45 Feld Street, Windhoek, Namibia
PO Box 81808, Windhoek, Namibia
Tel: (+264) 61 248 614 **Fax:** (+264) 61 238 586 **Web:** www.gcs-na.biz

Environmental Impact Assessment (EIA) for the Proposed Construction and Operation of a Sewage Treatment Plant at Osona Village, Otjozondjupa Region

Environmental Scoping Report

Version – Final

APP-003116

27 January 2022

Preferred Land Development Holdings

GCS Project Number: 21-0901

Client Reference: OVD Sewage Plant

Environmental Impact Assessment (EIA) for the Proposed Construction and Operation of a Sewage Treatment Plant at Osona Village, Otjozondjupa Region

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Preferred Land Development Holdings

21-0901

Proponent	Preferred Land Development Holdings PO Box 11709, Windhoek Contact Person: Peter Forster Email address: peterforster500@gmail.com
Environmental Assessment Practitioner	GCS Water Environmental Engineering Namibia (Pty) Ltd PO Box 81808 Windhoek Contact person: Stephanie Strauss Email: stephanies@gcs-na.biz

EXECUTIVE SUMMARY

Introduction

The Osona Village Development (OVD) is located approximately 10 km south of Okahandja, adjacent to the B1 road and north-west of the Osona Military base. The OVD provides a satellite urban area which complements the existing urban area of Okahandja.

The OVD currently operates a temporary self-contained sewage treatment facility at the site with a capacity to serve a maximum of 3780 people. However, the population at Osona is rapidly reaching this upper limit and as such an upgrade to the existing treatment capacity is required.

The existing plant was initially installed as a temporary facility. Due to increased development at the site which has resulted in residential properties being located close to the plant, the existing plant cannot be expanded. Therefore, a permanent plant is required at a new site. It is thus planned to develop a permanent sewage treatment plant at Osona that is more distant from the development. The exact location of the site is still under discussion; however, 4 sites have been proposed to the southwest of the Osona development (within the project boundary). The new plant aims to meet the increased sewage treatment demand. The plans for the upgraded plant will be submitted to MAWLR as part of the application in order to obtain the necessary permits.

Project Description

Preferred Land Development Holdings (PLDH or The Proponent) proposes to construct a Sewage Treatment Plant at the Osona Village Development. Four sites have been proposed which are located in the south west corner of the OVD site boundary, west of the Windhoek-Okahandja highway currently being constructed.

It is estimated that there will be a maximum of 75 000 inhabitants at the OVD once all houses are completed and occupied (Aquarius Consult, 2021). Due to the time constraints in implementing and commissioning the new plant it was proposed to provide a 1 ML/d permanent plant to serve approximately 10 000 people, where after additional 1 ML/d trains will be added as the development grows and more houses become occupied (Aquarius Consult, 2021). In addition, the current temporary plant will be decommissioned and relocated to the permanent site, in order to provide additional capacity during the transition to the new plant and to adhere to the minimum distance requirements to residential buildings.

Nutrient-removal activated sludge (AS) and new-generation trickling filter (TF) technology currently constitute the two most widely employed advanced biological treatment technologies in Namibia (Aquarius Consult, 2021) and is the technology under consideration for the proposed plant.

Public Consultation

Communication with I&APs about the proposed development was facilitated in English through the following means and in this order:

- A Background Information Document (BID) containing descriptive information about the proposed activities was compiled (**Appendix D**) and sent out to all identified and registered I&APs per email dated 20 October 2021;
- Notices were placed in *The Sun, Republikein and Algemeine Zeitung* newspapers dated 20 and 27 October 2021, briefly explaining the activity and its locality, inviting members of the public to register as I&APs (**Appendix E**);
- A site notice was fixed at the proposed site as well as at the Osona Village Customer Care Center and Woerman Brock Express Shop at Osona (**Appendix F**).

The scoping report was made available to all I&APs for public review from **9 December 2021 until 20 December 2021.** I&APs had until **20 December 2021** to submit their comments on the project. The comments received during the comment period are presented in the Issues and Response Trail (**Appendix I**).The comment period will remain open until the final scoping report is submitted to MEFT.

Conclusions and Recommendations

The key potential biophysical impacts related to the pre-operational, construction, operational and maintenance, and decommissioning phases of the proposed project were identified and assessed. Suitable mitigation measures (where required and possible) were recommended, and the impacts can be summarised as follows:

- **Impacts on biodiversity loss (during pre-operational phase and construction):** The preparation of the site for the proposed project involves clearing of certain areas on site. This may impact the existing biodiversity in the area. The subject sites do accommodate some vegetation and possibly some fauna. During site preparation it should be ensured that only the areas applicable to the project site are cleared. The layout of the proposed plant should incorporate existing protected trees which may not be removed without a valid permit from the local department of Forestry. However, the impact can be adequately addressed by the recommendations given under subchapter 7.2.1, and management actions given in the EMP (Chapter 3).
- **Impacts on soil, surface and groundwater (during construction and operational phases):** Improper handling, storage and disposal of hydrocarbon products and hazardous materials at the site may lead to soil and groundwater contamination, in case of spills and leakages during construction. Surface and groundwater impacts may further be encountered during the operation phase, especially if development takes place within the rainy season. The operational activities on site should be conducted in a manner to avoid the contamination of surface and groundwater. The impact can be adequately addressed by the recommendations given under subchapters 7.3.1, 7.4.1 and management actions given in the EMP (Chapter 3).
- **Impacts of soil erosion (during construction phase):** Soil erosion is likely to occur on site given the characteristics of the site. The impact can be adequately addressed by the recommendations given under subchapters 7.3.2 and management actions given in the EMP (Chapter 3).
- **Impacts on archeological and heritage resources (during construction phase):** The proposed activity is not taking place in an area that has significant archaeological or heritage resources. However, should these be encountered during the construction activities, mitigation measures need to be in place to ensure that these resources are not harmed. The impact can be adequately addressed by the recommendations given under subchapter 7.3.3 and management actions given in the EMP (Chapter 3).
- **Impacts on health and safety (during construction and operation phase):** Construction and operation activities may cause health and safety risks to people operating on the site. The impact can be adequately addressed by the recommendations given under subchapter 7.3.4, 7.4.4 and management actions given in the EMP (Chapter 3).

- **Impacts on dust and noise (during construction phase):** Construction activities may increase dust and noise generated around the site area. The impact can be adequately addressed by the recommendations given under subchapter 7.3.5, 7.3.5, and management actions given in the EMP (Chapter 3).
- **Impacts on waste (during construction and operation phase):** Improper disposal of waste materials at the site may lead to pollution of the site and resultant environmental degradation. Particularly the sludge proposed from the plant should be disposed appropriately. The impact can be adequately addressed by the recommendations given under subchapters 7.3.7, 7.4.3 and management actions given in the EMP (Chapter 3).
- **Impact of odour (during operation):** The operational activities may result in associated odour. Odour produced from the WWTP will impact people living near and working at the plant. The impact can be adequately addressed by the recommendations given under subchapters 7.4.2, and management actions given in the EMP (Chapter 3).
- **Impact of Hazardous Substance Handling and Storage (during operation):** Hazardous substances to be used on site such as chlorine gas must be used and stored in accordance with the relevant health and safety standards. The impact can be adequately addressed by the recommendations given under subchapters 7.4.5, and management actions given in the EMP (Chapter 3).

Based on the information provided in this report, GCS is confident the identified risks associated with the proposed development can be reduced to acceptable levels, should the measures recommended in the EMP be implemented and monitored effectively. It is therefore recommended that the project receive Environmental Clearance, provided that the EMP be implemented.

CONTENTS PAGE

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

1 INTRODUCTION

Preferred Land Development Holdings (PLDH or The Proponent) proposes to construct a Sewage Treatment Plant at the Osona Village Development. The approximate location of the proposed site is depicted in **Figure 1-1** below.

1.1 The Need for an Environmental Assessment (EA)

Under the 2012 Environmental Impact Assessment (EIA) Regulations of the Environmental Management Act (EMA) No. 7 of 2007, the proposed development is a listed activity that may not be undertaken without an Environmental Clearance Certificate (ECC). This activity is listed under the following relevant sections:

- ***WASTE MANAGEMENT, TREATMENT, HANDLING AND DISPOSAL ACTIVITIES***
    - *Activity 2.1 The construction of facilities for waste sites, treatment of waste and disposal of waste.*
    - *Activity 2.2 Any activity entailing a scheduled process referred to in the Atmospheric Pollution Prevention Ordinance, 1976.*
    - *Activity 2.3 The import, processing, use and recycling, temporary storage, transit or export of waste.*
- ***WATER RESOURCE DEVELOPMENTS***
    - *Activity 8.6 Construction of industrial and domestic wastewater treatment plants and related pipeline systems.*
- ***HAZARDOUS SUBSTANCE TREATMENT, HANDLING AND STORAGE***
    - *Activity 9.1 The manufacturing, storage, handling or processing of a hazardous substance defined in the Hazardous Substances Ordinance, 1974.*
    - *Activity 9.2 Any process or activity which requires a permit, license or other form of authorisation, or the modification of or changes to existing facilities for any process or activity which requires an amendment of an existing permit, license or authorisation or which requires a new permit, license or authorisation in terms of a law governing the generation or release of emissions, pollution, effluent or waste.*
- ***INFRASTRUCTURE***
    - *Activity 10.1 (a) The construction of oil, water, gas and petrochemical and other bulk supply pipelines.*

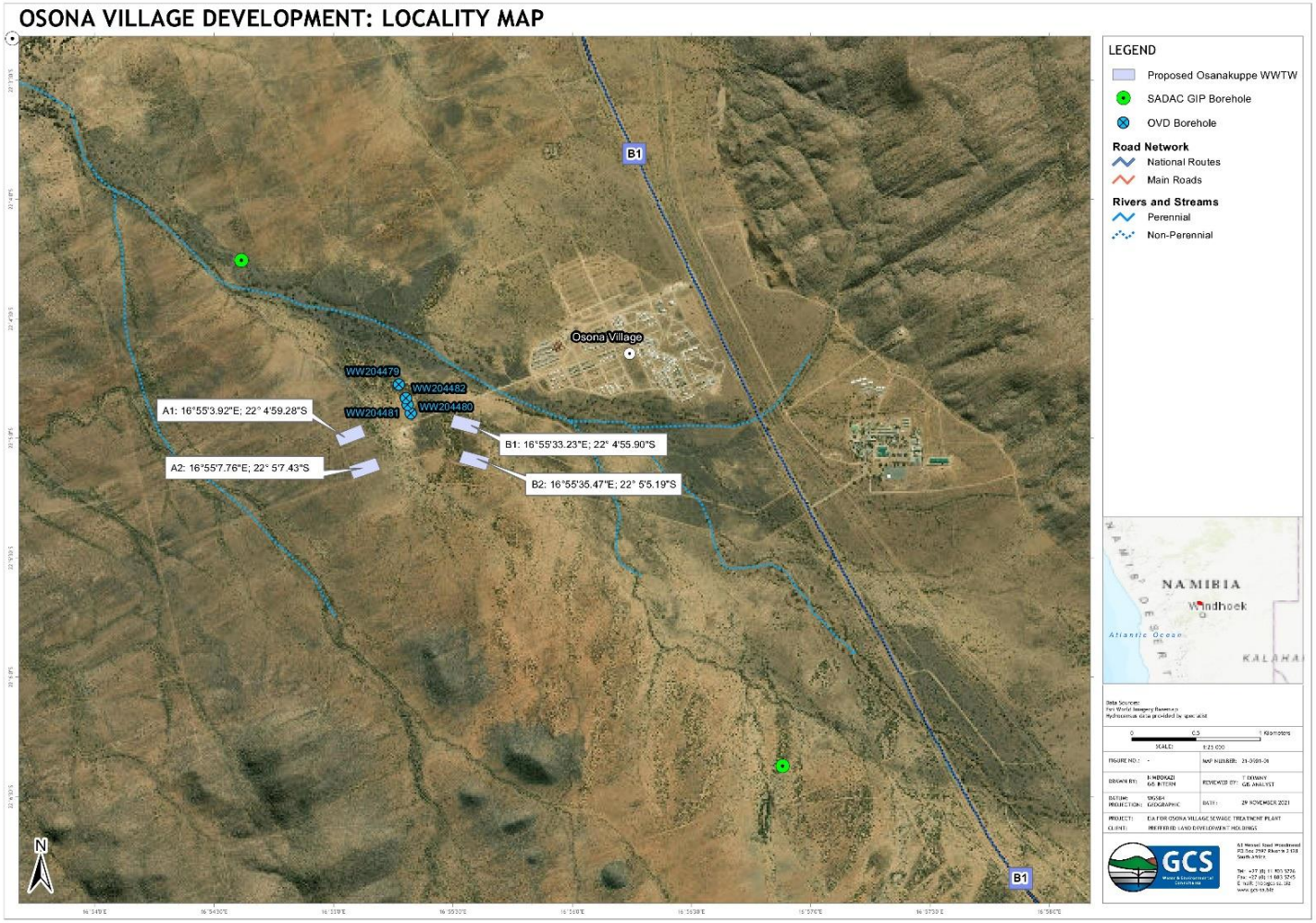

Figure 1-1: Approximate location of proposed sites.

In order to fulfil the requirements of the EMA and its 2012 EIA Regulations, PLDH appointed GCS Water and Environmental Engineering Namibia (Pty) Ltd (*GCS* hereafter), an independent Environmental Consultant to conduct an Environmental Assessment (EA) inclusive of public consultation for the proposed construction and operation of a sewage treatment plant at the Osona Village Development. The required documents will be submitted as part of an application for an ECC in terms of the EMA and its EIA Regulations. The findings of the EA process are incorporated into an Environmental Scoping Report (this report) and together with the draft Environmental Management Plan (EMP) will be submitted as part of an application for an ECC to the Environmental Commissioner at the Department of Environmental Affairs (DEA), Ministry of Environment, Forestry and Tourism (MEFT).

Stephanie Strauss, a qualified Environmental Assessment Practitioner (EAP) conducted this EA process under the supervision of Gerda Bothma, a qualified and experienced Senior Environmental Scientist. The team was assisted by Victoria Shikwaya, a Junior Environmental Scientist. The CV's of the consultants are attached as **Appendix A** at the end of this report.

1.2 Need and Desirability of the Project

The Osona Village Development (OVD) is located approximately 10 km south of Okahandja, adjacent to the B1 road and north-west of the Osona Military base. The OVD provides a satellite urban area which complements the existing urban area of Okahandja.

The OVD currently operates a temporary self-contained sewage treatment facility at the site with a capacity to serve a maximum of 3780 people. However, the population at Osona is rapidly reaching this upper limit and as such an upgrade to the existing treatment capacity is required.

The current Wastewater Treatment Plant (WWTP) receives effluent from the pump lifting station to allow for the primary treatment of the waste stream. The effluent is treated by fixed film activated sludge with nutrient removal. Sludge is removed off site. The final effluent is re-used as irrigation water for lucerne/grass. An application for a permit and effluent discharge licence has been submitted to the Ministry of Agriculture, Water and Land Reform (MAWLR) for the existing temporary plant.

The existing plant was initially installed as a temporary facility. Due to increased development at the site which has resulted in residential properties being located close to the plant, the existing plant cannot be expanded. Therefore, a permanent plant is required at a new site. It is thus planned to develop a permanent sewage treatment plant at Osona that is more distant from the development. The exact location of the site is still under discussion; however, 4 sites have been proposed to the southwest of the Osona development (within the project boundary). The new plant aims to meet the increased sewage treatment demand. The plans for the upgraded plant will be submitted to MAWLR as part of the application in order to obtain the necessary permits.

1.3 Scope of Work

This scoping study was carried out in accordance with the Environmental Management Act (EMA) (7 of 2007) and its 2012 EIA Regulations (GG No. 4878 GN No. 30). After submitting an application for ECC to the DEA, the first stage in the EA process is to submit a scoping report. This report provides the following:

Description	Section of the Report
The need and desirability of the proposed project	Subchapter 1.2
Project description and the need for it	Chapter 2
Alternatives considered for the proposed project in terms of no-go option, site location, hydrogeological impacts and relevant technology.	Chapter 3
The relevant laws and guidelines pertaining to the proposed project	Chapter 4
Baseline environment in which the proposed activity will be undertaken	Chapter 5
The public consultation process followed (as described in Regulation 7 of the EMA Act) whereby interested and affected parties (I&APs) and relevant authorities are identified, informed of the proposed activity and provided with a reasonable opportunity to give their concerns and opinions on the project	Chapter 6
The identification of potential impacts, impacts description, assessment, mitigation measures and recommendations	Chapter 7
Recommendations and Conclusions to the report	Chapter 8

The next chapter will be focusing on the description of the proposed project and its associated activities.

2 PROJECT DESCRIPTION

The Proponent proposes to construct and operate a Sewage Treatment Plant at the Osona Village Development.

2.1 Description of Activity

2.1.1 Site Location

Four sites have been proposed which are located in the south west corner of the OVD site boundary, west of the Windhoek-Okahandja highway currently being constructed. Please refer to **Figure 1-1** for the locality map and **Table 2-1** for the coordinates of the proposed sites.

Table 2-1: Site coordinates

Site A1	16°55'3.92"E; 22° 4'59.28"S
Site A2	16°55'7.76"E; 22° 5'7.43"S
Site B1	16°55'33.23"E; 22° 4'55.90"S
Site B2	16°55'35.47"E; 22° 5'5.19"S

2.1.2 The proposed Osona WWTP

It is estimated that there will be a maximum of 75 000 inhabitants at the OVD once all houses are completed and occupied (Aquarius Consult, 2021). Due to the time constraints in implementing and commissioning the new plant it was proposed to provide a 1 ML/d permanent plant to serve approximately 10 000 people, where after additional 1 ML/d trains will be added as the development grows and more houses become occupied (Aquarius Consult, 2021). In addition, the current temporary plant will be relocated to the permanent site, in order to provide additional capacity during the transition to the new plant and to adhere to the minimum distance requirements to residential buildings.

Nutrient-removal activated sludge (AS) and new-generation trickling filter (TF) technology currently constitute the two most widely employed advanced biological treatment technologies in Namibia (Aquarius Consult, 2021).

Whereas AS technology relies on biomass grown freely submerged in a reactor, new-generation TF technology relies on artificial media that serves as a host for the biomass to attach and grow on (Aquarius Consult, 2021). However, in a sewage treatment plant these technologies are employed in a very similar manner, typically as schematically depicted in

Figure 2-1 below.

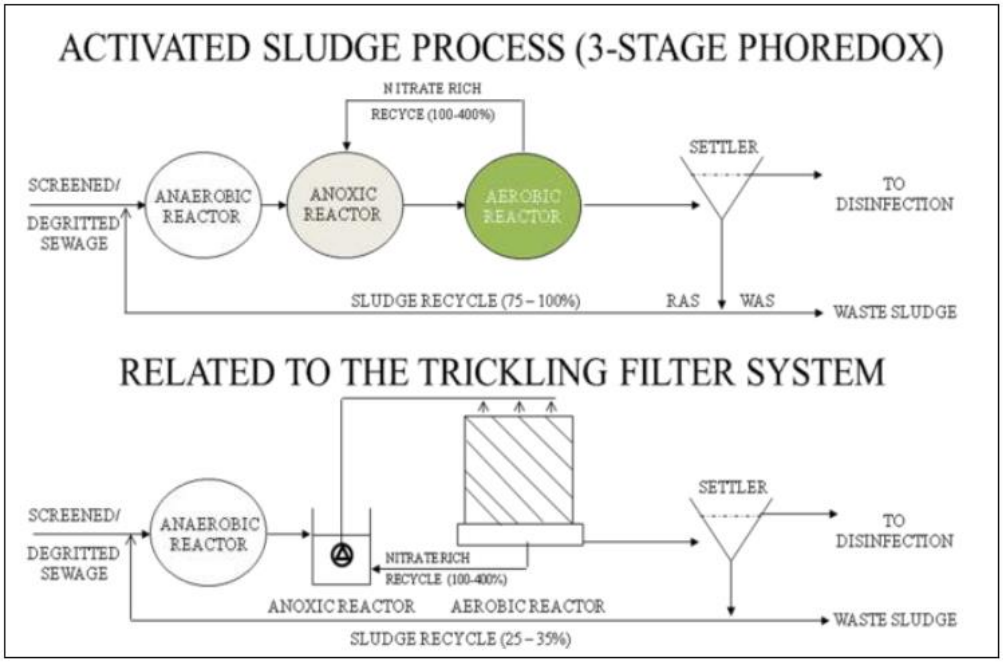

Figure 2-1: Comparison of Activated Sludge Process and trickling Filter System (Aquarius Consult, 2021).

The Phase 1 OVD WWTP is expected to have a sewage discharge of 1000 m^3/d to serve a population of approximately 10 000 people.

The plant will be designed to ensure that the final effluent produced will conform to the Namibia General Standard as per the Namibia regulations for effluent (as per the Water Act No 54 of 1956).

For the specific conditions encountered at Osona, trickling filter technology was therefore considered as most appropriate and most reliable technology to be employed. The Advanced biological treatment utilizing Trickling Filter (TF) technology will incorporate the following unit treatment processes:

- Inlet works with screening and grit removal in a drum screen;
- Flow balancing in a buffer tank, which also serves as emergency overflow tank;
- Suspended solids removal in a primary clarifier;
- Aerobic, biological carbonaceous material removal and nitrification in bio filters (trickling filters);
- Biomass removal in a secondary clarifier;
- Disinfection using chlorine gas;

- Sludge digestion in a humus tank with desludging to and sludge drying in on-site drying beds.

The figure below depicts the process schematic for the plant and unit processes.

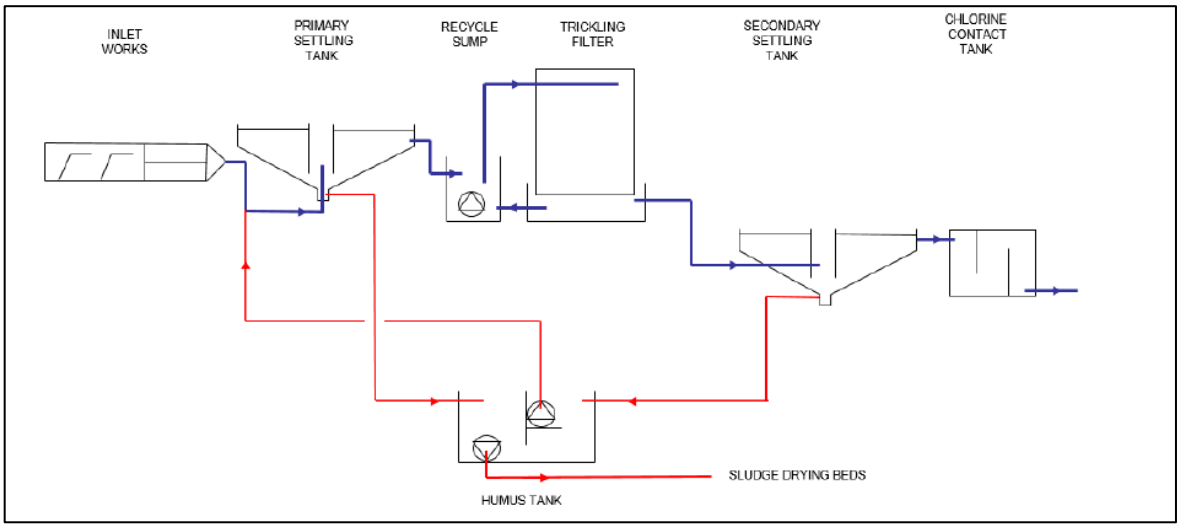

Figure 2-2: Process Schematic for Osona WWT

The detailed conceptual design and unit processes of the proposed WWTP is presented in **Appendix J** of this report.

2.1.3 Municipal Service Delivery

2.1.3.1 Water

Bulk water is supplied to the OVD by NamWater.

2.1.3.2 Electricity

Bulk electricity supply to the OVD is supplied by NamPower. The proposed plant is expected to have a total continuous power consumption of not more than 35kW (based on 1000m^3/d train serving approximately 10 00 people). The exact power requirements will however only be finalised once the detailed design is finalised.

2.1.4 Site Access

All four proposed sites are currently accessible via existing gravel road/tracks.

3 PROJECT ALTERNATIVES CONSIDERED

Alternatives are defined as: "different means of meeting the general purpose and requirements of the activity" (Environmental Management Act (2007) of Namibia [and its regulations (2012)]. This chapter will highlight the different ways in which the project can be undertaken and to identify the alternative that will be the most practical but least damaging to the environment.

Various alternatives have been identified in terms of the proposed development and its related activities. The most significant alternatives considered are; no-go option, site location, hydrogeological impacts and wastewater treatment technology.

The above-mentioned alternatives considered for the proposed activity are discussed in the following subchapters.

3.1 No-Go Option

The "No-Go" alternative is the option of not proceeding with the activity, which typically implies a continuation of the status quo. Should the proposed WWTP construction and operation not commence, none of the potential impacts (positive and negative) identified would occur. Furthermore, the existing sewage treatment facility would reach and/or exceed its capacity, which could lead to negative consequences resulting from this.

3.2 Site location

Four sites have been proposed for the locality of the proposed sewage treatment plant at the OVD as depicted in **Figure 3-1** below. The sites are all proposed to be approximately 20 000m^2 in size.

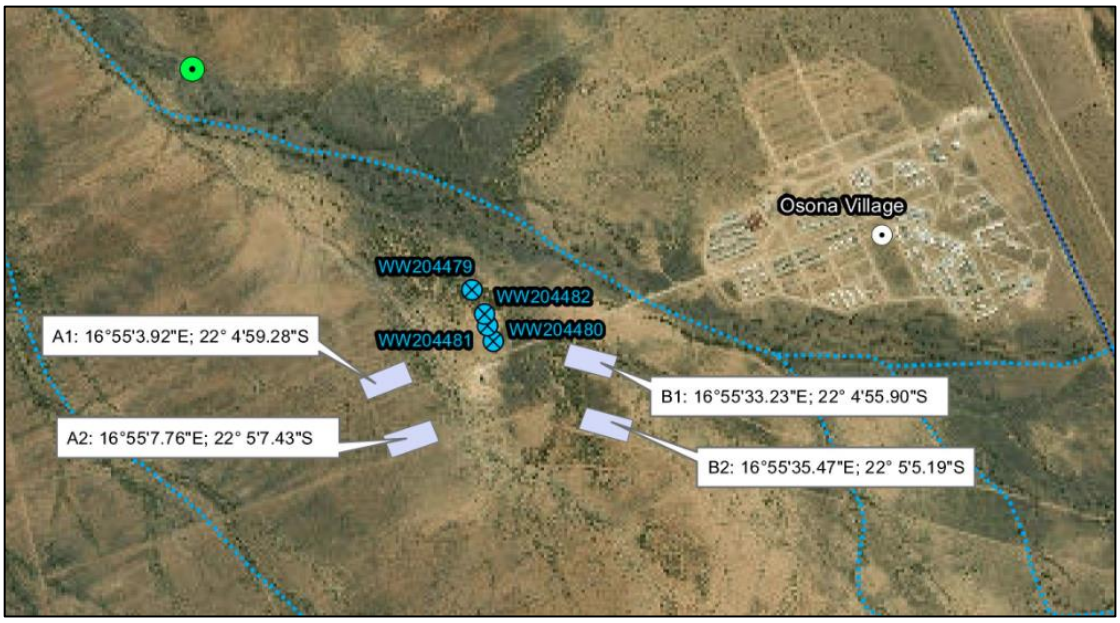

Figure 3-1: Proposed sites for sewage treatment plant.

A comparison of the alternative sites are presented in **Table 3-1** below.

Table 3-1: Alternatives considered in terms of site selection

Site	Location	Type of area	Environment
A1	Adjacent to the existing NamPower servitude	Undisturbed	Vegetated
A2	Adjacent to privately owned farm	Undisturbed	Vegetated
B1	250 meter from main road servitude and 448 meter from the nearest house	Within existing Roads Authority borrow pit	No vegetation present
B2	Adjacent to privately owned farm and 250 meter from the main road servitude	Within existing Roads Authority borrow pit	No vegetation present

In terms of location B2 is the preferred site as it is located furthest from any houses and has already been disturbed.

3.3 WWTP Technology

Nutrient-removal activated sludge (AS) and new-generation trickling filter (TF) technology currently constitute the two most widely employed advanced biological treatment technologies in Namibia and are the technologies under consideration for the OVD sewage treatment plant. The table below outlines a comparison of the two technologies under consideration as provided by Aquarius Consult (2021).

Parameter	Discussion
Capital cost	Capital costs for both systems are very similar
Operational cost	Operational costs of TF systems are substantially lower
Power consumption	A TF plant uses 35 to 45% less power than an AS plant of the same capacity. Not only does this result in less power used, but standby power required in the form of a standby generator will be lower and will result in additional savings.
Supervision	No night-shift supervision is required when employing TF technology, because these system are simple and robust, with stand-by pumps to immediately take over the function of a duty pump that may fail/trip. Therefore, TF systems can be left without supervision during the night, which cannot be done when operating an AS plant. AS plant needs 24 h supervision and control.

Parameter	Discussion
Maintenance	TF system low sophistication, easy maintenance. The most sophisticated equipment employed is pumps and electric motors (with gearbox), all of which are simple and easy to maintain. Also, for each set of pumps a duty and standby unit will be provided to ensure increased reliability.
Sludge production	Low sludge production. The volume of aerobic sludge produced in the TF is only 30% of that produced in an AS plant and therefore substantially less, requiring substantially less thickening and dewatering equipment compared to an AS plant.
Flexibility and control	Flexibility and control is limited in comparison to the AS processes (United States Environmental Protection Agency, 2000).
Environmental Impacts	The TF technology has been found to have reduced environmental impacts due to lower energy requirements and lower sludge production (Postacchini, Lamichhane, Furukawa, *et al.*, 2016).

3.4 Geohydrological Impact

The geohydrological assessment found that there are 4 boreholes situated downstream (ranging from 300 to 500 m from the WWTW options) of the proposed WWTW development options. The sites are situated on an unconfined aquifer system associated with quaternary deposits which likely is conformably underlain by weathered sediments of the Damara Granite Group.

The unconfined aquifer system and the OVD boreholes situated downstream of the site, are the only receptors of pollution in the study area. Any pollution from the establishment and operation phases of the WWTW (i.e., chemical spills, treated effluent discharge or sewage leakages and spills etc.) will likely percolate via the vadose zone into the groundwater system.

There are several paleo drainage / non-perennial streams associated with the project area, and these are situated downstream north and east of the proposed WWTW development area. The non-perennial streams flow into the Swakop River situated 4.7 km northwest of the site. The non-perennial river system downstream of the proposed sites is ephemeral.

A USA EPA DRASTIC (depth to groundwater, aquifer recharge, aquifer media, soil type, topography, impact on vadose zone and aquifer conductivity) aquifer vulnerability index was conducted for the study area (**Figure 3-2**). The DRASTIC index for the study area suggests that the relative aquifer vulnerability for WWT options A1, A2 and B2 is very low, and that of B1 is low. The impact on the groundwater units is therefore predicted to be low for all the WWTW options.

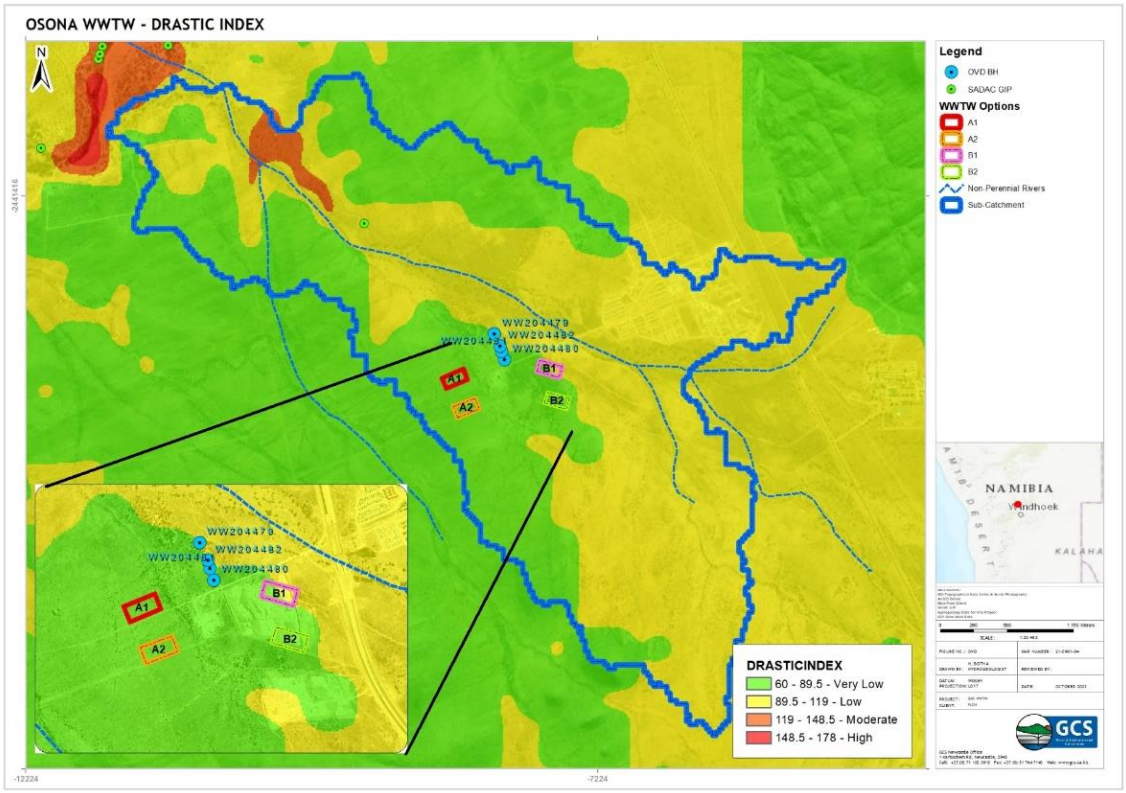

Figure 3-2: DRASTIC Aquifer Vulnerability Map

Based on the findings of this study, no protection buffer zones are proposed. From a geohydrological perspective, all sites are feasible. However, it is advised that WWTW option A2 be considered as it is located furthest away from receptors in the study area.

3.5 Conclusions on the Considered Alternatives

The alternatives considered for the project are summarized as follow:

- **No-go vs. continuation of the proposed project**: The no-go alternative is not considered to be the preferred option. Should the proposed WWTP construction and operation not commence, none of the potential impacts (positive and negative) identified would occur. Furthermore, the existing sewage treatment facility would reach and/or exceed its capacity, which could lead to negative consequences resulting from this.
- **Site selection**: All 4 sites are of the same size. Two of the sites are located within undisturbed, highly vegetated areas. Whereas the other two site areas are located within an existing Roads Authority borrow pit. The preferred alternative would be to construct the proposed sewage plant furthest away from the residential development as well as within an already disturbed area. However the adjacent farm accommodates livestock with a water drinking post located on the boundary fence. Based on the above the preferred alternative would be site B2.
- **Proposed WWTP technology**: For the specific conditions encountered at Osona, it was recommended by Aquarius Consult that the TF technology was considered as most appropriate and most reliable technology to be employed. Furthermore the TF technology has been found to have reduced environmental impacts due to lower energy requirements and lower sludge production.
- **Hydrogeological Impact**: The DRASTIC index for the study area suggests that the relative aquifer vulnerability for WWT options A1, A2 and B2 is very low, and that of B1 is low. The impact on the groundwater units is therefore predicted to be low for all the WWTW options. From a geohydrological perspective, all sites are feasible. However, it is advised that WWTW option A2 be considered as it is located furthest away from receptors in the study area.

4 LEGAL FRAMEWORK

A review of applicable and relevant Namibian legislation, policies and guidelines to the proposed development are given in this chapter. This review serves to inform the Proponent (PLDH), Interested and Affected Parties and the decision makers at the DEA of the requirements and expectations, as laid out in terms of these instruments, to be fulfilled in order to undertake the proposed activities.

4.1 The Environmental Management Act No. 7 of 2007

This scoping assessment was carried out according to the Environmental Management Act (EMA) and its Environmental Impact Assessment (EIA) Regulations (GG No. 4878 GN No. 30). The EMA has stipulated requirements to complete the required documentation in order to obtain an Environmental Clearance Certificate (ECC) for permission to undertake certain listed activities.

4.2 The Water Resources Management Act (No. 11 of 2013)

The Act provides for the management, development, protection, conservation and use of water resources, and established various regulatory and advisory institutions. Relevant principles of the Act include, inter alia:

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

Furthermore, any watercourse on/or in close proximity to the site and associated ecosystems should be protected in alignment with the principles above. Impacts on water resources should be avoided. Mitigations measures must be included in the EMP to reduce impacts on watercourses that cannot be avoided. If required, the relevant permits must be applied for.

The full list of all applicable legislation identified and conducted during the EA process are presented in **Table 4-1** below.

Table 4-1: Applicable and relevant Namibian and international legislations, policies and guidelines conducted during the EA process

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
Environmental Management Act (EMA) No. 7 of 2007	Requires that projects with significant environmental impacts are subject to an environmental assessment process (Section 27). Details principles which are to guide all EAs.	The EMA and its regulations should inform and guide this EA process.
Environmental Impact Assessment (EIA) Regulations GN 28-30 (GG 4878)	Details requirements for public consultation within a given environmental assessment process (GN 30 S21). Details the requirements for what should be included in a Scoping Report (GN 30 S8) and an Assessment Report (GN 30 S15).	
The Constitution of Namibia Act No. 1 of 1990	According to Legal Assistance Centre (LAC), there is no clear right to health in the Namibian Constitution. But under the Article 95 of the Namibian Constitution that deals with Principles of State Policy, the Namibian Constitution states, "the state shall enact legislation to ensure consistent planning to raise and maintain an acceptable standard of living for the country's people" and to improve public health.	The Proponent should ensure compliance with the conditions set in the Act.
Water Act No. 54 of 1956	The Water Resources Management Act 11 of 2013 is presently without regulations; therefore, the Water Act No 54 of 1956 is still in force:	The protection of ground and surface water resources should be a priority during the proposed activities.

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
	• Prohibits the pollution of water and implements the principle that a person disposing of effluent or waste has a duly 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)).	
Water Resources Management Act No.11 of 2013	The act provides for the management, protection, development, use and conservation of water resources; and provides for the regulation and monitoring of water services and to provide for incidental matters. The objects of this Act are to: Ensure that the water resources of Namibia are managed, developed, used, conserved and protected in a manner consistent with, or conducive to, the fundamental principles set out in Section 66 - protection of aquifers, Subsection 1 (d) (iii) provide for preventing the contamination of the aquifer and water pollution control (Section 68).	
Soil Conservation Act No. 76 of 1969	The Act makes provision for the prevention and control of soil erosion and the protection, improvement and conservation of soil, vegetation and water supply sources and resources, through directives declared by the Minister.	Duty of care must be applied to soil conservation and management measures must be included in the EMP.

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
Nature Conservation Ordinance No.4 of 1975	To consolidate and amend the laws relating to the conservation of nature; the establishment of game parks and nature reserves; the control of problem animals; and to provide for matters incidental thereto.	The Proponent should ensure that their activities do not in any way compromise the wildlife in the area of operations and the ordinance requirements are adhered to.
Forestry Act No. 12 of 2001	The Act provides for the management and use of forests and related products / resources. It offers protection to any living tree, bush or shrub growing within 100 metres of a river, stream or watercourse on land that is not a surveyed erven of a local authority area. In such instances, a licence would be required to cut and remove any such vegetation. These provisions are only guidelines.	Should there be a need to remove vegetation on site, a permit to remove protected species will need to be obtained from the Forestry office in Okahandja.
Atmospheric Pollution Prevention Ordinance No. 11 of 1976	This ordinance provides for the prevention of air pollution.	Measures should be instituted to ensure that dust emanating from construction activities is kept at acceptable levels.
Public Health Act No. 36 of 1919	Section 119 states that “no person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health.”	The Proponent and all its employees / contractors should ensure compliance with the provisions of these legal instruments.
Health and Safety Regulations GN 156/1997 (GG 1617)	Details various requirements regarding health and safety of labourers.	

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
Labour Act No. 6 of 1992	Ministry of Labour (MOL) is aimed at ensuring harmonious labour relations through promoting social justice, occupational health and safety and enhanced labour market services for the benefit of all Namibians. This ministry insures effective implementation of the Labour Act no. 6 of 1992.	The Proponent should ensure that the proposed activity does not compromise the safety and welfare of workers.
Local Authorities Act No. 23 of 1992	The Local Authorities Act prescribes the manner in which a town or municipality should be managed by the Town or Municipal Council.	The development must comply with provisions of the Local Authorities Act.
National Heritage Act No. 27 of 2004	The Act is aimed at protecting, conserving and registering places and objects of heritage significance.	All protected heritage resources (e.g., human remains etc.) discovered, need to be reported immediately to the National Heritage Council (NHC) and require a permit from the NHC before they may be relocated.
Roads Ordinance 17 of 1972	• Section 3.1 deals with width of proclaimed roads and road reserve boundaries • Section 27.1 is concerned with the control of traffic on urban trunk and main roads • Section 36.1 regulates rails, tracks, bridges, wires, cables, subways or culverts across or under proclaimed roads Section 37.1 deals with Infringements and obstructions on and interference with proclaimed roads.	Adhere to all applicable provisions of the Roads Ordinance.

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
Nature Conservation Ordinance no. 4 of 1975	• Chapter 6 provides for legislation regarding the protection of indigenous plants	Indigenous and protected plants must be managed within the legal confines.

The environmental baseline (features) of the project area and the surrounding areas are presented and discussed in the following chapter.

5 ENVIRONMENTAL AND SOCIAL BASELINE

The proposed activities will be undertaken in an environment with specific conditions. Prior to any development in an area and as part of an environmental assessment process, it is vital to firstly understand the pre-project/development conditions. This is also important to form a baseline understanding of the area and make reasonable conclusions on certain issues that may arise years later during or after the project's operations. The environmental and social baseline for the project area is presented under the subchapters below.

5.1 Biophysical Environment

5.1.1 Climate

Higher altitudes make the central highlands in the interior of Namibia cooler than would otherwise be expected, thus the average high temperature for the Okahandja area ranges between 22°C to 32°C while the average low temperature range from 4°C to 18°C. The average annual rainfall for the Okahandja area is between 300 mm and 400 mm and the median annual rainfall is between 300 mm to 350 mm.

5.1.2 Topography, Geology and Hydrogeology

Okahandja falls within the Damara Supergroup and Gariep Complex characterised by the Khomas group rock type (Mendelsohn, Jarvis, Roberts, *et al.*, 2002). The soil in the area is dominated by schists. The subject area falls within the Central Namib Hydrogeological region. Okahandja falls within the Swakop catchment, together with other towns such as Windhoek, Karibib, Usakos, Otjimbingwe, and Swakopmund.

Elevations in the area are 1325 metres above mean sea level (mamsl) from the position of the proposed WWTW to about 1400 mamsl towards the mountainous area northeast of the project area (GCS Water and Environment, 2021). There are several paleo drainage / non-perennial streams associated with the project area, and these are situated downstream north and east of the proposed WWTW development area (GCS Water and Environment, 2021). The non-perennial streams flow into the Swakop River situated 4.7 km northwest of the site.

According to the 1: 250 000 geological series for Namibia, the surface geology of the project area is characterized by Swakop River alluvial deposits, successions of quaternary sand deposits (mainly carbonates or Otavo lithologies) and mica schist, meta greywacke and migmatite, of the Damara Granite Group. Damaran granite rocks present in this unit include schists of the basal Nosib Group; marbles of the Ugab and Kudis Subgroups; schist, phyllite and amphibolite of the Chuos Formation; and marble, schists and amphibolites of the Karibib and Kuiseb Formations, including the Matchless Amphibolite Belt (Earthwise, 2021).

According to the Ministry of Agriculture, Water and Rural Development (2011) the soils that characterize the greater project area is classified as Leptosoils (very shallow soil over a hard rock or a deeper soil that is gravelly and/or stony), Acrisoils (clay-rich subsoil), Ferrasoils (red and yellow weathered soils whose colours result from an accumulation of metal oxides, particularly iron and aluminium) and Vertisoils (high content of expansive clay minerals) as depicted in **Figure 5-1** below.

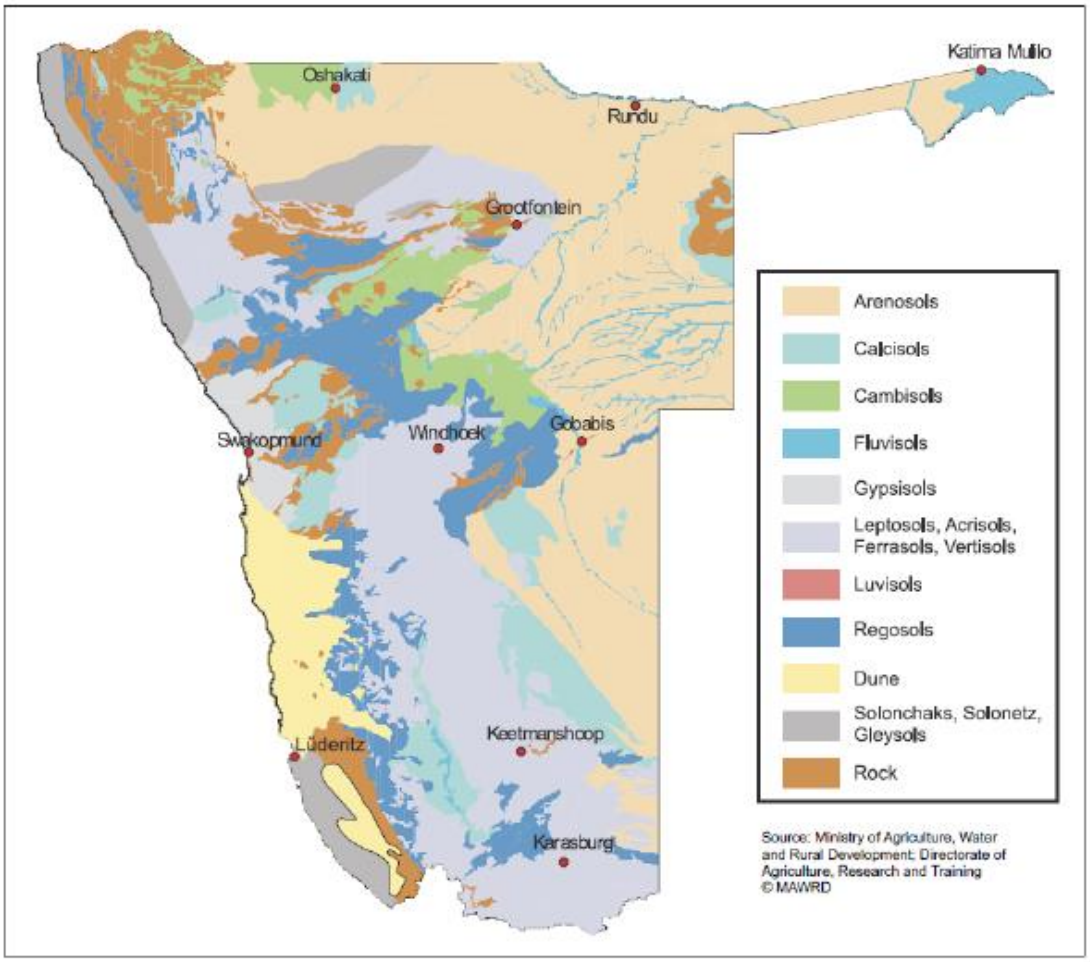

Figure 5-1: Soils of Namibia (Ministry of Agriculture, Water and Rural Development, 2011)

The study area falls within the Central Namib – Windhoek hydrogeological basin indicated as pale blue in **Figure 5-2** below. The Central Namib -Windhoek region extends from Windhoek in the east to the Atlantic Ocean in the west (near Walvis Bay). The Ugab and Kuiseb rivers form the northern and southern boundaries of this hydrogeological basin.

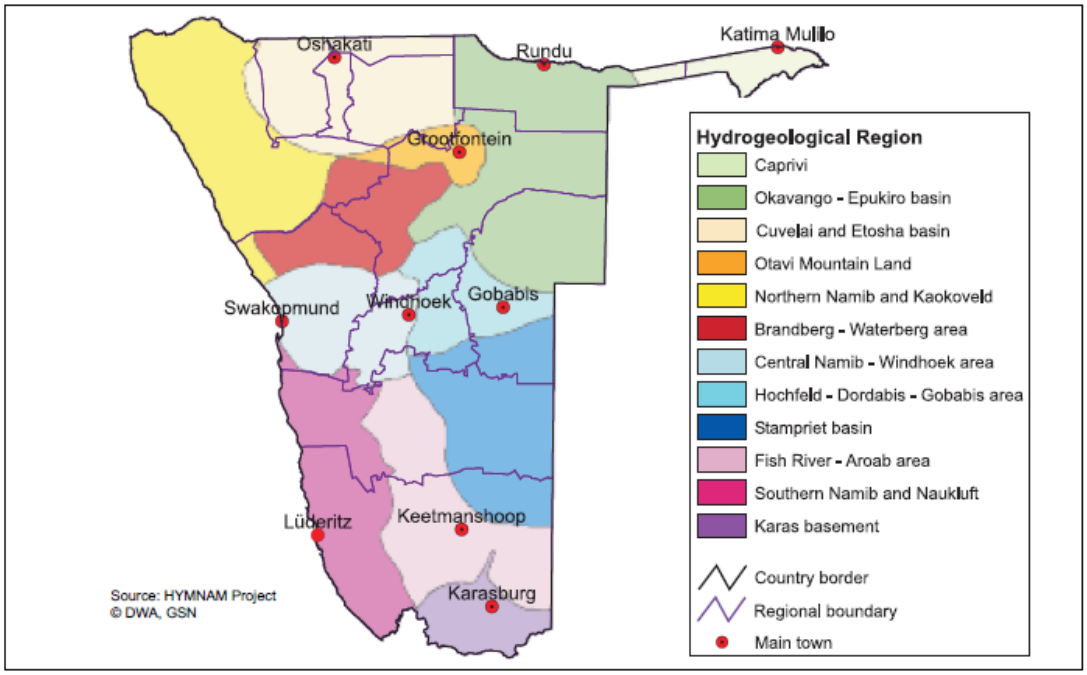

Figure 5-2: Groundwater basins and hydrogeological regions in Namibia (Ministry of Agriculture Water and Rural Development, 2011)

The proposed development (all 4 proposed sites) will be situated on quaternary sediments (successions of quaternary sand deposits) which likely is conformably underlain by weathered sediments of the Damara Granite Group (GCS Water and Environment, 2021). The aquifer is unconfined and hence any poor-quality seepage that makes its way through the sandy sediments may impact the groundwater quality. Available data suggest that the groundwater table is in the order of 22 mbgl. However, there may be perched water levels shortly after rainfall events if there are consolidated clay lenses within the sandy formations. Infiltration water will predominantly percolate vertically into the groundwater table, while the water table (saturated zone) mimics the general topography.

Based on the desktop hydrogeological assessment undertaken, the relative aquifer vulnerability for the proposed sites A1, A2 and B2 are very low, and that of B1 is low. The impact on the groundwater units is therefore predicted to be low for all the proposed site options (GCS Water and Environment, 2021).

5.1.3 Fauna and Flora

Osona Village falls within the Tree-and-Shrub Savanna biome, which is the largest of the biomes in the country. It is particularly located in the Acacia Tree-and-Shrub Savanna sub biome, characterised by large open expanses of grasslands dotted with Acacia trees (Mendelsohn, Javis, Roberts, & Robertson, 2002). The vegetation type in this area is known

as Thornbush Shrubland. This vegetation is mostly affected by the summer rainfall, frequent and widespread fires, as well as the grazing pressure from wildlife. Two of the proposed sites (A1 and A2) are covered by vegetation as can be seen in **Figure 5-4** below. Whereas proposed sites B1 and B2 are located at an existing borrow pit and have thus already been disturbed (**Figure 5-4**).

Figure 5-3: Pictures of site A1 and A2

Figure 5-4: Pictures of site B1 and B2

5.1.4 Archaeological and Anthropological Resources

No archaeological and heritage sites are known to be located within the proposed development area.

5.2 Social Environment

5.2.1 Social Demographics

According to Namibia Statistics Agency (2011), the population of Otjozondjupa Region is 143 903 people with the population of the Okahandja Constituency being 24 451 people.

5.2.2 Economy

Wages and salaries are the main source of income in this region (60%), while other income sources include farming (10%), business (10%) etc. (Namibia Statistics Agency, 2011).

5.2.3 Land Use

The Osona village development is largely a residential development complimented by additional land uses such as Business, Institutional, and Public Open Space land uses. Within the surrounding area some properties are found which include small scale farming and chicken farming.

6 PUBLIC CONSULTATION

6.1 Objective:

Public consultation forms an important component of an Environmental Assessment (EA) process. Public consultation provides potential Interested and Affected Parties (I&APs) with an opportunity to comment on and raise any issues relevant to the project for consideration as part of the assessment process. Public consultation has been done in accordance with both the EMA and its EIA Regulations.

The public consultation process assists the Environmental Assessment Practitioner (EAP) in identifying all potential impacts and to what extent further investigations are needed. Public consultation can also aid in the process of identifying possible mitigations measures.

6.2 Approach:

6.2.1 Interested and Affected Parties (I&APs)

GCS identified specific I&APs, who were considered interested in and/or affected by the proposed activities. The I&APs identified include; applicable organs of state (national, regional, and local) and other interested members of the public. These I&APs were contacted directly and registered as I&APs. In addition, notices regarding the project were placed in widely circulated national newspapers for two consecutive weeks inviting members of the public to register as I&APs. The detailed steps regarding the notification of I&APs are presented in **Section 6.2.2.** A summary of the I&APs identified are presented in **Table 6-1**. The complete list of I&APs is provided in **Appendix C.**

Table 6-1: Summary of Pre-Identified IAPs

	Description
List of IAPs	**Ministry of Environment, Forestry and Tourism**
	Ministry of Agriculture, Water and Land Reform
	Okahandja Municipality
	NamWater
	National Heritage Council of Namibia (NHCN)
	National Botanical Research Institute (NBRI)
	Surrounding property owner

6.2.2 Communication with I&APs

Regulation 21 of the EIA Regulations details steps to be taken during a given public consultation process and these have been used in guiding this process.

Communication with I&APs about the proposed development was facilitated in English through the following means and in this order:

- A Background Information Document (BID) containing descriptive information about the proposed activities was compiled (**Appendix D**) and sent out to all identified and registered I&APs per email dated 20 October 2021;
- Notices were placed in *The Sun, Republikein and Algemeine Zeitung* newspapers dated 20 and 27 October 2021, briefly explaining the activity and its locality, inviting members of the public to register as I&APs (**Appendix E**);
- A site notice was fixed at the proposed site as well as at the Osona Village Customer Care Center and Woerman Brock Express Shop at Osona (**Appendix F**).

The scoping report was made available to all I&APs for public review from **9 December until 20 December 2021.** I&APs had until **20 December 2021** to submit their comments on the project. The comments received during the comment period are presented in the Issues and Response Trail (**Appendix I**). The comment period will remain open until the final scoping report is submitted to MEFT.

7 IMPACTS IDENTIFICATION, DESCRIPTION AND ASSESSMENT

7.1 Impact Assessment Methodology

The proposed activities have impacts on certain biophysical and social features. The identified impacts were assessed in terms of probability (likelihood of occurring), scale/extent (spatial scale), magnitude (severity) and duration (temporal scale) as presented in **Table 7-1**, **Table 7-2**, **Table 7-3** and **Table 7-4**. To enable a scientific approach to the determination of the environmental significance, a numerical value is linked to each rating scale. This methodology ensures uniformity and that potential impacts can be addressed in a standard manner so that a wide range of impacts are comparable.

It is assumed that an assessment of the significance of a potential impact is a good indicator of the risk associated with such an impact. The following process will be applied to each potential impact:

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

The recommended mitigation measures prescribed for each of the potential impacts contribute towards the attainment of environmentally sustainable operational conditions of the project for various features of the biophysical and social environment.

The following criteria were applied in this impact assessment:

7.1.1 Extent (spatial scale)

Extent is an indication of the physical and spatial scale of the impact**. Table 7-1** shows rating of impact in terms of extent of spatial scale.

Table 7-1: Extent or spatial impact rating

Low (1)	Low/Medium (2)	Medium (3)	Medium/High (4)	High (5)
Impact is localised within the site boundary: Site only	Impact is beyond the site boundary: Local	Impacts felt within adjacent biophysical and social environments: Regional	Impact widespread far beyond site boundary: Regional	Impact extend National or over international boundaries

7.1.2 Duration

Duration refers to the timeframe over which the impact is expected to occur, measured in relation to the lifetime of the project. **Table 7-2** shows the rating of impact in terms of duration.

Table 7-2: Duration impact rating

Low (1)	Low/Medium (2)	Medium (3)	Medium/High (4)	High (5)
Immediate mitigating measures, immediate progress	Impact is quickly reversible, short term impacts (0-5 years)	Reversible over time; medium term (5-15 years)	Impact is long-term	Long term; beyond closure; permanent; irreplaceable or irretrievable commitment of resources

7.1.3 Intensity, Magnitude / severity

Intensity refers to the degree or magnitude to which the impact alters the functioning of an element of the environment. The magnitude of alteration can either be positive or negative. These were also taken into consideration during the assessment of severity. **Table 7-3** shows the rating of impact in terms of intensity, magnitude or severity.

Table 7-3: Intensity, magnitude or severity impact rating

Type of criteria	Negative				
	H- (10)	M/H- (8)	M- (6)	M/L- (4)	L- (2)
Qualitative	Very high deterioration, high quantity of deaths, injury of illness / total loss of habitat, total alteration of ecological processes, extinction of rare species	Substantial deterioration, death, illness or injury, loss of habitat / diversity or resource, severe alteration or disturbance of important processes	Moderate deterioration, discomfort, partial loss of habitat / biodiversity or resource, moderate alteration	Low deterioration, slight noticeable alteration in habitat and biodiversity. Little loss in species numbers	Minor deterioration, nuisance or irritation, minor change in species / habitat / diversity or resource, no or very little quality deterioration.

7.1.4 Probability of occurrence

Probability describes the likelihood of the impacts occurring. This determination is based on previous experience with similar projects and/or based on professional judgment. See **Table 7-4** for impact rating in terms of probability of occurrence.

Table 7-4: Probability of occurrence impact rating

Low (1)	Medium/Low (2)	Medium (3)	Medium/High (4)	High (5)
Improbable; low likelihood; seldom. No known risk or vulnerability to natural or induced hazards.	Likely to occur from time to time. Low risk or vulnerability to natural or induced hazards	Possible, distinct possibility, frequent. Low to medium risk or vulnerability to natural or induced hazards.	Probable if mitigating measures are not implemented. Medium risk of vulnerability to natural or induced hazards.	Definite (regardless of preventative measures), highly likely, continuous. High risk or vulnerability to natural or induced hazards.

7.1.5 Significance

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

Once the above factors (**Table 7-1, Table 7-2, Table 7-3** and **Table 7-4**) have been ranked for each potential impact, the impact significance of each is assessed using the following formula:

SP = (magnitude + duration + scale) x probability

The maximum value per potential impact is 100 significance points (SP). Potential impacts were rated as high, moderate or low significance, based on the following significance rating scale (**Table 7-5**).

Table 7-5: Significance rating scale

SIGNIFICANCE	*ENVIRONMENTAL SIGNIFICANCE POINTS*	*COLOUR CODE*
High (positive)	>60	H
Medium (positive)	30 to 60	M
Low (positive)	<30	L
Neutral	0	N
Low (negative)	>-30	L
Medium (negative)	-30 to -60	M
High (negative)	>-60	H

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

The impact assessment for the proposed activities is given in subchapter **7.2, 7.3, 7.4** and **7.5**.

7.2 Pre-operational Phase Impact Assessment

The pre-operational phase is mostly concerned with the preparation of the site for the proposed sewage treatment plant. The potential impacts during this phase include biodiversity impacts.

7.2.1 Impact Assessment of Biodiversity Loss

The preparation of the site for the proposed development involves clearing of certain areas on site. This may impact the existing biodiversity in the area. The subject sites do accommodate some vegetation and possibly some fauna. During site preparation it should be ensured that only the areas applicable to the project site area are cleared. The layout of the proposed plant should incorporate existing protected trees which may not be removed without a valid permit from the local department of Forestry. The impact is not expected to be of such a magnitude and/ or significance that it will have irreversible impacts on the biodiversity and endemism of the area and Namibia at large. The assessment of this impact is presented in **Table 7-6.**

Table 7-6: Assessment of the impacts of the proposed activities on biodiversity loss

	Extent	Duration	Intensity	Probability	Significance
Pre-mitigation	L - 1	M - 2	M - 6	M - 3	**L - 27**
Post-mitigation	L - 1	L- 1	M/L- 4	M/L - 2	L - 16

7.2.1.1 Mitigations and recommendation to biodiversity loss

- Vegetation should be cleared only where absolutely necessary and if cleared, numbers of protected, endemic and near endemic species removed should be documented.
- Trees and plants protected under the Forest Act No 12 of 2001 are not to be removed without a valid permit from the local Department of Forestry.

7.3 Construction Phase Impact Assessment

The construction phase is mostly concerned with the impacts on the biophysical and socio-economic environment that is likely to occur during the construction phase of the development. These potential impacts are likely to be temporary in duration but may have longer lasting effects.

7.3.1 Impact Assessment of Surface and Groundwater Impacts

Improper handling, storage and disposal of hydrocarbon products and hazardous materials at the site may lead to soil and groundwater contamination, in case of spills and leakages. Leakages from vehicles and machines during construction may also contribute to soil and groundwater contamination. Furthermore the following activities which may take place during construction will likely contribute to groundwater impacts:

- Site preparation, including placement of contractor laydown areas and storage (i.e., temporary stockpiles, bunded areas etc.) facilities.
- Disturbing vadose zone during soil excavations / infilling activities.
- In-situ placement of new soils, altering existing soil-flow processes (i.e., infilling of wetlands or cut-and-fill areas).
- Soil compaction.
- Soil & surface water contamination and sedimentation from the following activities:
    - Leakages from vehicles and machines, and seepage from building materials/stockpiles.
    - Erosion and sedimentation if excavations are left open due to unforeseen circumstances (i.e., bad weather, heat, construction downtime).

Without any mitigation measures implemented, the impact can be rated as of a "low" significance. The assessment of this impact is presented in **Table 7-7.**

Table 7-7: Assessment of the impacts of the proposed activities on surface and groundwater

	Extent	Duration	Intensity	Probability	Significance
Pre-mitigation	L/M - 2	M - 3	M/L - 4	M - 3	**L- 27**
Post-mitigation	L - 1	L- 1	L- 2	M/L - 1	L - 4

7.3.1.1 Mitigations and recommendation to surface and groundwater

- Careful storage and handling of hydrocarbons on site is essential.
- Workers responsible for the storage and handling of hydrocarbons should be suitably trained to do so and trained on spill prevention (e.g., the use of drip trays) and the handling of potential spills should they occur to be able to ensure implementation on site.
- Potential contaminants such as wastewater should be contained on site and disposed of in accordance with municipal wastewater discharge standards so that they do not contaminate surrounding soils and eventually groundwater.
- Contaminants such as hydrocarbons should be stored, handled, and managed appropriately. These must be collected on site and disposed at an appropriate facility that is licenced to receive such waste.
- Only excavate areas applicable to the project area.
- Backfill the material in the same order it was excavated to reduce contamination of deeper soils with shallow oxidised soils.
- Cover excavated soils with a temporary liner to prevent contamination.

- Keep the site clean of all general and domestic wastes.
- All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is essential.
- Exposed soils to be protected using a suitable covering or revegetating.
- Existing roads should be used as far as practical to gain access to the site.
- Have emergency fuel & oil spill kits on site.
- Visual soil assessment for signs of contamination at vehicle holding, parking and activity areas.
- Place oil drip trays under parked construction vehicles.

7.3.2 Impact Assessment of Soil Erosion Impacts

Soil erosion is likely to occur on site given the characteristics of the site. Without any mitigation measures implemented, the impact can be rated as of a "low" significance. The assessment of this impact is presented in **Table 7-8.**

Table 7-8: Assessment of the impacts of the proposed activities on soil erosion

	Extent	Duration	Intensity	Probability	Significance
Pre-mitigation	L/M - 2	L - 1	M - 6	M - 3	**L - 27**
Post-mitigation	L - 1	L- 1	M/L- 4	M/L - 2	L - 12

7.3.2.1 Mitigations and recommendation to soil erosion

- Erosion control measures should be implemented to ensure that the topsoil is not washed away.
- Checks must be carried out at regular intervals to identify areas where erosion is occurring.
- Appropriate remedial actions are to be undertaken wherever erosion is evident.

7.3.3 Impact Assessment of Archaeological and Heritage Impacts

The proposed activity is not taking place in an area that has significant archaeological or heritage resources. However, should these be encountered during the construction activities, mitigation measures need to be in place to ensure that these resources are not harmed. Without any mitigation measures implemented, the impact can be rated as of a "low" significance. The assessment of this impact is presented in **Table 7-9.**

Table 7-9: Assessment of the impacts of the proposed activities on Archaeological and Heritage Impacts

	Extent	Duration	Intensity	Probability	Significance
Pre-mitigation	L - 1	L/M – 2	M - 4	M/L - 2	**L - 14**

	Extent	Duration	Intensity	Probability	Significance
Post-mitigation	L - 1	L- 1	L- 2	L - 1	L - 4

7.3.3.1 Mitigations and recommendation to Archaeological and Heritage Impacts

- All works are to be immediately ceased in an affected area should an archaeological or heritage resource be discovered.
- The National Heritage Council of Namibia (NHCN) should advise with regards to the removal, packaging, and transfer of the potential resource.
- Should a heritage site or archaeological site be uncovered or discovered during the construction phase of the project, a "chance find" procedure should be applied as per the EMP.

7.3.4 Impact Assessment of Health and Safety

Construction activities may cause health and safety risks to people operating on the site. Without any mitigation measures implemented, the impact can be rated as of a "low" significance. The assessment of this impact is presented in **Table 7-10.**

Table 7-10: Assessment of the impacts of the proposed activities on health and safety

	Extent	Duration	Intensity	Probability	Significance
Pre-mitigation	L - 1	L - 1	M/L - 4	M/L - 2	**L - 12**
Post-mitigation	L - 1	L- 1	L- 2	L - 1	L - 4

7.3.4.1 Mitigations and recommendation to health and safety

- Construction workers should be provided with awareness training about the risks associated with the proposed construction work such as hydrocarbon handling and storage, the handling of heavy machinery etc.
- During the works conducted, workers should be properly equipped with personal protective equipment (PPE) such as coveralls, gloves, safety boots, safety glasses etc.
- The contractors should comply with the provisions with regards to health and safety as outlined in the Labour Act (No. 6 of 1992).

7.3.5 Impact Assessment of Noise Generation Impacts

Construction activities and the presence of construction vehicles may lead to the generation of noise which could impact the local surrounding residents negatively, if not properly handled. This may pose a disturbance on the surrounding residents. Without any mitigation measures implemented, the impact can be rated as of a "low" significance. The assessment of this impact is presented in **Table 7-11.**

Table 7-11: Assessment of the impacts of the proposed activities on noise generation

	Extent	Duration	Intensity	Probability	Significance
Pre-mitigation	L/M - 2	L - 1	L - 2	M/L - 2	**L - 10**
Post-mitigation	L - 1	L- 1	L- 2	L - 1	L - 4

7.3.5.1 Mitigations and recommendation to noise generation

- Construction activities should be limited to daytime hours (between 08h00 and 17h00) unless otherwise arranged with community members and businesses in the area.
- No amplified music should be allowed on site.
- Technology such as silencers should be installed on construction machinery.
- The use of horns as a general communication tool should not be allowed, they should only be used when necessary, as a safety measure.

7.3.6 Impact Assessment of Dust Generation Impacts

Construction activities and the presence of construction vehicles may lead to the generation of dust which could impact the local residents negatively, if not properly handled. Without any mitigation measures implemented, the impact can be rated as of a "low" significance. The assessment of this impact is presented in **Table 7-12.**

Table 7-12: Assessment of the impacts of the proposed activities on dust generation

	Extent	Duration	Intensity	Probability	Significance
Pre-mitigation	L/M - 2	L - 1	L - 2	M/L - 2	**L - 10**
Post-mitigation	L - 1	L- 1	L- 2	L - 1	L - 4

7.3.6.1 Mitigations and recommendation to dust generation

- Dust abatement techniques should be implemented e.g., spraying of water on site to reduce dust levels to an acceptable standard.
- The local community should be continuously consulted to ensure that the dust levels are acceptable.
- Residents should be informed prior to construction commencing so that they are aware of the planned construction.
- During high wind conditions the contractor must make the decision to cease works until the wind has settled.
- Stockpiles and sand being transported should be covered with plastic to reduce windblown dust.
- Workers should be provided with dust masks.

7.3.7 Impact Assessment of Waste Generation Impacts

Construction activities usually generate wastes which leads to environmental pollution, if not properly handled. This may result in blocked waterways should waste be blown into water pipelines; animals may choke on waste when ingested and additionally it may pose a negative visual impact on the surrounding environment. Without any mitigation measures implemented, the impact can be rated as of a "low" significance. The assessment of this impact is presented in **Table 7-13.**

Table 7-13: Assessment of the impacts of the proposed activities on waste generation

	Extent	Duration	Intensity	Probability	Significance
Pre-mitigation	L - 1	L - 1	M/L - 4	M/L - 2	**L - 8**
Post-mitigation	L - 1	L- 1	L- 2	L - 1	L - 4

7.3.7.1 Mitigations and recommendation to waste generation

- The construction site should be kept tidy at all times.
- All domestic and general construction waste produced on a daily basis should be cleared and contained.
- No waste may be buried or burned on site or anywhere else.
- Waste containers (bins) should be emptied during and after the construction and the waste removed from site to the municipal waste disposal site.
- Separate waste containers (bins) for hazardous and domestic / general waste must be provided on site.
- Construction labourers should be sensitised to dispose of waste in a responsible manner and not to litter.
- No waste may remain on site after the completion of the project.
- The recycling of waste should be considered and implemented as far as possible

7.3.8 Impact Assessment of Temporary Employment Creation

The proposed activity may provide employment opportunities for the local people during construction. The impact can be rated as of a "low-positive" significance. The assessment of this impact is presented in **Table 7-14**.

Table 7-14: Assessment of the impacts of the proposed activities on temporary employment creation

	Extent	Duration	Intensity	Probability	Significance
Pre-mitigation	M + 3	L + 1	M/H + 4	M + 3	**L + 24**
Post-mitigation	L + 4	L+ 3	L+ 2	L + 3	L + 27

7.3.8.1 Mitigations and recommendation to temporary employment creation

- Should any job opportunities result, they should be made available to the local people in the area as far as reasonably possible.

7.4 Operational Phase Impact Assessment

The potential impacts associated with the operational phase of the activities have been identified and assessed in this subchapter. The main impacts identified are; surface and groundwater, odour, waste, health and safety and hazardous substance handling and storage.

7.4.1 Impact Assessment of Soil, Surface and Groundwater

Surface and groundwater impacts may be encountered during the operational phase, especially if development takes place within the rainy season. The operational activities on site should be conducted in a manner to avoid the contamination of surface and groundwater. The following activates during the operational phase may impact the groundwater in the subject area:

- Poor quality seepage from the WWTW, if leakages occur.
- Soil quality could be compromised if leakages occur from sewer lines.
- Moreover, oil & fuel spills from resident vehicles can cause soil contamination.
- Seepage towards existing water users/boreholes.

The pre-mitigation impact is assessed to be “medium” in significance and after mitigation the impact is assessed to have a “low” significance. The assessment of this impact is presented in **Table 7-15**.

Table 7-15: Assessment of the impacts of the activities on soil, surface, and groundwater

	Extent	Duration	Intensity	Probability	Significance
Pre-mitigation	M/H - 4	M/H - 4	M/H - 8	M - 3	**M - 48**
Post-mitigation	M - 3	L/M- 2	M- 6	L/M - 2	L - 22

7.4.1.1 Mitigations and recommendation to soil, surface, and groundwater

- Contaminated runoff from the various operational activities should be prevented from entering any surface or ground water bodies.
- Ensure that surface water accumulating on-site are channelled and captured through a proper storm water management system to be treated in an appropriate manner before disposal into the environment.
- Disposal of waste from the various activities should be properly managed.
- Contain the newly exposed soil using soil bags, soil savers or suitable geotextile.

- Vegetate areas where heavy machinery was used to excavate the soils to prevent erosion.
- Establish where excavated soils will be placed, and if the area is suitable to receive the excavated soils.
- Cover excavated soils with a suitable cover / temporary liner to prevent contamination.
- Only excavate areas applicable to the project area.
- Monitoring of stormwater systems to ensure that the system operates as per design specifications.
- Vegetate areas where heavy machinery was used to excavate the soils to prevent erosion.
- Ensure the sewer system is monitored for leakages.
- Routine visual inspections of sewer infrastructure and resident parking areas for signs of soil contamination.
- Have emergency fuel and oil spill kits on site.
- Groundwater monitoring of known boreholes in the area, to determine if there is an impact. Mitigation measures should then be formulated.

7.4.2 Impact Assessment of Odour

The operational activities may result in associated odour production. Odour produced from the WWTP will impact people living near and working at the plant. Without any mitigation measures implemented, the impact can be rated as of a "low" significance. The assessment of this impact is presented in **Table 7-16**.

Table 7-16: Assessment of the impacts of the activities on odour

	Extent	Duration	Intensity	Probability	Significance
Pre-mitigation	L - 1	L - 1	M/L - 4	M/H - 4	**L - 24**
Post-mitigation	L - 1	L - 1	M- 3	M - 3	L - 15

7.4.2.1 Mitigations and recommendation to odour

- Plant should be located at least 250 meter away from the nearest house.
- Regular inspection of the system to detect failures in the system early in order to take remedial action accordingly.
- Should the odour become significant odour abatement measures should be implemented.

7.4.3 Impact Assessment of Waste

Waste will be produced from the plant such as sludge. The sludge should be disposed of in an appropriate manner to reduce the risk of pollution on site. The pre-mitigation impact is assessed to be "medium" in significance and after mitigation the impact is assessed to have a "low" significance. The assessment of this impact is presented in **Table 7-17**.

Table 7-17: Assessment of the impacts of the activities on waste

	Extent	Duration	Intensity	Probability	Significance
Pre-mitigation	M/L - 2	M/L - 2	M/L - 4	M/H - 4	**M - 32**
Post-mitigation	L - 1	L- 1	L- 2	M/L - 2	L - 8

7.4.3.1 Mitigations and recommendation to waste

- The sludge produced should be disposed at a registered waste landfill site.
- No waste may be buried or burned on site or anywhere else.

7.4.4 Impact Assessment of Health and Safety

Operational activities may cause health and safety risks to people operating on the site. Without any mitigation measures implemented, the impact can be rated as of a "medium" significance. After the implementation of the mitigations, the impact will be significantly reduced to "low" rating. The assessment of this impact is presented in **Table 7-18.**

Table 7-18: Assessment of the impacts of the proposed activities on health and safety

	Extent	Duration	Intensity	Probability	Significance
Pre-mitigation	L/M - 2	L/M - 2	M/H - 8	M - 3	**M - 36**
Post-mitigation	L - 1	L- 1	M- 6	M/L - 2	L - 16

7.4.4.1 Mitigations and recommendation to health and safety

- Operators at the site should be provided with awareness training about the risks associated with the associated operational activities.
- During the works conducted, workers should be properly equipped with personal protective equipment (PPE) such as coveralls, gloves, safety boots, safety glasses etc.
- All open water structures that are on ground level should be fitted with hand rails to prevent the possibility of operators falling into these structures.
- Chlorination equipment must be contained in the appropriate way in a separate building away from other chemicals.
- All relevant safety signage and equipment must be available on site.

7.4.5 Impact Assessment of Hazardous Substance Handling and Storage

Hazardous substances to be used on site such as chlorine gas must be used and stored in accordance with the relevant health and safety standards. Without any mitigation measures implemented, the impact can be rated as of a "medium" significance. After the implementation of the mitigations, the impact will be significantly reduced to "low" rating. The assessment of this impact is presented in **Table 7-10.**

Table 7-19: Assessment of the impacts of the proposed activities on Hazardous Substance Handling and Storage

	Extent	Duration	Intensity	Probability	Significance
Pre-mitigation	L/M - 2	L/M - 2	M/H - 8	M - 3	**M - 36**
Post-mitigation	L - 1	L- 1	M- 6	M/L - 2	L - 16

7.4.5.1 Mitigations and recommendation to Hazardous Substance Handling and Storage

- Emergency preparedness plans, safety equipment and emergency clean up procedures must be in place in case of a spillage.
- Hazardous waste, including emptied chemical containers (e.g. liquid chlorine, sodium hypochlorite) and other chemicals used for disinfection in the operational phase should be safely stored on site where they cannot be reached and used by the unsuspecting and uninformed locals for personal use.
- No waste should be improperly disposed of on site or its surroundings, i.e. unapproved waste sites.

7.5 Decommissioning Phase

Should the proposed sewage treatment facility be decommissioned the impacts and mitigation measures discussed during the construction phase apply.

8 RECOMMENDATIONS AND CONCLUSION

8.1 Conclusion

The key potential biophysical impact related to the pre-operational, construction, operational and maintenance and decommissioning phases of the proposed project were identified and assessed. Suitable mitigation measures (where required and possible) were recommended, and the impacts can be summarised as follows:

- **Impacts on biodiversity loss (during pre-operational phase and construction):** The preparation of the site for the proposed site involves clearing of certain areas on site. This may impact the existing biodiversity in the area. The subject sites do accommodate some vegetation and possibly some fauna. During site preparation it should be ensured that only the areas applicable to the project site area cleared. The layout of the proposed plant should incorporate existing protected trees which may not be removed without a valid permit from the local department of Forestry. However, the impact can be adequately addressed by the recommendations given under subchapter 7.2.1, and management actions given in the EMP (Chapter 3).
- **Impacts on soil, surface and groundwater (during construction and operational phases):** Improper handling, storage and disposal of hydrocarbon products and hazardous materials at the site may lead to soil and groundwater contamination, in case of spills and leakages during construction. Surface and groundwater impacts may further be encountered during the operation phase, especially if development takes place within the rainy season. The operational activities on site should be conducted in a manner to avoid the contamination of surface and groundwater. The impact can be adequately addressed by the recommendations given under subchapters 7.3.1, 7.4.1 and management actions given in the EMP (Chapter 3).
- **Impacts of soil erosion (during construction phase):** Soil erosion is likely to occur on site given the characteristics of the site. The impact can be adequately addressed by the recommendations given under subchapters 7.3.2 and management actions given in the EMP (Chapter 3).
- **Impacts on archeological and heritage resources (during construction phase):** The proposed activity is not taking place in an area that has significant archaeological or heritage resources. However, should these be encountered during the construction activities, mitigation measures need to be in place to ensure that these resources are not harmed. The impact can be adequately addressed by the recommendations given under subchapter 7.3.3 and management actions given in the EMP (Chapter 3).

- **Impacts on health and safety (during construction and operation phase):** Construction and operation activities may cause health and safety risks to people operating on the site. The impact can be adequately addressed by the recommendations given under subchapter 7.3.4, 7.4.4 and management actions given in the EMP (Chapter 3).
- **Impacts on dust and noise (during construction phase):** Construction activities may increase dust and noise generated around the site area. The impact can be adequately addressed by the recommendations given under subchapter 7.3.5, 7.3.5, and management actions given in the EMP (Chapter 3).
- **Impacts on waste (during construction and operation phase):** Improper disposal of waste materials at the site may lead to pollution of the site and resultant environmental degradation. Particularly the sludge proposed from the plant should be disposed appropriately. The impact can be adequately addressed by the recommendations given under subchapters 7.3.7, 7.4.3 and management actions given in the EMP (Chapter 3).
- **Impact of odour (during operation):** The operational activities may result in associated odour. Odour produced from the WWTP will impact people living near and working at the plant. The impact can be adequately addressed by the recommendations given under subchapters 7.4.2, and management actions given in the EMP (Chapter 3).
- **Impact of hazardous substance handling and storage (during operation):** Hazardous substances to be used on site such as chlorine gas must be used and stored in accordance with the relevant health and safety standards. The impact can be adequately addressed by the recommendations given under subchapters 7.4.5, and management actions given in the EMP (Chapter 3).

8.2 Recommendation

Based on the information provided in this report, GCS is confident the identified risks associated with the proposed development can be reduced to acceptable levels, should the measures recommended in the EMP be implemented and monitored effectively. It is therefore recommended that the project receive Environmental Clearance, provided that the EMP be implemented.

9 REFERENCES

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