

Comprehensive Environmental Management Plan (EMP) for the Operational and Management of the Four (4) Existing Oxidation Ponds in Oshifo Town, Omusati Region



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LIST OF ABBREVIATIONS

Abbreviation	Meaning
DEAF	Department of Environmental Affairs and Forestry
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
ECC	Environmental Clearance Certificate
EDS	Excel Dynamic Solutions
EIA	Environmental Impact Assessment
EHO	Environmental Health Officer
EMA	Environmental Management Act
EMP	Environmental Management Plan
RTC	Ruacana Town Council
HDPE	High Density Polyethylene i
MAWLR	Ministry of Agriculture, Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism
PPE	Personal Protective Equipment
SHE Officer	Safety, Health & Environmental Officer
WHO	World Health Organization

1 INTRODUCTION

1.1 Project Background and Locality

The Ruacana Town Council (hereinafter referred to as RTC or The Proponent) operates four oxidation ponds to manage the sewage waste produced by the Oshifo residents. Although the ponds are in Oshifo, they are managed by the Ruacana Town Council and located about 1km to the southwestern side of Oshifo Town (at -17.446997 14.420713) as shown on the locality map in Figure 1-1.

Following the Free Training of Environmental Health Officers (EHO) and representatives by Excel Dynamic Solutions (Pty) Ltd (EDS) from 12 local authorities in November 2021, EDS had requested the Town Council to share with EDS some of their existing facilities or planned projects that are listed activities in the Environmental Management Act (EMA) No. 7 of 2007 and its 2012 EIA Regulations requiring Environmental Clearance Certificates (ECCs). EDS then offered to assist the RTC with one project of their choice to obtain an ECC at no cost to the Local Authority. Therefore, to ensure compliance with the environmental legal requirements, the Town Council chose the environmental clearance application for the four oxidation ponds in Oshifo Town.

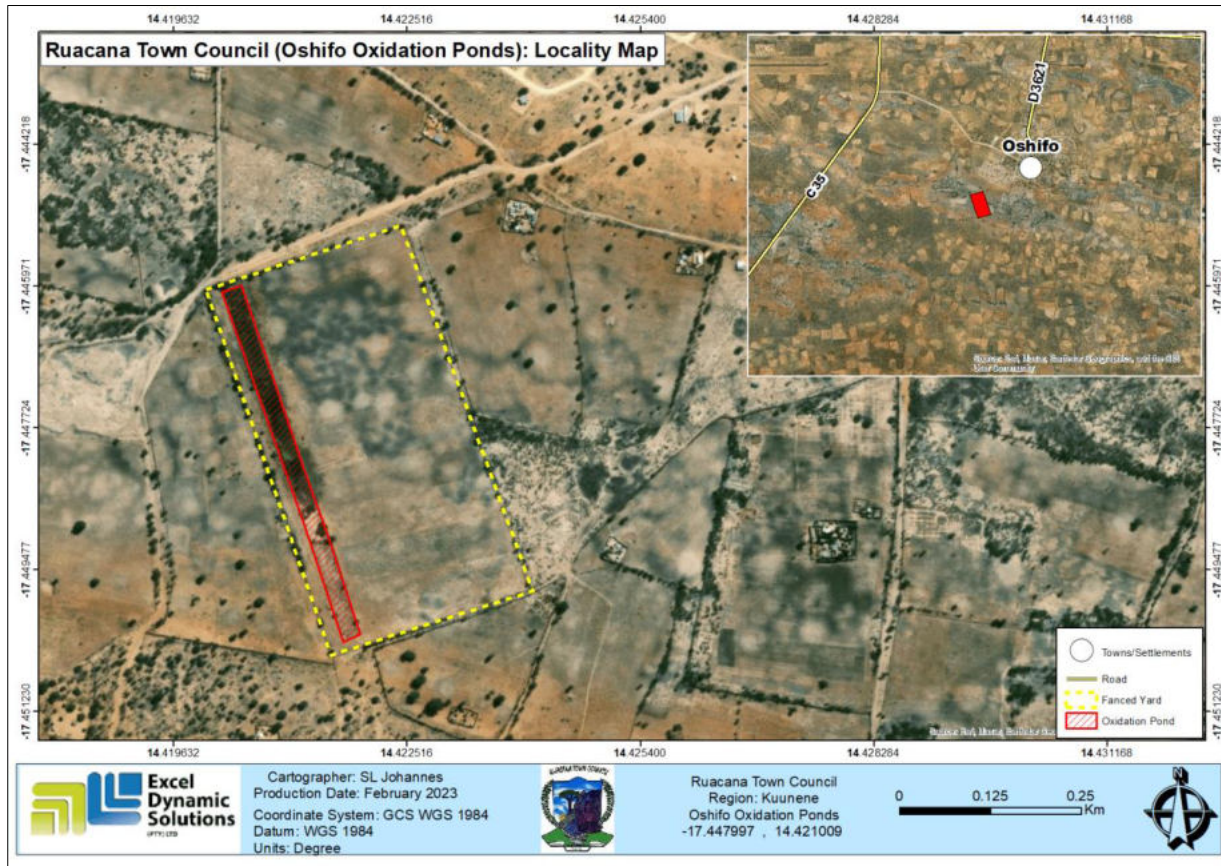


Figure 1-1: Locality map of the four oxidation ponds site in Oshifo Town

1.2 The Need for Environmental Clearance Certificate (ECC)

The Environmental Management Act (Act No. 7 of 2007) (EMA) and its 2012 EIA Regulations lists activities that need an Environmental Clearance Certificate (ECC). Waste management facilities are one of the listed activities that requires an EIA study and or for existing facilities, an Environmental Management Plan (EMP) should be developed. The relevant listed activities to the Town’s waste management site are as follows:

‘WASTE MANAGEMENT, TREATMENT, HANDLING AND DISPOSAL ACTIVITIES

- *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.*

8. WATER RESOURCE DEVELOPMENTS

- *Listed Activity 8.6 The construction of industrial and domestic wastewater treatment plants and related pipeline systems.”*

The ponds are currently not environmentally cleared as this could be explained by their establishment before the promulgation of the EMA and had not been cleared to date.

Subsequently, to ensure environmental management compliance of the ponds, the Town Council requires an Environmental Management Plan (EMP) developed and apply for the ponds' ECC. The application for an ECC and the EMP will be submitted by EDS to the MEFT for evaluation and consideration of the ECC.

1.3 The Need for Environmental Management & Closure Plan

Regulation 8(j) of the EIA Regulations (2012) requires that a draft Environmental Management Plan (EMP) shall be included as part of the Environmental Assessment (EA) scoping report (please note that since the site is already in operation, there was no EA conducted nor scoping report for it). A '**Management Plan**' is defined as:

“...a plan that describes how activities that may have significant environments effects on the environment are to be mitigated, controlled and monitored.”

It is important to note that an EMP is a statutory document and a person who contravenes the provisions of this EMP may face imprisonment and/or a fine. This EMP is a living document and can be amended to adapt to address project changes and/or environmental conditions and feedback from compliance monitoring.

The purpose of this document is, therefore, to guide environmental management throughout the site upgrading, operational (and maintenance) of the oxidation ponds, and closure phases:

- **Planning phase** - This is the stage during which the Proponent prepare all the administrative and technical requirements needed for the site upgrading. This planning will include the procurement of services such as site upgrading contractor.
- **Site upgrading phase** - This is the phase where during which the ponds' associated infrastructure are revamped through the appointed contractor(s). This will entail the earthworks for the erection of the ponds' wall/fencing and installation of additional and necessary services, infrastructures.

- **Continued (for the ponds) Operations, and Maintenance:** the Proponent will continue operating the oxidation ponds and maintain the site throughout the operational phase.
- **Closure (Decommissioning)** – This is the stage at which the Proponent will stop using the site for wastewater (effluent) management, leading to the decommissioning and closure of the facilities. However, this is unlikely that the site operations will cease as there will always be the needed for wastewater management in the Town.

This EMP has been prepared for the management of potential impacts associated with the site upgrading, operations and maintenance for the oxidation ponds. The Town Council will be required to operate the facility in accordance with the management measures provided in the EMP and adhere to the ECC conditions set by the Environmental Commissioner.

The description of the project activities is briefly provided under the next heading (Chapter 2).

2 THE DESCRIPTION OF PROJECT ACTIVITIES

This EMP was developed based on the site visit and assessment, consulted literature, information provided by the Proponent. The site visit was conducted on the 05th of July 2022. The activities currently undertaken onsite are presented under the following sections.

Once the ECC is issued, administrative and technical tasks completed, and the Town Council is ready, the site works, and associated activities will commence. There will be some earthworks to prepare the site for the site upgrade and installation necessary services infrastructure and structures required for the site to improve the oxidation ponds.

2.1 Existing Oxidation Ponds

The pond system consists of four (4) oxidation ponds of varying sizes. According to the Town Council, the ponds were established in before the promulgation of the Environmental Management Act in 2007 and its Regulations in 2012. However, the year is unknown.

2.1.1 Capacity of the Oxidation Ponds

The wastewater enters the ponds from the Town Council collection point via a connected blue pipeline on the western side of the ponds. Only the first 2 primary ponds (northwestern ponds) fill up with wastewater, but the flow increase to the two other ponds during the processing of asparagus at the facility. The wastewater production from both the asparagus processing facility and Town Council sewer increases which enables the wastewater to flow from the 2 primary ponds into the 3rd and 4th ponds.

Towards the south, the 3rd pond is partially filled with wastewater on its northern side and very dry towards the south. The 4th pond is completely dry and overgrown with pale dry grass.

There is a screening system (for filtering) between the ponds to remove solids from the wastewater.

Lining of ponds: only one of the primary ponds was lined but the lining is suspected to be dilapidated over time.

Capacity of the Ponds: The capacity was unknown to the interviewed personnel from the RTC. The current status of the ponds is shown in Figure 2-1.



Figure 2-1: The current status of the oxidation ponds in Oshifo Town

The final water produced by the ponds will be excellent for reuse in gardens, parks and even selected agricultural produce. It is therefore proposed to discharge the final water in such a way that one of the existing ponds will be used as a final water irrigation pond so that that the final treated water is not discharged into the environment.

The ponds were issued with an Effluent Discharge permit in March 2017 (valid for 3 years), however, this permit has expired, and therefore should be renewed.

2.2 Summary: Site Upgrading and Operational Phases

During the upgrading phase, earth works will be carried out in certain areas of the project site to install the necessary additional services infrastructure. The general site works will include soil excavation. The site has moderate to high vegetation cover around, thus there will be a possible removal of some of the vegetation within the site footprint.

The Proponent, through the appointed contractor will construct a security boundary wall for upgrading period and better fence for operational phase. The wall will provide controlled access to the site.

Once operational, the wastewater will be better managed. The wastewater would be sourced from the existing sewage system of the Town, and where necessary, maintenance will be done by the appointed specialist/maintenance contractor.

2.3 Resources, Services and Infrastructure

The required resources and services are provided by the Town Council as presented below:

- Human Resources: the operation of the existing ponds is done by Town Council employees, assigned to the site. During site upgrade, the work will be outsourced to an appointed contractor who will bring in their own workforce. Therefore, the number of workers to be hired cannot be determined at this stage.
- Equipment and Vehicles: The vehicles to be involved in the site upgrade include small trucks and pickup trucks and other small to medium sized vehicles services and goods required onsite.

- Water supply: There is no requirement for freshwater supply. However, any future needs will be sourced from the Town Council water supply line by connecting the project site to the line.
- Power supply: The site currently does not use electricity. However, during the site upgrade, diesel powered machinery and equipment will be used. The Town is supplied with power from the existing NORED grid.
- Site accessibility: The ponds site is accessible from the Oshifo Town via a single-track sandy road.
- Site Security: The site is fenced off with mesh wire with lockable gate to control access to site. A 24-hour site security will be considered to protect the site and equipment (properties) from possible theft and vandalism.
- Health and Safety: There are no onsite personnel, but this will be improved as part of the site upgrading works. The site personnel will be equipped with appropriate protective gear, i.e., Personal Protective Equipment (PPE). A first aid kit will also be availed onsite and administering training provided to the personnel.
- Potential Accidental Fire Outbreaks: There is currently no fire extinguishers onsite. However, as part of the site upgrading, at least one fire extinguisher will be availed onsite and basic firefighting and response training provided to site personnel.
- Solid waste: The site will be equipped with waste bins for domestic waste for site personnel and visitors. The waste will be disposed of at the Town' solid waste site.
- Hazardous waste: all the fuels and lubricants produced onsite during site upgrading will be properly handled and stored in containers for disposal at the nearest hazardous waste management facility.
- Human waste (sewage): the site currently has no ablution facilities (toilets and washroom), therefore, these will be considered for implementation as part of the site upgrade.

2.4 Challenges faced by the Town Council

The following challenges are faced by the Town Council in terms of the current wastewater (effluent) management at the ponds:

- Odour: there is an issue of odour from the ponds by the communities on the north and northeastern side of the prevailing direction of wind flow, i.e., wind is blowing from southwest to northeast.

- Vandalism: the ponds site area is fenced off but there are signs of vandalism by the community as indicated by the Town Council personnel. The ponds have slightly high walls around them to contain wastewater. Children are hanging around the ponds to look after livestock (particularly goats and sheep) that graze around the ponds and drink wastewater from the easily accessible sides of the ponds. Some local children were observed hunting birds in some shrubs and young trees (Figure 2-2) in the 2 dried up ponds.



Figure 2-2: The community children hunting birds around the ponds (inside the ponds fence)

- People ploughing inside the ponds area: the Town Council has leased the land to the eastern side of the ponds to the community to grow their crops. The crops grown in the field (land) is mahangu, sorghum, beans, watermelon, and maize. The community pay a once off fee of N\$50 annually, although it is only done on some years, probably based on good rainy years when they can grow crops.
- Animals drinking the wastewater: due to the unfenced nature of the ponds, there is easy access to the ponds and wastewater by local livestock. The livestock drink from the ponds.
- The capacity of the ponds is unknown: There are files with some dimension of the ponds, such as 1.5m depth. The numbers indicated on the available file may not be for the capacity, but only perimeters.
- Overgrown vegetation inside the ponds: there is visibly grown weed inside the ponds, especially the first 2 ponds that have wastewater. The Town Council controls the weed growth by using weed killers when the weed becomes a lot.
- Water sampling not done: the sampling of wastewater in the ponds is not regularly done to keep track of the quality.

- The Effluent / Wastewater discharge permit has expired (in March 2020). The permit has not been renewed yet.

2.5 Opportunities for the Ruacana Town Council (and possibly the Oshifo community)

The treated water can be used for the following purposes:

- The treated water can be used to water community or personal gardens in the Town and communities around the ponds.
- After quality of water is determined the raw sludge may be used as fertilizer provided that it is tested to ensure that it is not hazardous.

The summary of legal requirements that govern the project activities are provided under the next chapter.

3 LEGAL FRAMEWORK: APPROVALS, LICENSES AND OR PERMITS

The project and its associated activities are governed by certain legislative and legal requirements that are necessary to consider and outlined herein. This is done in terms of institutional (local) and national perspective. Therefore, the summary of these relevant legal requirements and these that require permitting and licensing for certain project activities are presented under Table 3-1.

Table 3-1: The legal requirements and permits and licenses applicable to the project activities

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this Project
Environmental Management Act EMA (No 7 of 2007): <u>Regulated under the Ministry of Environment, Forestry and Tourism (MEFT)</u>	The Act and its 2012 EIA Regulations aims to ensure that the potential impacts of the development on the environment are carefully considered. The Act aims at promoting sustainable management of the environment and use of natural resources. The Environmental Management Act (EMA) is broad; it regulates land use development through environmental clearance certification and/or Environmental Impact Assessments.	The EMA should inform and guide this EMP development and its implementation for: -ECC Amendment/Transfer and Renewal: Should the Proponent consider amending/Transferring the Project activities
Environmental Impact Assessment (EIA) Regulations Government Notice 28-30 (Government Gazette 4878) of February 2012: <u>Regulated under the MEFT</u>	For new projects, the Act requires that projects with significant environmental impacts are subject to an environmental assessment process (Section 27). Regardless to the site, mitigation measures should be developed for implementation during operations.	- The ECC needs to be renewed every 3 years (at least 3 months prior to its expiry date). The applications as deem necessary should be made with the Department of Environmental Affairs and Forestry (DEAF) as follows: Office of the Environmental Commissioner: Mr. Timoteus Mufeti Tel: 061 284 2701

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this Project
	<p>Details requirements for public consultation within a given environmental assessment process (Government Notice No. 30 Section 21).</p> <p>The details the requirements for what should be included in an Environmental Scoping Report (Government Notice No. 30 S8) and an EIA Report (Government Notice No. 30 Section 15).</p>	<p>Part of the Project is already in its operational phase. However, if necessary and required, constant consultations and engagements with the interested and affected parties (stakeholders) should be continued. In case of grievances raised by some members of the public, this should be addressed and resolved amicably.</p>
<p>Water Act 54 of 1956: <u>Regulated under the Ministry of Agriculture, Water and Land Reform</u></p>	<p>The Water Resources Management Act 11 of 2013 is presently without regulations; therefore, the Water Act No 54 of 1956 is still in force:</p> <ul style="list-style-type: none"> -Prohibits the pollution of water and implements the principle that a person disposing of effluent or waste has a duty of care to prevent pollution (S3 (k)). -Provides for control and protection of groundwater (S66 (1), (d (ii))). -Liability of clean-up costs after closure/abandonment of an activity (S3 (l)). 	<p>The protection (both quality and quantity/abstraction) of water resources should be a priority.</p> <p>The Town Council should renew the permit to discharge treated effluent into the environment.</p> <p>Mr. Franciskus Witbooi (Deputy Director: Water Policy and Water Law Administration.</p> <p>Tel: (061) 208 715</p>
<p>Water Resources Management Act (No 11 of 2013): <u>Regulated under the Ministry of Agriculture, Water and Land Reform</u></p>	<p>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).</p> <p>The Proponent will be required to apply for and renew the Treated Wastewater/effluent Discharge Permit from the Department of Water Affairs (DWA): Directorate of Water Resources Management (Water Environment Division). When issued, Proponent, the Permit should be renewed as required (as stipulated in therein).</p>	<p>Ms. Elise Mbandeka (Chief Hydrologist): Water Environment</p>

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this Project
<p>Pollution Control and Waste Management Bill: <u>Regulated under the MEFT</u></p>	<p>The bill aims to “prevent and regulate the discharge of pollutants to the air, water and land” Of particular reference to the Project is: Section 21 “(1) Subject to sub-section (4) and section 22, no person shall cause or permit the discharge of pollutants or waste into any water or watercourse.”</p> <p>Section 55 “(1) No person may produce, collect, transport, sort, recover, treat, store, dispose of or otherwise manage waste in a manner that results in or creates a significant risk of harm to human health or the environment.”</p>	<p>The Proponent and their workers/contractors should continue with the good waste management work (directly or indirectly) to ensure that the waste does not cause environmental threat and degradation.</p> <p>No permit or license required.</p>
<p>Soil Conservation Act (No 76 of 1969): <u>Regulated under the Ministry of Agriculture, Water and Land Reform (MAWLR)</u></p>	<p>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.</p>	<p>Duty of care must be applied to soil conservation and management measures must be included in the EMP. This is mainly aimed at soil disturbance through unnecessary creation of new tracks and pollution from project related activities.</p>
<p>The National Heritage Act (No. 27 of 2004): <u>Regulated under the Ministry of Education, Arts and Culture through National Heritage Council (NHC) of Namibia</u></p> <p>The National Monuments Act (No. 28 of 1969): <u>Regulated under the NHC</u></p>	<p>To provide for the protection and conservation of places and objects of heritage significance and the registration of such places and objects; to establish an NHC; to establish a National Heritage Register; and to provide for incidental matters.</p> <p>This impact is likely during site preparation for the site upgrade when there is a potential of inadvertent unearthing and damage of heritage resources such as old and unmarked graves, for instance.</p> <p>The Act extends the protection of archaeological and historical sites to private and communal land and defines permit procedures regarding activities at such sites.</p>	<p>Should heritage resources (e.g., artefacts, human remains/bones in the subsurface etc.) are discovered at some point on and /or around the site, these should be reported to the National Heritage Council of Namibia for relocation.</p> <p>Contact: Mrs. Erica Ndalikokule (Director)</p> <p>Or Ms. Agnes Shiningayamwe (Regional Heritage Officer)</p> <p>Tel: 061 301 903</p>

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this Project
Public Health Act (No. 36 of 1919): <u>Regulated under the Ministry of Health and Social Services</u>	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. This includes the provision of health and safety measures, wearing of Personal Protective Equipment (PPE), Health & Safety Trainings, etc.
Health and Safety Regulations GN 156/1997 (Government Gazette 1617): <u>Regulated under the Ministry of Health and Social Services</u>	Details various requirements regarding health and safety of labourers.	This includes the safety and health of the Town’s community. No permit or license required.
Public and Environmental Health Act No. 1 of 2015: <u>Regulated under the Ministry of Health and Social Services</u>	To provide a framework for a structured uniform public and environmental health system in Namibia; and to provide for incidental matters.	
Road Traffic and Transport Act, No. 22 of 1999: <u>Regulated under the Ministry of Works and Transport (Roads Authority of Namibia)</u>	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.	The Proponent should consider applying for a formal access road permit to the site. This permit is to be applied from Roads Authority. Contact: Mr Eugene de Paauw (Roads Authority – Specialist Road Legislation) Tel.: 061 284 7027
Atmospheric Pollution Prevention Ordinance (1976): <u>Regulated under the Ministry of Health and Social Services</u>	This ordinance provides for the prevention of air pollution and is affected by the Health Act 21 of 1988. Under this ordinance, the entire area of Namibia, apart from East Caprivi, is proclaimed as a controlled area for the purposes of section 4(1) (a) of the ordinance.	The project and related activities should be undertaken in such a way that they do not pollute or compromise the surrounding air quality.

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this Project
Hazardous Substance Ordinance, No. 14 of 1974: <u>Regulated under the Ministry of Health and Social Services</u>	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
Local Authorities Act No. 23 of 1992: <u>Regulated under the Ministry of Urban and Rural Development</u>	To provide for the determination, for purposes of local government, of local authority councils; the establishment of such local authority councils; and to define the powers, duties and functions of local authority councils; and to provide for incidental matters. This includes the management of waste.	Ruacana Town Council is the responsible Local Authority of the area, and the project Proponent. Regardless, they should ensure that the Site activities follow the Act and its Regulations, as relevant to the project.
Labour Act (No. 6 of 1992): <u>Regulated under the Ministry of Labour, Industrial Relations and Employment Creation (MLIREC)</u>	MLIERC 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 ensures effective implementation of the Labour Act No. 6 of 1992, specifically its Regulations, No. 156 Labour Act, 1992: Regulations relating to the health and safety of employees at work	The Proponent should ensure that the site upgrade, operations, and maintenance works, do not compromise the safety and welfare of workers. No permit or license required.

The project site is located in a specific biophysical and social environment. Understanding the existing environment would aid in identifying the sensitive or potentially affected features and how these can be protected from the site operations and implementation of mitigation or management measures. Therefore, the relevant features of this environment are presented under the next chapter.

4 ENVIRONMENTAL BASELINE: BIOPHYSICAL AND SOCIAL

The baseline current) environmental conditions of the site and surroundings are presented under the subheadings below. The information has been sourced from consulted literature (relevant books, reports, and websites) and observations made onsite by EDS Consultants in July 2022.

4.1 Climatic Conditions

4.1.1 Rainfall

The project area is described as a semi-arid savannah with a rainfall average ranging from 400-500mm per annual. The climate is classified as a local steppe clima with a subtropical thorn woodland. The summer season of the Region is hot with a maximum temperature between 32 °C and 38 °C during the hottest months and coldest winter temperatures are around 10°C to 16 °C (Mendelsohn et al., 2002). In this area, December is known as the hottest month of the year, while July is known as the coldest month of the year in the region. The mean evaporation figure for the region lies from 3,000 mm to 3,200mm per annum.

According to the 13-year period of rainfall data on the World Weather Online website (2022), Ruacana area received the highest rainfall of 490mm Dec 2011 as shown in Figure 4-1.

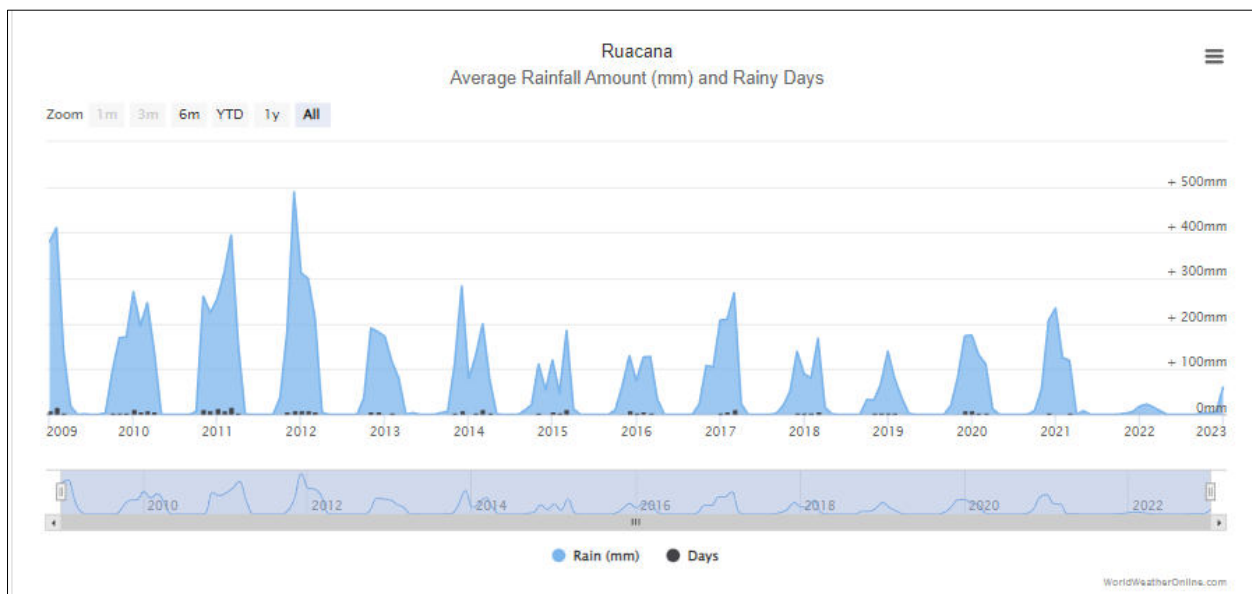


Figure 4-1: The average rainfall and rainy days for Ruacana (World Weather online, 2022)

The highest average rainfall for the area is 170mm in January, followed by 164mm in March, 163mm in February and 160mm in December as shown in the chart in Figure 4-2.

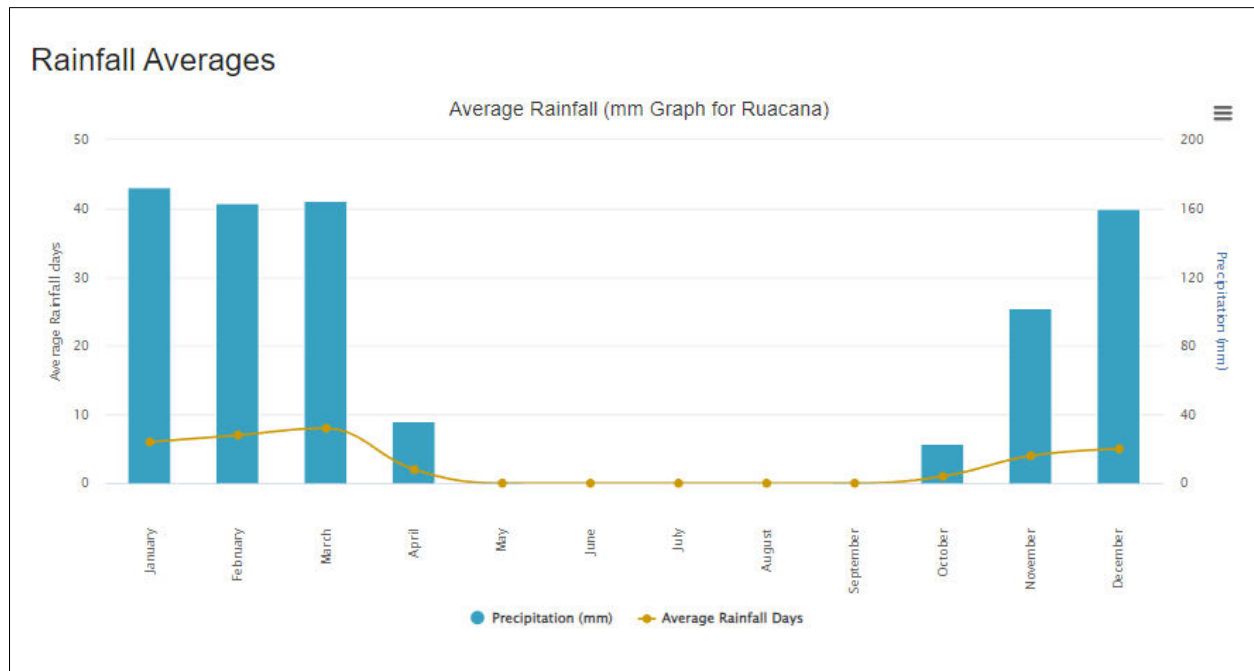


Figure 4-2: The monthly average rainfall for Ruacana (World Weather online, 2022)

4.1.2 Temperature

Mendelsohn et al, (2002) indicated that project area has annual temperature of more than 22°C, minimum temperatures ranging between 4 and 6°C and maximum temperatures within the range of 34 to 36°C. According to World Weather Online (2022), the minimum and maximum temperatures for Ruacana area are 10°C (in June), and 40°C (in October), respectively (Figure 4-3).

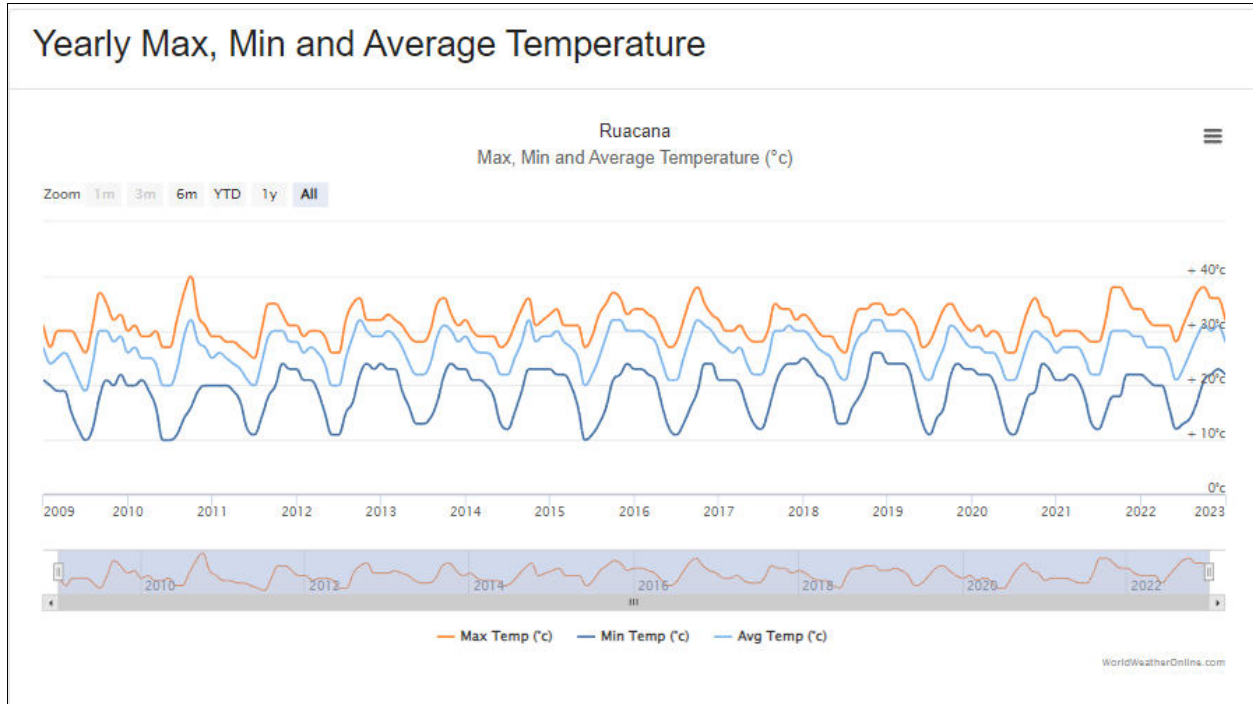


Figure 4-3: The maximum, minimum and average temperature for Ruacana (World Weather online, 2022)

The monthly average high and low temperatures are 36°C and 11°C, respectively (

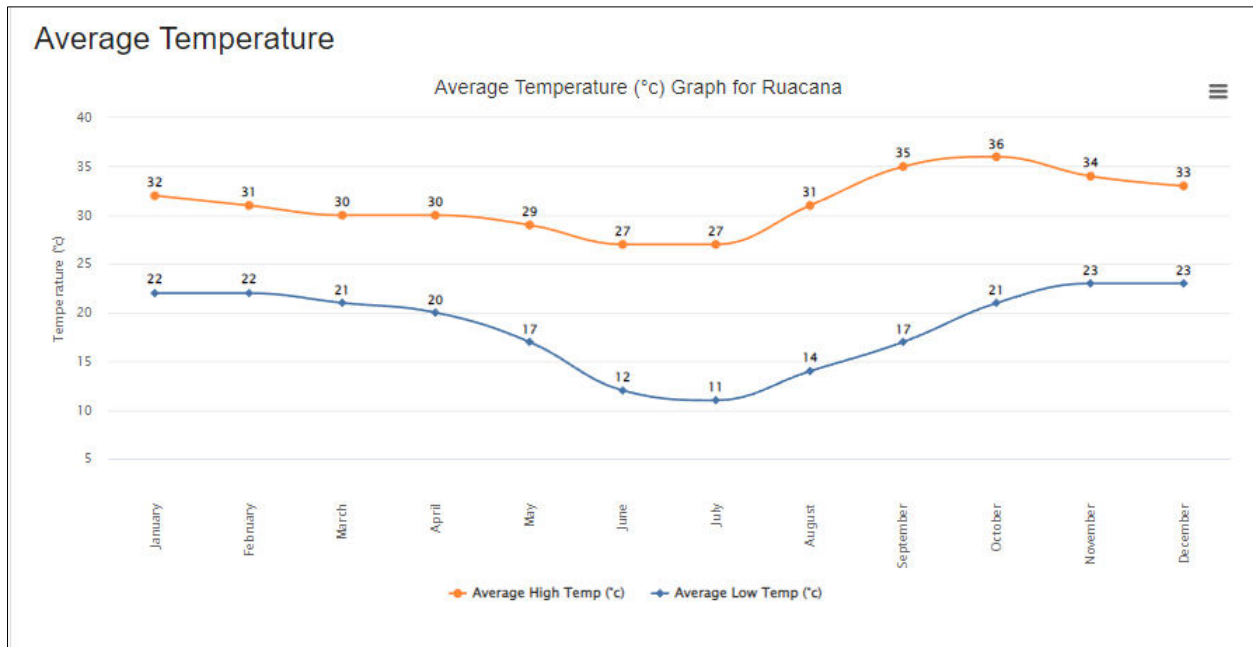


Figure 4-4).

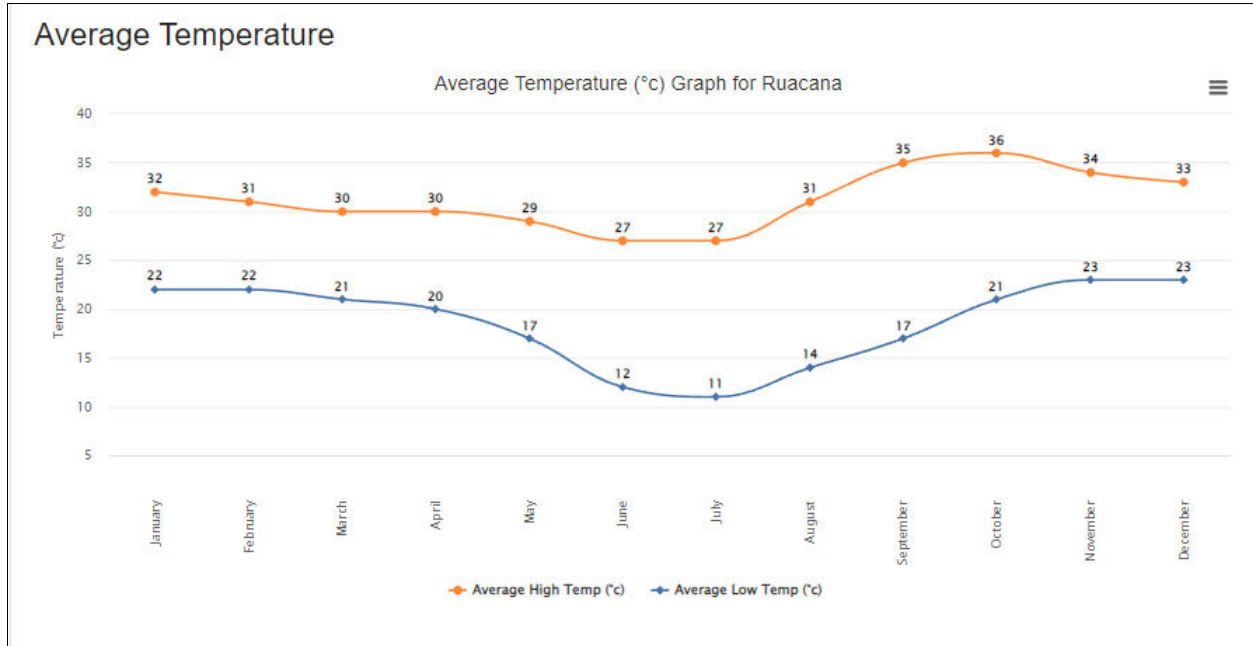


Figure 4-4: The monthly average temperature for Ruacana (World Weather online, 2022)

4.1.3 Wind Direction and Speed

The predominant wind in the project area has been derived from the wind data for Outapi, being the nearest place with data to Oshifo/Ruacana (about 63km away). According to Meteoblue (2022), the wind is blowing from Southwest (SW) to Northeast (NE) at a speed ranging between 12 and 19 kilometers per hour occurring throughout the year as shown Figure 4-5 (left-hand side). The strong winds (with a speed greater than 28km/h) occur between April and September as shown in the chart (Figure 4-5 - right-hand side).

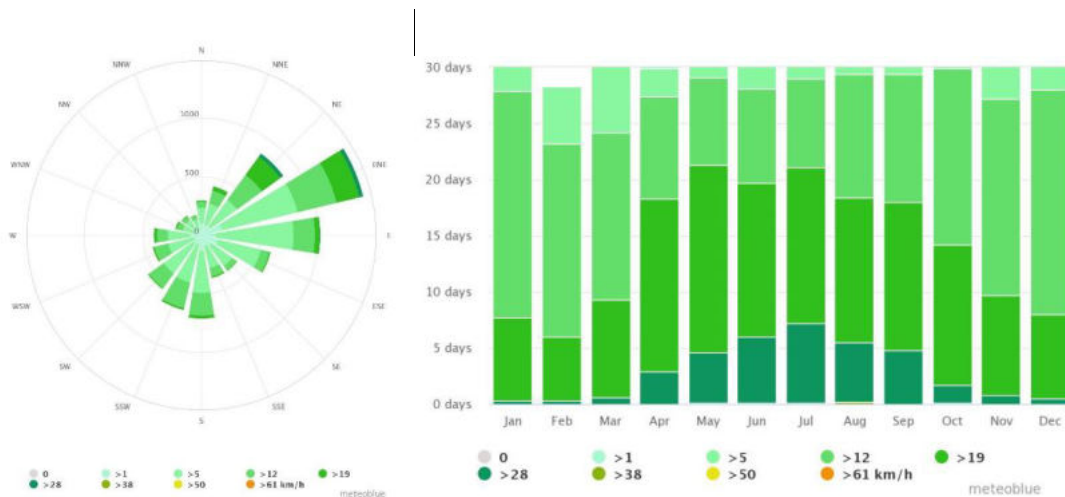


Figure 4-5: The modelled wind speed and chart for Ruacana (Meteoblue, 2022

4.2 Landscape

The landscape of the Ruacana Town and surroundings is characterized by the Kalahari sediments, hence Kalahari Sandveld. This landscape is found in much of the northern and eastern Namibia dominated by Savanna woodlands growing on sands deposited by wind over the last 70-63 million years ago. The landscape is particularly flat, although the sands have been molded into dunes in some areas. Altitudes are highest in the central and western areas, from where the whole landscape slopes gently down to lower ground in the east and south (Mendelsohn et al., 2002).

4.3 Geology and Soils

The geology of the northern parts of Namibia is characterized by the unconsolidated to semi-consolidated sands, calcrete and gravel sediments of the Quaternary and Tertiary age of the Kalahari Group. The site area falls within the Cuvelai landscape, the Cuvelai lies on silt, clay, limestone, and sandstone sediments. The area is distinguished by a myriad of drainage channels known as oshanas, these oshanas direct water to the Etosha Pan. They often fill with water during the wet season and cut into the underlying sediments.

The geological map created for the site area (Figure 4-6) indicates that the site geology is characterized by the unconsolidated Kalahari sediments (sand, calcrete and gravel).

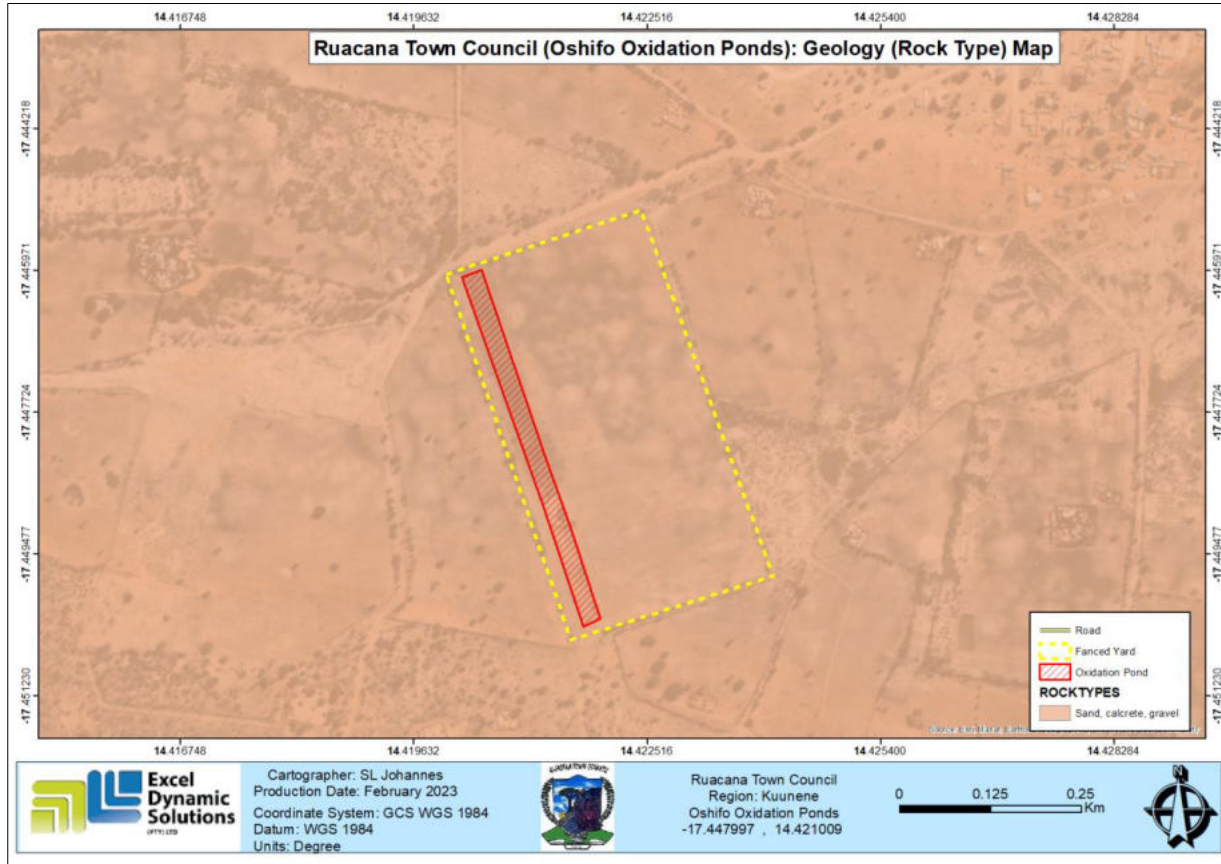


Figure 4-6: The geology of the site and Oshifo Town

The project site and its surrounding are overlain by arenosols as shown in Figure 4-7. According to Mendelsohn *et al.*, (2002), arenosols were formed from wind-blown sand and usually extend to a depth of at least 1m, with sand generally making up more than 70% of the soil, with the rest of the soil particles consisting of clay and silt.

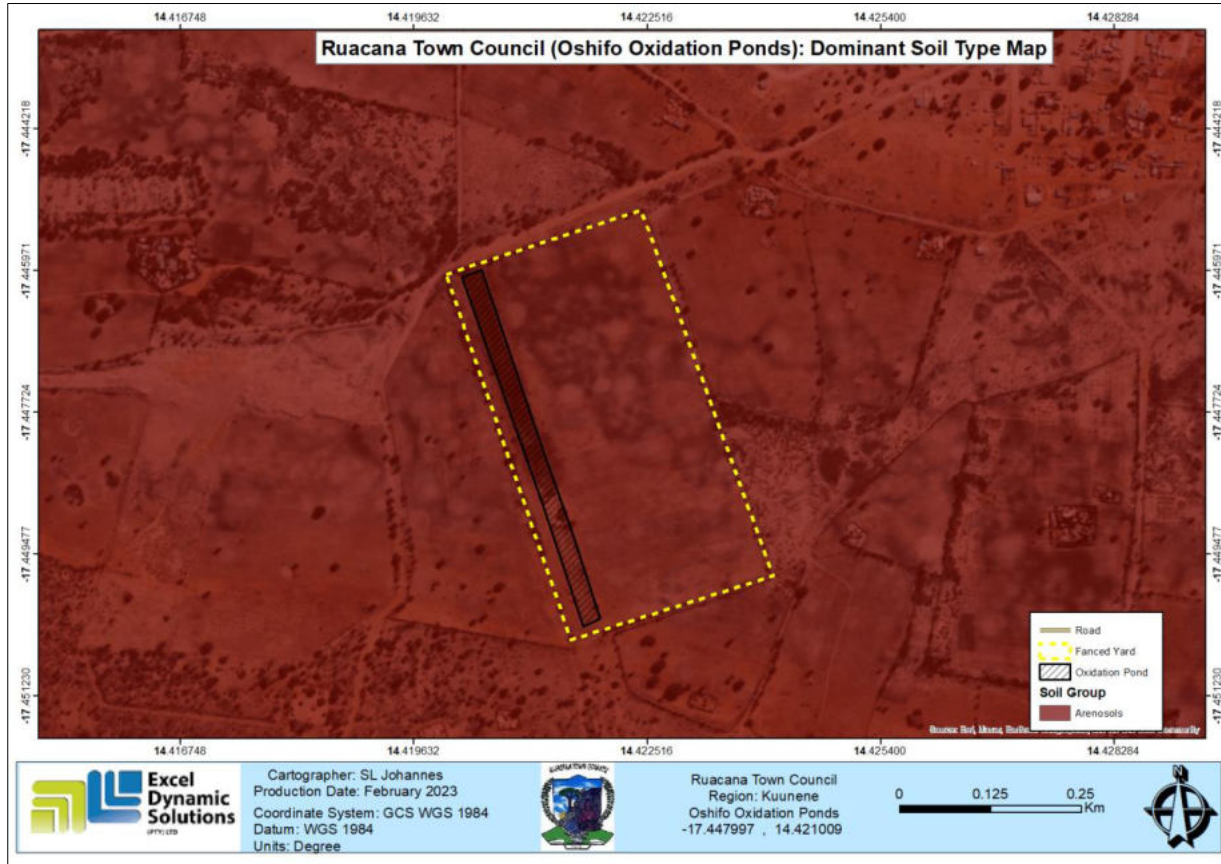


Figure 4-7: The dominant soil on and around the site

The site area is dominated by light brown to dark grey sandy loamy soils covered by grass. The site soils seem to be highly influenced by the ponds’ operations and surrounding activities- see Figure 4-8.



Figure 4-8: The soils observed onsite

4.4 Hydrology and Hydrogeology

There is not much water on the surface in Namibia, as the little rain that falls either evaporates, seeps into the ground or is rapidly drained by ephemeral rivers that dominate natural surface water systems inside the country. The only perennial water systems (rivers) that can hold surface water are extremely varied, ranging from great rivers that define the country's borders, to a host of smaller rivers and channels that flow at varying frequencies (Mendelsohn *et al.*, 2002). The nearest perennial river to Kunene is the Kunene River at the borders of Namibia and Angola. This River is 344km long with a catchment of 107,000 km² and annual average water volume of 5,100 million m³. The site is located within the Cuvelai catchment of the Etosha (Etosha-N River) Pan, an ephemeral river draining in a southern direction into the Etosha Pan. The local drainage in the area is poorly developed and runoff usually collects in shallow drainage channels and depressions (*oshanas*, pans and *omurambas*).

The project area and the Omusati Region at large falls under the Cuvelai Groundwater Basin (Christelis and Struckmeier, 2011). Groundwater flow is mostly through primary porosity in the Kalahari cover, but flow along secondary structures known as fractures. The flow can also be influenced by the presence of other geological structures underlying formations such as contact rock unit zones. The average piezometric level of the Cuvelai Basin is 30m below ground level, and the aquifer is mostly confined, but in some parts is unconfined. The typical borehole depth is 100 to 250 m, and the mean annual recharge is 35 million cubic meters (Mm³) (Christelis *et al.*, 2018).

The groundwater flow in the project area can be expected to flow in a south-eastern direction towards the Etosha Pan. According to Christelis and Struckmeier (2011), the groundwater flow towards Etosha Pan is due to the structure of the Basin and its deepest point, i.e., the base level of the groundwater flow system. However, in terms of local drainage patterns, these may vary due to local groundwater abstraction in the area. The local water table in the wider project area is expected to be more than 60m below ground level (mbgl).

Groundwater in the project site area is moderate and hosted in porous aquifers as shown in Figure 4-9.

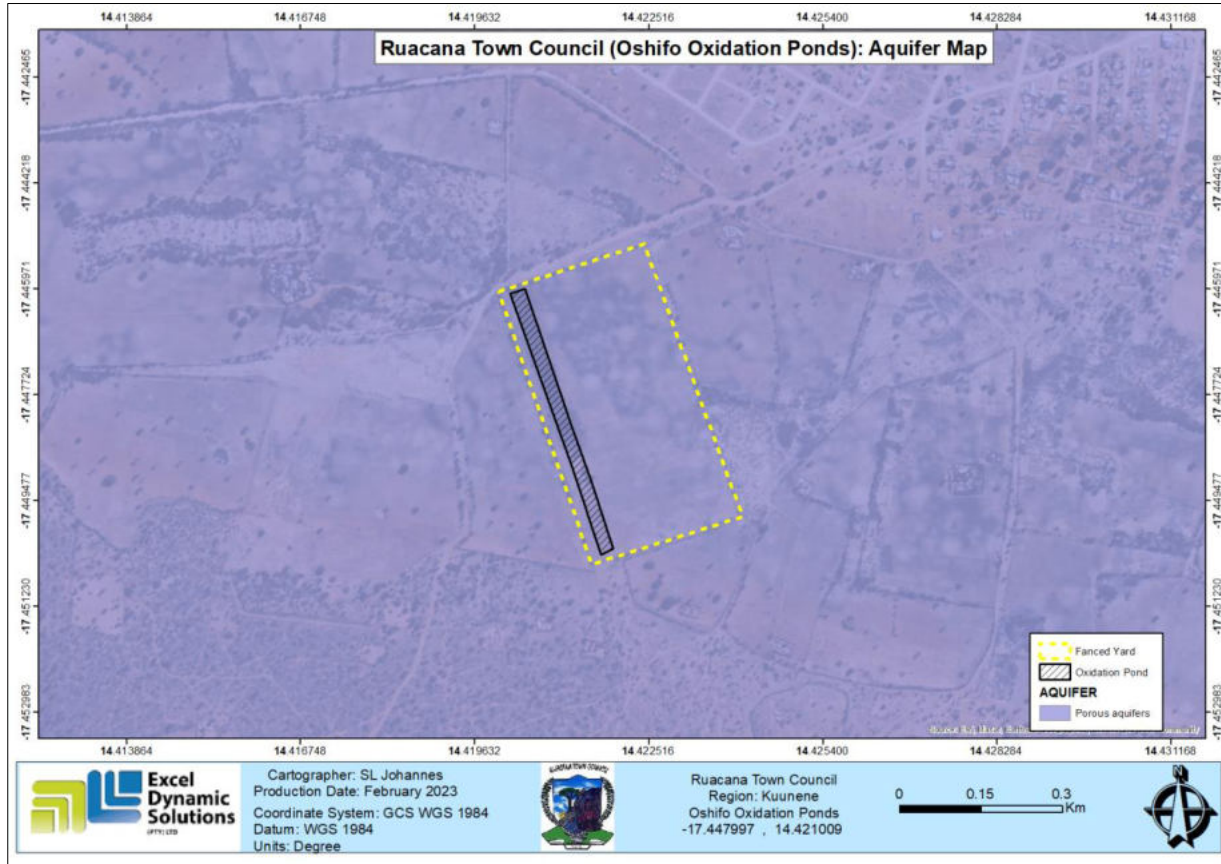


Figure 4-9: The geohydrology map of the site and surroundings

4.5 Fauna

Livestock: given the fact that Oshifo is in a rural and communal set up, there are domestic animals on and around the project site (ponds). The observed and known animals along the roads, and in proximity of the ponds site are sheep, and goats. Other animals include cattle and donkeys. Some goats were found grazing next to the oxidation ponds during site visit. Some of the cattle found grazing at the ponds are shown in Figure 4-10.



Figure 4-10: Some local goats found onsite

In terms of wildlife, there were no known or observed wildlife around the project site.

4.6 Flora

The site area is characterized by thick woodland of tall trees, shrubs, and grass species. The site area is medium vegetated by shrubs and trees. The observed vegetation comprises of Mopane (*Colophospermum mopane*), Purple-pod terminalia (*Terminalia prunioides*) and bitterbush or wild sage (*Pechuel-loeschea leubnitziae*).

The photos of some of the vegetation observed onsite are shown in Figure 4-11.



Figure 4-11: The vegetation observed on and around the site

4.7 Social and Economy

4.7.1 Demography

Ruacana and Oshifo areas fall under Omusati Region, which according to the 2011 Namibia Population and Housing Census had a population of 243,166 (133,621 females and 109,545 males) (Namibia Statistics Agency (NSA), 2014). The site falls within Ruacana Constituency which at the time had a population of population of 14,857 (7,327 females and 7,530 males).

4.7.2 Economic Activities

The main sources of household income for Ruacana Constituency's by 20211 was farming contributing 35%, wages & salaries 32%, cash remittance 5%, business (non-farming) amounting to 9% and pension at 12% (NSA, 2014).

With its cultural diversity and mountainous diversity, the main economic activities in and around Oshifo/Ruacana are dominated by the tourism activities at the Ruacana Water Falls, livestock and crop farming. The tourism activities are centered on the accommodation facilities, tour guides, cultural village, tracking and hiking as well as crafts and arts (Ruacana Town Council, 2020). Other economic activities include mining (quarrying), transport, retail, warehouse and recreation and leisure.

4.7.3 Services and Infrastructure

Oshifo Town is well-equipped with services and infrastructure, and some of the services and infrastructure are summarized below:

- Water supply: The Town gets its water supply from boreholes operated by NamWater through a bulk water supply scheme.
- Power supply: The Town is powered by northern regional electricity distributor (NORED)'s power grid.
- Roads: The town is connected to other towns by the C46 from Outapi and C35 from Omakange/Kamanjab side. There are several gravel and single-track roads that provide access to the Town from villages and settlements.
- Health Care and education: there is a clinic in Oshifo. There are primary education centers such as primary schools in the Town.

4.7.4 Surrounding Land Uses

The site is bordered to the east by the Oshifo Town, and homesteads on both sides. There is a sand mining operation to the immediate western side of the ponds, but this operation does not belong to the Ruacana Town Council.

4.7.5 Waste Management

A. Garbage and waste disposal

The most common means of disposing of garbage in the Omusati Region was through burning (62.6%). In urban areas, about 59% of households benefited from regular waste collection while 66 percent of households in rural areas burn their waste.

At the constituency level, all constituencies depended on burning as a means of disposing of their waste /garbage. The percentages of solid waste disposal in the Region and at a constituency level is shown in Table 4-1.

Table 4-1: Percent distribution of households by means of waste/garbage disposal and area (NSA, 2014)

Area	Households	Regularly Collected	Irregularly Collected	Burning	Roadside Dumping	Rubbish Pit	Other
Omusati	46 698	6.2	3.8	62.6	11.1	11.5	4.8
Urban	3 774	58.6	6.5	24.5	3.3	6.7	0.4
Rural	42 924	1.6	3.6	66.0	11.8	11.9	5.2
Anamulenge	2 340	0.2	0.5	72.8	6.1	16.9	3.5
Elim	2 132	0.4	4.4	74.6	6.1	9.5	5.1
Etyai	6 162	2.3	5.4	68.3	11	9.7	3.2
Ogongo	3 753	3.7	6.3	70.5	5.4	9.5	4.6
Okahao	3 799	6.3	5.7	67.5	7.1	11	2.3
Okalongo	4 889	2.9	3.7	66.9	12.8	9	4.7
Onesi	2 527	2.7	7.4	48.8	16.6	15.7	8.9
Oshikuku	1 736	25.3	6.3	54.5	2.4	9.2	2.4
Outapi	7 117	14.9	2	48.2	14.1	16.2	4.6
Ruacana	3 520	12.3	1.1	58.6	17.4	9.5	1
Tsandi	5 886	3.8	2.7	61.9	12.5	9.1	10.1
Otamanzi	2 837	0.2	2.4	68.8	10.9	12.8	4.9

B. Sewage Management

With respect to the type of the main toilet facility, about 77.9% of the households in Omusati Region had no toilet facilities and only 6.3% had access to flush toilets. There are notable differences between urban and rural areas. In urban areas about 49% percent of households

used flush toilets while the corresponding rural percentage was only about 3%. Similar trends were observed in all the constituencies with over 60% of households having no toilet facilities, except for Oshikuku Constituency where the proportion was 56% (NSA, 2014).

The percentage of toilet facilities in the Ruacana Constituency and the broader Omusati Region are shown in Table 4-2.

Table 4-2: Percent distribution of households by type of main toilet facility and area (NSA, 2014)

Area	Number of Households	Private Flush Connected to Sewer	Shared Flush Connected to Sewer	Private Flush Connected to Septic/Cesspool	Shared Flush Connected to Septic/Cesspool	Pit Latrine with Ventilation on Pipe	Covered Pit Latrine without Ventilation	Uncovered Pit Latrine without Ventilation	Bucket Toilet	No Toilet Facility	Other
Omusati	46 698	3.7	1.5	0.7	0.4	6.5	4.7	2.5	1.7	77.9	0.4
Urban	3 774	34.0	12.5	1.6	0.9	11.0	4.9	3.4	0.8	30.7	0.2
Rural	42 924	1.0	0.5	0.7	0.3	6.1	4.7	2.4	1.8	82.0	0.4
Anamulenge	2 340	1.5	1.1	1.2	0.6	12.1	5.3	3.9	1.3	72.7	0.3
Elim	2 132	1.5	0.6	0.8	0.6	11.2	10.4	4.5	1.3	68.5	0.7
Etyai	6 162	0.5	0.2	0.5	0.1	7.3	4.6	2.0	1.7	83.0	0.2
Ogongo	3 753	1.6	0.1	1.7	0.1	6.5	6.3	2.2	3.5	77.7	0.4
Okahao	3 799	5.8	3.0	0.7	0.7	5.1	6.3	4.9	2.2	71.0	0.3
Okalongo	4 889	0.9	0.1	1.5	0.2	6.7	4.2	2.0	1.9	82.4	0.1
Onesi	2 527	2.1	1.2	0.3	0.7	4.3	3.9	4.9	0.7	79.5	2.4
Oshikuku	1 736	16.6	2.2	1.5	0.3	12.0	8.6	2.0	0.6	55.9	0.2
Outapi	7 117	7.6	3.6	0.5	0.6	6.6	3.5	1.8	1.8	73.8	0.2
Ruacana	3 520	8.5	2.9	0.4	0.3	4.2	2.0	0.8	1.3	79.1	0.3
Tsandi	5 886	2.1	1.8	0.2	0.1	5.2	4.1	2.2	1.5	82.6	0.2
Otamanzi	2 837	0.3	0.0	0.1	0.2	2.2	3.6	1.9	1.0	90.3	0.4

4.7.6 Archaeology and Heritage Resources

Like many Namibian towns towards the Namibia-Angolan borders house many memories and history of the liberation struggle, therefore Ruacana is not an exemption. However, during site visit, there was no observed heritage or archaeological site. Although, there was no physical evidence onsite, the absence of surface findings does not mean an absence of subsurface resources that may be unintentionally unearthed during site maintenance and grave digging.

For the successful implementation of this EMP, the roles and responsibilities need to be assigned to different parties at Ruacana Town Council. Although the RTC holds overall responsibility of implementing the EMP, individual parties operating under the Town Council holds the responsibility of implementing specific measures (as entirely individually or collectively), therefore, the EMP roles and responsibilities are provided under the next chapter.

5 EMP IMPLEMENTATION: ROLES & RESPONSIBILITIES

The Ruacana Town Council (RTC), as the project Proponent has the overall responsible for the implementation of the EMP and the associated Closure Plan. The roles and responsibilities of all delegates/parties involved in the effective implementation of this EMP are set in Table 5-1.

Table 5-1: The list of responsible parties and their roles in implementing the EMP & Closure Plan

Role (Person and or Institution)	Responsibilities
The Proponent (Ruacana Town Council)	<ul style="list-style-type: none"> -Managing the implementation of this EMP and updating and maintaining it when necessary. -Management and monitoring of individuals and/ or equipment on-site in terms of compliance with this EMP and issuing fines for contravening EMP provisions.
Safety, Health & Environmental (SHE) Officer / Environmental Health Officer (EHO)	<ul style="list-style-type: none"> -Conducting site inspections of all areas with respect to the implementation of this EMP (monitor and audit the implementation of the EMP). -Advising the Proponent on the removal of person(s) and/or equipment not complying with the provisions of this EMP. -Undertaking an annual review of the EMP and recommending additions and/or changes to this document.
Site Manager / Operator	<ul style="list-style-type: none"> -Collaborate with the SHE Officer to ensure the implementation of the EMP, especially on the technical aspects regarding the site upgrading/maintenance and operations. -Collaborate with the SHE Officer / EHO to ensure the implementation of the EMP, especially on the technical aspects regarding the site upgrading, operations and maintenance works.
Site upgrading Contractor	<ul style="list-style-type: none"> -Collaborate with the SHE Officer and Site Manager to ensure the implementation of the EMP, especially on the technical aspects regarding the site upgrading and maintenance. -Ensure that their works onsite comply with the EMP components and requirements relevant to their works.
Technical Staff and Consultants	<p>The project's technical experts and consultants will be responsible for safely and effectively monitoring various technical parameters related to: mechanical designs of the oxidation ponds and associated facilities, waste management, water resources management, soil preservation/ protection, oxidation ponds operations and maintenance, and employee/ contractor health.</p>

6 ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURES

6.1 Identification of Key Impacts

The key potential impacts associated with the site upgrading, its operations and maintenance of the oxidation ponds thereof are as follows:

<u>Positive impacts</u>	<u>Potential Negative impacts (Continued)</u>
<p>-Improved wastewater management in the Town, thus preventing the amount of wastewater that would otherwise be uncontrollably released into the environment due to the overflowing state of the existing ponds. This would improve the local public and environment health</p> <p>-Availability of extra water for uses like renovation works, irrigation (agricultural activities) in and around the Town, etc.</p>	<p>-Odour: This may affect the locals in proximity of the ponds without odour control caps.</p> <p>-Vehicular traffic: potential increase in local traffic due to site upgrade activities on site.</p> <p>-Occupational and community health and safety: improper handling of site materials and equipment may cause health and safety risks (if unfenced, there is a risk of children and animals drowning in the ponds).</p> <p>-Archaeological or cultural heritage impact through uncovering of unknown objects on site (when carrying out earthworks).</p> <p>-Air pollution by potential dust on untarred roads and gas emissions from site upgrading activities (excavations, heavy vehicles, and machinery).</p> <p>-Loss of biodiversity through the removal of vegetation that may be found within the planned upgrading of the site footprints.</p>
<u>Potential Negative impacts</u>	
<p>-Soil and water pollution: improper handling of wastewater (sewage) may lead to pollution of surrounding soils and eventually water resources systems (through wastewater runoff and infiltration).</p> <p>-General environmental pollution through mishandling of project related waste during site upgrading and operational phases.</p>	

The impacts will be mitigated by the implementation of measures provided under the next section.

6.2 Environmental Management and Mitigation Measures for the Project

The management actions provided under this section are aimed at avoiding the above-listed potential negative impacts, where possible. Where it is impossible to avoid the impacts, mitigation measures are provided to reduce the impacts' significance. The measures are recommended for the planning & design (Table 6-1), site upgrading & operational phases of the ponds (Table 6-2) and decommissioning (Table 7-1).

Table 6-1: The Environmental management and mitigation measures for the Planning of the Site upgrading works

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
Planning Phase					
EMP implementation and training	Lack of EMP awareness and implications thereof	<ul style="list-style-type: none"> -A Comprehensive Health and Safety Plan for the project activities should be compiled. This will include all the necessary health, safety, and environmental considerations applicable to respective works on sites. -An EMP non-compliance penalty system should be implemented on site. -The Proponent should appoint a SHE Officer to be responsible for managing the EMP implementation and monitoring. 	<ul style="list-style-type: none"> -All required Plans and systems are compiled and in place Safety, Health and Environmental (SHE) Officer is appointed -Records of EMP implementation Plans and Systems 	-Proponent	Pre-site upgrade
Oxidation Ponds Maintenance	Cleaning and reconditioning of ponds	-The cleaning and reconditioning works of the ponds should be planned and provided for. This included the provision for maintenance and repairing of associated pond system infrastructure.	<ul style="list-style-type: none"> -Financial and technical provision made for the operational & maintenance and updated regularly -Provision for maintenance works -Site inspections conducted by relevant authorities -Reports and records of maintenance work and repairs undertaken 	<ul style="list-style-type: none"> -Proponent -Planning & Design Engineer 	Throughout the project phases
Stormwater and Pond	Runoff of polluted water	-Stormwater management plans (discharge points) should be designed and implemented on site to prevent	-Stormwater discharge points are included the ponds upgrading works	-Proponent: Design/Structural Engineer	Pre-site upgrade

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
overflow management	into the environment	<p>the on potential contaminated run-off from reaching surface water resources during heavy rain seasons.</p> <p>-The ponds should be equipped with a robust wastewater flow monitoring system ensure that the first sign of overflow is detected and addressed in time (for flow and capacity monitoring in the ponds).</p>	-Pond capacity detection incorporated into the ponds' upgrading design		
Employment opportunities	Unfair practices of labour recruitment an opportunity leads to conflicts	<p>-Local should be given preference for works (skilled, semi and unskilled) at the site.</p> <p>-Equal opportunities should be given to women and men.</p>	<p>-There is a fair recruitment process</p> <p>-Locals are given preference for the work</p>	<p>-Proponent (Human Resources Department) for site operations</p> <p>-Site upgrading contractor</p>	When deemed necessary during operations
Goods and services procurement	Conflicts from procurement of goods and service by outsiders over local business	<p>-The procurement of works for site upgrade works should follow a fair and transparent process.</p> <p>-Procurement should be open only to local and Namibian companies with strong local participation.</p> <p>-The business opportunities such as site cleaning services and maintenance should be given to local companies</p>	<p>-Goods and services are procured from Oshifo and nearby towns</p> <p>-Local businesses are considered for procurement opportunities</p>	-Proponent (Procurement Department)	<p>When deemed necessary throughout the project</p> <p>-Contractor to be appointed before works</p>

Table 6-2: The Environmental management and mitigation measures for the site upgrade and continued Operational & Maintenance

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility
Site upgrading, Operational & Maintenance Mitigation Measures				

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility
EMP implementation and training	Lack of EMP awareness and implications thereof	<p>-EMP trainings should be provided to all site personnel.</p> <p>-All site personnel should be aware of necessary health, safety, and environmental considerations.</p> <p>-The implementation of this EMP should be monitored.</p> <p>The site should be inspected, and a compliance audit done throughout <u>the project activities (bi-annually)</u>.</p> <p>-Implement EMP non-compliance penalty system onsite.</p>	<p>-Compliance monitoring conducted bi-annually and should be recorded.</p> <p>-The ECC is renewed every 3 years</p> <p>-Bi-annual reports</p> <p>-Records of EMP training conducted.</p>	-SHE Officer / EHO
Oxidation Ponds' Maintenance	Cleaning and reconditioning of ponds	<p>-The cleaning and reconditioning of the ponds should be regularly done. This included the provision for maintenance and repairing of associated pond system infrastructure.</p> <p>-The overgrown weeds inside the ponds should be regularly removed and ponds kept clean.</p>	<p>-Financial and technical provision made for the operational & maintenance and these are updated regularly</p> <p>-Provision for maintenance works</p> <p>-Site inspections conducted by relevant authorities</p> <p>-Reports and records of maintenance work and repairs undertaken</p>	-Site Manager
Authorizations	Lack of Permits/ Licenses	<p>-All the required agreements and licenses or permits should be applied for and obtained. The permits, agreements referred to herein include:</p> <ul style="list-style-type: none"> o Treated Wastewater (Effluent) Discharge Permit o Waste disposal authorization 	-Applicable permits and licenses to obtained from relevant authorities and kept on site for records keeping and future inspections	-Site Manager
Specialised procurement of services	Ponds maintenance and related services	-All services related to project activities such as maintenance that the Proponent may need, preference should be given to local services providers. If not available locally, the services search should be extended to a Regional level (Omusati Region) and lastly, nationally, or international, if all efforts lead to no success.	-The hired contractors are from Oshifo, then Ruacana and if not available, then Omusati Region and other Regions	-Site Manager

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility
Wastewater	Treated Wastewater / Effluent discharge	<ul style="list-style-type: none"> -A Permit to discharge treated effluent/wastewater should be renewed with the Department Water Affairs (DWA) Water Environment Division at MAWLR. -Consider setting up Town gardens (urban agriculture and aquaculture to grow fruits and vegetables) and recreational sites in the Town to make use of the treated water for these purposes. 	<ul style="list-style-type: none"> -Permits obtained -Adherence to permit conditions -Records of volumes of discharge and post-use effluent -The Town is utilizing treated water for medium to large scale urban agriculture and recreational sites for the Town 	-Site Manager
Soils	Physical soil / land disturbance	<ul style="list-style-type: none"> -The Site soils should not be disturbed, if not needed. -All site upgrading related excavated pits and trenches that will not be utilized for the subsequent phase should be backfilled, and areas rehabilitated. -The stockpiled topsoil on and around the site due to the project activities should be levelled. 	<ul style="list-style-type: none"> -No stockpiled soils onsite -No new erosion gullies. 	-SHE Officer / EHO -Site Manager
	Soil Contamination	-The appropriate and suitable measures and method(s) to remediate the contaminated site soils should be recommended by a specialist (soil scientist) and implemented accordingly and under the specialist' supervision.	<ul style="list-style-type: none"> -Implementation of contamination management measures -Remedial actions taken and implemented -Soil contamination monitoring -No signs of contaminated soils 	
Stormwater and Pond overflow management	Runoff of polluted water into the environment	<ul style="list-style-type: none"> -Stormwater management plans (discharge points) should be installed on site to prevent potential contaminated run-off during heavy rain seasons. -A robust wastewater flow monitoring system should be installed to ensure that the first sign of overflow is detected and addressed in time (for flow and capacity monitoring in the ponds). 	<ul style="list-style-type: none"> -Stormwater discharge points are installed and maintained frequently. -Pond capacity detection forms part of the ponds' system 	-Site Manager

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility
Health and Safety	Occupational Health and Safety	<ul style="list-style-type: none"> -Provide induction to all new personnel and site visitors. -Avail adequate and appropriate PPE to all workers and visitors. These include coveralls, gloves, safety boots, dust masks, safety glasses, etc. -Timeously recording and reporting of all health and safety incidences. 	<ul style="list-style-type: none"> -Regular health screening of workers (annually) -Bi-annual health and safety audits done 	<ul style="list-style-type: none"> -Site Manager -SHE Officer / EHO
	Public safety	<ul style="list-style-type: none"> -The site fence should be maintained to secure it and prevent possible public unauthorized. -The warning signage of “do not enter, do not swim and the water is not safe for human and livestock consumption” should be clearly written in English, otjiherero, Oshiwambo and pasted at the site gate. -Consider installing the site wall similar to that of Oshakati Town Council Solid Waste site – <u>Appendix A.</u> -Empty hazardous containers that may be used onsite should be securely kept on site, inside the boundary wall before transporting the containers to the nearest approved waste site. 	<ul style="list-style-type: none"> -The site fence has been upgraded to vandalism-resistant wall and maintained regularly. -Empty hazardous containers and waste container kept within the site fence boundaries and out of public reach 	<ul style="list-style-type: none"> -Site Manager
Air Quality	Odour from pond operation	<ul style="list-style-type: none"> -Install odour control caps at the ponds. 	<ul style="list-style-type: none"> -Odour is controlled and impact minimized -Less to no odour complaints from the public 	<ul style="list-style-type: none"> -Site Manager
	Dust generation, fumes (poor air quality)	<ul style="list-style-type: none"> -Vehicles to and from site should only be driven at the speed of 40km per hour to avoid dust generation. -The heavy vehicles and fumes generating equipment should not be left idling when not in use. 	<ul style="list-style-type: none"> -No complaints from the public about vehicle emissions and dust generation. -Visible efforts to curb dust 	<ul style="list-style-type: none"> -Site Manager -SHE Officer / EHO

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility
Post-Treatment Effluent	Handling	<p>-The effluent must be treated thoroughly and tested/analysed to ensure full compliance with the Standards before used or discharged into the environment.</p> <p>-The treated effluent logistics should be properly handled and done onsite when delivering to the intended consumers.</p> <p>-The effluent transportation pipelines should be maintained and checked for breakages to prevent soil and groundwater pollution.</p> <p>-Other options of utilizing the effluent should be investigated and implemented to ensure that effluent is sufficiently treated to the Standards and utilized for other applications in the environment.</p>	<p>-Effluent stored on lined storage area</p> <p>-No mishandling of effluent on site</p> <p>-Records of Effluent production and distribution</p> <p>-Compliance with the Standards and Regulations</p>	<p>-Site Manager</p> <p>-SHE Officer / EHO</p>
Fire outbreaks	Accidental fire outbreaks risks	<p>-Warning signs of “No Smoking” and “No open fires” should be clearly written in English and Oshiwambo languages and pasted at site entrance.</p> <p>-Continue with the regular servicing of site fire extinguishers, and personnel trained on how to use extinguishers (basic fire firefighting skills).</p> <p>-No open fires should be created onsite.</p> <p>-The contact details of fire services should be readily and visibly displayed onsite.</p> <p>-All personnel must be sensitised about responsible fire protection measures and good housekeeping such as the removal of flammable materials (e.g., rubbish, dry vegetation, and hydrocarbon-soaked soil) onsite.</p>	<p>-No open fires by site personnel or visitors</p> <p>-Fire extinguishers are readily available and up to date with service</p>	<p>-SHE Officer / EHO</p> <p>-Site Operator</p>

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility
Site safety and security	Compromised site security and safety	-The site fence should be upgraded and maintained.	-The site fence and security measures are in place.	-Site Manager
Waste generation and management	Environmental Pollution (littering)	-Project workers should be sensitized to dispose of waste in a responsible manner and not to litter. -No waste should be left scattered on site. Dispose of in allocated site waste containers. -The burning and burying of waste on site or anywhere else is prohibited. -All solid waste produced daily should be contained until such that time it will be transported to the Town’s waste disposal site on a weekly basis. -A penalty system for irresponsible disposal of waste on site and anywhere in the area should be implemented.	-Site wide evaluation of the general condition of all waste storage sites must be conducted as part of the bi-annual environmental audits -A register of all waste generated on site is kept on site -All waste disposal permits are available on site -No littering on and around the project site	-Site Manager -Proponent: Solid waste division (dumpsite management) -SHE Officer / EHO
	Wastewater generated by workers and visitors (sanitation)	-Provision of sufficient ablution facilities (toilets) for project workers and visitors. -Open defecation on /around the site is strictly prohibited.	Adequate toilet facilities on site.	-Site Manager
	Hazardous waste	-All hazardous materials used for site upgrade and maintenance should be stored (on bunded area), handled and disposed of according to the applicable material safety data sheets (MSDS), as well as applicable regulations (e.g., the Health and Safety Regulations). -Hazard identification signage should be erected at appropriate site locations.	-Site wide evaluation of the general condition of all hazardous waste storage sites must be conducted as part of the bi-annual environmental audits -A register of all waste generated on site is kept on site -All waste disposal permits from relevant	-SHE Officer / EHO

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility
		<p>-All hydrocarbon substances should be contained in designated containers on site and later disposed of at nearby approved waste sites.</p> <p>-Hazardous waste, including emptied chemical containers should be safely stored on site where they cannot be accessed and used by uniformed locals for personal use. These containers can then be transported to the nearby approved hazardous waste sites for safe disposal.</p> <p>-No waste should be improperly disposed of on site or in the surroundings, i.e., unapproved waste sites.</p>	<p>authorities are available on site</p>	
<p>Vehicular Traffic</p>	<p>Traffic safety</p>	<p>-The transportation of project materials, equipment and machinery should be limited to twice a week only.</p> <p>-The deliveries of goods and services to the site should be done during weekdays between 8am and 5pm only.</p> <p>-Drivers of all project phases' vehicles should be in possession of valid and appropriate driving licenses.</p> <p>-Vehicle drivers should adhere to the road safety rules.</p> <p>-Drivers should drive slowly (40km/hour or less).</p> <p>-Project vehicles should be in a road worthy condition and serviced regularly to avoid accidents due to mechanical faults of vehicles.</p> <p>-Vehicle drivers should only make use of designated site access roads provided.</p> <p>-Vehicle's drivers should not be allowed to operate vehicles while under the influence of alcohol.</p>	<p>-No complaints from members of the public regarding vehicular traffic issues related to the project</p> <p>-All personnel operating the project vehicles and machinery are appropriately licensed and possession of valid driving licenses.</p> <p>-Demarcated areas for parking, offloading, and loading zones are on site.</p>	<p>-Site Manager</p> <p>-SHE Officer / EHO</p>

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility
		<ul style="list-style-type: none"> -Make provision for safe materials and equipment offloading and loading areas on sites. -Project loads should be properly fastened onto the vehicles to prevent falling causing injuries on the roads. 		
Water Resources Use	Over-utilization of water resources	-Water conservation awareness and saving measures training should be provided to all the project workers so that they understand the importance of conserving water and become accountable.	-Water is recycled and re-used where possible	-SHE Officer / EHO
Soils and water resources	Soils and water resources contamination	<ul style="list-style-type: none"> -Spill control preventive measures should be in place on site to management soil contamination. -Site areas where hazardous waste will be used, consider using an HDPE liner or natural clay liner to eliminate the risk of possible leakage/leachate. -Sensitized personnel on the impacts of soil contamination. -Site upgrading machines and equipment should be equipped with drip trays to contain possible oil spills. -Contaminated soil should be removed immediately and disposed of at an approved and appropriately classified hazardous waste treatment facility. -Refuelling of vehicles should be done offsite (in Town). -Washing of equipment contaminated hydrocarbons, as well as the washing and servicing of vehicles should take place at a dedicated area offsite. 	<ul style="list-style-type: none"> -No complaints of contamination on the soils due to project activities -No visible oil spills on the ground or pollution spots. -Sufficient waste containers provided onsite -Non-permeable material are used on areas where hydrocarbons and potential pollutants are utilized. 	-SHE Officer / EHO
Biodiversity	Loss Fauna and Flora	-Avoid the illegal harvesting of site vegetation and collection of firewood onsite.	-No killing or disturbance of biodiversity	-SHE Officer / EHO

Aspect	Impact	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility
		<ul style="list-style-type: none"> -Limit the site working areas to open land, thus preventing the disturbance of site vegetation. -Avoid leaving equipment or machinery leaning on vegetation. -Avoid the killing or hunting of animals (birds, reptiles, mammals) encountered onsite or within site proximity. -Provide environmental awareness on importance of biodiversity preservation to personnel and contractors. 	<ul style="list-style-type: none"> -Site vegetation is preserved and conservation awareness is raised 	
Archaeology and heritage	Accidental disturbance of archaeological or heritage objects	<ul style="list-style-type: none"> -The site upgrading and maintenance contractor should be sensitized to exercise and recognize Heritage “Chance Finds Procedure (CFP)” – <u>Appendix B</u>. -Adhere to the provisions of Section 55 of the National Heritage Act in event significant heritage and culture features are discovered while conducting site works. -When the removing topsoil and subsoil on the site for site upgrade works, the site should be monitored for subsurface archaeological materials. 	<ul style="list-style-type: none"> -Preservation of all artefacts and objects that are discovered on and around the project site during earthworks 	<ul style="list-style-type: none"> -Site Manager -SHE Officer / EHO
Noise	Nuisance	<ul style="list-style-type: none"> -Noise from operations’ vehicles and equipment on the sites should be at acceptable levels. -The site upgrading and maintenance activities should not be carried out during the night or before 08h00 in the morning and should be carried out during weekdays only. -Site workers and contractors should be equipped with PPE such as earplugs to reduce exposure to excessive noise during noisy site operations. 	<ul style="list-style-type: none"> -No complaints of excessive noise from site -Noise protective equipment for workers 	<ul style="list-style-type: none"> -Site Manager -SHE Officer / EHO

7 CLOSURE MEASURES FOR THE OXIDATION PONDS AND ASSOCIATED FACILITIES

Table 7-1 below contains few measures to be taken by the Ruacana Town Council should they consider decommissioning the oxidation ponds in future.

Table 7-1: The Management measures for the Closure (Decommissioning) of the oxidation ponds

Aspect	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
Closure Phase				
Site Fencing and associated infrastructure	<p>-The site fencing should be maintained to ensure the security of the site at least until decommissioning is completed. The fencing can then be dismantled once all decommissioning activities are completed.</p> <p>-Alternatively, the site fencing can be used for other project activities such as agricultural developments upon decommissioning of oxidation ponds that may not be needed for the post-sewage treatment activities and the site is treated for the next intended use.</p>	-The site is looked after and used appropriately	-Proponent	Upon cessation of sewage/effluent treatment activities
Infrastructure and structures: Decommissioning of services and infrastructures	<p>-Dismantling of structures and materials that are no longer required upon decommissioning/closure. These, if still in usable condition can be utilized for other purposes in the Town. If cannot be reused, the materials should be taken to the Town Council dumpsite.</p> <p>-All the waste generated from leading to the last days on site should be transported to the Town Council dumpsite.</p> <p>-Transport all equipment to offsite storage facilities.</p> <p>-The sewage pipelines should be emptied and properly removed for dismantling to prevent sewage spills into the ground.</p>	<p>-Structures are used for other purposes in the Town</p> <p>-Waste transported to an approved dumpsite</p>	<p>-Proponent</p> <p>-SHE Officer / EHO</p>	At the end of the site operations

Aspect	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	<p>-All access roads that may have been created for site upgrading contractor phase and no longer required for operational phase should be closed off.</p>			
Existing contaminated Soils	<p>-Undertake a site-wide contaminated soil to determine the nature and extent of contamination and to identify appropriate remediation measures.</p> <p>-Rehabilitate contaminated by excavating contaminated material to a depth of 300mm and remove and dispose of at the nearest capable landfill site and approved waste management facility.</p> <p>-Treat organic contamination by means of biological remediation via the establishment of a bioremediation site and monitor soil quality against a selected control site.</p>			
Handling of Existing Sewage during Ponds' Demolition Stage	<p>To ensure that no further safety, environmental and human health hazards and to provide land/space for other land uses, through the Demolishing Contractor, the Town Council may need to decide on carrying out progressive demolition by determining the feasibility of either of the two options or both:</p> <p>-This will need to be done by demolishing one or two ponds at a time to ensure that there is still one or two ponds to still contain incoming wastewater from the Town sources and avoid environmental catastrophe of uncontrolled sewage overflowing into the general surrounding surface area and into the ground (groundwater)</p> <p>-Alternatively, provision to be made for industry standard temporary storage facilities such as sewage tanks to contain sewage for disposal at a new selected site.</p>	<p>-The ponds infrastructures are successfully demolished without causing environmental damages such as pollution.</p>	<p>-Proponent</p> <p>-SHE Officer / EHO</p>	<p>At the end of the site operations</p>

Aspect	Management and Mitigation Measure(s)	Key Performance Indicator (KPI)	Implementation Responsibility	Timeline
	<p><u>The decommissioning of these ponds will entail the following:</u></p> <ul style="list-style-type: none"> -The treatment of liquids as well as removal and disposal of biosolids accumulated at the bottom of the ponds, especially the two active ponds. These solids need to be handled properly before re-using the ponds, i.e., for the construction of new ones and cleaned up. -Cleaning up and closure of the ponds. -Proper demolition, capping and elimination of existing treatment components as well as disposal of waste to relevant approved waste management facilities. -The demolition of old ponds should also be planned and done in <u>consultation and collaboration with the Water Environment Division at the Department of Water Affairs of the MAWLR</u> to ensure compliance to Regulations pertaining to handling Wastewater. If required, a Permit should be applied for and obtained from the Division. <p>The most important end component of pond demolition will be to determine the quantity and quality of the biosolids that will have to be removed from the ponds and the option that will be appropriate for land use or disposal (Minnesota Pollution Agency, 2010).</p>			
Waste (solid and sewage from site facilities)	<ul style="list-style-type: none"> -All waste storage containers should be removed, and waste disposed of at designated and approved waste management sites. -Sanitation facilities should be carried away by a designated sewer removal expert. 	-All waste and removed from site and transported to authorized sites	-Proponent -SHE Officer / EHO	At the end of the site operations

8 ENVIRONMENTAL MONITORING

To ensure that the implementation of recommended environmental management and mitigation measures is working and produces the desired results (to minimize and or eliminate adverse impacts), implementation of measures will need to be monitored and reported on. Monitoring is crucial as it helps with early identification of new adverse impacts that would arise during project operations/implementation and timely development of mitigation measures for implementation.

The Bi-annual environmental monitoring reports should be compiled by the Proponent's availed resources (Environmental Health or SHE Officer) and submitted to the DEAF for archiving on a bi-annual basis as required by the conditions to be attached to the ECC. The reports should be audited annually by an Independent Environmental Consultant and prior to applying for an ECC renewal.

9 LIST OF REFERENCES

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APPENDIX A: EXAMPLE OF THE RECOMMENDED SITE WALL (AS SEEN WITH THE OSHAKATI TOWN COUNCIL)



Oshakati Town Council solid waste dumping site entrance and eastern side wall

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

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

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

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

Manager/Supervisor must report the finding to the following competent authorities:

- National Heritage Council of Namibia (Head Office: +264 61 244 375 / Technical Office +264 61 301 903)
- National Museum (+264 61 276 800),
- National Forensic Laboratory (+264 61 240 461).

Archaeological material must NOT be touched. Tempering with the materials is an offence under the heritage act and punishable upon conviction by the law.

Responsibility:

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

Procedure:

Action by person identifying archaeological or heritage material:

Oxidation Ponds

- a) If operating machinery or equipment stop work
- b) Identify the site with flag tape
- c) Determine GPS position if possible
- d) Report findings to foreman

Action by foreman

- a) Report findings, site location and actions taken to superintendent
- b) Cease any works in immediate vicinity

Action by superintendent

- a) Visit site and determine whether work can proceed without damage to findings
- b) Determine and mark exclusion boundary
- c) Site location and details to be added to project GIS for field confirmation by archaeologist

Action by Archaeologist

- a) Inspect site and confirm addition to project GIS
- b) Advise NHC and request written permission to remove findings from work area
- c) Recovery, packaging and labelling of findings for transfer to National Museum

In the event of discovering human remains

- a) Actions as above
- b) Field inspection by archaeologist to confirm that remains are human
- c) Advise and liaise with NHC and Police
- d) Recovery of remains and removal to National Museum or National Forensic Laboratory, as directed.