

CENTRAL NORTH WATER SUPPLY AREA: ZONE 3

ENVIRONMENTAL MANAGEMENT PLAN

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Prepared by:
NamWater, Private Bag 13389, Windhoek, Namibia
Contact Person: N.P du Plessis
Tel: +264-6171 2093
Email: Plessisn@namwater.com.na

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LIST OF ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
CoC	Code of Conduct
DEA	Directorate of Environmental Affairs
EMA	Environmental Management Act
EMP	Environmental Management Plan
HIV	Human Immunodeficiency Virus
I&AP	Interested and Affected Parties
MEFT	Ministry of Environment, Forestry and Tourism
NEM	NamWater Environmental Manager
MSDS	Material Safety Data Sheet
NWQG	Namibian Water Quality Guidelines
NWQS	Namibian Water Quality Standards
STI's	Sexually Transmitted Infections
WTW	Water Treatment Works

1. PURPOSE OF THE EMP

This Environmental Management Plan (EMP) has been compiled and updated for the management of potential environmental impacts during the operation, and decommissioning phases of the existing Central North Water Supply Area (CNWSA): Zone 3 Water Supply Scheme. Best practice is proposed for the generic issues of construction management and supervision as well as the on-going management and operation of the water supply scheme.

In terms of the Environmental Assessment Policy of 1994 and the Environmental Management (Act No 7 of 2007) (EMA), the activities required for the construction of the proposed project requires authorization from the Directorate of Environmental Affairs at the Ministry of Environmental, Forestry and Tourism (MEFT: DEA).

An Environmental Clearance Certificate (ECC) was originally issued in 2018 and this EMP serves as an application for the renewal of the ECC.

2. INTRODUCTION

The Central North Water Supply Area (CNWSA) is located in the Central North area of Namibia, and covers areas of the Oshikoto, Omusati, Oshana and Ohangwena Regions. CNWSA infrastructure components have been divided into 8 separate zones.

The infrastructure of CNWSA: Zone 3 includes, the Outapi or Ombalantu Purification Plant, a pump station at this plant, the Outapi–Tsandi Pipeline and the Ombalantu North Rural Water Supply Scheme. A reservoir is located at the Outapi Purification Plant.

The location of Water Supply Zone 3 is depicted in **Figure 1**.

2.1 Outapi/Ombalantu Purification Plant

The Ombalantu Purification Plant is situated on the outskirts of the town of Outapi, between the tarred road to Olushandja and the Olushandja – Ombalantu Canal. The purification plant consists of an old batch plant, and a new, so-called package plant. The batch plant has been taken out of operation.

The Ombalantu Purification Plant is therefore a package plant consisting of the following principal components:

- A pump station housing various raw water and potable water pump sets,
- A prefabricated treatment plant comprising flash mixers, a flocculator and settling tanks.
- A bank of pressure filters,
- A reinforced concrete potable water reservoir,
- An elevated reservoir,
- A bank of five sludge lagoons
- A raw-water storage dam.

2.2 Ombalantu North Rural Water Supply Scheme

The Ombalantu North RWSS was built between 1998 and 1999 and LCE were the Engineers responsible for the design and construction supervision.

The EMP is for an existing CNWSA: Zone 3 and it is therefore only for the operation and maintenance of the Zone.

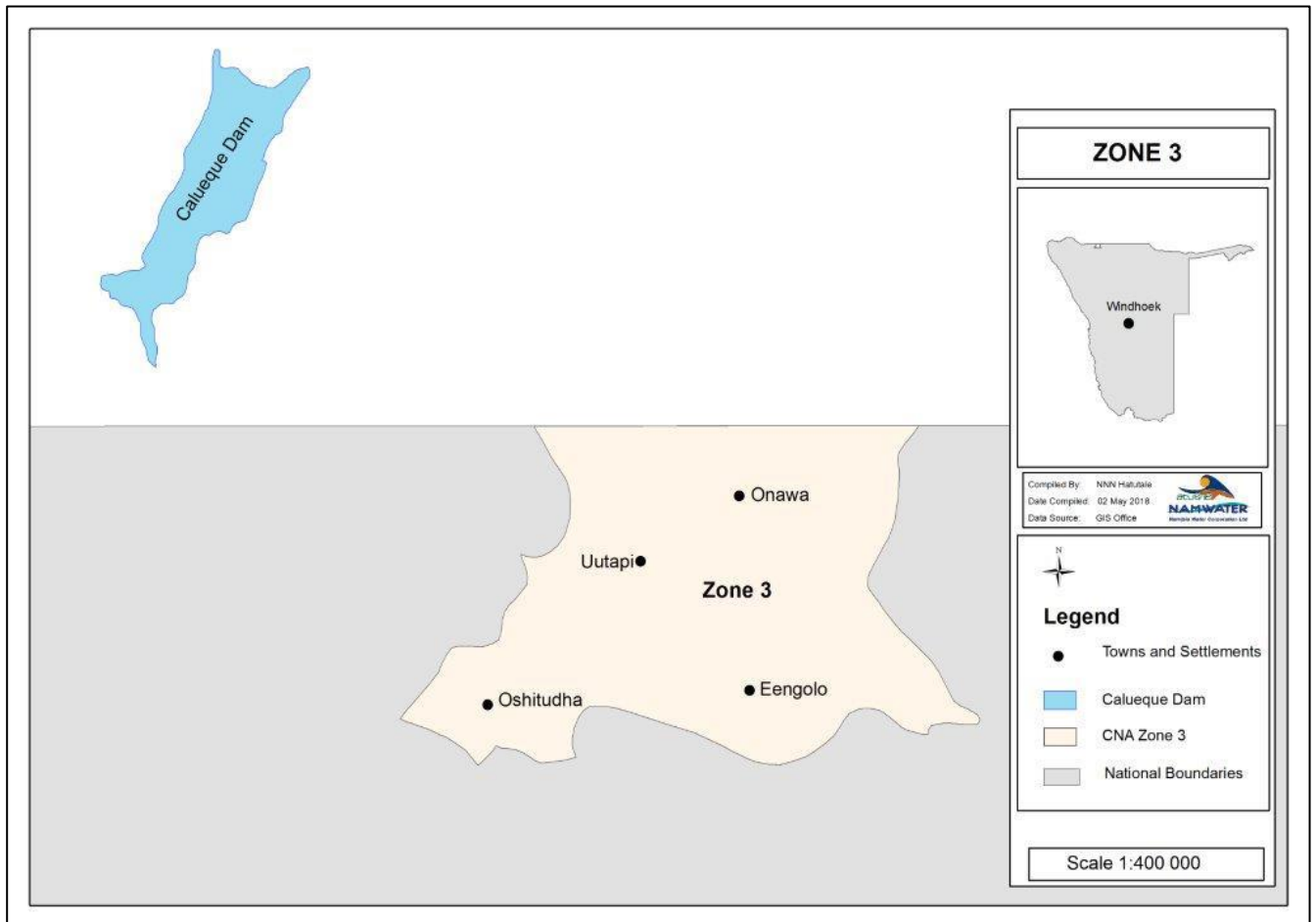


Figure 1: Water Supply Zone 3 Location Map

3. EXISTING CNWSA: ZONE 3 WATER SUPPLY INFRASTRUCTURE

3.1 Water Source

3.1.1 Outapi/Ombalantu Purification Plant

Water is supplied to the plant from the Olushandja–Ombalantu Canal which is pumped from the 70 000 m³ storage dam which is also filled from the canal. The water is then pumped into a ground level reservoir. From this reservoir, water is pumped into pipelines supplying the Ombalantu North Rural Water Supply Scheme. Water is also drawn from this ground level reservoir and pumped into an elevated reservoir, from where it gravitates into Outapi town.

The water purification processes include the unit processes of pre-chlorination, flash mixing, coagulation, flocculation, sedimentation and filtration. Other activities include chemical storage, chemical preparation and dosing, waterworks sludge disposal, with recirculation of the supernatant.

A schematic layout of the existing infrastructure is indicated in **Figure 2-3** below

3.1.2 Ombalantu North Rural Water Supply Scheme

Main water source is the ground level water reservoir. The water reservoir pumps water into the Ombalantu North Rural Water Supply Scheme pipelines. The scheme is divided into 7 areas, i.e. A1, A2, B1, B2, B3, C and D. Each area is supplied with water from its own source. Areas A and B are supplied from the Outapi Purification Plant and therefore fall in CNWSA: Zone 3.

3.2 Water Quality and Disinfection

The quality of water supplied to the pump station was evaluated for compliance with the guidelines presented in the Water Act, 1956 (Act 54 of 1956), Namibian Water Quality Guidelines (NWQG) and the draft Namibian Water Quality Standards (NWQS) as contained in the draft regulations of the Water Resources Management Act of 2013. The Department of Water Affairs, as the custodian of water affairs in Namibia, is applying the new regulations even though it is not yet promulgated. It is expected that the Act and Regulations will come in force before the end of the year (2017) or by early next year (2018). The Guidelines and Standards were formulated to ensure the safety of water supplied for human consumption. Evaluations for compliance to NWQS are not mandatory yet but it indicates compliance with the standards.

According to the NWQG the water can be classified in group A indicated in water analysis report (see appendix attached).

The existing disinfection system consists of two small multi-stage Grundfos pumps (Model CR3-12) with 1.1 kW, 230 V Grundfos motors running at a maximum speed of 2 900 rpm and each pump has a capacity of 3 m³ at 560 kPa. The pumps are installed in parallel and operate automatically, depending on the demand. The pumps as well as the dosing system are in good condition, with little maintenance required. The disinfection facility provides chlorine dosing at the following rates:

- Pre-Chlorination for the purification plant (50-1000 g/h),
- Post-Chlorination for the purification plant (50-1000 g/h).

A schematic layout of the existing infrastructure is indicated in **Figure 3** below.

3.2.1 Outapi/Ombalantu purification plant - Dosing System

The dosing system is being adjusted manually due to the fact that the ion charge analyser is not connected to the dosing system.

3.2.2 Coagulation and Flocculation

Instant blending of the coagulant with the raw water, and flocculation, takes place in a vertically installed glass fibre floc column located next to the settlers. The floc column is provided with a scour outlet for cleaning and maintenance purposes.

3.2.3 Sedimentation

Sedimentation takes place in three stainless steel sedimentation tanks installed with lamella packs. Desludging is activated by sensors and takes place automatically by means of electrically operated valves. Sludge flows, under gravity, to one or more of the five sludge drying beds.

The only way to remove the sludge that has accumulated is by removing the access covers and pipework at the bottoms of the tanks (i.e., below the lamella packs) and jetting out the sludge. Operators are compelled to remove the accumulated sludge in this manner due to the fact that the lamella packs cover the total surface area.

3.2.4 Sludge Handling

Sludge from the settlers and wash water from the filters is piped to the five concrete sludge drying beds. Water decanted from the sludge drying beds is pumped back to the plant or allowed to overflow into unlined ponds located close to the drying beds.

Desludging of the settlers appears to take place daily at 11 am, for approximately one minute. It appears as if backwashing takes place at a fixed time every day, at approximately 4 pm. Although backwashing of the filters takes place frequently, the air blower only operates once a day.

3.2.5 Sand Filtration

Sand filtration takes place in three pressure filters, with automatic backwash. Backwashing Cycles are initiated by a high-water pressure in the filters all processes associated with the package plant are Programmable Logic Controller (PLC) controlled and take place automatically.

3.3 Pipework

The Outapi Ombalantu purification plant uses a 300 mm diameter pipeline which supplies water under gravity from the Olushandja – Ombalantu Canal to a deep well on the site. The design is such that when the canal is out of operation or maintenance is being carried out on it.

The Ombalantu North Pipeline for the base year demand scenario (2007/08), the flow velocity in the bulk distribution network is below 0.31 m/s, while for the future demand scenario (2029/30), the flow velocity in the bulk distribution network is 0.62 m/s.

3.4 Reservoirs

There are approximately 3 reservoirs in CNWSA: Zone 3 that cater for Ombalantu purification plant:

- A Reinforced concrete (round) GLR with a capacity of 600 (m³).

- A constructed with Pressed steel ER with a capacity of 200 (m³).
- Consist of 6 x 10 m³ plastic shells of an elevated pressed steel tank. Water can also be supplied to the purification plant by pumping from the 70 000 m³ pump storage dam. The pipeline to the treatment plant is equipped with an electro-magnetic flow meter.

3.5 Power supply and control system

3.5.1 Raw Water Pumps

The raw water pump consists of Rapid Allweiler 125-250 pumps with 18.5 kW, 380 V, Eberle TEFC motors running at 1 445 rpm. The deep well is fitted with grid to screen out debris. The pumps are manually controlled.

3.5.2 Clear Water Pump Station (Supply to the Ombalantu North RWSS)

This pump station consists of two banks of pumps, one containing three pumps and the other containing four pumps, which draw water from the 600 m³ ground level reservoir and deliver into the pipelines to Areas A, B0 and B1 of the Ombalantu North Rural Water Supply Scheme (RWSS). All 7 pumps are Grundfos CR32-4 pumps, driven by 7.5 kW, 400 V, Grundfos TEFC motors running at between 700 and 2 880 rpm.

The two pumps are variable speed driven and are controlled via pressure sensors and electro-magnetic flow meters. The speed of the pumps increases with increasing demand and loss of pressure in the pipeline.

The power supply to Ombalantu North RWSS Area A is supplied from the purification plant new control panel via a 30 A TP circuit breaker and Areas B0 and B1 are supplied via a 63 A TP. Pumps are controlled with variable speed drives (VSDs) which prevent high start-up currents. All the pumps work automatically by monitoring the pressure and the flow.

The telemetry system is installed at the purification plant and all flow meters and pressure transmitters are connected to the telemetry system to allow all measurements to be recorded on the SCADA system

3.5.3 Outapi Clear Water Pump Station (Supply to Outapi Town)

This pump station consists of two Rapid Allweiler 80-250 pumps, driven by 11 kW, 380 V, Eberle TEFC motors running at 1 455 rpm, which draw water from the 600 m³ ground level reservoir and deliver into a 60 m³ elevated reservoir, from where water gravitates to Outapi Town and Onakayale

The pump station consists of two banks of pumps, one containing three pumps and the other containing four pumps, which draw water from the 600 m³ ground level reservoir and deliver into the pipelines to Areas A, B0 and B1 of the Ombalantu North Rural Water Supply Scheme. Two pumps are installed in parallel and are controlled via a level float switch installed in the elevated water tank. Both pumps are constant speed pumps.

The power supply to the pumps is via 25 A TP circuit breaker situated in the main control panel of the purification plant.

The telemetry system is installed at the purification plant and all level detectors are connected to the telemetry system to allow all measurements to be recorded on the SCADA system.

3.5.4 Ombalantu/Onayakale Town Pumps

The Ombalantu/Onayakale Town Pump Station has two matching pumps with a duty head of 15.2 m and a duty flow of 79.2 m³/h. Only one pump is operated and the other is kept as standby. The pump operates at a head of 16.1 m and delivers 67.1 m³/h and has sufficient capacity to satisfy the current and future water supply requirements.

3.5.5 Ombalantu North RWSS Pumps

The Ombalantu North Pump Station has seven pumps which supply water to Ombalantu Areas A, B0 and B1 simultaneously. Each pump has a duty head of 58.3 m and a duty flow of 29.8 m³/h. The pump station is normally operated on the VSD mode to control the pressure of the system to a maximum of 6 bar. This pump station was however simulated as a fixed speed pump station with a pressure reducing valve installed on the delivery side of the pump station, which valve controls the downstream pressure to maximum of 6 bar.

3.6 Scheme Processes/Operation

There are fulltime NamWater operators based at each purification plant in CNWSA: Zone 3.

3.7 Maintenance

Maintenance is done by a permanent NamWater team.

3.7.1 Pumps

All motors bearings should be lubricated with a high-temperature lithium-based grease after 3000 hours.

If a pump/s were out of operation for six months, lubrication is required before service commence on all motor bearings.

3.7.2 Air Valves

The valves must be opened monthly to be descaled and cleaned to ensure effective operation. The service intervals will depend on the severity of the conditions.

3.7.3 Pressure Gauges and Transducers

The gauge cocks must be turned monthly to bleed-off air and ensure accurate readings. Turning prevents scale accumulation which prevents the gauge cock from functioning. The operational or service intervals will depend on the severity of the conditions.

3.7.4 Reservoirs

The reservoirs should be checked for leaks and other damages on a monthly basis. If leaks are detected, it should be fixed immediately.

3.7.5 Pipe Breaks/leaks

Monthly monitor of pipes should be done to avoid wastage of water in an event a major pipe break. The pipeline corridor for maintenance work is 10 m by 5 m.

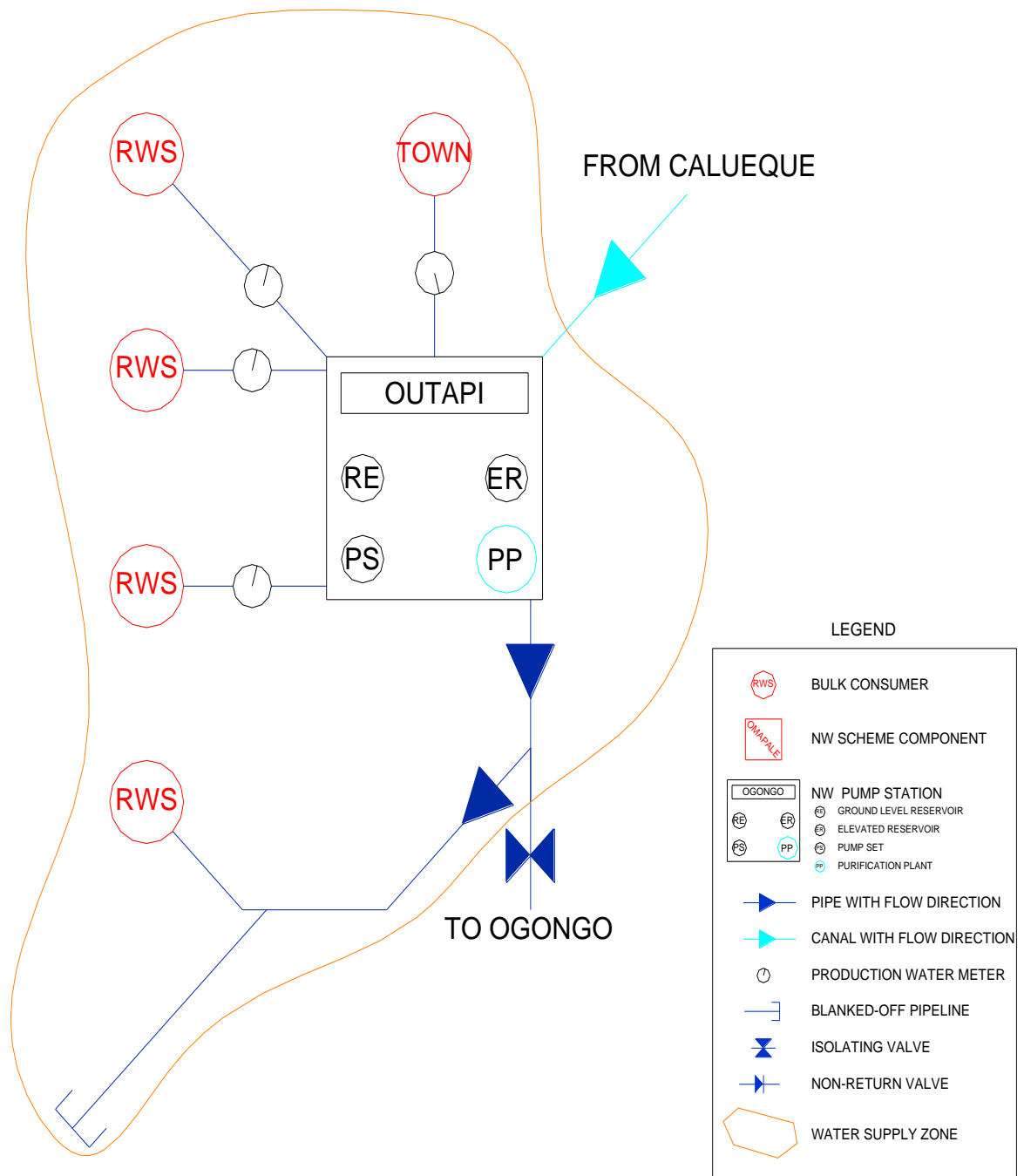


Figure 2: Schematic Layout of the Infrastructure of CNWSA: Zone 3

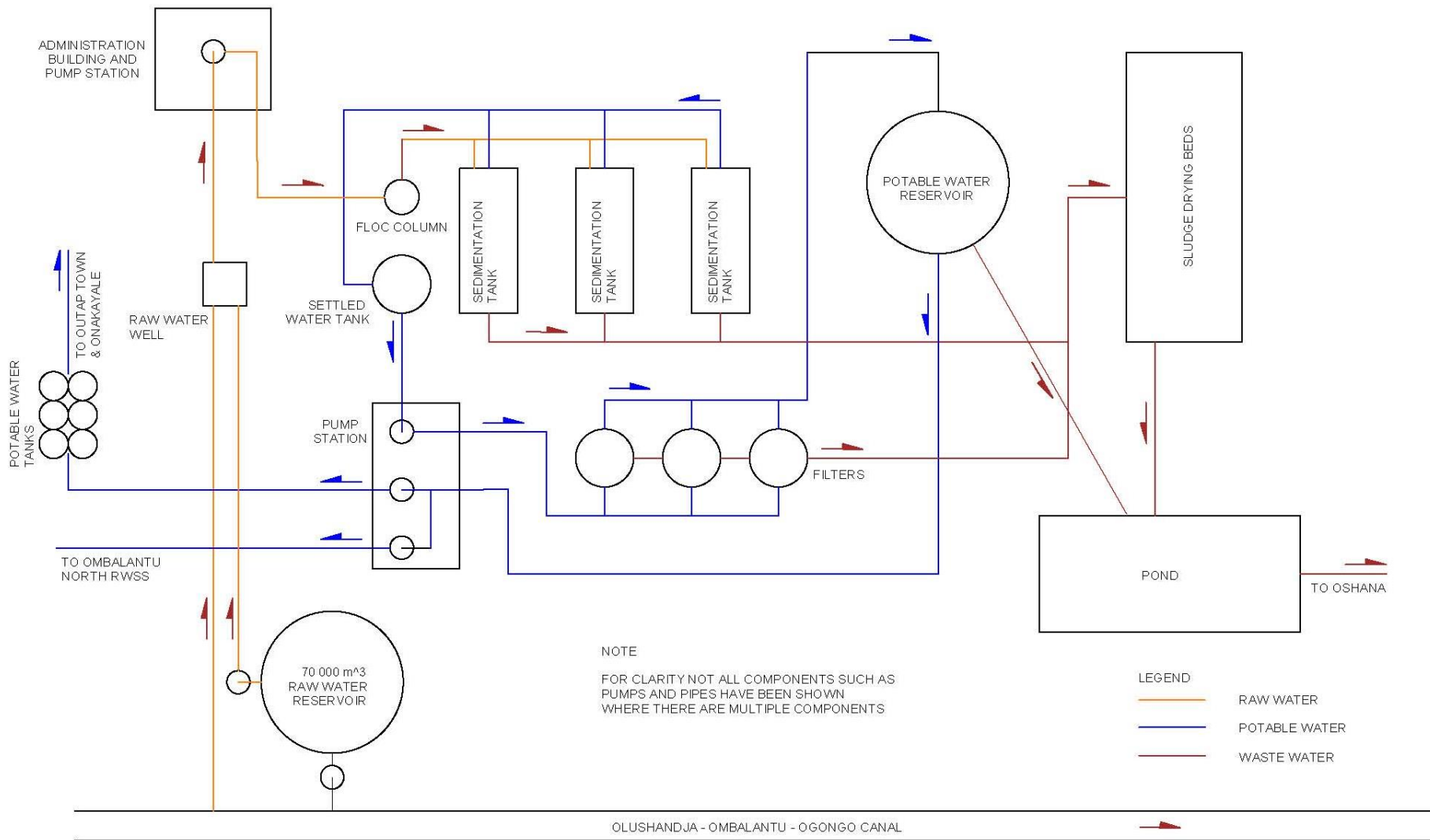


Figure 3: Schematic Layout of the Outapi Purification Plant

4. BRIEF DESCRIPTION OF THE RECEIVING ENVIRONMENT

The baseline description provided below focuses on the receiving environment:

4.1 Climate

The CNWSA: Zone 3 area has a hot semi-arid climate, which is characterised by warm winter days to chilly winter's nights and particularly hot summer's days and semi cool summer nights. The area is susceptible to minimal rainfall which fluctuates in period and volume every season. Rainfall typically ensues in the summer months starting in November and ending in April (Mendelsohn *et. al.*, 2000).

4.1.1 Precipitation

The driest month in the CNWSA: Zone 3 area is July, while the most rain falls in the months of January and February. The CNWSA: Zone 3 Area has an average annual rainfall of 550-600 mm. and a median average rainfall of 450 mm to 500 mm. The wettest months fall between November and March months, whilst the driest months are from May to October (Mendelsohn, *et. al.*, 2002).

4.1.2 Temperature

The warmest month of the year is October and June has the lowest average temperature of the whole year. Average maximum temperature in CNWSA: Zone 3 ranges between 34 °C to 36 °C, these moderately high temperatures occur in the summer months of November to January. CNWSA: Zone 3 has minimum average temperatures of 6°C to 8°C, lowest temperatures occur during winter months of June and July (Mendelsohn, *et. al.*, 2002).

4.2 Geology

The CNWSA Zone is located in the Cuvelai Basin; the basin floor consists of gneissic and granitic basement. Outcrops of this occur in the Kamanjab Inlier along the south-western rim of the basin (Fransfontein Granitic Suite and Khoabendus Group, 2 700 to 1700 Ma). Up to 8 000 m of sedimentary rocks of the Nosib, Otavi and Mulden groups of the late-Proterozoic Damara Sequence overlie this. Carbonatic rocks of the Otavi Group are found on the surface in the mountain ridges south and west of the basin (Christelis, *et. al.*, 2011).

Traditionally, shallow, hand-dug wells or omithima, located throughout CNWSA: Zone 3, have been used to draw water from the shallow Discontinuous Perched Aquifer after the Oshana's have dried up. However, useful amounts of water are only located in certain places, some of these wells dry up during the winter months, and most of the water drawn from these wells is saline and unfit for human consumption (Christelis, *et. al.*, 2011).

4.3 Natural Fauna and Flora

The Angolan Mopane Woodlands ecoregion has four mammals which are almost endemic to the ecoregion: blackish white-toothed shrew (*Crocidura nigricans*), Thomas's rock rat (*Aethomys thomasi*), heather shrew (*Crocidura erica*) and the black-faced impala. The mopane trees are the habitat of the mopane emperor moth (*gonimbrasia belina*), who's caterpillars feed on the leaves and are collected for food by people in the area (Spriggs, n.d).

Four mammals are near-endemic to the Angolan Mopane Woodlands. These are the bush rat (*Aethomys thomasi*), two white-toothed shrews (*Crocidura erica*, and *C. nigricans*), and the black-faced impala (*Aepyceros melampus petersi*). *Crocidura erica* and the black-faced impala are classified as vulnerable in the IUCN red list of threatened animals. The area has four endemic reptiles: *Afrogecko ansorgii*, *Coluber zebrinus*, Ruben's sand lizard (*Pedioplanis rubens*), and the skaapsteker snake (*Psammophylax rhombeatus ocellatus*).

The area is prone to Oshana (water pans) and during the dry season, most of the Oshana's are covered by grass, saline Kalahari sands support Mopane scrub and various larger trees. CNWSA: Zone 3 area is dominated by tree and savannah landscape, with a combination of mopane woodlands (*Colophospermum mopane*), and shrub lands. Various saline grasses dominate the vegetation. Grass types such as hairy crabgrass (*Digitaria*), Wool grass (*Anthephora*), African lovegrass (*Eragrostis*) and tree types such as the makalani palm tree (*hyphaene petersiana*), mangetti tree (*schinziophyton rautanenii*), purple pod tree terminalia (*terminalia pruniodes*) and lastly the silver leaf Terminalia tree (*Terminalia sericea*) (Mendelsohn et. al., 2000).

5. THE LEGAL ENVIRONMENT

A legal review was done and the key laws of concern include those which protect the ecological integrity of the CNWSA: Zone 3 ecosystem and its water resource, including the Water Act of 1954 and the Water Resources Management Act of 2004, and applicable international treaties such as the Convention on Biological Diversity. These laws and conventions place Namibia under an obligation to conserve the ecological integrity of the CNWSA: Zone 3 ecosystem for the sustainable use by Namibians.

5.1 The Constitution of the Republic of Namibia

There are two clauses contained in the Namibian Constitution that are of particular relevance to sound environmental management practice, viz. articles 91(c) and 95(l). In giving effect to articles 91(c) and 95(l) of the Constitution of Namibia, general principles for sound management of the environment and natural resources in an integrated manner have been formulated. The formulation of these general principles resulted in the Namibia's Environmental Assessment Policy of 1994. To give statutory effect to this Policy, the Environmental Management Act was approved in 2007, and gazetted as the Environmental Management Act (Act No. 7 of 2007) (herein referred to as the EMA. As the organ of state responsible for management and protection of its natural resources, MET: DEA is committed to pursuing the 13 principles of environmental management that is set out by Part 2 of the Act.

To summarise, Articles 91(c) and 95(l) refer to:

- Guarding against over –utilisation of biological natural resources;
- Limiting over-exploitation of non-renewable resources;
- Ensuring ecosystem functionality
- Protecting Namibia's sense of place and character;
- Maintaining biological diversity and
- Pursuing sustainable natural resource use.

5.2 Environmental Assessment Policy (1995)

Cabinet endorsed Namibia's Environmental Assessment Policy in 1995 as the first formal effort in Namibia to regulate the application of environmental impact assessments and environmental management. Amongst others, the Policy provides a procedure for conducting EIA's which sets out to:

- Better inform decision makers and to promote accountability of decisions taken;
- Strive for a high degree of public participation and involvement of all sectors of the Namibian community during the execution of the EIA;
- Take into account the environmental costs and benefits of projects and Programmes;
- Promote sustainable development in Namibia;
- Ensure that anticipated adverse impacts are minimized and that positive impacts are maximized.

5.3 Environmental Management Act (No 7 of 2007) (EMA)

The Environmental Management Act (EMA) was promulgated in 2007 by Parliament and gives effect to the Environmental Assessment Policy. The Act specifies the environmental assessment procedures to be followed as well as the listed activities (activities that require an EIA).

Of relevance to this project are the following listed activities, as provided in Section 27 of this Act, which include:

- Water use and disposal;
- Transportation

5.4 EIA Regulations Government Notice No. 30, promulgated on 6 February 2012

The regulations, promulgated in terms of the EMA, were promulgated on 6 February 2012 and indicated certain activities that require an Environmental Clearance from MET: DEA prior to commencing.

5.5 Water Act 54 of 1956 and Water Resources Management Act 11 of 2013

The Water Resources Management Act 11 of 2013 is presently without regulations; therefore the Water Act 54 is still in force. The Act provides for the management and protection of surface and groundwater resources in terms of utilisation and pollution.

6. RESPONSIBLE PARTIES

NamWater's Environmental Manager is primarily responsible for the implementation of the EMP during the operational and maintenance phases.

6.1 NamWater

NamWater, as the implementing agency, is responsible for:

- Ensuring that the management actions are being adhered to;
- Ensuring that all environmental impacts are managed according to the environmental principles of avoiding, minimizing, mitigating and rehabilitation. This will be achieved by successful implementation of the EMP;
- Ensuring that appropriate monitoring and compliance auditing are executed;
- Ensuring that the environment is rehabilitated to its natural state as far as possible.

NamWater shall ensure that all employees attend an Environmental, Awareness Training Course. This course shall be structured to ensure that attendees:

- Become familiar with the environmental controls contained in the EMP;
- Are made aware of the need to conserve water and minimise waste;
- Are made aware of NamWater's Code of Conduct;
- Are aware that a copy of the EMP is readily available at the plant and that all staff are aware of the location and have access to the document;
- Are informed that employee information posters, outlining the environmental "do's" and "don'ts" (as per the environmental awareness training course) will be placed at prominent locations throughout the site.

7. ENVIRONMENTAL MANAGEMENT PLAN

An Environmental Management Plans (EMP) is an important tool focusing on the management actions that are required to ensure environmental compliance of a particular project.

EMP implementation is a cyclical process that converts mitigation measures into actions and through cyclical monitoring, auditing, review and corrective action, ensures conformance with stated EMP aims and objectives. Monitoring and auditing, feedback for continual improvement ensures that environmental performance has been provided and corrective action is taken for an effective EMP.

The main aim of this EMP is to ensure that the project complies with the goals of the Namibian Environmental Management Act (No. 7 of 2007); and, more specifically, to provide a framework for implementing the management actions as described in the EMP for the operational and maintenance phases of the scheme. Best practice is proposed for the operation of the scheme.

There are some environmental impacts that cannot be avoided. These environmental impacts require mitigation, and in order to mitigate against these impacts an EMP is required. The EMP aims to ensure best practises are implemented and environmental degradation is avoided through appropriate environmental protection, adherence to legal requirements and maintaining good community relationships.

MET indicated that EMP's for existing operations are sufficient.

The project activities are grouped according to the different operational processes and stages. Most of the impacts can be reduced through good housekeeping.

8. MANAGEMENT ACTIONS

8.1 Operation and Maintenance phase of the CNWSA: Zone 3 Water Supply Scheme

8.1.1 Introduction

The Operational Phase Section relates to the management and mitigation measures required to ensure that the continuation of the bulk water supply network and the maintenance of the infrastructure is operated in a manner that demonstrates responsible, precautionary environmental management.

The EMP will address specific areas of concern in terms of the long-term environmental management of the affected environment and is intended to serve as a guide to the on-going management of the water supply scheme site as well as the affected environment. The EMP will therefore aim to provide NamWater with the necessary tools to ensure that the potential impacts on the natural environment of the site during the operation of the water supply scheme are minimised. Moreover, it will aim to ensure that the infrastructure is operated and maintained according to Best Practice, in an environmentally sensitive and sustainable manner, and that the operation of the infrastructure does not result in reasonably avoidable environmental impacts.

Table 2: Operation and Maintenance Phase Management Table

Issue	Objective	Strategy	Actions	Time frame
Maintenance and emergency procedures	To ensure correct procedures are in place to avoid environmental impacts associated with maintenance activities as well as proactive intervention to avoid, and if required, to respond to emergencies	<ul style="list-style-type: none"> • Establish environmentally sensitive and technically sound maintenance procedures as well as reporting structures. • Compile a staff competency assessment and training programme. • Establish emergency procedures to ensure appropriate response and minimise potential risk to the biophysical and social environment. 	<ol style="list-style-type: none"> 1. Establish regular reporting procedures on maintenance 2. Undertake regular inspection and maintenance of all infrastructure to ensure in working order and to assess damaged / deficient equipment, as per the O&M Manual. 3. Review, and if necessary, revise maintenance manual. 4. Establish emergency procedures guidelines for the blockage/failure, flooding, contaminant removal and disinfection, power failure and fire of the scheme. 5. Implement the response procedures when emergency incident occurs. 6. Complete the incident report checklist in the case of emergency and keep with monitoring records for submission. 7. Undertake annual education course for all operational staff. 8. Review, and if necessary revise emergency manual. 	<p>Bi-monthly for the lifespan of infrastructure as per the maintenance manual.</p> <p>Bi-annually for lifespan of works.</p> <p>When emergency incident occurs.</p> <p>Emergency incident</p> <p>Annually for lifespan of operation.</p> <p>Annually for lifespan of operation</p> <p>Annually for lifespan of operation</p>

8.2 Maintenance Procedures

The optimal operation and effective maintenance of all the scheme components is important in protecting the environment and ensuring that resources are not wasted and environmental incidents arising out of equipment or infrastructure failures, are avoided. Operation and Maintenance Manuals are available for the CNWSA: Zone 3 Water Treatment Works (WTW). The manuals provide a detailed guidance on the operation of all machinery and associated systems as well as related maintenance procedures, including maintenance schedules. Implementation of this manuals by NamWater will facilitate the proactive management of potential risks and thus result in impacts on the receiving environment being averted.

The maintenance procedures set out in the manuals, provides specific guidance in terms of the monitoring and maintenance of the scheme components. These procedures will specify the equipment item and specific component of each piece of equipment requiring checking, the scope and nature of the check that is to be carried out including detailed instructions related to the specific check, and the programme for conducting each check.

8.3 Facility Management and Operations

NamWater shall ensure that sufficient budget allocations and provisions are made available to ensure that the infrastructure can be adequately operated and maintained. NamWater must also attend to damage to the scheme components resulting in water loss as a matter of high priority.

8.4 Routine Maintenance and Repairs

The condition of the infrastructure shall be inspected routinely and a maintenance list compiled. Identified, preventative maintenance issues shall be undertaken as soon as possible. Any wastes arising from the repair and maintenance work must be removed and disposed-off at a designated waste disposal site as part of the operation.

8.5 Environmental Awareness

Instilling a sense of environmental awareness and consideration in all employees, but especially those involved with the scheme operations is vital to the overall success of any environmental management plan. It is therefore recommended that a general environmental awareness course for the Scheme Staff Members, who may be required to carry out duties on the scheme, be undertaken.

8.6 Waste and Pollution Management

8.6.1 Waste and Pollution Prevention

To prevent the improper disposal of waste and to prevent pollution, the following management actions shall be enforced:

- All waste will be removed to an appropriate waste dump.
- No waste should be buried.
- General Waste: Includes waste paper, plastic, cardboard, harmless organic (e.g., vegetables) and domestic waste.
- No littering will be allowed. The plant area will be kept free of waste at all times.
- Provide sufficient waste bins at worksites. Make sure that all waste is removed from the worksites.

- Hazardous Substances include: sewerage, fuels, lubrication oils, hydraulic and brake fluid, solvents, paints, anti-corrosives, insecticides and pesticides, chemicals, acids etc. It should be disposed of at designated hazardous disposal sites.
- Contaminated soil should be stored in drums and taken to the nearest appropriate waste dumpsite.
- Do not change oil on uncovered ground. Drip trays will be used to catch oil when vehicles are repaired in the field.
- Used oil and hydraulic fluids will not be discarded on the soil or buried. It will be removed from site and taken back to an appropriate dump.
- In the event of a hazardous spill:
 - ✓ Immediately implement actions to stop or reduce the spill.
 - ✓ Contain the spill.
 - ✓ Arrange implementation of the necessary clean-up procedures.
 - ✓ Collect contaminated soil, water and other materials and dispose it at an appropriate waste dumpsite.
- Used solvents and grease should be stored in drums or other suitable containers. It should be sealed and recycled or disposed at an appropriate disposal site.
- Hazardous waste should not be burnt.
- Bunding, concrete slabs and/or other protective measures should be installed where hazardous materials are handled.
- Ensure that the staff are informed and have information pertaining to the management of spills or ingestion.

8.6.2 Hazardous Materials

Where hazardous materials are required for repair and maintenance work (including fuels and oils), care will be taken to ensure that a competent individual is appointed to enforce the responsible use of such materials. The operational staff or maintenance teams shall carry a copy of the relevant Material Safety Data Sheet (MSDS) whenever using such materials. The Scheme Supervisor shall ensure that persons working with hazardous materials have been trained in the handling of such substances, as well as in emergency procedures to be followed in the event of an accidental spillage or medical emergency. Maintenance teams shall also carry a spill kit containing the appropriate neutralizing chemicals, absorbent materials and other relevant equipment required to undertake a clean-up of any spill that may occur.

8.6.3 Noise Management

During maintenance operations, all silencing mechanisms on all equipment must be in a good state of repair. Except for in emergency situations, no amplified sound may be broadcast. All routine maintenance shall be restricted to daylight hours.

8.7 Health and Safety

To minimise the risk of HIV infection and the increase of STI's and the occurrence injuries the following management actions shall be enforced:

- Provide an AIDS awareness programme to all the staff.

- Make sure that all staff are equipped and know how to use safety and protective gear. This includes hard hats, goggles, hearing protectors, dusk masks, steel-toed shoes etc.
- Keep a comprehensive first aid kit at Scheme.
- Establish an emergency rescue system for evacuation of serious injured people.
- Emergency procedures for accidents should be communicated to all employees.
- Dangerous areas must be clearly marked and access to these areas controlled or restricted.
- Good driving and adherence to safety rules will result in a minimum number of road and workplace accidents.
- Fire extinguishers must be available at all refuelling sites. Staff should be trained to handle such equipment.
- Nobody is allowed to dispose a burning or smouldering object in an area where it may cause the ignition of a fire.
- Hazardous substances must be kept in adequately protected areas to avoid soil, air or water pollution.
- Work areas, such as these for the maintenance of equipment, must be on concrete slabs.
- Explosives should be stored according to the prescribed regulations.

9. SITE CLOSURE AND REHABILITATION

Rehabilitation is the process of returning the land in a given area that has been disturbed by construction and earthworks to some degree of its former state, or an otherwise determined state. Many projects, if not all, will result in the land becoming degraded to some extent. However, with proper rehabilitation most impacts associated with the reservoir construction project, could be mitigated and restored to an acceptable level. Poorly rehabilitated construction areas provide a difficult legacy issue for governments, communities and companies, and ultimately tarnish the reputation of operators as a whole.

Objectives of proper site closure and rehabilitation include the following:

- Reduction or elimination of the need for a long-term management program to control and minimise the long-term environmental impacts;
- Clean-up, treatment or restoration of contaminated areas (e.g., soils contaminated by oil or fuel spills, concrete spills, etc.). Excavation of contaminated material and disposal thereof in an acceptable manner.

Rehabilitation measures to implement:

- a. A site inspection will be held quarterly by the scheme supervisor after every maintenance work during operation of the scheme. Rehabilitation will be done to the satisfaction of the ENV section and MET.
- b. Frequent inspections of the scheme and effective follow-up procedures, to prevent minor defects from becoming major repair jobs.
- c. Make sure all soil polluted during maintenance work is properly stored in drums and removed to an appropriate waste dump.
- d. Make sure all windblown litter is removed once maintenance has seized.
- e. Make sure that all potential hazards (i.e., the sewerage pit) are properly closed and left in a safe and neat position.

Rehabilitation will be completed when the above have be achieved.

10. NAMWATER ENVIRONMENTAL CODE OF CONDUCT

What is an Environmental Code of Conduct?

It is a set of rules that everybody has to follow in order to minimise damage to the environment.

What is the ENVIRONMENT?

The ENVIRONMENT means the surroundings within which people live. The ENVIRONMENT is made up of the **soil, water, plants, and animals** and those characteristics of the soil, water, air, and plant and animal life that influence **human health and well-being**. **People and all human activities** are also part of the environment and have to be considered during the operation of the Scheme.

Do these ENVIRONMENTAL RULES apply to me?

YES, The Environmental Rules apply to EVERYBODY. This includes all permanent, contract, or temporary workers as well as any other person who visits the Scheme. Every person will be required to adhere to the Environmental Code of Conduct.

ALL PERSONNEL must study and keep to the Environmental Code of Conduct

The SCHEME SUPERVISOR will issue warnings and will discipline ANY PERSON who breaks any of the Environmental Rules. Repeated and continued breaking of the Rules will result in a disciplinary enquiry and which may result in that person being asked to leave the Scheme permanently.

What if I do not understand the ENVIRONMENTAL RULES?

ASK FOR ADVICE, if any member of the WORKFORCE does not understand, or does not know how to keep any of the Environmental Rules, that person must seek advice from the SCHEME SUPERVISOR. The PERSON that does not understand must keep asking until he/she is able to keep to all the Environmental Rules.

Safety and Security

1. Only enter and exit roadways and construction areas at demarcated entrances.
2. Wear protective clothing and equipment as per signboards at the Scheme and according to instructions from your SCHEME SUPERVISOR.
3. Report to your SCHEME SUPERVISOR if you see a stranger or unauthorised person in the construction area.
4. Never enter any area that is out of bounds or that is demarcated as dangerous without permission of your SCHEME SUPERVISOR.
5. Never climb over any fence or enter private property without permission of the landowner or your SCHEME SUPERVISOR.
6. Do not remove any vehicle, machinery, equipment, or any other object from the construction site without the permission of your SCHEME SUPERVISOR.
7. Keep clear of blasting sites. Follow the instructions of your SCHEME SUPERVISOR.
8. Never enter or work in the Scheme while under the influence of alcohol or other intoxicating substances.
9. All staff should know the emergency procedures in case of accidents.

Waste Disposal

10. Learn the difference between different types of waste, namely:
 - general waste, and
 - hazardous waste.

Containers will be provided for different types of wastes.

General Waste includes waste paper, plastic, cardboard, harmless organic (e.g., Vegetables) and domestic waste

Hazardous Waste includes objects, liquids or gases that are potentially dangerous or harmful to any person or the environment. Sewage, fuel, tyres, diesel, oils, hydraulic and brake fluid, paints, solvents, acids, soaps and detergents, resins, old batteries, etc. are all potentially hazardous.

11. Learn how to identify the containers for the different types of wastes. Only throw general waste into containers, bins or drums provided for general waste.
12. Recycle drums, pallets and other containers.
13. Never bury or burn any waste on site, all waste is to be disposed in allocated refuse disposal containers, bins or bags.
14. Never overfill any waste container. Inform your SCHEME SUPERVISOR if you notice a container that is nearly full.
15. Do not litter.
16. Do not bury litter or rubbish in the backfill trench.

Plants and Animals

21. **Do not ever pick any plants, or catch any animal.** People caught with plants or animals in their possession will be handed to the authorities for prosecution.
22. Never feed, tease, play with, or set devices to trap any animal or livestock. Wild animals are not to be domesticated.
23. Keep off the rock outcrops unless given specific permission by the SCHEME SUPERVISOR to be there.
24. Never cut down any tree or branches for firewood.
25. Never leave rubbish or food scraps or bones where it will attract animals, birds, or insects.
26. Rubbish must be thrown into allocated waste disposal bins/bags.
27. Always close the gates behind you.

Preventing Pollution

28. Only work with hazardous materials in bunded areas.
29. Never discard any hazardous substances such as fuel, oil, paint, solvent, etc. into stream channels or onto the ground. Never allow any hazardous substances to soak into the soil.
30. Clean up spills immediately.
31. Immediately report to your SCHEME SUPERVISOR when you spill, or notice any hazardous substance overflow, leak or drip or spill on site, into the streambeds or along the road.

32. Immediately report to your SCHEME SUPERVISOR when you notice any container, which holds hazardous substances overflow, leak or drip. Spillage must be prevented.
33. Only wash vehicles, equipment and machinery, containers and other surfaces at work site areas designated by your SCHEME SUPERVISOR.
34. Do not change oil on uncovered surfaces.
35. If you are not sure how to transport, store, use, or get rid of any hazardous substances ask your SCHEME SUPERVISOR for advice.

Health

36. Drink lots of clean water every day.
37. Use toilets that have been provided.
38. Take the necessary precautions to avoid contracting HIV / AIDS. Condoms are available at most Clinics.
39. Inform your SCHEME SUPERVISOR when you are sick.
40. Do not work with any machinery when you are sick.
41. If you are working in malaria areas, you must take the necessary precautions.

Dust Control

42. Do not make any new roads or clear any vegetation unless instructed to do so by your SCHEME SUPERVISOR.
43. Keep to established tracks and pathways.
44. Keep within demarcated work areas.

Saving Water

47. Always use as little water as possible. Reduce, re-use and recycle water.
48. Never leave taps or hose pipes running. Close all taps after use.
49. Report any dripping or leaking taps and pipes to your SCHEME SUPERVISOR.

Working Hours

50. You may only work on weekends and after hours with the consent of the SCHEME SUPERVISOR.

Archaeological and Cultural Objects

52. If you find any archaeological, cultural, historical or pre-historical object on the construction site you must immediately notify your SCHEME SUPERVISOR.
53. Never remove, destroy, or disturb any cultural, historical, or pre- historical object on site.

Cultural and Historical Objects include old buildings, graves or burial sites, milestones, old coins, beads, pottery and military objects.

Pre-Historical objects include fossils and old bones, old human skeletal remains, pieces of pottery and old tools and implements.

Sensible Driving

54. Tracks and roads should be kept to a minimum. Where possible follow existing roads.
55. No off-road driving is allowed.
56. Never drive any vehicle without a valid licence for that vehicle class and do not drive any vehicle that is not road-worthy.
57. Never drive any vehicle when under the influence of alcohol.
58. **Always** keep your headlights on when driving on dusty roads.
59. Keep to the roads as specified by your SCHEME SUPERVISOR. Vehicles may only be driven on demarcated construction roads. Drivers should always use three points turns, “u-turns” are not allowed. Do not cut corners.
60. Do not drive on rocky outcrops.

Noise

61. Keep noise levels as low as possible.
62. Do not operate noisy equipment outside normal working hours.

Fire Control

63. Do not make open fires, use a drum or tin and do not collect any vegetation to burn.
64. Do not smoke or make fires near refuelling depots or any other area where fuel, oil, solvents, or paints are used or stored. Fireplaces should be at a safe distance from fuel and explosive storage sites as well as vehicle parking sites.
65. Cigarette butts should always be thrown in allocated refuse bins. Make sure that the cigarette butt is out before throwing it into the bin.
66. Immediately notify your SCHEME SUPERVISOR if you see an unsupervised fire at the campsite or construction site.

Dealing with Environmental Complaints

67. If you have any complaint about dangerous working conditions or potential pollution to the environment, talk to your SCHEME SUPERVISOR.
68. If any person complains to you about noise, lights, littering, pollution, or any harmful or dangerous condition, immediately report this to your SCHEME SUPERVISOR.

NP du Plessis

Tell: 061-71 2093

Cell: 081 127 9040

OR

Jolanda Kamburona

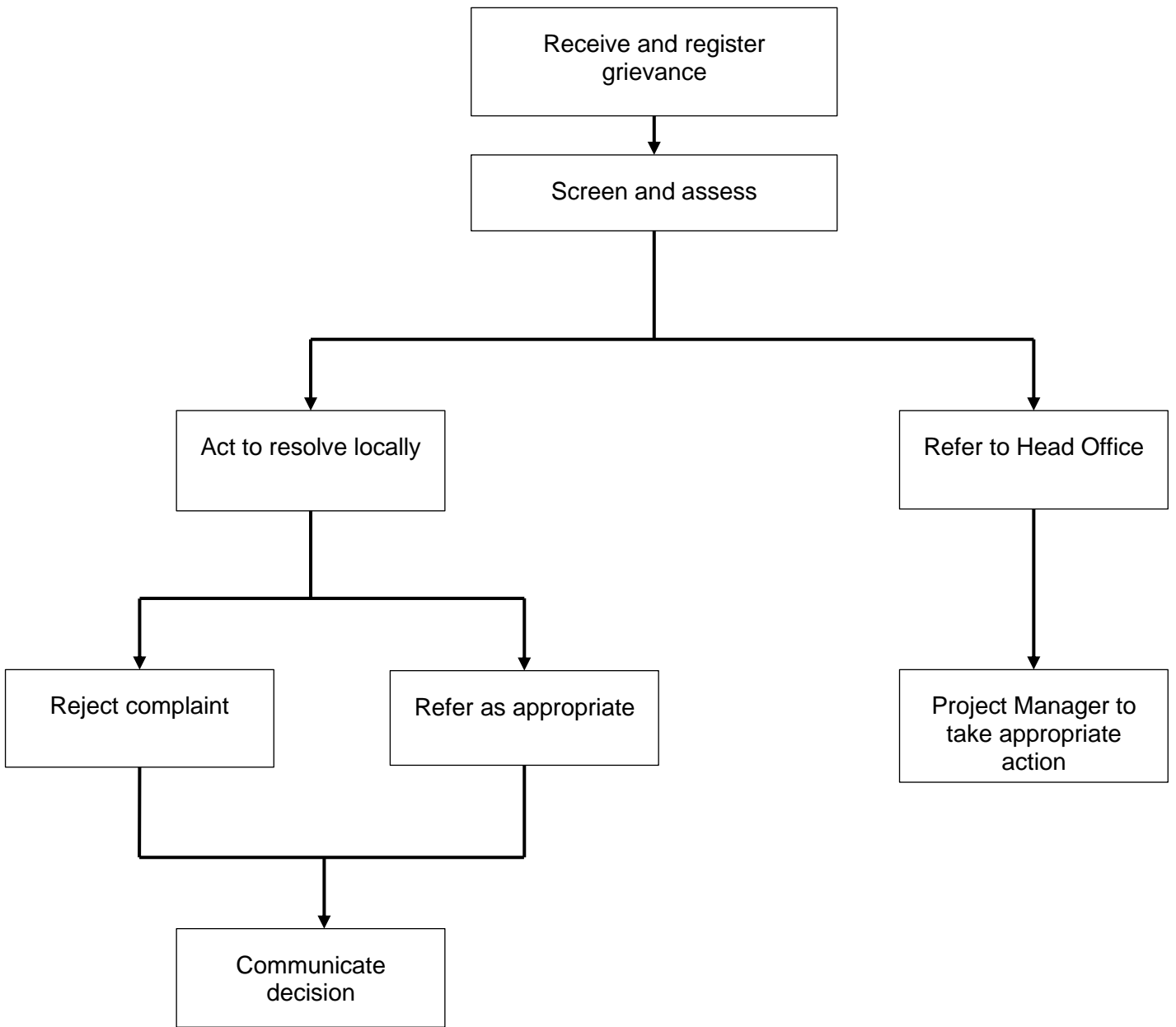
Tell: 061-71 2105

Cell: 081 144 1528

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ANNEXURE 1: GRIEVANCE PROCEDURE AND REGISTRATION FORM



Grievance Registration

Grievance Registration	
Case No:	Date:
Name of complainant:	Cell no:
	Email address:
Details of grievance: (Date, location, persons involved, frequency of occurrence, effects of ensuing situation, etc)	
Name of person recording grievance:	Cell number:
Proposed date of response:	
Signature of recording person:	Signature of complainant:
Date of redress:	
Decision and action:	