EMP.

4 PROJECT DESCRIPTION

The Shituwa Secondary School provides education to children from mainly the Endola Village and surrounds. It also has hostels to provide accommodation to learners from further away. The school and hostels' ablution facilities and kitchens produce wastewater in the form of black- and grey-water. A biological wastewater treatment plant, making use of trickling filter technology, was constructed to treat the wastewater to allow for its discharge into an evaporation pond.

4.1 SITE LAYOUT

The general layout of the wastewater handling and treatment infrastructure present at the school, is presented in Figure 4-1. The entire site is surrounded with a security fence. Figure 4-2 indicates the various stages of the wastewater treatment of the plant. A brief description of the steps follows below.

Figure 4-1 General site layout

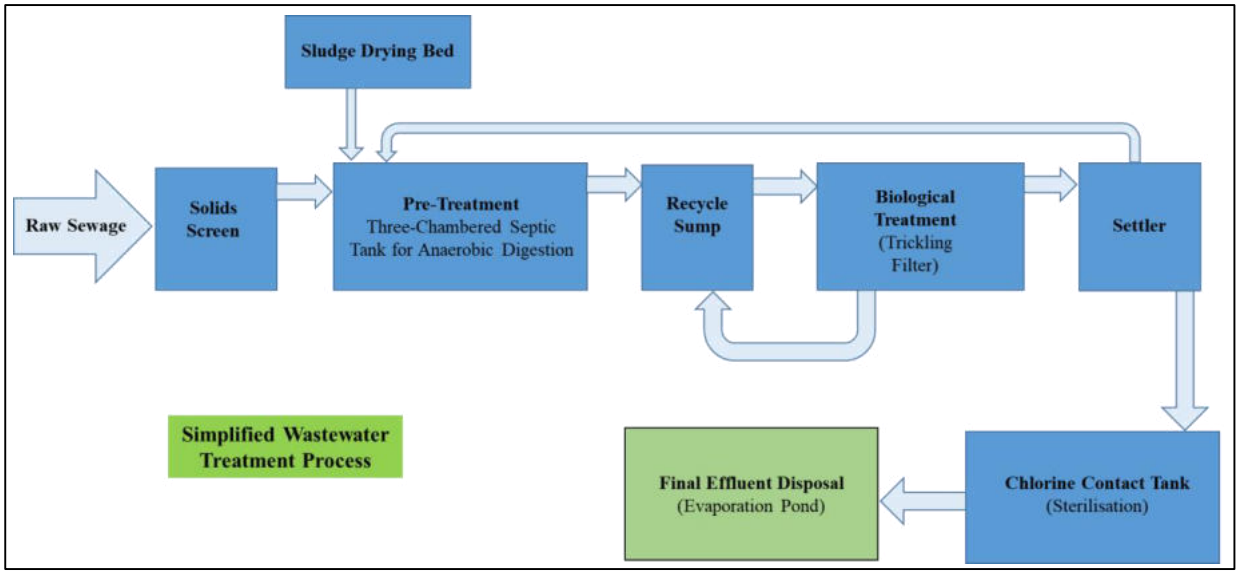

Figure 4-2 Simplified wastewater treatment process as proposed for the Shituwa Secondary School

4.1.1 Raw Sewage Collection and Receipt

All black- and grey- water (raw sewage) from the ablution facilities and hostel kitchen collect in sewer pipes and are transferred to the wastewater treatment plant. This raw sewage pass through a solids screen for removal of any large objects that enters sewers that should not enter the plant (e.g. sanitary products). Screened effluent then enters a septic tank for pre-treatment.

4.1.2 Pre-Treatment

Pre-treatment occurs in a three-chambered septic tank. Raw sewage will be a mixture of solids and liquids and will include substances like surfactants (soap) and oils (body lotions). The aim of pre-treatment is to prevent solids from entering subsequent treatment steps as well as to start the digestion process of such solids. It typically is a process of sedimentation and anaerobic digestion. Raw sewage enter the first chamber and solids settle to the bottom. Anaerobic digestion of solids occur here in the presence of anaerobic bacteria. The liquid part, containing a reduced amount solids, is allowed to flow into the second chamber and then the third, where, in each tank, sedimentation of finer particles is allowed and more anaerobic digestion occurs. The effluent from the third tank is relatively clear and will proceed into a recycle sump before entering the aerobic stage of treatment. Although the digestion of solids in the septic tank system is relatively efficient (depending on the design and efficiency of the system), it may be required to remove the solids (sludge) from time to time for disposal.

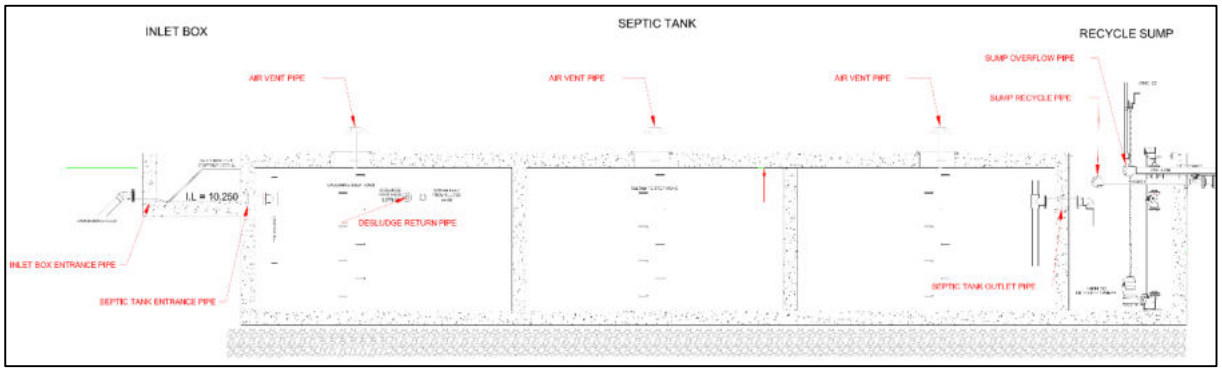

Figure 4-3 Three-chamber septic tank and recycle sump

4.1.3 Aerobic Treatment

The second stage of the treatment process is an aerobic stage where micro-organisms in the presence of oxygen degrades remaining organic material and some inorganic material (e.g. nitrite and nitrate) within the effluent form the pre-treatment process. For aerobic treatment to work optimally there are several requirements that must be met. These are: 1) the presence of an abundance of micro-organisms that can include bacteria, ciliates, protozoans and many other organisms; 2) the presence of sufficient oxygen that typically is present in the wastewater, but can also be increased by passing air through the water; 3) a large surface area covered by the micro-organisms (biofilm) which is achieved by the presence of media (e.g. coke, pumice, clinker, gravel, plastic and geotextile); 4) slow passage of wastewater over the biofilm as well as equal distribution of water over the biofilm.

A typical aerobic treatment process trickling filter was installed at the project site (Figure 4-5). Wastewater is trickled over biofilm covered media to allow the oxidation (and sometimes reduction) of organic and inorganic materials. The wastewater is circulated through the system via the recycle sump to allow it to pass over the media multiple times to allow maximum treatment. Organic particles and dead microorganism are collected in the process as sludge that must be discarded. Effluent from the aerobic treatment process will contain micro-organisms and is

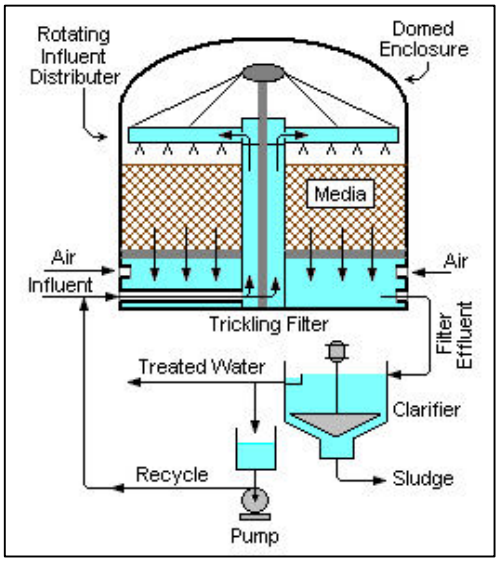

Figure 4-4 Example of a typical trickling filter design

therefore not suitable for applications where human contact or ingestion of water can occur. Thus, a sterilisation step is required.

4.1.4 Clarifying

A clarifying step follows the aerobic treatment phase and its purpose is to remove very fine particles that remain in the effluent from the trickling filter (Figure 4-5). Such particles are returned to the pre-treatment phase to allow for complete digestion.

4.1.5 Sterilisation

The effluent from the aerobic process is sterilized by chlorination in a chlorination contact tank. This step kills off any micro-organisms that are present in the treated water (Figure 4-5).

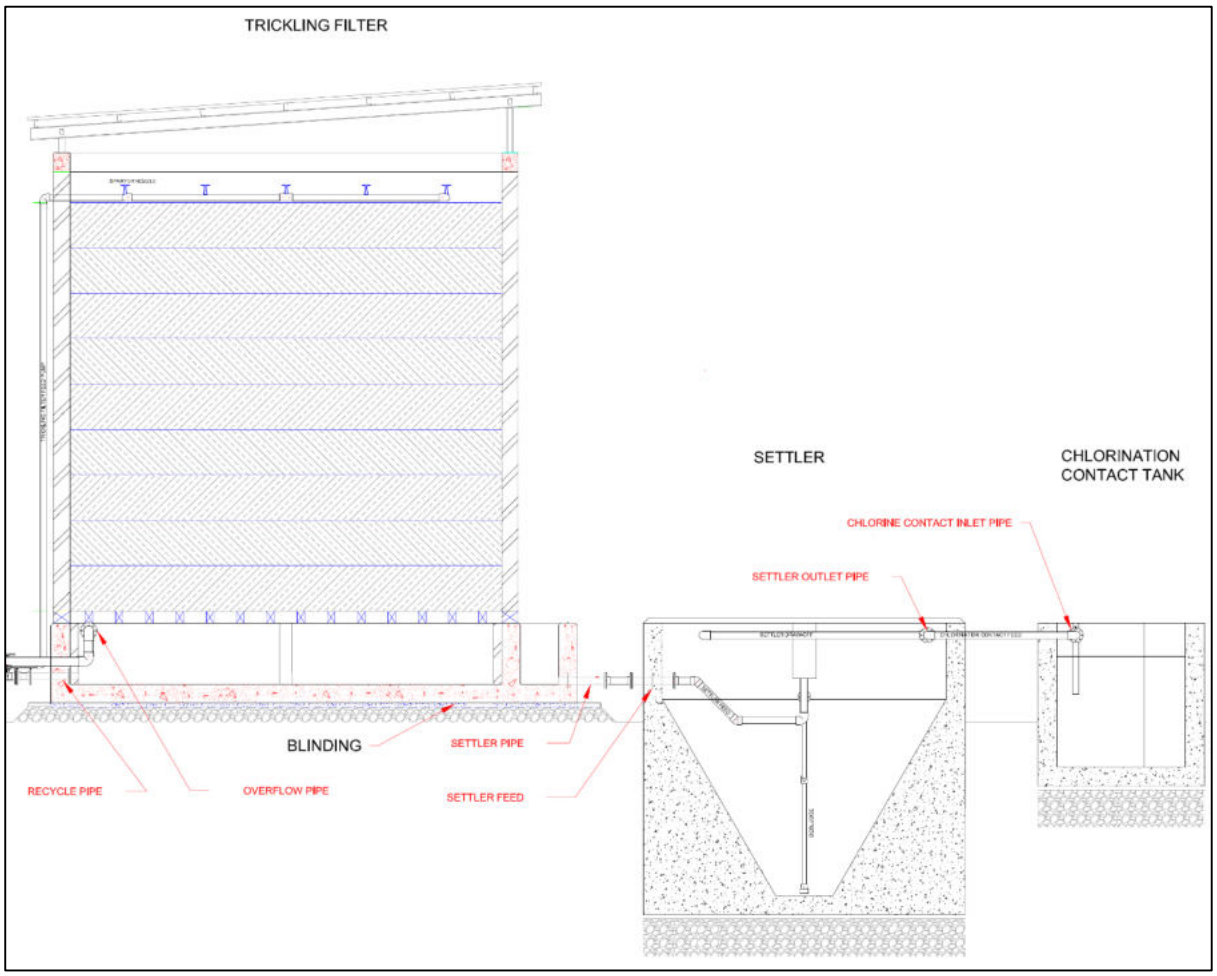

Figure 4-5 Trickling filter, settler and chlorine contact tank

4.1.6 Sludge

Complete breakdown of all solid materials cannot be achieved in the wastewater treatment plant. Sludge will thus slowly accumulate in the treatment plant, and specifically the septic tanks, and this will require periodic removal and disposal. Three sludge drying beds are present for disposal of the removed sludge (Figure 4-6). Liquid from the sludge drying beds filters out and is returned to the septic tanks. Once dry, the sludge can be disposed of according to accepted standards.

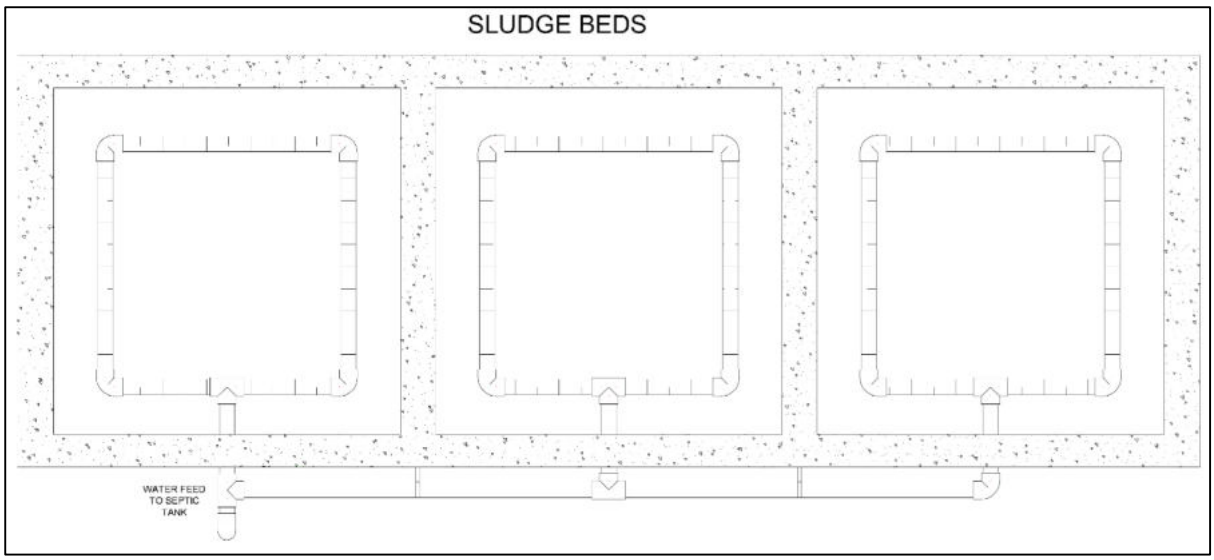

Figure 4-6 Three sludge drying beds

4.2 EVAPORATION POND

Final effluent is released into the evaporation pond. The pond has the capacity to receive 100 m^3 of effluent per day. Final effluent must conform to the standards and requirements for effluent discharged into the environment, as prescribed in the regulations of the Water Resources Management Act.

Photo 4-1 Aerial view of wastewater treatment plant and evaporation pond (Source: Denchi Consulting Engineers)

4.3 GENERAL OPERATIONS

The wastewater treatment plant and associated infrastructure will require periodic maintenance and cleaning. This will be performed by trained individuals. Sludge will be disposed of in the sludge drying beds when required.

5 ADMINISTRATIVE, LEGAL AND POLICY REQUIREMENTS

To protect the environment and achieve sustainable development, all projects, plans, programmes and policies deemed to have adverse impacts on the environment require an environmental assessment, as per the Namibian legislation. The legislation and standards provided in Table 5-1 to Table 5-3 govern the environmental assessment process in Namibia and/or are relevant to the project.

Table 5-1 Applicable Namibian law

Law	Key Aspects
The Namibian Constitution	♦ Promote the welfare of people. ♦ Incorporates a high level of environmental protection. ♦ Incorporates international agreements as part of Namibian law.
Environmental Management Act Act No. 7 of 2007, Government Notice No. 232 of 2007	♦ Defines the environment. ♦ Promote sustainable management of the environment and the use of natural resources. ♦ Provide a process of assessment and control of activities with possible significant effects on the environment.
Environmental Management Act Regulations Government Notice No. 28-30 of 2012	♦ Commencement of the Environmental Management Act. ♦ List activities that requires an environmental clearance certificate. ♦ Provide Environmental Impact Assessment Regulations.
Water Resources Management Act Act No. 11 of 2013	♦ Provide for management, protection, development, use and conservation of water resources. ♦ Prevention of water pollution and assignment of liability.
Forest Act (Act 12 of 2001, Government Notice No. 248 of 2001)	♦ Makes provision for the protection of the environment and the control and management of forest fires. ♦ Provides the licencing and permit conditions for the removal of woody and other vegetation as well as the disturbance and removal of soil from forested areas.
Soil Conservation Act Act No. 76 of 1969	♦ Law relating to the combating and prevention of soil erosion, the conservation, improvement and manner of use of the soil and vegetation and the protection of the water sources in Namibia.
Local Authorities Act Act No. 23 of 1992, Government Notice No. 116 of 1992	♦ Define the powers, duties and functions of local authority councils.
Public and Environmental Health Act Act No. 1 of 2015, Government Notice No. 86 of 2015	♦ Provides a framework for a structured more uniform public and environmental health system, and for incidental matters. ♦ Deals with Integrated Waste Management including waste collection disposal and recycling; waste generation and storage; and sanitation.
Labour Act Act No 11 of 2007, Government Notice No. 236 of 2007	♦ Provides for Labour Law and the protection and safety of employees. ♦ Labour Act, 1992: Regulations relating to the health and safety of employees at work (Government Notice No. 156 of 1997).

Law	Key Aspects
Hazardous Substances Ordinance Ordinance No. 14 of 1974	♦ Applies to the manufacture, sale, use, disposal and dumping of hazardous substances as well as their import and export. ♦ Aims to prevent hazardous substances from causing injury, ill-health or the death of human beings.
Pollution Control and Waste Management Bill (draft document)	♦ Not in force yet. ♦ Provides for prevention and control of pollution and waste. ♦ Provides for procedures to be followed for licence applications.

Table 5-2 Relevant multilateral environmental agreements for Namibia and the treatment plant

Agreement	Key Aspects
Stockholm Declaration on the Human Environment, Stockholm 1972.	♦ Recognizes the need for a common outlook and common principles to inspire and guide the people of the world in the preservation and enhancement of the human environment.
Convention on Biological Diversity, Rio de Janeiro, 1992	♦ Under article 14 of The Convention, EIAs must be conducted for projects that may negatively affect biological diversity.

Table 5-3 Standards or codes of practise

Standard or Code	Key Aspects
Department of Water Affairs, Ministry of Agriculture Water and Forestry: Code of Practice Vol 3 Biological Filtration Systems	♦ Provides design parameters for wastewater treatment plants and the disposal of wastewater. ♦ Provides minimum requirements for the quality of wastewater.

Listed activities which require an ECC application (Government Regulation No 29 of 2012) related to this project include the following:

Section 8 of Government Notice No. 29 of 2012: Water Resource Developments

♦ 8.6 Construction of industrial and domestic wastewater treatment plants and related pipeline systems

6 ENVIRONMENTAL CHARACTERISTICS

This section lists pertinent environmental characteristics of the study area.

6.1 LOCALITY AND SURROUNDING LAND USE

The wastewater treatment plant is located in Endola Village, Ohangwena Region (17.597728°S; 15.736147°E) (Figure 2-1). The Shituwa Secondary School is located east to northeast of the plant. Some houses are located south to east of the plant while there is no development west of the plant. The M0120 Main Road (C45 Route) is located approximately 400 m east of the site.

6.2 CLIMATE

According to the Köppen-Geiger Climate Classification system the project is located in a hot semi-arid climate (BSh) (http://koeppen-geiger.vu-wien.ac.at/present.htm). This means that the area receives precipitation below potential evapotranspiration, but not as low as a desert climate and have a mean annual temperature of at least 18°C. Average rainfall received is 400-450 mm/a with a variation of 30-40%. Monthly rainfall peaks in January. The potential evapotranspiration is 2,300 – 2,400 mm/a. By dividing the mean annual potential evapotranspiration into the mean annual precipitation, an aridity index value for the area was computed as 0.2, which indicates the area to be semi-arid. The average annual minimum temperature is 8-10 °C, while the average annual maximum temperature is 34-36 °C, with an average annual temperature range of 26-28 °C.

The average diurnal temperature (difference between daily minimum and maximum temperature) for this area is around 16-18 °C. Direct normal solar irradiance for the area is 6.96 kWh/m²/day. Monthly temperature data was retrieved from the Modern-Era Retrospective analysis for Research and Applications version 2 (MERRA-2) data set for a height of 2 m above surface (Ronald Gelaro, et al., 2017). This data set is a NASA atmospheric reanalysis, incorporating satellite data integration and aims at historical climate analyses at 0.5° × 0.625° spatial resolution. Table 6-1presents statistics of daily data abstracted from the data set for the last 41 years. The lowest temperature (1.69 °C) over the data period was calculated for the month of June, with no days being below freezing point. The maximum temperature for the data period was calculated at 41.4 °C which was calculated for the month of January.

Table 6-1 Temperature statistics based on Merra-2 data

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum (°C)	13	11	10	8	4	2	2	3	8	8	9	12
Maximum (°C)	41	40	40	38	35	32	32	36	40	41	41	41
Average (°C)	27	26	26	25	22	19	18	21	25	28	28	28
Diurnal (°C)	13	12	12	14	16	18	18	19	19	17	15	14
Average days < 0°C)	0	0	0	0	0	0	0	0	0	0	0	0

6.3 TOPOGRAPHY AND DRAINAGE

The project falls within the Cuvelai landscape, a very flat landscape, intersected by an anastomosing to braided fluvial system with numerous pans (oshonas) that periodically floods. No permanent surface water is present nearby, but water does collect in the Oshonas in the general area. Shallow perched aquifers are typically formed by infiltrating water. One such oshona is located immediately west of the evaporation pond. Ground surface elevation falls between 1,100-1,200 m above sea level and the area falls within the Etosha River catchment.

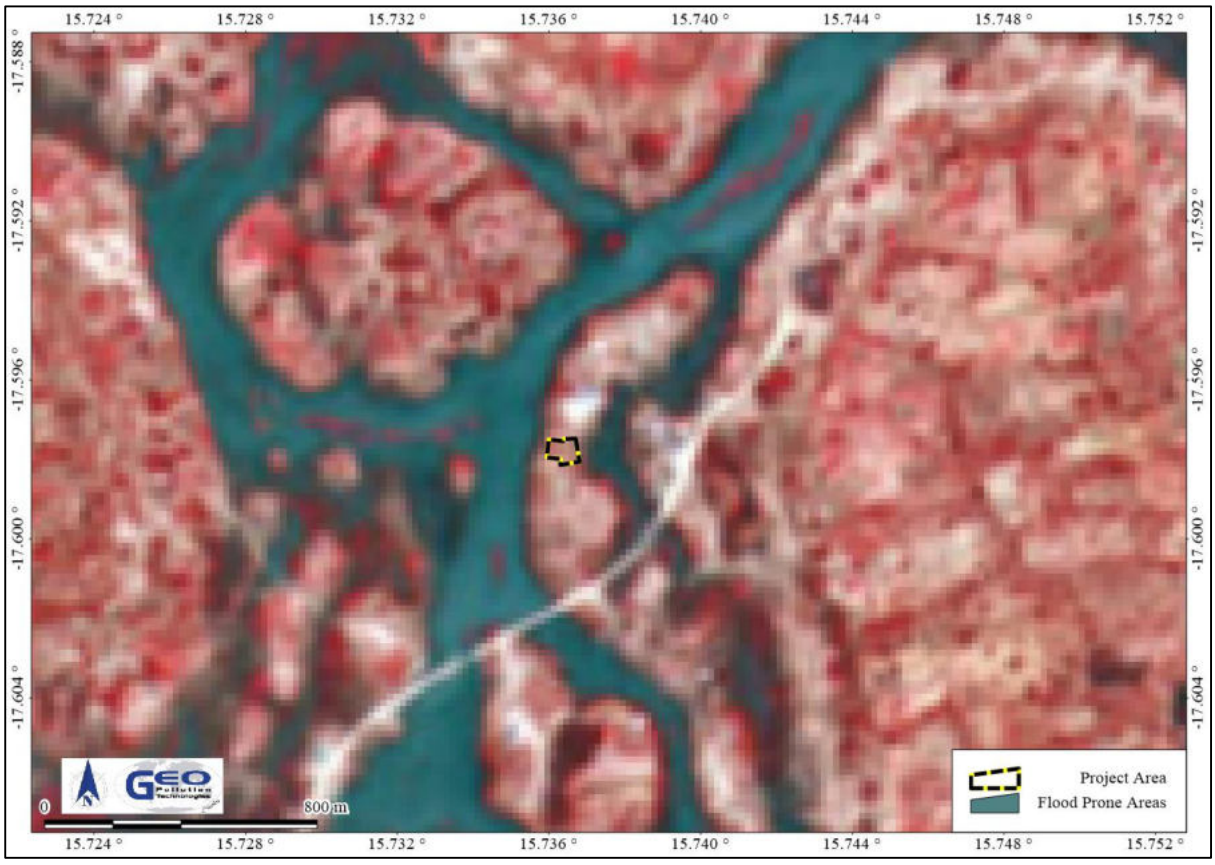

Figure 6-1 Flood prone areas in relation to the project area

6.4 GEOLOGY AND HYDROGEOLOGY

The dominant soil type for this area is Sodic Salic Cambisol which refers to the young soil group that shows the first signs of differentiating into distinct horizons. These soils typically form in newly exposed or deposited colluvial, alluvial and aelion materials, or where aridity has slowed down soil formation. In addition to this, the cambisol of this particular area is known for having, within 100 cm from the soil surface, a salic horizon. The composition of soil in this particular area is roughly 70-75% sand, 0-5% silt and 20-25% clay which gives it the characteristics and texture of sandy clay loam soil. Soil cover at the site is from the Kalahari Group (Tk), consisting of sand, calcrete and/or gravel of Quaternary and Tertiary age. The Kalahari Group consists mainly of unconsolidated formations, but some degree of consolidation may be present. Red mudstone, siltstone, sandstone, grit and conglomerate of the Triassic Age – Omingonde Formation of the Ecca Group underlay the Kalahari Group. Groundwater flow would be mostly through primary porosity but flow along fractures, faults (secondary porosity) and other geological structures present within the formations might take place where consolidated layers are present.

Subsurface water in the area is utilized, although none is on record in the generally outdated Department of Water Affairs database. A well is present 155 m north of the evaporation ponds. Water quality is generally acceptable to poor. The site does not fall within a water controlled area, however groundwater remains the property of the Government Republic of Namibia.

6.5 PUBLIC WATER SUPPLY

Public water supply is proved by NamWater from the Oshakati-Calueque Canal. The canal source water the Calueque Dam in Angola and carries water to Oshakati where it is purified in a NamWater water treatment plant. From there, it is piped to various villages in the area. The Omakango – Endola Bulk Water Pipeline supplies the Endola village with water. Locals however also make use of shallow wells and oshonas for water, especially for livestock watering.

6.6 FAUNA AND FLORA

Endola is located in the tree and shrub savanna biome with a Cuvelai drainage vegetation type. This vegetation type is dominated by the trees *Hyphaena petersiana* (makalani palm), *Sclerocarya birrea* (marula), *Ficus sycamores* (sycamore fig), *Diospiros mespiliformis* (jackalberry) and *Adansonia digitata* (African baobab). The area has relatively low higher plant species diversity with about 32 species. Due to human impact, very few large animal species remain in the area.

The area surrounding the wastewater treatment plant is mostly devoid of vegetation with a few shrubs and trees sparsely scattered in the area. Within the perimeter of the plant's fence, some vegetation has established due to limited disturbances such as livestock grazing.

6.7 DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS

The project is located in the Endola Constituency of the Ohangwena Region. The total population for this Region is 255,510 of which 117,944 are male and 137,566 are female. This is the second most populated region of Namibia. The Region has a population density of 22.9 people/km² and a literacy rate of 85.6%. Unemployment in the Region is 30%. The Endola Constituency has a total population of 25,591 of which 11,481 are male and 14,110 are female. Population density is 77.6 people/km² and the Constituency has a very high unemployment rate at 44%.

7 ENVIRONMENTAL MANAGEMENT PLAN

The EMP provides management options to ensure impacts of the facility are minimised. An EMP is a tool used to take pro-active action by addressing potential problems before they occur. This should limit the corrective measures needed, although additional mitigation measures might be included if necessary. The environmental management measures are provided in the tables and descriptions below. These management measures should be adhered to during the various phases of the operations of the

facility. All personnel taking part in the operations of the facility should be made aware of the contents in this section, so as to plan the operations accordingly and in an environmentally sound manner.

The objectives of the EMP are:

- to include all components of operations, maintenance and possible decommissioning of the facility,
- to prescribe the best practicable control methods to lessen the environmental impacts associated with the facility,
- to monitor and audit the performance of operational personnel in applying such controls; and
- to ensure that appropriate environmental training is provided to responsible operational personnel.

7.1 IMPLEMENTATION OF THE EMP

The sections below outline the management of the environmental elements that may be affected by the different activities. Impacts addressed and mitigation measures proposed are seen as minimum requirements which have to be elaborated on. Delegation of mitigation measures and reporting activities should be determined by the Proponent and included in the EMP. The EMP is a living document that must be prepared in detail, and regularly updated, by the proponent as the project progress and evolve.

The EMP and (ECC) must be communicated to the site managers. A copy of the ECC and EMP should be kept on site. All monitoring results must be reported on as indicated. Reporting is important for any future renewals of the ECC and must be submitted to the MEFT. Renewal of ECC will require six monthly reports based on the monitoring prescribed in this EMP.

Various potential and definite impacts will emanate from the operations and decommissioning phases. The majority of these impacts can be mitigated or prevented. The prevention and mitigation measures are listed below.

7.1.1 Planning

During the phases of planning for the operations, maintenance and upgrades, and decommissioning of the wastewater treatment plant, it is the responsibility of Proponent and the contractors to ensure they are and remain compliant with all legal requirements. The Proponent must also ensure that all required management measures are in place prior to, and during all phases, to ensure potential impacts and risks are avoided/minimised. The following actions are recommended for the planning phase and should continue during various other phases of the project:

- Ensure that all necessary permits from the various ministries, local authorities and any other bodies that governs the maintenance and upgrades, and decommissioning of the plant, remains valid. This include an effluent discharge permit from the Ministry of Agriculture, Water and Land Reform.
- Ensure a contractor management program is in place and that it includes the EMP.
- Employees to adhere to relevant sections of the EMP, as applicable to their scope of work and general operations.
- Make provisions to have a Health, Safety and Environmental (HSE) Coordinator or similar to oversee implementation of the EMP, occupational health and safety as well as general environmental related compliance at the site.
- Public liaison processes to be followed in the event of complaints from public entities.
- Have the following emergency plans, equipment and personnel on site, where reasonable, to deal with all potential emergencies:
  - EMP, risk management plan, emergency response plan and HSE manuals.
  - Adequate protection and indemnity insurance cover for incidents.
  - Procedures, equipment and materials required for emergencies (e.g. firefighting, first aid, etc.).
  - Relevant labour and safety standards.
- Develop and adopt a waste management plan inclusive of a waste minimisation strategy for all aspects of the facility.

- Ensure availability of sufficient funds or insurance spill clean-up or pollution remediation if ever required.
- Establish and / or maintain a reporting system to report on aspects of construction activities, operations and decommissioning as outlined in the EMP.
- Submit bi-annual reports to the MEFT to allow for environmental clearance certificate renewal after three years. This is a requirement by MEFT.
- Update the EMP and apply for renewal of the environmental clearance certificate prior to expiry.

7.1.2 Employment

Some skilled and unskilled labour are required for the operational and maintenance and upgrade activities associated with the wastewater treatment plant. Livelihoods are thus sustained and spending power increased.

Desired Outcome: Provision of employment to local Namibians.

Actions

Enhancement:

- The Proponent must employ local Namibians from the area where possible.
- Develop and maintain a contractor management program, inclusive of compliance reviews of service level agreements etc.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Bi-annual summary report based on employee records.

7.1.3 Skills and Development

During the operational phases, some training may be provided to a portion of the workforce (or the workforce of the contractors used) to be able to conduct certain tasks related to the plant according to the required standards. Skills are periodically transferred to an unskilled workforce for general tasks. Development of people and technology are key to economic development. During normal operations, employees identified to operate and maintain the wastewater treatment plant will enhance their working expertise.

Desired Outcome: To see an increase in skills of local Namibians, as well as development and technological advancements.

Actions

Mitigation:

- Sourcing of employees and contractors must first be at local level and if not locally available, regional or national options should be considered.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Record should be kept of training provided.
- Ensure that all training is certified or managerial references provided (proof provided to the employees) inclusive of training attendance, completion and implementation.
- Include all information in a bi-annual report.

7.1.4 Demographic Profile and Community Health

The establishment of a proper wastewater treatment facility at the school improved the conditions related to public health in the area. No change in the demographic profile of the area is expected to have occurred as a result of the facility's presence.

Desired Outcome: To prevent the occurrence of social ills and prevent the spread of diseases such as HIV/AIDS.

Actions:

Prevention:

- Appointment of reputable contractors where applicable.
- Employ only people from the area, deviations from this practice should be justified.
- Adhere to all local authority by-laws relating to environmental health, which includes, but is not limited to, sanitation requirements for employees.
- Educational programmes for employees and the community in general on various topics of social behaviour and HIV/AIDs and general upliftment social status.

Mitigation:

- Take disciplinary action against employees not adhering to contractual agreements with regard to socially deviant behaviour (e.g. alcohol or drug abuse during working hours).

Responsible Body:

- Proponent
- Contractor

Data Sources and Monitoring:

- Bi-annual summary report based on educational programmes and training conducted.
- Employee contracts on file.
- Bi-annual report and review of employee demographics.

7.1.5 Health, Safety and Security

Daily operational and maintenance activities are reliant on human labour. Such activities have varying degrees of health and safety risks. Examples include the operation of machinery and exposure to raw and semi-treated sewage. Treated effluent may still contain parasitic cysts, even after treatment with chlorine. As such, exposure and ingestion of such water, continue to pose health risks.

Security risks will be related to unauthorized entry, theft and vandalism. If the fence is not maintained, people and animals can fall into the evaporation pond or people can source water from the pond for domestic use.

Desired Outcome: To prevent injury, health impacts, damage to property and theft.

Actions

Prevention:

- Implement and maintain an integrated health and safety management system, to act as a monitoring and mitigating tool.
- Comply with all health and safety standards as specified in the Labour Act and related legislation.
- Ensure that all personnel receive adequate training on the operational procedures of equipment and machinery and the handling of potential hazardous substances.
- Provide employees with required and adequate personal protective equipment (PPE) where required.
- Train selected personnel of the construction team in first aid and ensure first aid kits are available on site, specifically when maintenance or upgrades are performed.
- The contact details of all emergency services must be readily available.
- Lock away or store all equipment and goods on site in a manner suitable to discourage criminal activities (e.g. theft).
- Implement a maintenance register for all equipment whose malfunction can lead to injury or exposure to hazardous substances.
- Maintain and regularly services the wastewater treatment plant as per the manufacturers requirements to ensure its proper function and thus generation of effluent safe for disposal.
- Any functionality issues experienced with the wastewater treatment plant should be reported to the service agent without delay to ensure quick servicing and repair of equipment.
- Regularly inspect the security fence and repair any damage timeously.
- Ensure signs are present on the perimeter fence restricting entry as well as warning the public that the pond contains semi-purified water, not fit for consumption.

Mitigation:

- Treat all minor work related injuries immediately and obtain professional medical treatment if required.
- Assess any safety problems and implement corrective action to prevent future occurrences.
- Security procedures and proper security measures must be in place to protect workers and patients.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Any incidents must be recorded with action taken to prevent future occurrences.
- Compile a bi-annual report of all incidents reported. The report should contain dates when training were conducted and when safety equipment and structures were inspected and maintained.

7.1.6 Fire

Failing electrical infrastructure and fires outside of designated areas may increase the risk of the occurrence of uncontrolled fires. Due to the sparse vegetation around the site, fires are not a big problem. Dry vegetation building up within the boundaries of the plant are may pose fire risks which can damage the plant's infrastructure. Methane build-up in the septic tank can result in explosions if an ignition source is present (e.g. smoking when opening the tank).

Desired Outcome: To prevent property damage, veld fires, possible injury and impacts caused by uncontrolled fires. To prevent damage the wastewater treatment plant and related infrastructure.

Actions:

Prevention:

- Prepare a holistic fire protection and prevention plan. This plan must include evacuation plans and signage, an emergency response plan and a firefighting plan.
- Personnel training (safe operational procedures, firefighting, fire prevention and responsible housekeeping practices).
- No smoking or fires to be allowed on site.
- Ensure all flammable chemicals, if any, are stored according to material safety data sheet (MSDS) and South African National Standards (SANS) instructions and all spills or leaks are cleaned immediately.
- Maintain regular site, mechanical and electrical inspections and maintenance.
- Maintain firefighting equipment.
- Dry vegetation from the site must be removed regularly. Vegetation on the evaporation pond wall should not be removed as this helps stabilizing the wall and prevent erosion during rain events.

Mitigation:

- Implement the fire protection and firefighting plan in the event of a fire.
- Quick response time by trained staff will limit the spread and impact of fire.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Maintain a register of all incidents. Include measures taken to ensure that such incidents do not repeat themselves.
- Compile a bi-annual incidents report. The report should also contain dates when fire drills were conducted and when firefighting equipment were tested and training given.

7.1.7 Noise

The wastewater treatment plant will not create significant noise during operations and is considered to be a quite system which will not disturb the school or nearby residents. During maintenance and upgrades limited noise may be caused, but this will be short lived.

Desired Outcome: To prevent any nuisance and hearing loss due to noise generated.

Actions

Prevention:

- Follow Health and Safety Regulations of the Labour Act and / or World Health Organization (WHO) guidelines on maximum noise levels (Guidelines for Community Noise, 1999) to prevent hearing impairment and nuisances.
- All machinery must be regularly serviced to ensure minimal noise production.

Mitigation:

- Hearing protectors as standard PPE for workers in situations with elevated noise levels.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Health and Safety Regulations of the Labour Act and WHO Guidelines.
- Contractor HSE plan.
- Maintain a complaints register.
- Bi-annual report on complaints and actions taken to address complaints and prevent future occurrences.

7.1.8 Waste Production

Waste will be produced in the form of screened solids and sludge. Construction waste during maintenance and upgrades may include building rubble and discarded equipment. Waste presents a contamination risk and when not removed regularly may become a health and / or fire hazard and attract wild animals and scavengers. Sewage is a form of liquid biological waste that needs disposal.

The biological wastewater treatment plant will treat sewage effluent to a standard suitable for release into the environment. The sludge waste produced will be of an organic nature and will be contained within the reclamation plant until removed and placed in the sludge drying beds. The Proponent will be responsible for the removal of the dry sludge waste to an appropriately licensed facility. Sludge will be removed from the septic tanks every two or three years or once it has accumulated to 600 mm (or as specified by the plant manufacturer). Only dry sludge may be disposed of.

Desired Outcome: To reduce the amount of waste produced, and prevent pollution and littering.

Actions

Prevention:

- Prepare a waste management plan focussed on reduction and recycling of waste in order to minimize the local impact of waste.
- Educate employees on the importance of proper waste handling and disposal. As a proactive approach such educational programmes can be extended to the school pupils and clean-up campaigns can be initiated to reduce the amount of waste carelessly disposed of in the environment.
- Ensure adequate temporary storage facilities for waste are available and that these facilities are secure so that waste is contained and scavenging (human and non-human) of waste is prevented and that waste cannot be blown away by wind.
- Maintain the fence around the pond to ensure wind-blown debris and waste is not blown into the pond.

Mitigation:

- Waste should be disposed of regularly and hazardous material / waste (empty chemical containers, and contaminated materials, soil and water) must be disposed of at approved facilities.
- Empty chemical containers that may present a contamination / health risk must be treated as hazardous waste. Workers or residents should not be allowed to collect such containers for purposes of storing water or food. This can be achieved by puncturing or crushing such containers prior to disposal.
- Screened solids and sludge form the drying beds must be discarded at an approved waste handling facility.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Maintain a register of disposal of hazardous waste. This should include type of waste, volume as well as disposal method/facility.
- Any complaints received regarding waste should be recorded with notes on action taken.
- All information and reporting to be included in a bi-annual report.

7.1.9 Ecosystem and Biodiversity Impact

The establishment of the wastewater treatment plant and evaporation pond have resulted in some vegetation establishing within the boundaries of the plant's perimeter fence. The pond may also attract birds and snakes. Malfunction and or operational failures of the plant may contaminate and alter localised ecosystems. The potential operational impact on the local ecology mainly relates to pollution of the environment by waste and/or sewage.

Desired Outcome: To avoid pollution of, and impacts on, the ecological environment.

Actions.

Prevention:

- Educate all contracted and permanent employees on the value of biodiversity.
- Regularly inspect and maintain the plant and the evaporation pond containment (walls).

Mitigation:

- Mitigation measures related to waste handling and the prevention of groundwater, surface water and soil contamination should limit ecosystem and biodiversity impacts.

Responsible Body:

- Contractor
- Proponent

Data Sources and Monitoring:

- Compile a bi-annual report on all monitoring results and incidents.

7.1.10 Flood Damage to Infrastructure

As the area is prone to flooding, the design and placement of the wastewater treatment plant considered the height of water during flooding events. The oshona, west of the evaporation ponds, reaches the fence of the plant when flooded. Flooding of the facility is therefore not a risk at present, but future developments downstream which may impede the oshona, or parts thereof, can result in a different damming pattern, which could, as a result, lead to the flooding of the ponds. Such water typically rise and retreat relatively slowly and without much force. The plant and pond is thus not likely to experience significant structural damage. Extraordinary high rainfall events may result in the pond flooding.

Desired Outcome: To maintain a wastewater treatment plant that can withstand the risks of flooding.

Actions

Mitigation:

- Regularly inspect the plant and report any damage as a result of flooding to ensure it is repaired and actions are taken to prevent future occurrences.
- Raise community and stakeholder awareness in the dangers of impeding the Oshana and related natural drainage, if and where required.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- A report should be compiled of any damage to the wastewater treatment plant and actions taken to prevent future occurrences.

7.1.11 Groundwater, Surface Water and Soil Contamination

During maintenance and upgrades, various activities may require the use of fuel, lubricants and chemicals such as paints and solvents. The use of such materials poses a contamination risk to the soil, groundwater and surface water. Spills and leaks may occur which may detrimentally affect the environment. Porous surface substrate can allow hazardous substances to seep down to the water table either at the location of the spillage or after being washed away by surface flow. Groundwater might spread pollutants to neighbouring receptors and may create an impact on downstream water users. During operations, contamination risks are related to indiscriminate disposal of biological wastes and possible sewage leakages. Theses may occur due to a system malfunction or overload. Should the pond's containment fail, semi-purified water will enter the nearby oshona. However, if the plant is operated effectively, and meets the required standards for effluent released into the environment, it should sufficiently treat water to not present a significant groundwater contamination risk.

Desired Outcome: Prevent any form of contamination of the groundwater, surface water and soil.

Actions

Prevention:

- All fuel and chemicals must be stored and handled according to their respective SANS and / or MSDS requirements.
- The procedures followed to prevent environmental damage during service and maintenance of potentially polluting equipment and infrastructure, and compliance with these procedures, must be audited and corrections made where necessary.
- All construction and operational machines to have the necessary spill kits and drip trays where and if required.
- Training to be provided to staff in emergency measures to be taken should the wastewater system fail or have operational issues.
- Effluent from the wastewater treatment plant must meet the standards as prescribed by the regulations of the Water Resources Management Act.
- Regular inspection and maintenance of all equipment and sewage handling and treatment infrastructure (e.g. pipes, sumps, treatment plant, etc.).

Mitigation:

- Removal of waste should be at regular intervals to maintain visual orderliness, but more so to not give time for liquid waste to enter the soil substrate.
- Strictly adhere to the effluent standards as determined by the effluent discharge permit.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Effluent discharge permit
- Effluent monitoring as per effluent disposal permit conditions including daily residual chlorine concentrations.
- Maintain MSDS file for all hazardous chemicals kept on site.
- A report should be compiled bi-annually of all spills or leakages reported and effluent and groundwater quality analysis results.

7.1.12 Air Quality

The sewerage plant is located more than 80 m from the nearest residential unit. The biological wastewater treatment plant is a closed plant that emits no or very limited foul smelling odours. The distance from the plant to the housing development still acts as a buffer in the event of some odours being present and thus the plant is not considered to impact on the nearby residents.

The possible impacts, which may emanate from the project, will be on a local scale. It is not foreseen that the greenhouse gas emissions (GHG) from such activities will have a significant impact on the community health.

Desired Outcome: To prevent nuisances due to foul odours.

Actions

Mitigation:

- Ensure that the wastewater treatment plant works effectively and is regularly maintained.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Compile a bi-annual report of all complaints received and actions taken.

7.1.13 Cumulative Impact

Very few cumulative impacts are associated with the operational phase of the wastewater treatment plant. The main negative cumulative impacts are related to pollution of the environment by waste and potentially inadequately treated sewage or raw sewage if the treatment plant fails.

It should be noted that the overall benefit of the plant, when operated in accordance to requirements, will have a significant positive impact for all the pupils and in turn the community at large, contributing to the overall waste management of the area.

Desired Outcome: To minimise cumulative all impacts associated with the facility.

Actions

Mitigation:

- Addressing each of the individual impacts as discussed and recommended in the EMP would reduce the cumulative impact.
- Reviewing biannual reports for any new or re-occurring impacts or problems would aid in identifying cumulative impacts. Planning and improvement of the existing mitigation measures can then be implemented.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Bi-annual reports.

7.2 DECOMMISSIONING AND REHABILITATION

Decommissioning is not foreseen during the validity of the ECC. Decommissioning was however assessed. Should decommissioning occur at any stage, rehabilitation of the area may be required. Decommissioning will entail the complete removal of all infrastructure including buildings. ponds and any underground infrastructure. Any pollution present on the site must be remediated. The impacts associated with this phase include noise and waste production as structures are dismantled. Noise must adhere Labour Act Health and Safety Regulations and WHO guidelines and waste should be contained and disposed of at an appropriately classified and approved waste facility and not dumped in the surrounding areas. Future land use after decommissioning should be assessed prior to decommissioning and rehabilitation initiated if the land will not be used for similar future purposes. The EMP for the facility will have to be reviewed at the time of decommissioning to cater for changes made to the site and to implement guidelines and mitigation measures.

7.3 ENVIRONMENTAL MANAGEMENT SYSTEM

The Proponent could implement an Environmental Management System (EMS) for their operations. An EMS is an internationally recognized and certified management system that will ensure ongoing incorporation of environmental constraints. At the heart of an EMS is the concept of continual improvement of environmental performance with resulting increases in operational efficiency, financial savings and reduction in environmental, health and safety risks. An effective EMS would need to include the following elements:

- A stated environmental policy which sets the desired level of environmental performance;
- An environmental legal register;
- An institutional structure which sets out the responsibility, authority, lines of communication and resources needed to implement the EMS;
- Identification of environmental, safety and health training needs;
- An environmental program(s) stipulating environmental objectives and targets to be met, and work instructions and controls to be applied in order to achieve compliance with the environmental policy; and
- Periodic (internal and external) audits and reviews of environmental performance and the effectiveness of the EMS.
- The EMP.

8 CONCLUSION

The operations of the school and hostels have a positive impact on the local community. The installation of a properly designed wastewater treatment plant, ensured the environment is not polluted and residents are not impacted by unhygienic conditions and odours from no or poorly developed wastewater treatment plants.

Negative impacts associated with the operational activities can successfully be mitigated. Implementing a safety, health, environment and quality (SHEQ) policy will contribute to effective management procedures to prevent and mitigate impacts. Groundwater, surface water and soil pollution must be prevented at all times. Fire prevention should be key and fire response plans must be in place and regular training provided. All staff must be made aware of the importance of biodiversity. Any waste produced must be stored and regularly burnt at a designated site to prevent pollution of the environment. Hazardous waste must be disposed of at an approved hazardous waste disposal site.

The environmental management plan (Section 7) should be used as an on-site reference document for the construction and operation of the facility. Relevant construction and operational personnel must be taught the contents of these documents. Parties responsible for transgressing of the environmental management plan should be held responsible for any rehabilitation that may need to be undertaken. It is important that the Proponent ensures sufficient budgetary provisions for regular inspections and maintenance of the wastewater treatment plant and evaporation pond to ensure its proper functioning and longevity.

Should the DEA of the MEFT find that the impacts and related mitigation measures, which have been proposed in this report, are acceptable, an environmental clearance certificate may be granted to the Proponent. The ECC issued, based on this document, will render it a legally binding document which should be adhered to.

9 REFERENCES

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Appendix A: Consultant's Curriculum Vitae

ENVIRONMENTAL SCIENTIST **André Faul**

André entered the environmental assessment profession at the beginning of 2013 and since then has worked on more than 190 Environmental Impact Assessments including assessments of the petroleum industry, harbour expansions, irrigation schemes, township establishment and power generation and transmission. André's post graduate studies focussed on zoological and ecological sciences and he holds a M.Sc. in Conservation Ecology and a Ph.D. in Medical Bioscience. His expertise is in ecotoxicological related studies focussing specifically on endocrine disrupting chemicals. His Ph.D. thesis title was The Assessment of Namibian Water Resources for Endocrine Disruptors. Before joining the environmental assessment profession he worked for 12 years in the Environmental Section of the Department of Biological Sciences at the University of Namibia, first as laboratory technician and then as lecturer in biological and ecological sciences.

CURRICULUM VITAE ANDRÉ FAUL

Name of Firm	:	Geo Pollution Technologies (Pty) Ltd.
Name of Staff	:	ANDRÉ FAUL
Profession	:	Environmental Scientist
Years' Experience	:	22
Nationality	:	Namibian
Position	:	Environmental Scientist
Specialisation	:	Environmental Toxicology
Languages	:	Afrikaans – speaking, reading, writing – excellent
		English – speaking, reading, writing – excellent

EDUCATION AND PROFESSIONAL STATUS:

B.Sc. Zoology/Biochemistry	:	University of Stellenbosch, 1999
B.Sc. (Hons.) Zoology	:	University of Stellenbosch, 2000
M.Sc. (Conservation Ecology)	:	University of Stellenbosch, 2005
Ph.D. (Medical Bioscience)	:	University of the Western Cape, 2018

First Aid Class A	OSH-Med, 2022
Basic Fire Fighting	OSH-Med, 2022

PROFESSIONAL SOCIETY AFFILIATION:

Environmental Assessment Professionals of Namibia (Environmental Assessment Practitioner)

AREAS OF EXPERTISE:

Knowledge and expertise in:

- Water Sampling, Extractions and Analysis
- Biomonitoring and Bioassays
- Biodiversity Assessment
- Toxicology
- Restoration Ecology

EMPLOYMENT:

2013-Date	:	Geo Pollution Technologies – Environmental Scientist
2005-2012	:	Lecturer, Department of Biological Sciences, University of Namibia
2001-2004	:	Laboratory Technician, Department of Biological, University of Namibia

PUBLICATIONS:

Publications:	5
Contract Reports	+190
Research Reports & Manuals:	5
Conference Presentations:	1