RENEWAL OF THE ENVIRONMENTAL CLEARANCE FOR THE CONSTRUCTION AND OPERATION OF A SEWERAGE TREATMENT PLANT IN OSHAKATI, OSHANA REGION

March 2024

App - _____

Project Name:	***RENEWAL OF THE ENVIRONMENTAL CLEARANCE FOR THE CONSTRUCTION AND OPERATION OF A SEWERAGE TREATMENT PLANT IN OSHAKATI, OSHANA REGION***
Proponent:	**Oshakati Town Council** **Private Bag 5530** **Oshakati**
Prepared by:	Green Earth ENVIRONMENTAL CONSULTANTS 1st floor Bridgeview Offices & Apartments, No. 4 Dr Kwame Nkrumah Avenue, Klein Windhoek, Namibia PO Box 6871, Ausspannplatz, Windhoek
Release Date:	March 2024
Consultant:	C. Du Toit C. Van Der Walt Cell: 081 127 3145 Email: charlie@greenearthnamibia.com

EXECUTIVE SUMMARY

Green Earth Environmental Consultants have been appointed by Oshakati Town Council to attend to and complete an Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) **to renew the Environmental Clearance (EC) for the construction and operation of a sewerage treatment plant in Oshakati** as per the requirements of the Environmental Management Act (No. 7 of 2007) and the Environmental Impact Assessment Regulations (GN 30 in GG 4878 of 6 February 2012). The proposed plant will be located at the sites of the existing West and East ponds.

The implementation of the project was delayed due to a shortfall of funds. The Ministry of Urban and Rural Development made an additional budget allocation from the 23/324 Financial Year of N$ 7,076,000-00 to the Oshakati Town Council to be used for the construction of the new sewage plant. Oshakati Town Council has now confirmed that funds were obtained to finalise the designs and bidding documents and go out on tender for the implementation of the project. The renewal of the Environmental Clearance Certificate (ECC) is required to allow Council to proceed with the project as the old ECC which was issued on 6 October 2020 expired on 6 October 2023.

The activities listed below, which forms part of the proposed operations, may not be undertaken without an Environmental Clearance Renewal:

> ***WASTE MANAGEMENT, TREATMENT, HANDLING AND DISPOSAL ACTIVITIES***
> *2.1 The construction of facilities for waste sites, treatment of waste and disposal of waste.*
> *2.2 Any activity entailing a scheduled process referred to in the Atmospheric Pollution Prevention Ordinance, 1976.*
> *2.3 The import, processing, use and recycling, temporary storage, transit or export of waste.*
>
> ***WATER RESOURCE DEVELOPMENTS***
> *8.6 Construction of industrial and domestic wastewater treatment plants and related pipeline systems.*
>
> ***HAZARDOUS SUBSTANCE TREATMENT, HANDLING AND STORAGE***
> *9.1 The manufacturing, storage, handling or processing of a hazardous substance defined in the Hazardous Substances Ordinance, 1974.*
> *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.*

From an Assessment Report (*Seifart, 2018*) compiled for the Proponent and onsite observations it is confirmed that:

- The sewer treatment plant and ponds cannot process the current sewer load of the Town;

- Ponds are filled to capacity with undertreated water flowing over into the surrounding areas which is illegal;
- The embankment of some of the ponds are damaged due to overfilling which allows untreated wastewater spills into neighbouring residential and farming areas;
- The rapid growth of the town as well as residents converting houses and businesses to waterborne toilet systems resulted that the system cannot cope with the additional sewer load;
- Currently the Oshakati oxidations ponds are operated outside the guidelines and requirements of the Ministry of Agriculture, Water and Land Reform (Code of Practice: Vol. 2, 2008);
- The fences around the ponds have been damaged allowing unrestricted access to people and animals.

The key characteristics/environmental impacts of the proposed project are as follows:

Positive impacts	Negative impacts
The sewer generated by the inhabitants and activities of the town will be treated efficiently	Dust and noise will be generated during construction
The area currently required for the sewer treatment facility will be drastically reduced to be used for other more productive purposes	Risk of uncontrolled chlorine gas emissions or spillage during operations
The treated water will be reused for irrigation purposes allowing the Council to save on the total water usage of the Town	
The spillage/discharge of undertreated wastewater into the areas surrounding the water treatment works will be stopped	
The implementation of the proposed water treatment plant will bring the activity in line with the guidelines Ministry of Agriculture, Water and Land Reform (Code of Practice: Vol. 2, 2008)	
Employment will be created during construction and operation and from the added irrigation activities	

The **Water Resources Management Act (No 11 of 2013)** stipulates conditions that ensure effluent that is produced to be of a certain standard. There should also be controls on the disposal of sewage, the purification of effluent, measures should be taken to ensure the prevention of surface and groundwater pollution and water resources should be used in a sustainable manner. Therefore the Town's sewer system must be upgraded to conform to applicable Namibian standards and the requirements of the Act.

The sewer system and treatment plant will be constructed in accordance with requirements of the town council. The project site is in a transformed state from an ecological perspective and human interference is largely visible. It is thus believed that the overall cumulative impact of the proposed treatment plant on the natural resources is

expected to be extremely low. It is envisaged that the project will create work in the construction phase and after completion.

Negative impacts derived from the project are mainly associated with the construction phase for instance an increase in traffic, dust and noise. However, the construction and operational activities further on need to be controlled and monitored by the assigned developers and the proponent. It is thus furthermore believed that the proposed project will not pose any long-lasting negative effects to neighbours or on the environment. The following Environmental Impact Assessment was conducted in accordance with the Environmental Management Act (No 7 of 2007) and the environment was taken in full consideration throughout the assessment. Additional details will be presented in the following report.

Based upon the conclusions and recommendations of the renewed Environmental Impact Assessment Report and Environmental Management Plan, the Environmental Commissioner of the Ministry of Environment, Forestry and Tourism is herewith requested to:

1. Accept and approve the renewed Environmental Impact Assessment.
2. Accept and approve the renewed Environmental Management Plan.
3. Issue a renewed Environmental Clearance for the construction and operation of a sewerage treatment plant in Oshakati and for the following listed activities:

WASTE MANAGEMENT, TREATMENT, HANDLING AND DISPOSAL ACTIVITIES

2.1 The construction of facilities for waste sites, treatment of waste and disposal of waste.

2.2 Any activity entailing a scheduled process referred to in the Atmospheric Pollution Prevention Ordinance, 1976.

2.3 The import, processing, use and recycling, temporary storage, transit or export of waste.

WATER RESOURCE DEVELOPMENTS

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

HAZARDOUS SUBSTANCE TREATMENT, HANDLING AND STORAGE

9.1 The manufacturing, storage, handling or processing of a hazardous substance defined in the Hazardous Substances Ordinance, 1974.

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.

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LIST OF ABBREVIATIONS

ADWF	Average daily water flow
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
DWAF	Department of Water Affairs and Forestry
EC	Environmental Clearance
ECO	Environment Control Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
I&APs	Interested and Affected Parties
MAWLR	Ministry of Agriculture, Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism
NGTF	New-Generation Trickling Filters
NSA	Namibian Statistics Agency
Ox Ponds	Oxidation ponds
STP	Oshakati Sewage Treatment Plant
TSS	Total Suspended Solids

1. INTRODUCTION

Green Earth Environmental Consultants have been appointed by Oshakati Town Council to attend to and complete an Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) to renew the Environmental Clearance (EC) for the proposed construction and operation of the sewerage treatment plant in Oshakati as per the requirements of the Environmental Management Act (No. 7 of 2007) and the Environmental Impact Assessment Regulations (GN 30 in GG 4878 of 6 February 2012).

The implementation of the project was delayed due to a shortfall of funds. The Ministry of Urban and Rural Development made an additional budget allocation from the 23/324 Financial Year of N$ 7,076,000-00 to the Oshakati Town Council to be used for the construction of the new sewage plant. See below a copy of the letter of the Ministry of Urban and Rural Development confirming the additional budged allocation.

See below extract from the letter:

The additional allocated budget (N$7,076,000.00) is exclusively intended for the projects as indicated in the attached table. It should be used for the construction of the new sewage treatment plant to address sewage overflow. It is essential to ensure that these funds are not reallocated or diverted to other projects;

Republic of Namibia

Ministry of Urban and Rural Development

Enquiries: Beata Namupala
Tel: (+264) 61 297-5056
Fax: (+264) 61 297-52979
beata.namupala@murd.gov.na

Government Office Park
Luther Street

Private Bag 13289
Windhoek,
Namibia, 1001

Our Ref.: 30/2/2 Your Ref.:

Mr. Timoteus Namwadi
The Chief Executive Office
Oshakati Town Council
Private Bag 5530
Oshakati, 15001

Dear Mr. Namwandi,

SUBJECT: ADDITIONAL BUDGET ALLOCATION AND CONFIRMATION OF FUNDS IN COMPLIANCE WITH SECTION 25. (4)(B) OF THE PUBLIC PROCUREMENT ACT, 2015 (ACT NO. 15 OF 2015) AS AMENDED (THE ACT): CAPITAL PROJECTS 2023/2024

This circular aims to convey the outcome of the 2023/24 Financial Year mid-year development budget, and We are happy to inform you that the Ministry has been allocated an additional budget to cater for your emergency projects.

We wish like to kindly emphasise the following:

1. The additional allocated budget (N$7,076,000.00) is exclusively intended for the projects as indicated in the attached table. It should be used for the construction of the new sewage treatment plant to address sewage overflow. It is essential to ensure that these funds are not reallocated or diverted to other projects;
2. You are urged to indicate the additional allocated development budget in your 2023/2024 financial year budget;
3. You are cautioned not to over commit the Government by ensuring that any projects to be undertaken are strictly within the limit of the allocated additional budget;
4. You are hereby advised to comply with the conditions of disbursement of funds as stated in Treasury Circular 4 of 2015 and MURD Circular dated 03rd December 2019 as well as the provisions of the Public Procurement Act, 2015, (Act No. 15 of 2015) as amended when implementing and managing your capital projects, including Section 25. (4)(b).

Notwithstanding the above, we are open to have further engagements with you during the planned budget consultations with a view to explore ways on how to optimise the utilisation of the available resources.

All official correspondence must be addressed to the Executive Director

In order to avoid the reduction or even a complete re-allocation or forfeiture of funds allocated to us in the current and subsequent financial years, we are urged to start executing our projects soonest and ensure that our projects and budget execution rate is at least 10% by or before January 2024. Accordingly your Council is urged to commence the procurement processes timely and accelerate the implementation process.

Thank you in anticipation of your usual understanding, cooperation and prompt action.

Yours sincerely,

NGHIDINUA DANIEL
EXECUTIVE DIRECTOR

MINISTRY OF URBAN AND RURAL DEVELOPMENT
EXECUTIVE DIRECTOR
22 NOV 2023
PRIVATE BAG 13289
WINDHOEK

MINISTRY OF URBAN AND RURAL DEVELOPMENT
CAPITAL PROJECTS EXPENDITURE TO DATE
FY - 2023/2024
OSHANA REGION

ADDITIONAL BUDGET ALLOCATION

NPC Code	Project Name	PROJECT DESCRIPTION/REMARKS	Additional Budget FY - 2022/2023
18717	Oshakati	Construction of wastewater treatment plant (WWTP)	7,076,000.00
Total			**7,076,000.00**

VERIFIED BY:
07/11/2023
Mr. Festus Haihambo
DEPUTY DIRECTOR:TECHNICAL SERVICES COORDINATION

CONFIRMED BY:
Mr. Shadrick Tubaleye
FINANCIAL ADVISOR

APPROVED / ~~NOT APPROVED~~
Mr. Nghidinua Daniel
EXECUTIVE DIRECTOR

MINISTRY OF URBAN AND RURAL DEVELOPMENT
EXECUTIVE DIRECTOR
22 NOV 2023
PRIVATE BAG 13289
WINDHOEK

Oshakati Town Council has now confirmed that funds were obtained to finalise the designs and bidding documents and go out on tender for the implementation of the project. The renewal of the Environmental Clearance Certificate (ECC) is required to allow Council to proceed with the project as the old ECC which was issued on 6 October 2020 expired on 6 October 2023.

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The following Environmental Impact Assessment Renewal contains information on the project and the surrounding areas and activities.

2. PROJECT DESCRIPTION/SITE INFORMATION

2.1. STATUS OF OSHAKATI TREATMENT PLANT AND PONDS

The current situation regarding sewage discharge and treatment at Oshakati Town was assessed during a visit undertaken during November 2017, by invitation of Council's Engineering Department in conjunction with Aqua Utilities Corporation (Pty) Ltd.

Based on this visit, Aquarius Consult CC, in 2018, did a thorough assessment and prepared a comprehensive assessment report (*Seifart, 2018*) regarding the condition of the existing sewage treatment plants at Oshakati East and West, which employ oxidation pond systems. See below *Map* showing the locality of the ponds:

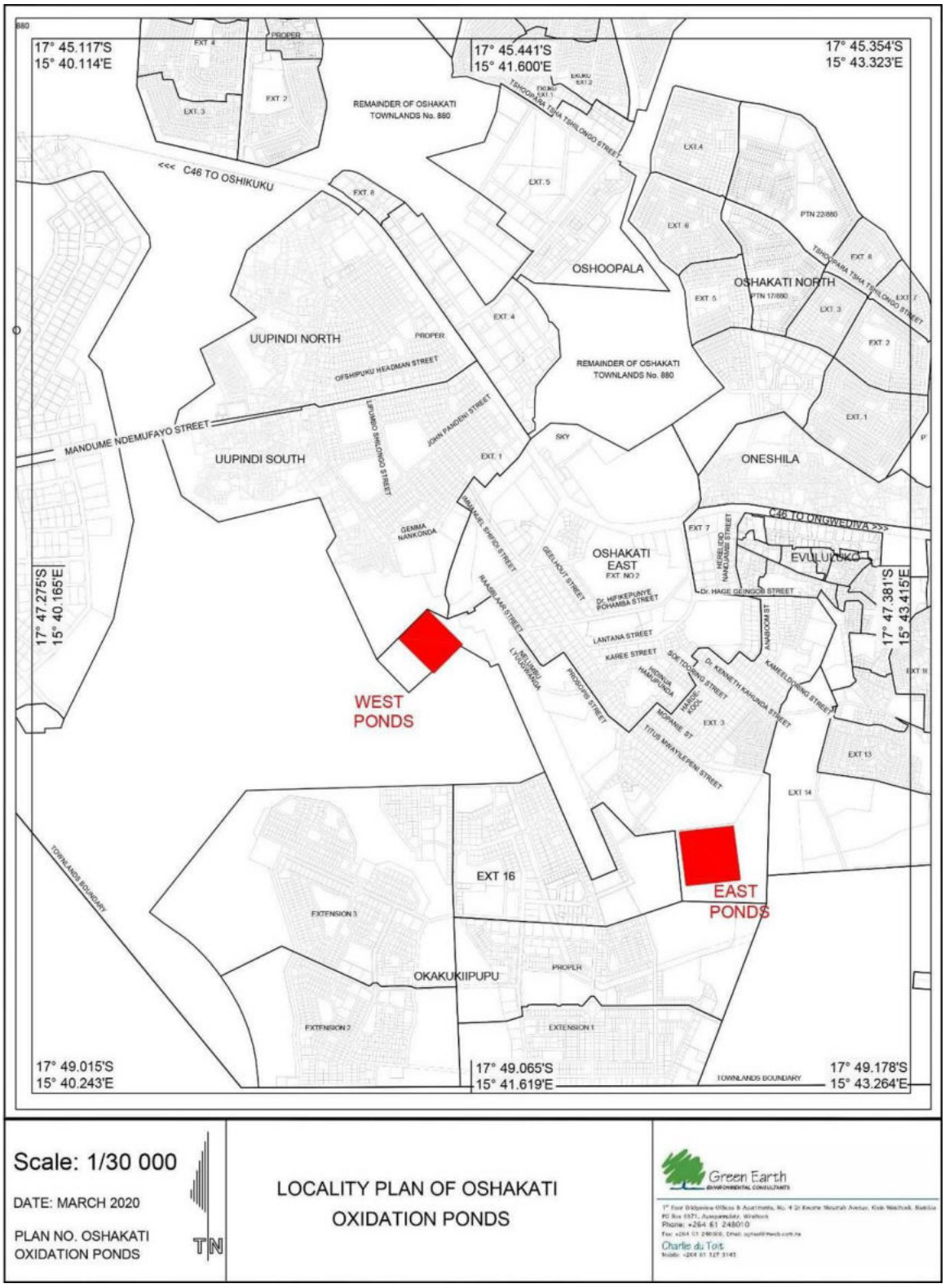

Figure 1: Locality Plan for the Oxidation Ponds

Figure 2: Locality Plan for the Oxidation Ponds with image

This report addressed the existing situation prevailing at the Oshakati Sewage Treatment Plant (STP).

Oshakati currently uses oxidation ponds (OxPonds) for treatment of all sewage collected. The sewage is transferred to two separate OxPonds, known as the "West Ponds" and the "East Ponds", each of which has had multiple extensions and upgrades over the years. Various pump stations transfer sewage from the collection points and distribute it between the two OxPonds.

Oshakati has recently experienced significant development, with various residential extensions being serviced and connected to the sewerage system. This has resulted in the OxPonds currently not being able to cope with excessive inflows, especially during the rainy season and they are therefore hydraulically overloaded. Also, both the current OxPonds systems have a final effluent that discharges into an adjacent oshona that is freely accessible to animals and humans, which does not fulfil the basic requirements as specified by the Ministry of Agriculture, Water and Land Reform (MAWLR) in their Guidelines for Pond Systems (MAWLR, Code of Practice: Vol. 2, 2008). Furthermore, the population of Oshakati has grown to a number in excess of the size where OxPonds are permitted as the only treatment means. Its population is even expanding at an above average growth rate, mainly due to urbanization from the surrounding rural areas.

Low-technology OxPonds have been the technology of choice for sewage treatment in Namibia in the past twenty to sixty years. It should however be noted that MAWLR has two basic requirements for communities that wish to make use of OxPonds as only treatment method for their sewage:

- **No final effluent is allowed to be discharged into nature.** The MAWLR Guidelines (Code of Practice: Vol. 2, 2008): "*Generally, open ponds cannot produce a final effluent complying with the currently applicable Namibian standards for effluent discharge, viz the General Standard of Act No. 24 of 2004. Therefore, final effluent produced by a pond system will not be allowed for discharge into the environment.*" This is not adhered to at Oshakati, where a large stream of insufficiently treated final effluent is discharged into the environment – this applies to both pond systems.

- **All water treated in ponds must be completely evaporated** because ponds are not able to produce a final effluent conforming to the General Standard. This requirement results in a good source of secondary water that is wasted instead of reused. Namibia is an arid country that needs to exploit its water resources more optimally and that is why MAWLR does not allow use of ponds for larger communities. The MAWLR Code of Practice (Vol. 2, 2008) states that: "*Pond systems may only be considered if the ultimate load does not exceed 5 000 PE (population equivalents) or 800 kℓ/d…*", and further: "*Since water is a scarce commodity in Namibia, reuse thereof is strongly encouraged*". The population of Oshakati exceeds latter figures by far, which requires the Town to implement more reuse projects to conserve potable water. However, this will require the final effluent that will be reused to conform at least to the General Standard.

There is thus a serious need for the implementation of a new sewage treatment plant as the OxPonds at Oshakati are overloaded and especially during the rainy season, partly raw or inadequately treated final effluent overflows into the environment. This causes a serious health hazard for humans as well as animals. Some of the fences at the ponds show signs of damage and cattle dung can be seen within the pond area and all over the pathways, which allows animals to drink the insufficiently treated water. Also, fish is harvested from the ponds, which poses a serious danger of humans developing diarrhoea and even cholera when coming into contact with this effluent and/or eating the fish.

Although problems mentioned above are the typical problems normally associated with OxPond systems, Aquarius Consult CC also observed and commented on some specific issues applicable to the Oshakati East and West OxPonds in the 2018 Report which needs to be addressed in the upgrading of the sewer plant.

2.2. OSHAKATI WEST PONDS

General Condition: The West Pond system consists of a total of 8 ponds, some of which are still in a very good condition and have been recently constructed or refurbished. All ponds have either Hyson cell or concrete embankments and, if the entire pond floor area of each primary ponds is constructed similarly to the embankments, these ponds can be considered to be lined. MAWLR (Vol. 2, 2008) requires specifically the anaerobic and primary ponds to be lined.

Some of the embankments and especially the primary ponds, however, show significant growth of weeds, reeds and bushes. The primary ponds are completely overgrown with dense vegetation to such an extent that the water surface is not visible. This is unacceptable and the complete area needs to be freed from all growth. MAWLR (Vol. 2, 2008) always requires owners to keep the ponds and embankments free from growth.

The locality of the West Ponds is shown on the *Map* below:

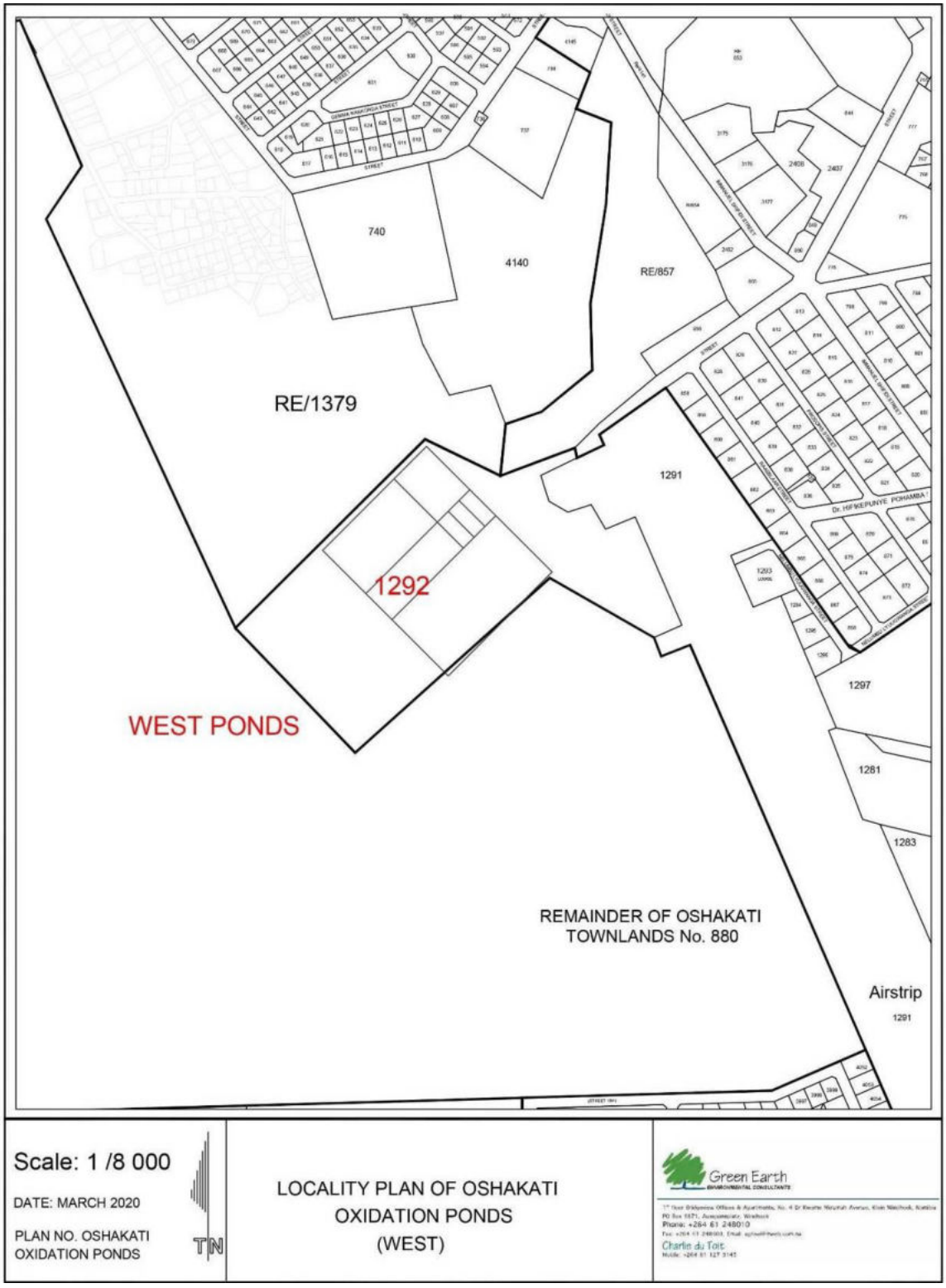

Figure 3: Locality of West Ponds

Figure 4: Locality Plan of West Ponds with image

Figure 5: Oshakati West Ponds – Primary ponds overgrown

While not as bad as at the primary ponds, the facultative and maturation ponds also show signs of vegetation. Aquarius Consult CC advised that these should also be cleaned, and all vegetation removed. At a few places, the embankments are damaged in these ponds, but not (yet) to such an extent that the water overflows out of the pond. It was also advised that these areas should be refurbished as soon as possible, to prevent further erosion and pond leakages.

Figure 6: Oshakati West Ponds – Minor vegetation growth

Aquarius Consult CC recommended that the West Ponds be cleaned by removing all grass and shrubs from inside the ponds as well as the embankments and surrounding, fenced-in area. In addition, the few areas where the embankments are damaged should be repaired.

Final Effluent Discharge: Despite low rainfall experienced in the summer of 2016/17, and the visit taking place in the dry season before the summer rainfalls of 2017/18 started, the ponds were found to discharge into an adjacent oshona. This means that hazardous and not fully treated wastewater is discharged into an unfenced area where it can come into contact with people and where animals drink, which presents a severe health hazard to the community.


Figure 7: Oshakati West Ponds – Final water discharge outside pond areas

Fencing: Whereas a new, proper fence (Nato razor wire) was provided around the OxPonds, there is evidence of many repairs done to the fence after having been damaged by people. An area under the south-western gate has been dug out and a hole has been cut in the fence at the southern corner, giving free access to humans inside the pond area. Also, evidence of fish being harvested was found at ponds, which poses danger to humans developing water-borne diseases such as diarrhoea and cholera when coming into contact with this effluent and/or eating the fish if not well cooked


Figure 8: Oshakati West Ponds – damaged fence and evidence of fishing activities

MAWLR (Vol. 2, 2008) requires a 1.8 m high diamond mesh ("jakkalsproef") fence with locked, double gate for access. Furthermore, the fence must completely enclose the whole treatment plant area and must ensure that all animals and people are always kept out of the pond area. Aquarius Consult CC recommend that the Town Council's continuous efforts to restore the fence and prevent access to the pond area are intensified to prevent further health hazards. Additional security guards should be employed to protect further removal of this fence or parts thereof and adequate warning signs in this regard should be put up.

2.3. OSHAKATI EAST PONDS

General Condition: The East Pond system consists of a total of 10 ponds and, as with the West Ponds, some are still in a very good condition and have been recently constructed or refurbished.

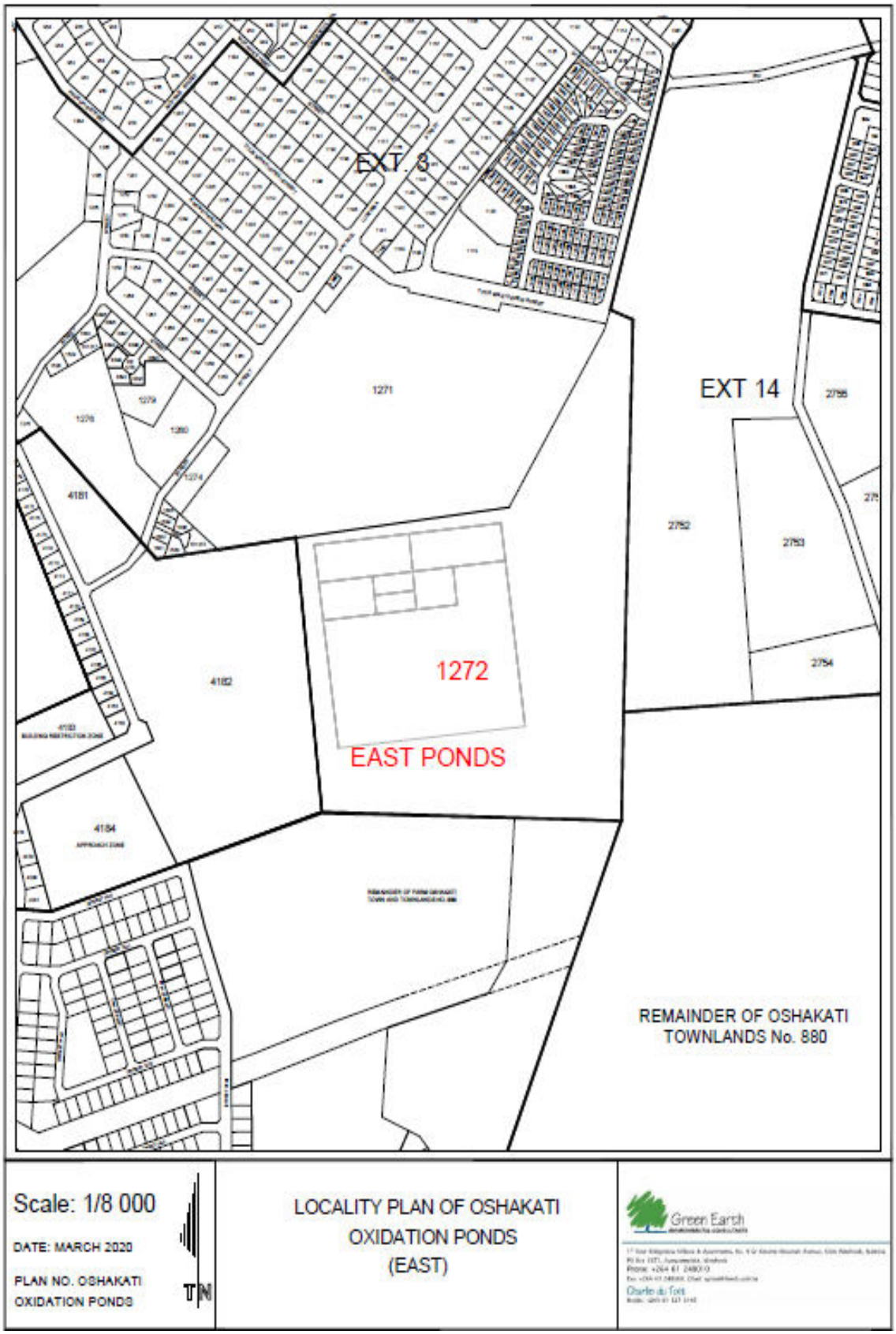

Figure 9: Locality of East Ponds

Figure 10: Locality Plan of East Ponds with image

In general, the East Ponds appear in a slightly better overall condition as the West Ponds. All the ponds have either Hyson cell or concrete embankments and, as long as the entire pond floor area of the primary ponds are also constructed similarly to the embankments, the ponds can be considered to be lined, as required by MAWLR (Vol. 2, 2008).

Figure 11: Oshakati East Ponds – March 2020

The general appearance of these ponds is good, and the area is kept neat and tidy. Some of the embankments show minor growth of weeds, reeds and bushes, but in general much less than at the West Ponds. Pond embankments seem to be in a fair condition. At a few places, the embankments are damaged in these ponds, but not (yet) to such an extent that the water overflows out of the pond. However, these areas should be refurbished as soon as possible, to prevent further erosion and pond leakages.

Figure 12: Oshakati East Ponds – Minor damage to embankments

The primary and large, facultative ponds are, however, overgrown with reeds and should be cleaned as a matter of urgency. The complete area needs to be freed from all growth, before it becomes a problem.

Figure 13: Oshakati East Ponds – Vegetation growth in primary and facultative ponds

Aquarius Consult CC therefore recommended that the East Ponds are urgently cleaned by removing all grass and shrubs from inside the ponds as well as the embankments and surrounding, fenced-in area. In addition, the few areas where the embankments are damaged should be repaired.

Final Effluent Discharge: At the time of the assessment visit, there was no overflow of the final pond to the environment. However, the visit took place before the rain season commenced and there was clear evidence that there had previously been final water discharged from the ponds into the surrounding area, with signs of water erosion and a previously ponded area just outside the plant fence. This means that, during the rainy season, hazardous and not fully treated wastewater is discharged into an unfenced area where it can come into contact with people and where animals drink, which presents a severe health hazard to the community.

Figure 14: Oshakati East Ponds – Final water health hazards at the ponds

Fencing: The fence seems to be in a relatively good condition, although there is evidence of repairs having been done at several places. Unfortunately, there will always be people that try to gain access to the ponds to water their livestock or to do fishing at the pond. The Town Council is doing their utmost in repairing the fences as and when damaged and proper signage prohibiting fishing and grazing is also clearly visible. Whereas this sign is large, clearly visible and serves its purpose, it is recommended to change “ENTRY AT OWN RISK” to “NO ENTRY FOR UNAUTHORIZED PERSONS”.

Figure 15: Oshakati West Ponds – Council's Signage

3. TREATMENT CAPACITY OF OSHAKATI OXPONDS

Aquarius Consult CC calculated the actual treatment capacity of both the West and East Ponds to establish the current treatment capacity for comparison to the population of Oshakati.

Capacity: Due to uncertainties in the design capacity of these ponds, an assessment on site of the actual capacity of the OxPonds was made. The total pond area is approximately:

West Ponds:

- Anaerobic Ponds: 4 off, total area	= 47 500 m2
- Primary Ponds: 2 off, total area	= 96 400 m²
- Secondary (facultative) Ponds: 2 off, total area	= 54 000 m²
SUB-TOTAL	**= 197 900 m²**

East Ponds:

- Anaerobic Ponds: 8 off, total area	= 52 900 m²
- Primary Ponds: 1 off, total area	= 85 100 m²
- Secondary (facultative) Ponds: 1 off, total area	= 28 500 m²
SUB-TOTAL	**= 166 500 m²**
TOTAL COMBINED AREA	**= 364 400 m²**

When the MAWLR Guidelines (Vol. 2, 2008) are followed, the total volume of effluent that can be treated in this plant would only serve approximately 10 000 people for the Oshakati West Ponds and 8 400 people for the East Ponds, for a combined total of 18 400 people. Latter figure compares badly with the current population estimated of approximately 40 000 - 45 000 for Oshakati, of which about 27 000 people are currently residing on erven

that are already serviced, with a further 13 500 people's erven currently being serviced. This is based on the information given verbally by Mr Tomas Negongo of Oshakati Town Council (personal communication: 24 October 2017), who indicated that about 6 000 erven are currently serviced with another 3 000 in the process of being serviced. Since the town council and developers are currently driving services in order to connect up as many as possible existing and new households to the sewer system and also enforcing legislation to service and connect up households in future developments, additional treatment plant capacity is required. Aquarius Consult CC's estimate is that the capacity of the existing sewage treatment plant should now already cater for at least 30 000 people whose effluent currently already reaches the treatment plants. If the 3 000 erven currently being serviced are expected to be completed in the near future, the total treatment plant capacity to be provided now should be for 45 000 people.

From the above discussion it becomes clear that the existing pond systems for Oshakati are inadequate, require urgent attention and need to be upgraded, not only to cater for future growth, but also already to serve all existing users.

4. DEVELOPMENT OPTIONS

Based on the 2018 Report of Aquarius Consult CC, the Proponent have three (3) development options which is discussed in the section below.

4.1. OPTION 1: NO-GO OPTION

Under this option the Proponent can decide to keep the current sewer systems with no upgrade. The maintenance issues relevant to the East and West Ponds addressed in the 2018 Report of Aquarius Consult CC should be attended to, to ensure the optimal operation of the ponds, prevent undertreated water to flow into nearby surface draining systems and to keep people and animals from coming in contact with the untreated water.

The 'no-go option' is however not supported due to the following reasons:

- The Report of Aquarius Consult CC concluded that *"the existing pond systems for Oshakati are inadequate, require urgent attention and need to be upgraded, not only to cater for future growth, but also already to serve all existing users".*

- The current Oshakati OxPonds do not meet the basic requirements of the MAWLR which are:

    - (Code of Practice: Vol. 2, 2008): "*Generally, open ponds cannot produce a final effluent complying with the currently applicable Namibian standards for effluent discharge, viz the General Standard of Act No. 24 of 2004. Therefore, final effluent produced by a pond system will not be allowed for discharge into the environment.*"

    - Code of Practice (Vol. 2, 2008): "*Pond systems may only be considered if the ultimate load does not exceed 5 000 PE (population equivalents) or 800*

kℓ/d…", and further: "*Since water is a scarce commodity in Namibia, reuse thereof is strongly encouraged*".

The OxPonds at Oshakati are overloaded and especially during the rainy season, partly raw or inadequately treated final effluent overflows into the environment and therefore the no-go option is not supported by Green Earth Environmental Consultants.

4.2. OPTION 2: UPGRADING/EXTENDING EXISTING SYSTEM

A further development option to the Proponent is to extend the current oxidation ponds with bigger ponds (to evaporate all effluent produced). This option is not supported by Aquarius Consult CC and Green Earth Environmental Consultants due to:

- MAWLR not allowing oxidation and evaporation ponds to serve communities in excess of 5 000 people and discharging more than 800 m^3/d, because reuse of the final effluent is propagated. The current population served and sewage reaching the treatment plant already far exceeds latter figures;

- Evaporation ponds require large surface areas and open land is not readily available in the area. To cater for the currently needed capacity of approximately 4 500m^3/d of effluent to be treated (45 000 people), will require approximately 893 000m^2 of constructed ponds. Compared with the currently constructed 365 000m^2 of ponds, it will mean that extensions totalling 2.4 times the existing pond area are required. Even if this land would be available, it would be expensive and could be better utilized for further industrial and/or housing developments or for producing agricultural products;

- Potential health hazard. During times of excessive rains, oxidation ponds become flooded and spill over into the floodplains. This poses a serious health hazard to humans and animals living in and crossing the floodplains and consuming fish caught in the ponds;

- Difficulty to keep people and animals from reusing effluent. Especially during the dry season, the people will damage the fences to allow their animals to feed and drink in the pond area, as happens currently;

- Reliable source of secondary water with high nutritional value (for plants). This effluent, once properly treated, is an asset because it forms a reliable source of water, especially in the dry season. Also, all important nutrients needed for plants are still contained in the final water, necessitating no or very little fertilizer for continuous, sustainable agricultural produce. Thus, the final water can be reused for parks, sports fields, gardens and selected agricultural produce.

- Future food security and huge potential for community upliftment. The effect of climate change is already experienced in Namibia and can be expected to intensify in the near future. The large amount of a good quality of final water discharged reliably by this plant will make it attractive for community-based agricultural projects that want to address and implement poverty and upliftment programs. It

will also contribute largely towards food security because a large, steady stream of water will be available daily for growing selected agricultural produce.

Extending the existing ponds by adding additional ponds is not an option and thus not supported.

4.3. OPTION 3: BIOLOGICAL TREATMENT PROCESS

Aquarius Consult CC in the 2018 Report advised that a treatment process giving a final effluent that can be reused for agricultural purposes should be favored. Several advanced biological treatment processes, that treat raw sewage to the General Standard and thus produce a final effluent that can be reused for agricultural purposes are currently available on the market. The most familiar ones would be the activated sludge process, submerged membrane bioreactors, rotating disc reactors and trickling filters. Aquarius Consult CC recommended that **new-generation trickling filter technology** be used, because it was found most applicable to local conditions and especially because it involves simple technology and is easy to operate and maintain.

New-Generation Trickling Filters (NGTF) effect advanced biological treatment of an effluent using attached-growth media technology to produce a high-quality final effluent. NGTF employ low-level mechanical technology in the form of submersible pumps, but latter require little service and maintenance. Generally, this technology is gaining increased acceptance throughout third world countries for the following reasons:

- Small footprint. To treat domestic effluent, NGTF need only ca 2-5% of the land area necessary for oxidation ponds (including evaporation).
- High quality final effluent. A final effluent exceeding the Namibian General Standard and WHO standards is produced. This will be safe for discharge even during periods of severe flooding of the area. Also, the final effluent can be reused for growing selected crops and aquaculture in line with WHO guidelines (WHO 2006a) or for gardening and lawns (e.g. sports fields and public parks) in the town.
- Simple technology. The only advanced mechanical equipment employed, are submersible pumps, which can be replaced without specific technical knowledge, and the drives for clarifier bridges (large plants only). Once commissioned, no further process control or adjustment to the process is required.
- Little mechanical equipment that can break. Under the latter, only the service/recycle pumps would be of concern, but designers always allow for duty and standby pumps.
- Little inspection, service and maintenance required. Only submersible pumps, which require periodic inspection and maintenance, are employed. However, the town will also need other pump stations to transfer sewage to the treatment plant and submersible pumps can therefore be regarded as standard mechanical equipment once a full reticulation system has been provided for the town.
- Low power requirements. NGTF use only ca 40 to 65% of the power required by other advanced treatment processes giving a comparable treated effluent, such as oxidation ditches or activated sludge processes. Not only will the continuous power demand be low, but standby power in the form of a standby generator can be provided at minimal costs.

For the specific conditions encountered at Oshakati, Trickling Filter Technology was therefore considered as most appropriate and most reliable technology to be employed.

5. PROPOSED NEW SEWAGE TREATMENT SYSTEM

The system proposed by Aquarius Consult CC and agreed upon by the Municipality is based on the use of new-generation trickling filter technology.

5.1. SYSTEM DESIGN PHILOSOPHY

The general and specific design aspects that have been taken into consideration by Aquarius Consult CC when designing the new Oshakati STP include:

5.1.1. GENERAL DESIGN ASPECTS

Similar construction and lay-out of all structures. To allow for phase implementation (see later), the plant is designed in multiple trains, with each train looking and operating the same, so that operators will find the same arrangement and equipment at all plant trains and will be familiar with the operation thereof.

Operation and maintenance. Emphasis was placed on simple operation, ease of maintenance and minimal process adjustments, coupled to familiar processes as also currently used at the STP.

General design aspects. The following aspects have been considered for choosing a specific unit treatment process:

- Known, well-proven unit processes and equipment will be employed;
- As the availability of electricity is limited and power costs are expensive – energy-intensive unit processes were avoided;
- Simplicity with regards to operation and maintenance;
- Limited reliance based on skilled personnel;
- Routine maintenance to be performed by locally trained personnel;
- A standby pump is provided for each set of duty pumps;
- Duplication of critical equipment such as pumps and valves will ensure limited stocks of spares can be kept on site.

Specific design aspects. Specific attention was given to the following, area specific aspects:

- Flooding. Large parts of northern Namibia are regularly flooded during the rainy season. Therefore, both plants were lifted approximately 1.5 m above natural ground level to ensure that they remain dry, even during times of severe flooding;
- Tamper-resistant plant operation. Emphasis was placed on incorporating unit processes and equipment such that operators cannot simply bypass critical equipment unless necessary for emergency maintenance purposes.

- Plant location. The new plant will be constructed at the site of the current West Ponds. This will allow all sewage that is currently pumped from various pump stations throughout the town to the West Ponds to discharge into the new plant, with no modifications to the sewage collection and transfer network required. Sewage that is currently discharged into the East Ponds will be collected in one of the existing ponds and will be transferred by a set of pumps to the new plant. This means that all of the existing transfer pump stations throughout the town will remain in use as is, and no rerouting of existing pump lines will be required.

Figure 16: Locality of the new plant

5.1.2. SPECIFIC DESIGN PARAMETERS

Aquarius Consult CC based the design and phasing of the proposed system on current discharge figures observed plus expected growth due to more consumers installing flush toilets and being connected up to the sewer network, as well as future expected growth for the next ten years. Since it will take already approximately three to four years to secure funds from Central Government, do a detail design, tendering, construction and putting into operation the extensions to this plant, a ten-year window is not very far into the future.

Population Estimate and Design Criteria

The *Table* below shows the population projection until 2028 based on actual population counts that were conducted by the Namibian Statistics Agency (NSA) in 2001 and 2011. Three scenarios are given:

- Population grows further at 0.9 % as experienced in the Oshana Region from 2001 to 2011;

- Population grows further at 1.4% as per the national average from 2001 to 2011;
- Population grows further at 3.5% due to urbanization;

Table 1: Population Projections for Oshakati – 2001 to 2028

Year	2001	2011	2018	2028
% Increase	Growth at 0.9% as experienced for Oshana Region between 2001 and 2011			
Population	28 255	36 541	38 906	42 553
% Increase	Growth at 1.4% as per current national growth rate between 2001 and 2011			
Population	28 255	36 541	40 276	46 283
% Increase	Growth at 3.5% due to urbanisation			
Population	28 255	36 541	46 490	65 579

Although the estimate of 3.5% growth due to urbanisation over the next ten years may be a bit high, Oshakati Town can be expected to show growth-rates substantially above the national average. Looking at the above figures, one should now already plan for serving ca 45 000 people, with another 15 000 additional inhabitants by 2028, thus 60 000 people in total. To serve latter amount of people will require treatment capacity to be provided of ca 4 500 m^3/d (at 100 l/p/d).

Thus, three off treatment trains (=modules) need to be planned for now, each module serving 15 000 people and hydraulic capacity of 1 500 m^3/d. Additional module(s) of 1 500 m^3/d treatment capacity can then be added later, as the need arises and future growth-rate evolves. The *Table* below shows Aquarius Consult CC's recommended design figures for a new STP plant for Oshakati that needs to be allowed for at this stage already. It was recommended that Phase 1 consist of 3 off Modules for a total treatment capacity of 4 500 m_3/d and Phase 2 of an additional Module of 1 500 m_3/d to be provided within the next 10 years after construction of Phase 1.

Table 2: Population served and wastewater design volumes for Oshakati STP

DESIGN PARAMETER	UNITS	PLANT CAPACITY		
		Phase 1 now	Phase 2 future	TOTAL
Population served	PE	45 000	15 000	60 000
Sewage Discharged	m^3/d	4 500	1 500	6 000
Average Dry Weather Flow m^3	m^3/d	187.5	62.5	250
Peak Flow	m^3/d	525	175	700

Based on the above figures, the corresponding organic loads for raw sewage discharged to the new works that need to be used for design purposes are shown in the *Table* below:

Table 3: Average Daily Design Wastewater Loads for new Oshakati STP

DESIGN PARAMETER	Basis	PLANT CAPACITY		
	Load (mg/l)	Phase 1 (kg/d)	Phase 2 (kg/d)	TOTAL (kg/d)
Chemical Oxygen Demand (COD)	1000	4 500	1 500	6 000
Biological Oxygen Demand (BOD)	500	2 250	750	3 000
Total Suspended Solids (TSS)	400	1 800	600	2 400
Peak Flow Ammonia-Nitrogen (NH_4-N as N)	35	157.5	52.5	210
Total Phosphates (TP as P)	25	112.5	37.5	150

The location of the three modules for Phase 1 (1 500 m3/d capacity each) will be on the existing site and will be finalised if and when the project goes ahead. Based on current inflow, Aquarius Consult CC recommend that 2 x 1 500 m^3/d train are constructed at the West Pond site and one 1 500 m^3/d train at the East Pond site, as the West Pond is currently the pond receiving more raw sewage inflow. The bulk of existing pump stations and pipework infrastructure could then be further used without requiring major changes.

5.1.3. FINAL WATER QUALITY

The plant will be designed that the final effluent that is produced will conform to the Namibian General Standard as per current Namibian legislation for final effluents (Water Act No. 54 of 1956) and will exceed European Standards (EC Directive 91/271/EHS) for plants of this size. New effluent quality standards have been drawn up and are currently being circulated by the Department of Water Affairs and Forestry (DWAF). These are expected to be legalized soon and the proposed design therefore already includes for adhering to the future Namibian General Standard for Effluents as well.

5.2. DESIGN OF THE SYSTEM

The advanced biological treatment utilizing Trickling Filter (TF) technology as employed for Oshakati will incorporate the following unit treatment processes:

- Inlet works with screening and grit removal in a grit channel;
- Suspended solids removal in a primary clarifier;
- Aerobic, biological carbonaceous material removal and nitrification in biofilters (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 following figure depicts the proposed process schematics for the plant and unit processes.

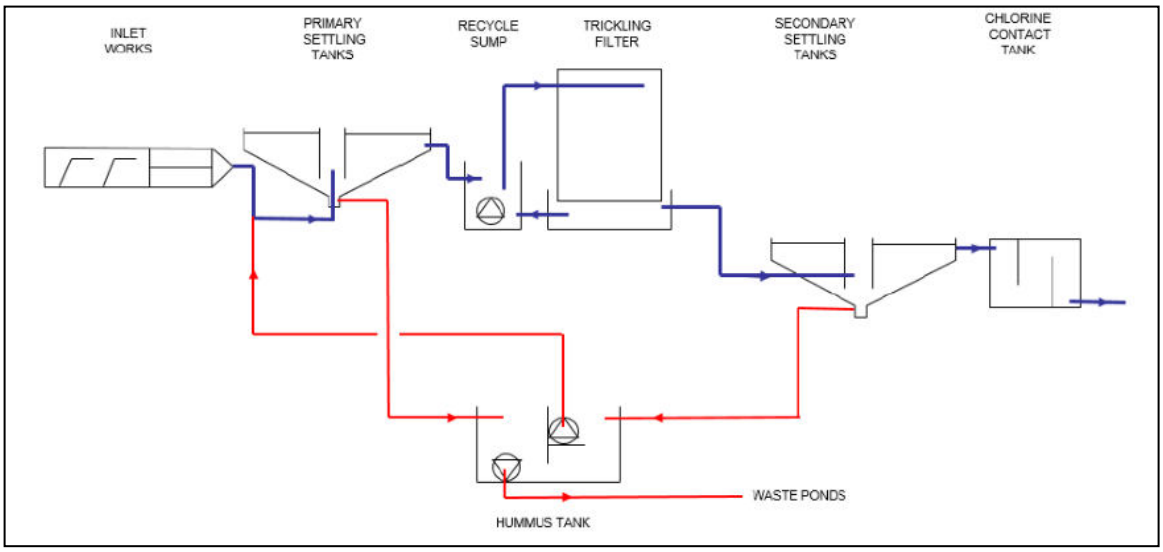

Figure 17: Process Schematic for Oshakati STP

The individual unit processes will be discussed in a similar order as the raw sewage.

5.3. INLET WORKS

A typical inlet works structure will serve two off trains, each sized for 1 500 m³/d average daily water flow (ADWF). Large objects such as plastic bags, bottles, rags and other, generally non-biodegradable material will be caught by a set (two off) of screens in series at the inlet to the treatment plant. These screens consist of static, parallel bars at a 45° angle with spacing between the bars of 25 mm for the first screen, followed by 10 mm for the second screen. The screens will be manually cleaned (raked) and the screenings collected and disposed of in a waste-bin that will be placed next to the screens. Final disposal of the screenings will be at the municipal solid-waste dump site.

After screening a set of grit removal, channels will ensure that the bulk of sand and grit can be removed from the sewage before further treatment. During normal operation both channels are in operation and heavy, mostly inorganic particles settle in these channels. During times of low inflow to the works, one channel is taken out of operation by inserting manual sluice gates on either side thereof and draining the water from it. The grit is then manually removed by an operator from the bottom of the channel and left to drip off and dry out on a ledge at the top of the channel.

Figure 18: Proposed inlet works with grit removal channel

After passing through the grit channels, the inflow will be split to feed two trains, thus to the inlet of the primary clarifiers. A flowmeter will be provided to measure inlet flows to each clarifier.

5.4. PRIMARY CLARIFIER (SETTLING TANKS)

Primary clarifiers are employed to remove 60% - 70% of total suspended solids (TSS) and 35 - 40% of COD/BOD in the raw sewage. One primary settler will be provided per train with main dimensions as follows:

- Diameter = 16,0 m
- Water depth (sidewall) = 3,5 m

The settler will be fitted with a central, stilling well to equally distribute the inflow, with the following dimensions:

- Diameter = 1,2 m
- Water depth (sidewall) = 2,5 m

Peripheral overflow weirs (V-notch) with a 500 mm wide Stamford baffle will be installed to prevent density currents and ensure equal draw-off of clarified effluent.

The settler will be fitted with a rotating (travelling) bridge driven by a peripheral bridge drive and scum and sludge-scraping mechanism at a peripheral speed between 1.5 and 2 m per minute. The peripheral drive runs on the outside wall of the clarifier and the sludge is moved towards the central sludge hopper for periodic sludge withdrawal. Sludge and scum

are withdrawn by opening the desludge valve (mechanically when the bridge passes over the desludge valve opening mechanism).

Figure 19: Clarifier with Rotating Bridge

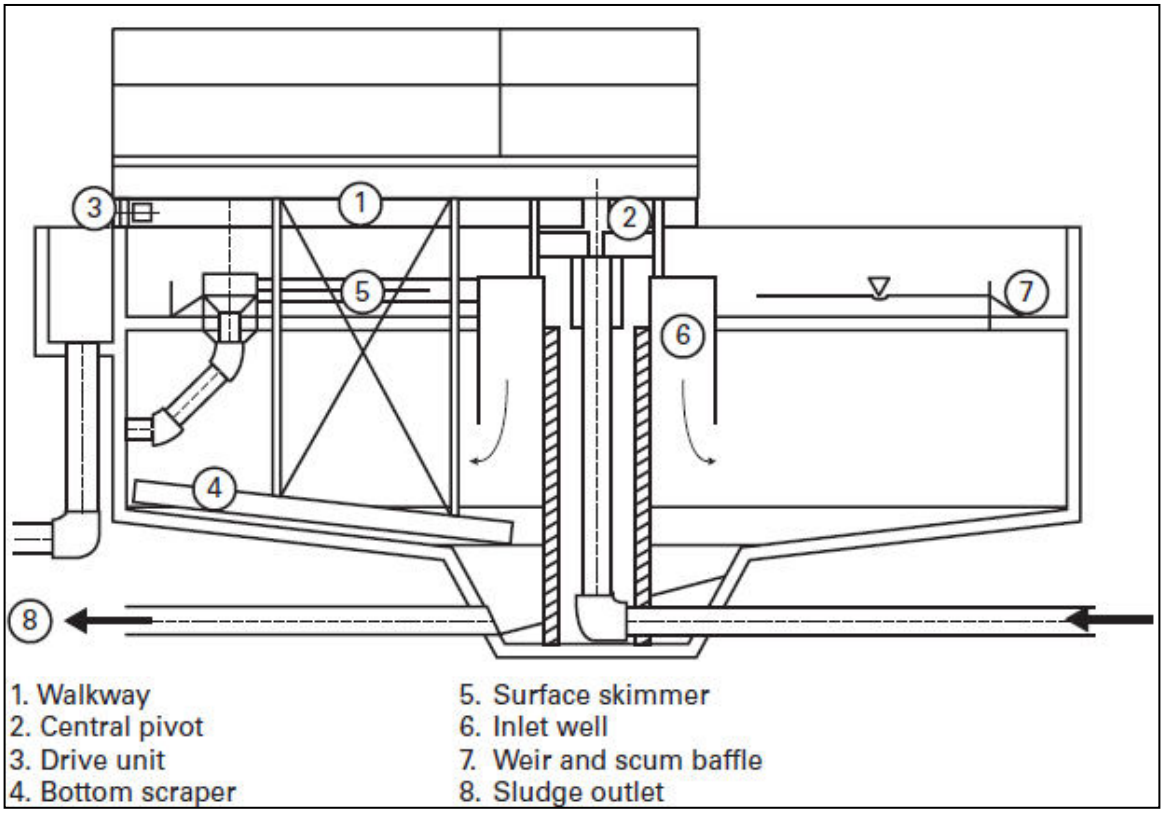

Figure 20: Clarifier with Rotating Bridge Illustration

5.5. TRICKLING FILTER SYSTEM

The trickling filter system consists of a feed/recycle sump, which is sized for and acts as anoxic reactor for denitrification, the trickling filter tower and trickling filter basin.

5.5.1. TRICKLING FILTER FEED SUMP

After primary treatment, the overflow from the primary settler/clarifier, is discharged into a pump sump, from where it is recirculated by open impellor submersible pumps (2 duty, 1 standby) through the trickling filter. This sump is sized with a hydraulic retention time that allows anoxic conditions to prevail.

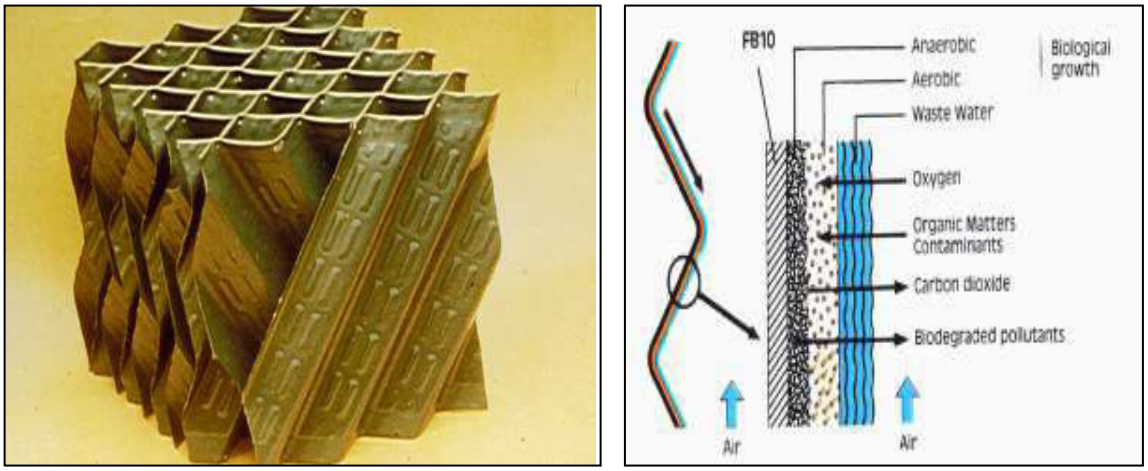

Figure 21: Packing in trickling filer - Biofilm growth on media

The trickling filter itself consists of highly permeable medium, which serves as host for micro-organisms to attach to and grow on, to form a biological film. The filter medium is manufactured from robust, weatherproof and UV-stabilised plastic material with self-supporting structure. Organic material in the wastewater is absorbed by micro-organisms growing as a biological film on the media. In the outer portion of the film, aerobic organisms degrade organic material, whereas anaerobic organisms exist deeper into the biological film, i.e. near the surface of the media.

5.5.2. TRICKLING FILTER TOWER

The trickling filter tower is stacked with a bed of the highly permeable medium to a height of 6m. Wastewater is sprayed over and percolates through the medium. A simple system of non-clogging, open nozzles is used to distribute the water evenly over the top of the media. The media will allow for carbonaceous material removal as well as nitrification to take place inside the trickling filter. The packing will have a high void ratio (>97%) to reduce the risk of clogging and to maximize ventilation throughout the filter. Efficient mixing and wetting are essential and media with a crossflow pattern for the even distribution of water throughout the filter bed will be provided.

Figure 22: Trickling Tower with Wetting (Spray Nozzles) on Top

The water, after percolating through the media, is collected in the trickling filter basin. Biological solids that have become detached from the packing media have to be removed before the effluent is disinfected and can be finally discharged. Removal of the biomass is achieved in a conventional, secondary settler/clarifier.

5.5.3. SECONDARY CLARIFIER

Treated effluent from the trickling filter is discharged into the settling tank, where the suspended solids settle out and clear water is drawn off via V-notch weirs that discharge into a peripheral channel at the top of the clarifier. The sludge is scraped by a rotating bridge to the center of the tank, where it is collected in a desludge hopper. A sludge scraper is fitted to the rotating bridge of the clarifier to scrape the sludge (bottom) into a central hopper, from where it is then periodically discharged into the humus tank. One secondary clarifier will be provided per train, thus with capacity of 1 500 m^3/d ADWF.

5.5.4. SLUDGE HANDLING - HUMUS TANK

All sludge discharged from the primary and secondary clarifiers is collected in the humus tank. The sludge will be anaerobic due to microbial degradation/decay taking place in an oxygen deficient environment in this tank. Part of this sludge (the more dilute part) is continuously returned with a set of sludge return pumps (1 duty, 1 standby) to the inlet of the primary clarifier, where this return sludge also serves as seeding material for anaerobic microorganisms in the primary clarifier. The sludge return pumps will be mounted approximately half-way (down) in the sump, ensuring that only the more dilute sludge is returned to the primary settler, whereas the thicker sludge will settle to the bottom of the humus tank.

The thicker sludge that settles at the bottom of the humus tank will be discharged from time-to-time to the sludge drying beds (CT07) by a separate set of sludge pumps.

5.5.5. DISINFECTION – CHLORINE CONTACT TANK

It is a requirement by DWAF that all final effluent produced in sewage treatment plants **must** be disinfected properly, even if only discarded to the environment. The effluent will be disinfected utilizing chlorine gas. A chlorine gas dosing station will be supplied for each

site/plant. This will consist of 2 off 68 kg chlorine gas cylinders (on hire by client), each of which is fitted with a gas chlorinator. The dosing rate of the chlorinator can be manually adjusted to provide the necessary dosage for disinfecting the final effluent before discharge. An automatic switch-over unit will ensure that, when the cylinder in operation is empty, the system will switch over to a new, full bottle.

Water for the booster pump stream is obtained from filtered final water. The chlorinated stream discharges into the inlet to the chlorine contact tank, which is sized to provide at least 20 min contact time at peak flow for proper disinfection.

5.5.6. SLUDGE DISPOSAL – SLUDGE DRYING BEDS

20 off Sludge drying beds, each with a surface area of 10 m², will be supplied per 15 000 PE train. Sludge is periodically (ca once per week) removed from the humus tank and pumped to the drying beds. The operators will select which drying bed to fill by switching the isolating valves such that these pumps discharge only into the selected sludge drying bed(s). The sludge is then left to dry and can then be manually removed from the sludge drying beds and reused as compost, typically for gardening purposes.

5.5.7. FINAL WATER REUSE

The plant will be designed such that the final effluent that is produced will conform to the Namibian General Standard as per current Namibian legislation for final effluents (Act No. 54 of 1956) and will exceed European Standards (EC Directive 91/271/EHS) for plants of this size. New effluent quality standards have been drawn up and are currently being circulated by the Department of Water Affairs and Forestry (DWAF). These are expected to be legalized soon and the proposed design therefore already includes for adhering to the future Namibian General Standard for Effluents as well.

The final water produced by these plants will be excellent for reuse in gardens, parks and even selected agricultural produce. It is therefore proposed to discharge the final water as follows:

- At Oshakati West ponds, final water will be discharged into one of the existing ponds, to be used as a final water irrigation pond. In addition, a set of pumps will be provided to pump final water to the East ponds to be used for irrigation.
- At Oshakati East ponds, one of the existing ponds will be used to store the treated final water pumped from the new plant (located at the West ponds) so that the water can be used for irrigation in the nearby area, including the golf course.

5.5.8. RISING MAINS AND SEWER CONNECTION LINE

The pipelines connecting sewer treatment facilities will be constructed along the existing road reserves provided for the alignment and construction of municipal bulk services.

5.5.9. POWER SUPPLY, CONTROL AND MONITORING

Total, continuous power consumption for one train serving 15 000 people will be not more than 45 kW (absorbed power). However, it is recommended that a feeder that also caters for future extensions to both plants should be installed now already. This will require provision made for:

- Phase 1 (3 x 1 500 m^3/d trains): 135 kW (absorbed), 380 V, 3-phase, continuous power to be drawn;
- Phase 2 (1 x 1 500 m^3/d train): 45 kW (absorbed), 380 V, 3-phase, continuous power to be drawn;

The plant will be fitted with very basic control:

- Automatic duty/standby rotation every 12 h of all pumps sets;
- Two indication lights (running/trip) for every pump are required;
- An alarm signal light (similar to a break-down truck) on top of the control board will be provided. Latter will be activated if any pump trips and will be switched off when all signals are healthy again. Thus, an operator will be able to already see from a considerable distance from the plant, if any motor has tripped.

Data logging/monitoring will include:

- Raw water inflow;
- Sludge wastage;
- Final water discharge.

6. REUSE OF TREATED WATER

The proponent intends to use the treated water for the irrigation of:

- The town's parks and gardens;
- The golf course;
- The irrigation of crops/trees in a demarcated area to be set aside specifically for this purposes under supervision of Council's Public Health and Environmental Departments.

The new sewage treatment plants will require only a small fraction of the land currently used for the pond systems. These ponds can then be dried out and the land used or sold for residential or agricultural purposes.

The areas indented for irrigation of crops is located directly south of the Oshakati East Ponds in the proximity of the proposed new treatment plant. See below images of the proposed irrigation areas in relation to the ponds and plant position:

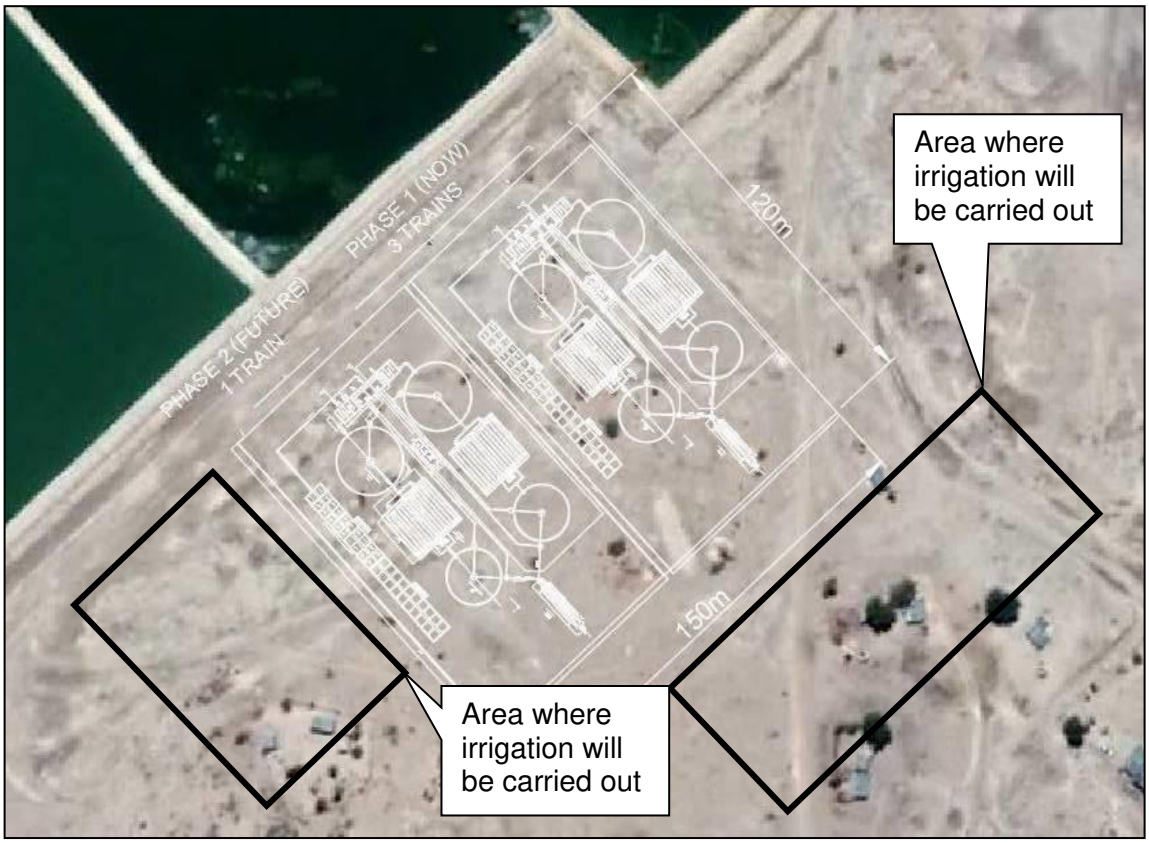

Figure 23: Proposed Oxidation Ponds

There are small residential dwellings on some of the proposed areas where the proposed irrigation will take place. Compensation will be given to the individuals making use of the land. The project was already discussed with the individuals and a relocation strategy will be arranged with them.

6.1. WATER QUALITY REQUIREMENTS FOR AGRICULTURE

The reuse of wastewater (greywater, reclaimed domestic effluent, industrial effluents) is guided by the guidelines set out in the Code of Practice (Volume 6, July 2011) of the of the Ministry of Agriculture, Water and Forestry as well as under the Water Resources Management Act (No. 24 of 2004).

Sewer treatment through oxidation ponds do not achieve a final water quality that conforms to the Namibian General Standard, nor is the final, treated effluent safe for reuse for irrigation purposes. However, wastewater is increasingly used for agricultural purposes in both developing and industrialized countries. This is due to increased water scarcity and degradation of freshwater resources caused by improper disposal of wastewater. Also, the value of nutrients contained in wastewater is now being recognized. Domestic effluent contains all nutrients required for agricultural applications and renders fertilizer addition obsolete. The increase in food demand resulting from population growth, results in increased irrigation water demand. Thus, the safe and efficient use of treated wastewater in agriculture is of environmental and economic importance, as it can help communities to grow more food while conserving natural water and nutrient/fertilizer resources.

The proposed use of the treated effluent for irrigation is thus permitted under the guidelines of the Code of Practice. On condition that the irrigation with treated wastewater emphasis must be placed on continuous monitoring and safe use thereof, especially where treated wastewater ultimately comes into direct contact with humans, or plants and animals consumed by humans, in order to guarantee public health and safety at all times. Wastewater irrigation, for example, can present a risk to public health if not carefully controlled and applied as stipulated in this guideline. However, wastewater reuse can be beneficial because it can prevent over-exploitation of natural water resources. Also, wastewater contains valuable nutrients and no fertilizer needs to be added when reusing treated, domestic effluent for agricultural purposes. Thus, the advantages and disadvantages of wastewater reuse must be carefully weighed up when determining areas of application for such reuse.

The Code of Practice sets out the various combinations of wastewater treatment and the suitability of the use of the treated water for different methods of irrigation (see *Table* below).

Table 4: Agricultural Reuse

Irrigation of	Primary and Secondary Ponds	Oxidation Pond with 40 day maturation pond	Primary, Secondary & Tertiary Treatment, not to General Standard	Primary, Secondary & Tertiary Treatment, to General Standard	Primary, Secondary & Tertiary Treatment*, to Special Standard
1. Vegetables and crops consumed raw by humans (3 excluded)	Not permissible	Not permissible	Not permissible	Not permissible	Any type of irrigation permissible
2. Vegetables and crops not consumed raw by humans	Not permissible	Not permissible	Not permissible	- Flood and drip irrigation permissible provided products are not directly exposed to spray - Effective draining and drying before harvesting; - Fallen produce unsuitable for human consumption	Any type of irrigation permissible
3. Fruit trees and vineyards for the cultivation of fruit which is consumed raw by humans	Not permissible	- Flood and drip irrigation permissible on merit provided fruits are not directly exposed to spray; - Effective draining and drying before harvesting - Fallen fruit is unsuitable for human consumption	- Flood and drip irrigation permissible on merit, provided fruits are not directly exposed to spray - Effective draining and drying before harvesting - Fallen fruit is unsuitable for human consumption	- Flood and drip irrigation permissible on merit provided fruits are not directly exposed to spray - Effective draining and drying before harvesting - Fallen fruit is unsuitable for human consumption	Any type of irrigation permissible
4. Cultivation of cut flowers	Not permissible	- Flood and drip irrigation permissible on merit provided flowers are not directly exposed to spray; - Effective draining and drying before harvesting essential	- Flood and drip irrigation permissible on merit provided flowers are not directly exposed to spray; - Effective draining and drying before harvesting essential	- Any type of irrigation permissible - Effective draining and drying before harvesting essential	Any type of irrigation permissible
5. Grazing for milk or meat producing animals	Not permissible	Not permissible	Not permissible	- Flood and drip irrigation permissible on merit; - Not Permissible as drinking water for animals - Effective draining and drying before consumption	- Any type of irrigation permissible; - Permissible as drinking water for animals.
6. - Crops not for grazing, but utilized as dry fodder; - Crops cultivated for seeds purpose only; - Tree plantations; - Nurseries (cut flower excluded, see 4)	Not permissible	- Any type of irrigation permissible on its merits - No over-irrigating or pool forming - No smell nuisance - Properly fenced (no public allowed) - No meat animals, milk producing animals or poultry permissible	- Any type of irrigation permissible on its merits - No over-irrigating or pool forming - No smell nuisance - Properly fenced (no public allowed) - No meat animals, milk producing animals or poultry permissible	Any type of irrigation permissible	Any type of irrigation permissible

* Sand and Granular Activated Carbon Filtration and Disinfection must form part of the Tertiary Treatment steps.

Table 5: Landscape Irrigation

Irrigation of	Primary and Secondary Ponds	Oxidation Ponds with 40 day maturation pond	Primary, Secondary & Tertiary Treatment, not to General Standard	Primary, Secondary & Tertiary Treatment, to General Standard	Primary, Secondary & Tertiary Treatment*, to Special Standard
1. Lawns at swimming pools, nursery schools, children's' playgrounds	Not permissible	Not permissible	Not permissible	Not permissible	- Any type of irrigation permissible; - No public allowed during irrigation, only allowed after effective draining/drying.
2. School grounds and public parks (children's' playground excluded, see 1).	Not permissible	- Only flood or drip, no spray irrigation permissible; - No over-irrigation and no pool forming allowed; - No public allowed during irrigation, only allowed after effective draining /drying.	- Only flood or drip, no spray irrigation permissible; - No over-irrigation and no pool forming allowed; - No public allowed during irrigation, only allowed after effective draining/drying.	- Any type of irrigation permissible; - No public allowed during irrigation, only allowed after effective draining/drying.	- Any type of irrigation permissible; - No public allowed during irrigation, only allowed after effective draining/ drying.
3. Parks - only for beautifying flowerbeds, traffic islands etc. (not recreation areas)	- Not permissible	- Only flood or drip, no spray irrigation permissible; - No public allowed during irrigation.	- Only flood or drip, no spray irrigation permissible; - No public allowed during irrigation.	- Any type of irrigation permissible; - No public allowed during irrigation.	Any type of irrigation permissible.
4. Sports fields were limited contact is made with the surface (golf course, cricket and hockey fields)	Not permissible	- Only flood or drip, no spray irrigation permissible; - No over-irrigation and no pool forming allowed; - No players or public during irrigation; - Players and public allowed only after effective draining and drying.	- Only flood or drip, no spray irrigation permissible; - No over-irrigation and no pool forming allowed; - No players or public during irrigation; - Players and public allowed only after effective draining and drying.	- Any type of irrigation permissible - No over-irrigation and no pool forming allowed; - No players or public during irrigation.	- Any type of irrigation permissible; - No players or public during irrigation.
5. Sport fields where regular contact is made with the surface (athletic tracks, rugby and soccer fields)	Not permissible	- Only flood or drip, no spray irrigation permissible; - No over-irrigation and no pool forming allowed; - No players or public during irrigation; - Players and public allowed only after effective draining and drying.	- Only flood or drip, no spray irrigation permissible; - No over-irrigation and no pool forming allowed; - No players or public during irrigation; - Players and public allowed only after effective draining and drying.	- Any type of irrigation permissible - No over-irrigation and no pool forming allowed; - No players or public during irrigation; - Players and public allowed only after effective draining and drying.	- Any type of irrigation permissible; - No players or public during irrigation; - Players and public allowed only after effective draining and drying.

* **Sand and Granular Activated Carbon Filtration and Disinfection must form part of the Tertiary Treatment steps.**

From the *Tables* above (*Column 4*), wastewater treated to general standards may be used for various purposes as long as:

- The public is kept away during irrigation;
- Over irrigation and puddle or pool forming is avoided;
- Players or training is only allowed once the sports field is effectively drained and dried;
- Flood or drip irrigation is used provided that fruits are not directly exposed to spray;
- Effective drying of the ground is allowed before harvesting;
- Fallen fruit is not collected for consumption;

6.2. PRECAUTIONS FOR WASTEWATER REUSE

The Code of Practice (*Department of Water Affairs and Forestry, 2011*) lists the following aspects which need to be considered when installing and using wastewater reuse systems:

- Evidence shall be obtained that the type of soil, the size of the surface as well as the type of crop concerned are suitable for irrigation with the proposed quantity and quality of effluent to be reused;
- In order to prevent accidental cross-coupling of pipes, piping used for effluent shall be distinctly different from piping used for drinking water in respect of colour, construction and type of material. As a suitable color for piping to identify wastewater (for reuse), a purple color such as “jacaranda” should be used;
- Taps, valves and sprayers of the irrigation system shall be designed so that accidental drinking or washing with effluent water is prevented. Only authorized personnel shall be able to operate them;

- Clear and legible notices shall be provided at every water point where persons could possibly drink reclaimed effluent, indicating that it is potentially dangerous to drink the water;
- Wherever the expression “after effective draining and drying” is used in this guideline, the activity concerned shall only be performed once the irrigated area no longer contains evident effluent drops or pools;
- All possible precautions shall be taken to ensure that excessive irrigation is avoided and the irrigation area is protected against storm water runoff with suitable screening walls and contours to avoid contamination of surface or underground water with irrigation water, especially when the latter does not comply with the general standard;
- Spray irrigation shall only be permitted in cases where spray cannot be blown over to adjoining areas for which such irrigation is prohibited. The distance of an adjoining area and its use, as well as the quality of the effluent and prevailing winds shall be considered before spray irrigation is permitted;
- Necessary precautionary measures shall be taken to ensure that effluent is not used for drinking water or domestic purposes (*Department of Water Affairs and Forestry, 2011*).

7. OPERATION AND MAINTENANCE

Although the trickling filter technology as proposed for Oshakati is simple to operate, requires no seasonal adjustments and needs minimal maintenance, it is recommended that two semi-skilled persons are employed to oversee proper operation at the site and to do all necessary routine service and maintenance functions. Theoretically, only one person would suffice, but for health and safety reasons, a minimum of two people must be present at any industrial site. The project will result in at least 120 temporary jobs created during construction and 85 permanent jobs during agricultural processes (*Aquarius Consult CC, 2020*).

8. ENVIRONMENTAL, SAFETY AND HEALTH ASPECTS

The following aspects are especially important for the environmental analysis:

- Quantities and nature of chemicals used at the water treatment works. Emergency preparedness plans, safety equipment and emergency clean-up procedures need to be in place in case of a spillage. Chlorine gas that is used for disinfection is a particular concern, as this is a highly toxic gas and can have severe health and environmental impacts if leakages occur. The chlorination equipment including the chlorine cylinders will be contained within a separate building, away from any other chemicals. All relevant safety notices and safety equipment will be available at this building (*Aquarius Consult CC, 2020*).

- Waste material disposal. All waste produced by the plant, including waste sludge from the process, domestic waste and sewage needs to be disposed of or treated in a suitable manner. The most suitable disposal or reuse of sludge should be considered. Recommended options include the use of dried sludge for gardening,

local farmers or residents for soil fertilisation. Other disposal options include land application or disposal at land fill sites (*Aquarius Consult CC, 2020*).

- Safety. All open water structures that are on ground level will be fitted with hand railing to prevent the possibility of operators falling into these structures, especially during night shifts when visibility is poor (*Aquarius Consult CC, 2020*).

- Construction. The construction process for the sewage treatment plant will take the best part of 2 – 3 years. During this time, care must be taken to ensure minimal impact on the environment and to ensure that all construction works comply with the relevant Acts regarding health and safety (*Aquarius Consult CC, 2020*).

9. CURRENT ENVIRONMENTAL CLEARANCE CERTIFICATE

The current Environmental Clearance Certificate was issued by the Ministry of Environment, Forestry and Tourism on 6 October 2020 which expired on 6 October 2023. See below a copy of the current Certificate:

ECC – 00957 Serial: W5czSI957

REPUBLIC OF NAMIBIA

MINISTRY OF ENVIRONMENT, FORESTRY AND TOURISM

OFFICE OF THE ENVIRONMENTAL COMMISSIONER

ENVIRONMENTAL CLEARANCE CERTIFICATE

ISSUED

In accordance with Section 37(2) of the Environmental Management Act (Act No. 7 of 2007)

TO

Oshakati Town Council
Private Bag 5530, Oshakati

TO UNDERTAKE THE FOLLOWING LISTED ACTIVITY

Construction and operation of a new Sewerage Treatment Plant in Oshakati, Oshana Region

Issued on the date: 2020-10-06

Expires on this date: 2023-10-06

(See conditions printed over leaf)

ENVIRONMENTAL COMMISSIONER

Private Bag 13306 WINDHOEK NAMIBIA 07 OCT 2020 REPUBLIC OF NAMIBIA

Reduce Reuse Recycle

NAMIBIA IS NOT A TRASH BIN

This certificate is printed without erasures or alterations

The purpose of this submission is to renew the Environmental Clearance for a further 3 years to allow the Proponent to continue with the implementation of the project.

10. BULK SERVICES AND INFRASTRUCTURE PROVISION

A professional engineering firm (*Aquarius Consult CC*) was appointed by the proponent to design and supervise the installation of the treatment plant. All service designs will meet the requirements of the town council. The infrastructure will eventually be handed back to the town council to be managed and maintained by them. From the information obtained, the following bulk services are proposed:

10.1. ROADS AND ACCESS

The project site will be accessed through existing roads leading from the town. No new roads have to be constructed.

10.2. WATER SUPPLY

The project site will obtain water from the water reticulation system in the town. Water should be used sparingly in the construction and operational phase.

10.3. ELECTRICITY SUPPLY

The project site will obtain electricity from NORED's electrical reticulation system for Oshakati Town. The proponent will also install a silent backup generator to provide electricity in case of power failures on the local network.

10.4. SOLID WASTE DISPOSAL

The solid waste generated on the site will be collected by the proponent and be disposed of at an approved landfill site. Hazardous Waste which might be generated on the site will be dealt with in accordance with the required procedures for hazardous waste.

10.5. STORMWATER AND DRAINAGE MANAGEMENT

The design of the treatment plant will include provision for storm water infrastructure to accommodate storm water received from adjacent areas through natural surface drainage. Appropriate storm water infrastructure will be constructed to prevent any damage to the site or adjacent areas.

10.6. WASTEWATER/SEWER

Only household sewer will be generated on site from the toilet facilities for the staff and clients. This sewer will be connected to the sewerage system of the town.

10.7. FIRE PROTECTION

The Proponent has put in the necessary fire protection infrastructure / extinguishers as per requirements. A specialist Fire Protection Specialist was contracted to introduce a proper fire protection plan with the required infrastructure and to oversee the annual auditing and maintenance of the infrastructure.

11. AFFECTED NATURAL AND SOCIAL ENVIRONMENT

11.1. BIODIVERSITY AND VEGETATION

The area forms part of the Tree and Shrub Savannah Biome (specifically the Highland Savannah). The project site is showing evidence of human interference where vegetation was cleared on some areas of the site.

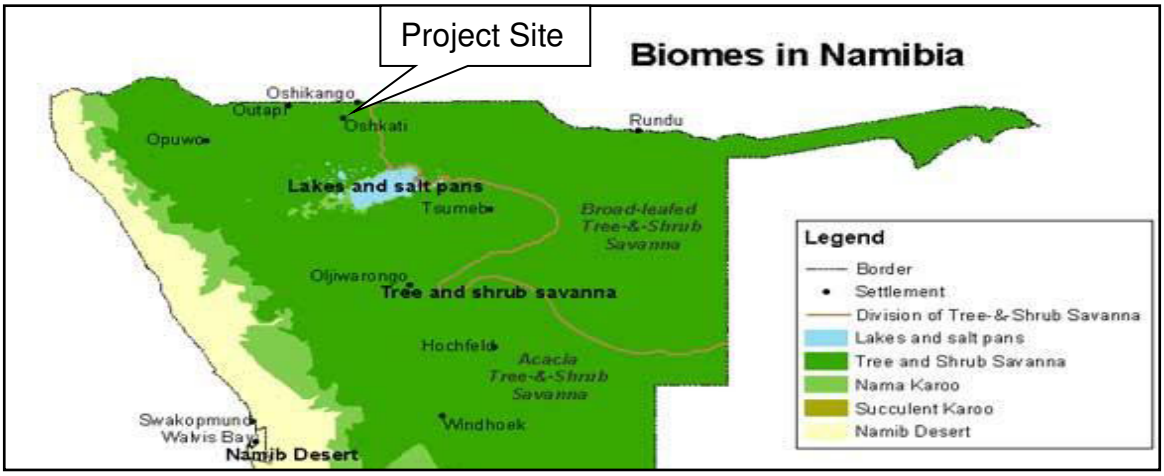

Figure 24: Biomes in Namibia (Atlas of Namibia, 2002)

See below a photo of the project site's surroundings where vegetation is visible. The project site does not have vegetation of importance however where possible vegetation should be retained.

The natural characteristics of the project site namely the vegetation clearance and the destruction of habitats is expected to further on have a low impact on the environment before the mitigation measures are taken and after the mitigation measures are taken, the impact will be very low.

Figure 25: Vegetation close to project site

CONCLUSION AND IMPACT

The development will have a low impact on vegetation, shrubs and trees.

11.2. CLIMATE

The area belongs to the tropical climate zone and receives high rainfalls during the rainy season (December to March). High humidity is most often experienced in this region. The project area is located in some of the wettest regions in Namibia with its high annual rainfall of ±700 mm. Rainfall however can also be variable and drought years are common. The hottest months are September, October and November with temperatures of 30ºC. The prevailing wind in the area is southeast and eastern winds. The prevailing wind direction is expected to prevent the spread of any nuisance namely noise and smell. Strong winds during certain times of the year may aggravate dust impacts during the construction phase.

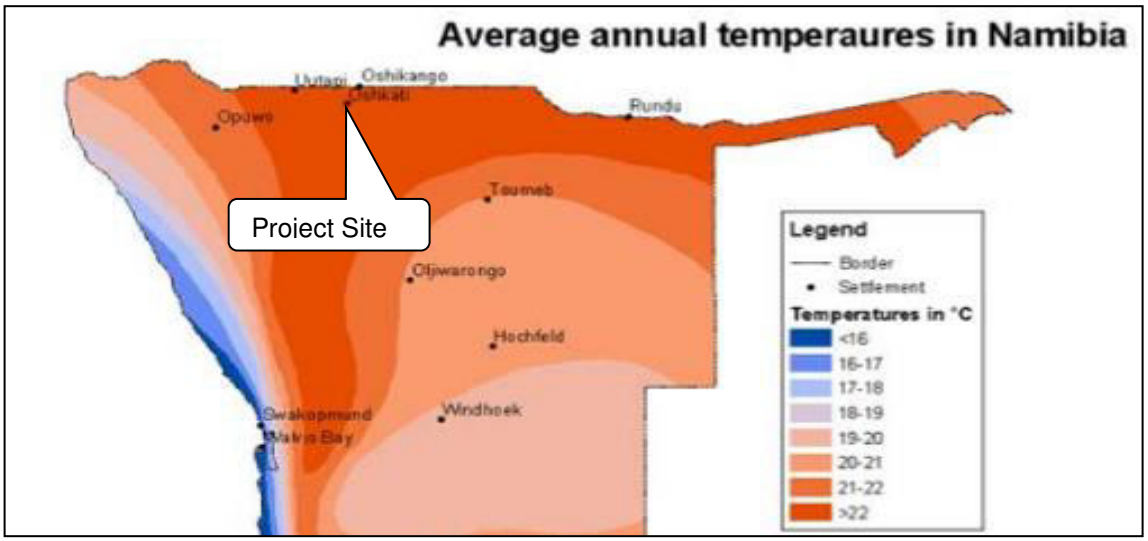

Figure 26: Average annual temperatures (Atlas of Namibia Project, 2002)

CONCLUSION AND IMPACT

The activities will not have an impact on the climate.

11.3. HYDROLOGICAL COMPONENT

The area where the project site is located has generally a low to average groundwater potential from a permeability and yield perspective (Grunert, 2003). However, groundwater is one of the important water sources and the protection thereof should be regarded as a high priority. The main uses of water in the area are for business, industrial and domestic purposes and agriculture and farming activities.

Although most of the surface water evaporates, runoff can be expected due to the impermeability of soils (Grunert, 2003). The storage and accumulation of substances, which might pollute river courses or basins because of surface water drainage, should be prevented. No potential pollutants should be channeled or directed towards any rivers.

From the hydrological assessment perspective, no major geological structures that will enhance groundwater recharge or flow are evident on the proposed project site and the development that will take place will not pose any long-term negative effects on the hydrological cycle (Grunert, 2003).

CONCLUSION AND IMPACT

The activities will not have an impact on the groundwater if mitigation measures are followed.

11.4. SOCIAL-ECONOMIC COMPONENT

The proposed project will have a positive impact on the socio-economic environment because additional employment will be created during construction and after construction. Most land uses around the area are characterised by open land, business and industrial activities and therefore the treatment plant will not have a negative impact on the environment. The infrastructure and services will be built with little disturbance to the environment and towards the individuals that are residing/working in the area. People residing in Oshakati will benefit from employment created during planning, construction and operation of the project. The construction impacts will be little if mitigated by the Environmental Management Plan. The town of Oshakati will also benefit from skills and technology transfer during construction and operations. The spending power of locals is likely to increase because of employment during the construction and operational phase.

CONCLUSION AND IMPACT

The impact on the town will be low and positive.

11.5. CULTURAL HERITAGE

The proposed project site is not known to have any historical significance prior to or after Independence in 1990. The specific area does not have any National Monuments and the specific site has no record of any cultural or historical importance or on-site resemblance of any nature. No graveyard, artifacts or related article was found on the site.

CONCLUSION AND IMPACT

No heritage resources or graveyards were observed on the site or in the area.

11.6. SENSE OF PLACE

The project site is located on the outskirts of the town of Oshakati. The project site is however situated in reaching distance to bulk infrastructural networks consisting of roads and electricity. The proposed activities will not have a large/negative impact on the sense of place in the area. An untidy or badly managed site can detract from the ecological well-being and individuality of the area. Unnecessary disturbance to the surroundings could be caused by poorly planned or poorly managed operational activities. The project site should be kept neat and clean where possible. Vegetation should not be removed or harmed if not necessary since it covers topsoil which prevents erosion. Noise and dust should be limited in the construction phase because of the neighbouring activities.

CONCLUSION AND IMPACT

The impact on the sense of place is low.

11.7. HEALTH

The safety, security and health of the labour force, employees and neighbours are of great importance, workers should be orientated with the maintenance of safety and health procedures and they should be provided with PPE (Personal Protective Equipment). A health and safety officer should be employed to manage, coordinate and monitor risk and hazard and report all health and safety related issues in the workplace. The introduction of external workers into the area is sometimes accompanied with criminal activities posing security risks for neighbours. However, the proponent will take certain measures to prevent any activity of this sort. The welfare and quality of life of the neighbours and workforce needs to be considered for the project to be a success on its environmental performance. Conversely, the process should not affect the overall health of persons related to the project including the neighbours.

CONCLUSION AND IMPACT

The proposed activities will have a low impact on the health of the community.

12. IMPACT ASSESSMENT AND EVALUATION

The Environmental Impact Assessment Renewal sets out potential positive and negative environmental impacts associated with the project site. The following assessment methodology will be used to examine each impact identified, see *Table* below:

Table 6: Impact Evaluation Criterion (DEAT 2006)

Criteria	Rating (Severity)	
Impact Type	+	Positive
	O	No Impact
	-	Negative
Significance of impact being either	L	Low (Little or no impact)
	M	Medium (Manageable impacts)
	H	High (Adverse impact)

Probability:	Duration:
5 – Definite/don't know	5 - Permanent
4 – Highly probable	4 – Long-term (impact ceases)
3 – Medium probability	3 – Medium term (5 – 15 years)
2 – Low probability	2 – Short-term (0 – 5 years)
1 – Improbable	1 - Immediate
0 - None	
Scale:	**Magnitude:**
5 – International	10 – Very high/don't know
4 – National	8 - High
3 – Regional	6 - Moderate
2 – Local	4 - Low
1 – Site only	2 - Minor
	0 - None

The impacts on the receiving environment are discussed in the paragraphs below:

12.1. IMPACTS DURING THE OPERATIONAL PHASE

12.1.1. ECOLOGICAL IMPACTS

Staff and visitors should only make use of walkways and existing roads to minimise the impact on vegetation. Minimise the area of disturbance by restricting movement to the designated working areas during maintenance and drives.

Impact Evaluation

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Ecology Impacts	-	1	2	4	2	M	L

12.1.2. DUST POLLUTION AND AIR QUALITY

Vehicles transporting goods and staff will contribute to the release of hydrocarbon vapours, carbon monoxide and sulphur oxides into the air. Possible release of sewer

odour, due to sewer system failure of maintenance might also occur. All maintenance of bulk services and infrastructure at the project site has to be designed to enable environmental protection.

Impact Evaluation

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Dust & Air Quality	-	2	2	4	4	M	L

12.1.3. CONTAMINATION OF GROUNDWATER

Spillages might also occur during maintenance of the sewer system. This could have impacts on groundwater especially in cases of large sewer spills. Proper containment should be used in cases of sewerage system maintenance to avoid any possible leakages. Oil and chemical spillages may have a heath impact on groundwater users. Potential impact on the natural environment from possible polluted groundwater also exists.

Impact Evaluation

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Groundwater contamination	-	2	2	4	2	M	L

12.1.4. GENERATION OF WASTE

Household waste from the activities at the site and from the staff working at the site is generated. This waste is collected, sorted to be recycled and stored in on site for transportation and disposal at an approved landfill site.

Impact Evaluation

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Waste Generation	-	1	2	2	2	M	L

12.1.5. FAILURE IN RETICULATION PIPELINES

There may be a potential release of sewage, stormwater or water into the environment due to pipeline/system failure. As a result, the spillage could be released into the environment and could potentially be health hazard to surface and groundwater. Proper reticulation pipelines and drainage systems should be installed. Regular bulk services infrastructure and system inspection should be conducted.

Impact Evaluation

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Failure of Reticulation Pipeline	-	1	1	4	2	M	L

12.1.6. FIRES AND EXPLOSIONS

There should be sufficient water available for firefighting purposes. Ensure that all fire-fighting devices are in good working order and are serviced. All personnel have to be trained about responsible fire protection measures and good housekeeping such as the removal of flammable materials on site. Regular inspections should be carried out to inspect and test firefighting equipment by the contractor.

Impact Evaluation

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Fires and Explosions	-	2	1	4	2	M	L

12.1.7. HEALTH, SAFETY AND SECURITY

The safety, security and health of the labour force, employees and neighbours are of great importance, workers should be orientated with the maintenance of safety and health procedures and they should be provided with PPE (Personal Protective Equipment). Workers should be warned not to approach or chase any wild animals occurring on the site. No open flames, smoking or any potential sources of ignition should be allowed at the project location. Signs such as 'NO SMOKING' must be prominently displayed in parts where inflammable materials are stored on the premises.

Impact Evaluation

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Safety & Security	-	1	2	4	2	M	L

12.2.CUMULATIVE IMPACTS

These are impacts on the environment, which results from the incremental impacts of the construction and operation of the development when added to other past, present, and reasonably foreseeable future actions regardless of which person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. In relation to an activity, it means the impact of

an activity that in it may not become significant when added to the existing and potential impacts resulting from similar or diverse activities or undertakings in the area.

Possible cumulative impacts associated with the proposed construction include: sewer damages/maintenance, uncontrolled traffic and destruction of the vegetation or the environment. These impacts could become significant especially if it is not properly supervised and controlled. This could collectively impact on the environmental conditions in the area. Cumulative impacts could occur in both the operational and the construction phase.

Impact Evaluation

Aspect	Impact Type	Scale	Duration	Magnitude	Probability	Significance	
						Unmitigated	Mitigated
Cumulative Impacts	-	2	3	4	2	M	L

13. CONCLUSION

In line with the Environmental Management Act (No 7 of 2007), *Green Earth Environmental Consultants* have been appointed to conduct an Environmental Impact Assessment Renewal for the construction and operation of the sewerage treatment plant in Oshakati.

Negative impacts that can be associated with the development are most likely to include: production of solid waste, dust emissions, atmospheric emissions, noise pollution, movement of soils, increased wastewater generation, the disruption of groundwater from the foundation or other structures, can result in an increase in traffic on the nearby roads and there can be an impact on the occupational health and safety of workers. However, this project is believed to be an asset to this area. Facilities and employment were made available for which there is a need.

After assessing all information available on this project, *Green Earth Environmental Consultants* believe that the development was required.

14. RECOMMENDATION

It is therefore recommended that the Ministry of Environment, Forestry and Tourism through the Environmental Commissioner support and approve the Environmental Clearance Renewal for the construction and operation of the sewerage treatment plant in Oshakati and for the following listed activities:

WASTE MANAGEMENT, TREATMENT, HANDLING AND DISPOSAL ACTIVITIES

2.1 The construction of facilities for waste sites, treatment of waste and disposal of waste.

2.2 Any activity entailing a scheduled process referred to in the Atmospheric Pollution Prevention Ordinance, 1976.

2.3 The import, processing, use and recycling, temporary storage, transit or export of waste.

WATER RESOURCE DEVELOPMENTS

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

HAZARDOUS SUBSTANCE TREATMENT, HANDLING AND STORAGE

9.1 The manufacturing, storage, handling or processing of a hazardous substance defined in the Hazardous Substances Ordinance, 1974.

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.

LIST OF REFERENCES

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Water Resource Management Act, 2004. *Office of the Prime Minister*. Windhoek. Namibia, pp. 6 – 67.

APPENDIX A: CURRICULUM VITAE OF CHARLIE DU TOIT

1. Position:	Environmental Practitioner	
2. Name/Surname:	Charl du Toit	
3. Date of Birth:	29 October 1960	
4. Nationality:	Namibian	

5. Education:	Name of Institution	University of Stellenbosch, South Africa
	Degree/Qualification	Hons B (B + A) in Business Administration and Management
	Date Obtained	1985-1987
	Name of Institution	University of Stellenbosch, South Africa
	Degree/Qualification	BSc Agric Hons (Chemistry, Agronomy and Soil Science)
	Date Obtained	1979-1982
	Name of Institution	Boland Agricultural High School, Paarl, South Africa
	Degree/Qualification	Grade 12
	Date Obtained	1974-1978

6. Membership of Professional Association:	EAPAN Member (Membership Number: 112)	

7. Languages:		Speaking	Reading	Writing
	English	Good	Good	Good
	Afrikaans	Good	Good	Good

8. Employment Record:	From	To	Employer	Position(s) held
	2009	Present	Green Earth Environmental Consultants	Environmental Practitioner
	2005	2008	Elmarie Du Toit Town Planning Consultants	Manager
	2003	2005	Pupkewitz Megabuild	General Manager
	1995	2003	Agra Cooperative Limited	Manager Trade
	1989	1995		Chief Agricultural Consultant

1985	1988	Namibia Development Corporation Ministry of Agriculture	Agricultural Researcher

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience. I understand that any wilful misstatement described herein may lead to my disqualification or dismissal, if engaged.

_____

Charl du Toit

APPENDIX B: CURRICULUM VITAE OF CARIEN VAN DER WALT

1. **Position:** Environmental Consultant
2. **Name/Surname:** Carien van der Walt
3. **Date of Birth:** 6 August 1990
4. **Nationality:** Namibian
5. **Education:**

Institution	Degree/Diploma	Years
University of Stellenbosch	B.A. (Degree) Environment and Development	2009 to 2011
University of South Africa	B.A. (Honours) Environmental Management	2012 to 2013

6. **Membership of Professional Associations:**

EAPAN Member (Membership Number: 113)

7. **Languages:**

Language	Speaking	Reading	Writing
English	Good	Good	Good
Afrikaans	Good	Good	Good

8. **Employment Record:**

From	To	Employer	Positions Held
07/2013	Present	Green Earth Environmental Consultants	Environmental Consultant
06/2012	03/2013	Enviro Management Consultants Namibia	Environmental Consultant
12/2011	05/2012	Green Earth Environmental Consultants	Environmental Consultant

9. **Detailed Tasks Assigned:**

Conducting the Environmental Impact Assessment, Environmental Management Plan, Public Participation, Environmental Compliance and Environmental Control Officer

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience. I understand that any wilful misstatement described herein may lead to my disqualification or dismissal, if engage.

_____

Carien van der Walt

APPENDIX C: ENVIRONMENTAL MANAGEMENT PLAN