

CENTRAL NORTH WATER SUPPLY AREA: ZONE 4

ENVIRONMENTAL MANAGEMENT PLAN

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Table of Contents

LIST OF ABBREVIATIONS	III
1. PURPOSE OF THE EMP	4
2. INTRODUCTION	5
2.1 Outapi/Ombalantu Purification Plant	5
2.2 Ombalantu North Rural Water Supply Scheme.....	5
3. EXISTING CNWSA: ZONE 4 WATER SUPPLY INFRASTRUCTURE	7
3.1. Water Source	7
3.1.1 Ogongo Purification Plant.....	7
3.2. Water Quality and Disinfection	7
3.2.1 Ogongo purification plant configuration – Dosing System.....	7
3.2.2 Flocculation and Sedimentation	7
3.2.3 Potable Water Reservoir & Filtration	7
3.2.4 Sludge Disposal	8
3.2.5 Forebay	8
3.3. Pipework	8
3.3.1 Ogongo – Okahao – Tsandi Pipeline.....	8
3.3.2 Ogongo – Okahao – Tsandi Pipeline.....	8
3.3.3 Onaanda Rural Water Supply Scheme	8
3.3.4 Okahao South Rural Water Supply Scheme	8
3.3.5 Ogongo West Rural Water Supply Scheme	9
3.4. Reservoirs.....	9
3.5. Power supply and control systems	9
3.5.1 Ogongo Clear Water Pump Station	9
3.5.2 Okahao Water Pump Station	10
3.5.3 Tsandi Water Pump Station	10
3.5.4 Raw Water Pump Station	11
3.5.5 Filter Pumps.....	11
3.6. Scheme Processes/Operation	11
3.7. Maintenance.....	11
3.7.1 Pumps.....	11
3.7.2 Air Valves	11
3.7.3 Pressure Gauges and Transducers.....	12
3.7.4 Reservoirs.....	12
3.7.5 Pipe Breaks/leaks	12
4. BRIEF DESCRIPTION OF THE RECEIVING ENVIRONMENT	15

4.1	Climate.....	15
4.1.1	Precipitation	15
4.1.2	Temperature	15
4.2	Geology.....	15
4.3	Natural Fauna and Flora.....	15
5.	THE LEGAL ENVIRONMENT.....	16
5.1	The Constitution of the Republic of Namibia.....	16
5.2	Environmental Assessment Policy (1995)	16
5.3	Environmental Management Act (No 7 of 2007) (EMA)	16
5.4	EIA Regulations Government Notice No. 30, promulgated on 6 February 2012 .	17
5.5	Water Act 54 of 1956 and Water Resources Management Act 11 of 2013	17
6.	RESPONSIBLE PARTIES	18
7.	ENVIRONMENTAL MANAGEMENT PLAN	19
8.	MANAGEMENT ACTIONS	20
8.1	Operation and Maintenance phase of the CNWSA: Zone 4 Water Supply Scheme 20	
8.1.1	Introduction	20
8.2	Maintenance Procedures.....	22
8.3	Facility Management and Operations	22
8.4	Routine Maintenance and Repairs	22
8.5	Environmental Awareness.....	22
8.6	Waste and Pollution Management.....	22
8.6.1	Waste and Pollution Prevention.....	22
8.6.2	Hazardous Materials	23
8.6.3	Noise Management	23
8.7	Health and Safety.....	23
9.	SITE CLOSURE AND REHABILITATION.....	25
10.	NAMWATER ENVIRONMENTAL CODE OF CONDUCT	26
11.	REFERENCES	30
	ANNEXURE 1: GRIEVANCE PROCEDURE AND REGISTRATION FORM	31

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 4 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 4 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 4 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 4 and it is therefore only for the operation and maintenance of the Zone.

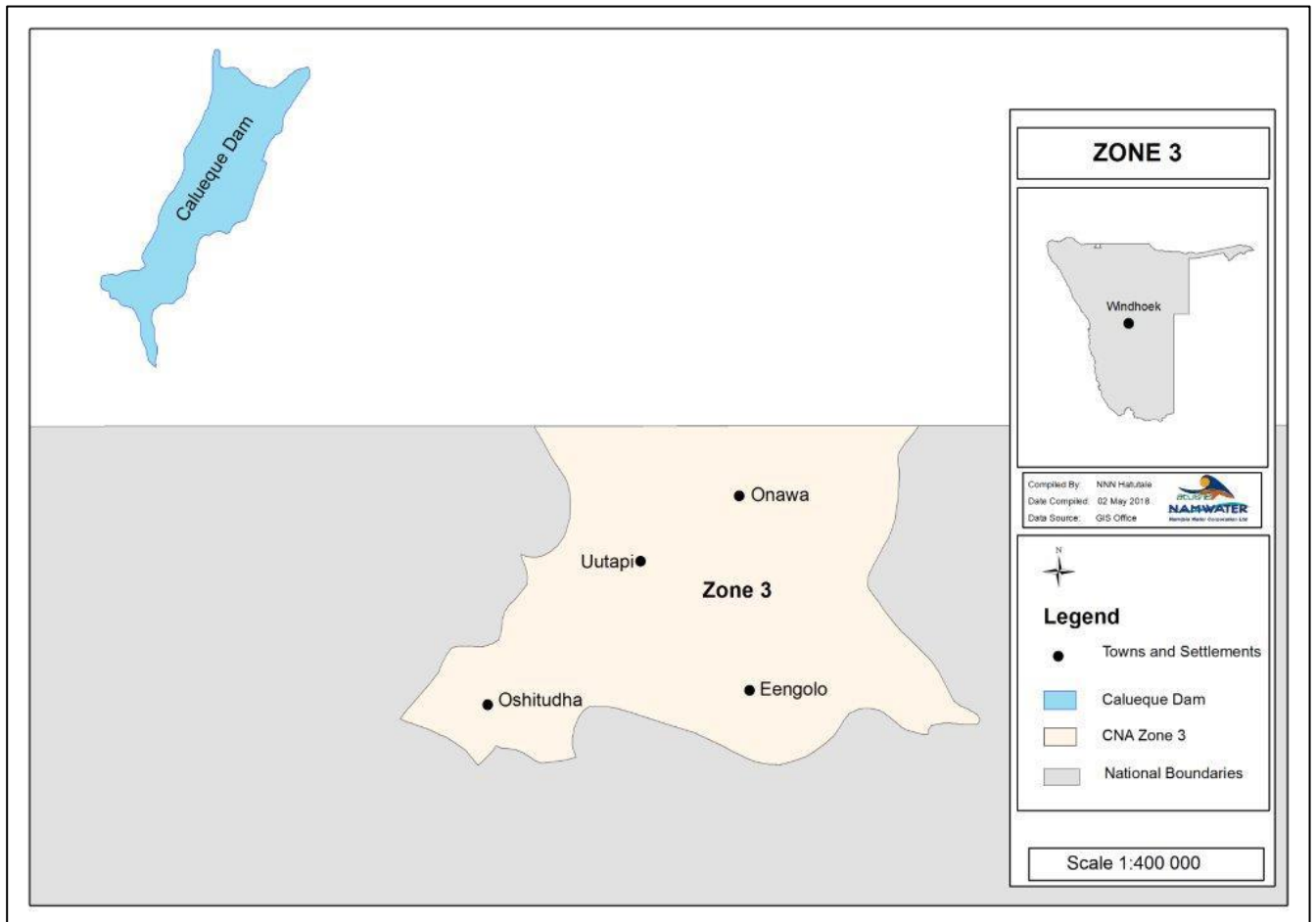


Figure 1: Water Supply Zone 4 Location Map

3. EXISTING CNWSA: ZONE 4 WATER SUPPLY INFRASTRUCTURE

3.1. Water Source

3.1.1 Ogongo Purification Plant

Water is drawn from the Ombalantu – Ogongo Canal, treated by the Ogongo Purification Plant and is then pumped southwards and westwards from Ogongo, to Okahao, Tsandi and beyond towards Etunda.

The Ombalantu–Ogongo Canal discharges into the fore bay at Ogongo, from where the water is pumped to the hydraulic flash mixer, where lime and a coagulant are dosed. Water gravitates from the flash mixer to three clariflocculators. The settled water is piped to six pressure filters, from where the water is delivered into a clear water reservoir. Water from the clear water reservoir is then pumped to various Rural Water Supply Schemes. Excess water can also be supplied to the reservoirs at the Oshakati Purification Plant.

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

3.2. Water Quality and Disinfection

Chlorine is used to sterilise the water and prevent algae growth. Pre-chlorination is done in the flash mixer, and post-chlorination in the clean water reservoir. The dosing of chemicals is done at a hydraulic flash mixer located next to the chemical dosing building.

The existing chlorination system consists of two small multi-stage pumps; one removed, installed in parallel and operates automatically depending on the demand. The Sud-Floc dosing system consists of a bulk tank and a day tank.

3.2.1 Ogongo purification plant configuration – Dosing System

Chemical dosing is done from a chemical dosing building which consists of three floors, with the lime and alum hoppers on the top floor, dosing equipment on the second floor, and chlorine storage and dosing equipment on the ground floor. The flocculants and lime slurry are delivered to the flash mixer by means of open PVC half channels.

3.2.2 Flocculation and Sedimentation

Flocculation and sedimentation take place at the clariflocculators, which are circular in shape, Connected in parallel, with a capacity of 1 500 m³ each. Settled water flows over launders into a collection channel and pipework, which delivers the water to the pressure filters. Sludge that has settled to the bottom of the clariflocculators is scraped to the centre of the structure by means of scrapers attached to a rotating bridge.

Desludging valves are mechanically opened by the bridge, and this takes place on every rotation of the bridge..

3.2.3 Potable Water Reservoir & Filtration

The filtered water is discharged into a circular, steel reservoir, with a capacity of 2 500 m³. The walls and roof are of steel construction, and the floor is reinforced concrete.

The present operating arrangement is that the operators of each shift ensure that the reservoir is full at the end of their shift. The water level is indicated by the water level indicator on the reservoir.

The filters consist of six 60 m³ horizontally mounted, cylindrical steel pressure sand filters, arranged in three sets of two filters. Air and water for backwashing are supplied by air blowers and water pumps located in the old pump station.

3.2.4 Sludge Disposal

Sludge from the clariflocculators and filters are discharged into four sludge lagoons located close to the forebay. Water decanted from the lagoons is discharged into the forebay.

3.2.5 Forebay

The canal from Ombalantu discharges into the forebay. Due to the difficulty of cleaning the forebay, a pipe bypass was constructed around it at the time that the so-called one million cubic metre storage dam was constructed. The bypass pipeline allows water from the canal and from the one million cubic metre storage dam to be discharged directly into the raw water pump.

3.3. Pipework

3.3.1 Ogongo – Okahao – Tsandi Pipeline

The Ogongo and the Okahao pipeline has a total length of 40.052 km which is made up as follows:

- 36.411 km - 350 mm Ø – Class 12 AC pipes, and
- 3.642 km - 350 mm Ø – Class 18 AC pipes.

The Class 18 sections occur where the pipeline crosses Oshana's. Between Okahao and Tsandi, the pipeline consists of 250 mm diameter AC pipes, as follows:

- 1.158 km – 250 mm AC Class 35, starting at Okahao,
- 1.100 km – 250 mm AC Class 30,
- 1.100 km – 250 mm AC Class 24,
- 5.580 km – 250 mm AC Class 18,
- 16.108 km – 250 mm AC Class 12, ending at Tsandi.

3.3.2 Ogongo – Okahao – Tsandi Pipeline

This pipeline is supplied by the Tsandi Pump Station and transfers water from Tsandi in a north westerly direction, past Onesi, towards Eunda. The pipeline consists of approximately 22.90 km of 250 mm diameter Class 6, approximately 7.5 km of 200 mm diameter Class 6 and approximately 11.4 km of 160 mm diameter Class 6 uPVC pipes (from Tsandi in the direction of Eunda). Class 9 uPVC pipes of appropriate diameters are used where the pipeline route passes through Oshana's.

3.3.3 Onaanda Rural Water Supply Scheme

This scheme branches off from the Ogongo – Okahao Pipeline and starts out as a 200 mm diameter Class 6 uPVC pipe.

3.3.4 Okahao South Rural Water Supply Scheme

This scheme supplies the area south of Okahao. The main pipeline starts out as a 200 mm diameter Class 6 uPVC pipe, reducing in diameter along its length.

3.3.5 Ogongo West Rural Water Supply Scheme

The main pipeline configuration is as follows:

- 7.7 km – 315 mm diameter Class 6 uPVC,
- 19.65 km – 250 mm diameter Class 6 uPVC,
- 8.95 km – 200 mm diameter Class 6 uPVC,
- 6.3 km – 160 mm diameter Class 6 uPVC,
- 4.8 km – 110 mm diameter Class 6 uPVC.

3.4. Reservoirs

Reservoir Name or Location	Reservoir Type and Configuration	Nominal Capacity (m ³)
1.Ogongo Reservoir	Circular steel GLR	2500 m ³
2.Okahao Reservoir	Earth embankment with float roof	3000 m ³
3.Okahao Reservoir	4 x 10 m plastic tanks (ER)	40 m ³
4.Tsandi Reservoir	Steel (round)	600 m ³
5.Tsandi Reservoir	3 x 10 m plastic tanks (ER)	30 m ³

3.5. Power supply and control systems

3.5.1 Ogongo Clear Water Pump Station

The Clear Water Pump Station at the Ogongo Purification Plant pumps water in five different directions; to the Ogongo Agriculture College, towards Okahao, towards Outapi (and to the Ogongo West Rural Water Supply Scheme), towards Okalongo and towards Oshakati.

Two pumps transfer the water provided by the two Priming Pumps of the Purification Plant to the Ogongo Agriculture College.

A bank of five priming or base pumps provide water to a bank of five booster pumps, which pump water into one pipeline which splits into the pipelines towards Okahao, Ogongo West, Oshakati and Okalongo (refer also to Section 10.3.1.3). The Ogongo West Rural Water Supply Scheme is supplied from the Ogongo – Outapi Pipeline, whilst the Onaanda Rural Water Supply Scheme is supplied from the Ogongo – Okahao Pipeline.

The 10 pumps, pumps water into one pipeline which later splits into four different directions Okahao, Ogongo West, Oshakati and Okalongo. There is a set of five base pumps installed in parallel and a further set of five booster pumps installed in parallel. The booster pumps are installed in series with base pumps. These 10 pumps are KSB model ETA 150-315 pumps, driven by 45 kW, 380 V, WEG TEFC motors running at 1 480 rpm.

The total system is pressure and flow controlled and the pump flow increases as the demand increases. All pumps are variable speed driven. First the base pump set is staggered started, each with its own motorised valve, until the system reaches the desired pressure and flow.

Two Grundfos CR15-03 multi stage pumps driven by 3 kW, 400 V, Grundfos TEFC motors running at 2 902 rpm are installed in parallel to provide clear water for the Ogongo Agricultural

College. The pumps operate in a duty/standby configuration and shut off on pressure and start on a time basis

The main power supply to the plant is via a 1 600 A TP circuit breaker situated in a distribution board underneath two 11 000/400 V, 500 kVA pole mounted transformers located at the plant. A 1 600 A TP main isolator is installed for the purification plant. The transformer is the property of NORED Electricity and maintenance costs for the transformer are the responsibility of NORED.

A telemetry system is installed at the clear water pump station and all flow meters are connected to the telemetry system to allow all measurements to be recorded on the SCADA system. The telemetry system is used for observation only and no pumps are controlled with the telemetry system.

3.5.2 Okahao Water Pump Station

At the Okahao Pump Station, clear water from Ogongo either enters a 3 000 m³ storage dam, a 40 m³ elevated reservoir or the inlet to the pump station. The pump station contains four pumps which draw water from the 3 000 m³ storage dam and deliver into a pipeline which branches to supply the 40 m³ elevated reservoir, the Okahao – Tsandi Pipeline and/or the Okahao South Rural Water Supply Scheme, depending on which isolating valves are open or closed.

The outlet of the elevated reservoir divides to provide a supply under gravity to Okahao Town and the school and hospital through separate pipelines. The pump station contains four pumps, with provision for the later installation of another four pumps.

The pump station contains four pumps, the four pumps which supply clear water to the 40 m³ elevated reservoir, the Okahao – Tsandi Pipeline and / or the Okahao South Rural Water Supply Scheme are installed in parallel and are constant speed pumps. These are KSB ETA 50-200 pumps, driven by 11 kW, 400 V, Siemens TEFC motors running at 2 935 rpm. The pumps are controlled via a pressure sensor and an electro-magnetic flow meter which shuts down and starts the pumps as the pressure increases/decreases and demand increases/decreases.

The additional two new pumps (Grundfos type CR64-3-1 and CR64-3-2 units respectively, driven by 18.5 kW, 400 V, Siemens TEFC motors running at 2 940 rpm), supplying rural areas, are installed in parallel and are variable speed pumps. These pumps are pressure and flow controlled and the controls increase / decrease pump speed as demand increases / decreases.

A telemetry system is installed at the pump station and all flow meters are connected to the telemetry system to allow all measurements to be recorded on the SCADA system. The telemetry system is used for observation only and no pumps are controlled with the telemetry system. An old radio communication system is still operational in the pump station

3.5.3 Tsandi Water Pump Station

At the Tsandi Pump Station, water from the Ogongo – Okahao – Tsandi Pipeline enters a 600 m³ reservoir via one of two inlet pipelines. Two dosing pumps (Grundfos CR 1-15 units, driven by 0.75 kW, 400 V, Grundfos TEFC motors running at 2 840 rpm, with a nominal capacity of 2 m³/h) allow water drawn from the reservoir to be chlorinated and returned to the reservoir.

The Tsandi Pump Station, has Two booster pumps (Grundfos CR 90-3 units, driven by 30 kW, 400 V, Siemens TEFC motors running at 2 960 rpm, with a nominal capacity of 90 m³/h), draw water from the 600 m³ reservoir and pump into a pipeline which splits to supply the (new) Tsandi – Eunda Pipeline and Tsandi Town. The two VSD pumps are installed in parallel and operate in a duty / standby configuration. The pumps are pressure and flow controlled. The main power supply to the pump station is via a 50 A TP circuit breaker located against the wall of the pump station building and supplied from a 11 000/400 V, 50 kVA pole mounted transformer which is not only dedicated to the pump station and is situated outside the pump station. The transformer is the property of NORED Electricity and maintenance costs for the transformer are the responsibility of NORED.

A telemetry system is installed at the pump station and all measurements are recorded on the SCADA system. The telemetry system is used for observation only and no pumps are controlled with the telemetry system.

3.5.4 Raw Water Pump Station

The Raw Water Pump Station consists of six KSB pumps installed in parallel. Three pumps are KSB ETA 150-315 models and three are ETA 250-33 models. The first three are driven by 15 kW, 380 V Siemens TEFC motors running at 970 rpm, whilst the second three are driven by 30 kW, 380 V, and Siemens TEFC motors running at 980 rpm. All the pumps are switched on and off manually from the plant.

3.5.5 Filter Pumps

Two filter pumps are installed at the Ogongo purification plant in parallel in a duty / standby configuration and are automatically operated. Both pumps are KSB; one is a KSB ETA 125/33 K model, whilst the other is a KSB ETA-B 150-250 BPK model. Both are driven by 22 kW, 380 V, Siemens motors running at 1 460 rpm.

3.6. Scheme Processes/Operation

There are fulltime NamWater operators based at the Outapi/Ombalantu purification plant in Zone 4.

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.

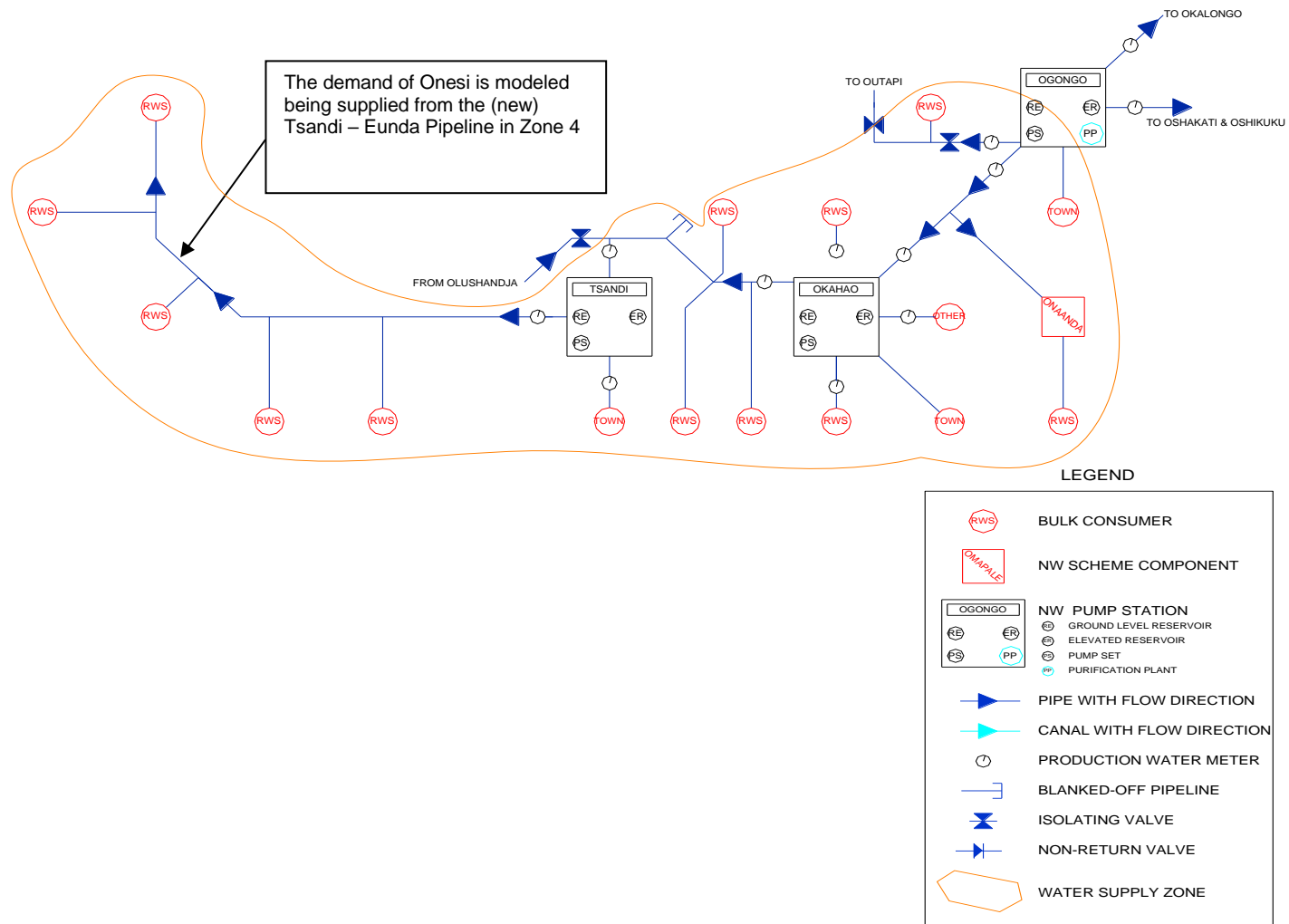


Figure 2: CNWSA: Zone 4 Schematic Layout

LEGEND

- RAW WATER
- POTABLE WATER
- WASTE WATER

NOTE

FOR CLARITY NOT ALL COMPONENTS SUCH AS PUMPS AND PIPES HAVE BEEN SHOWN WHERE THERE ARE MULTIPLE COMPONENTS

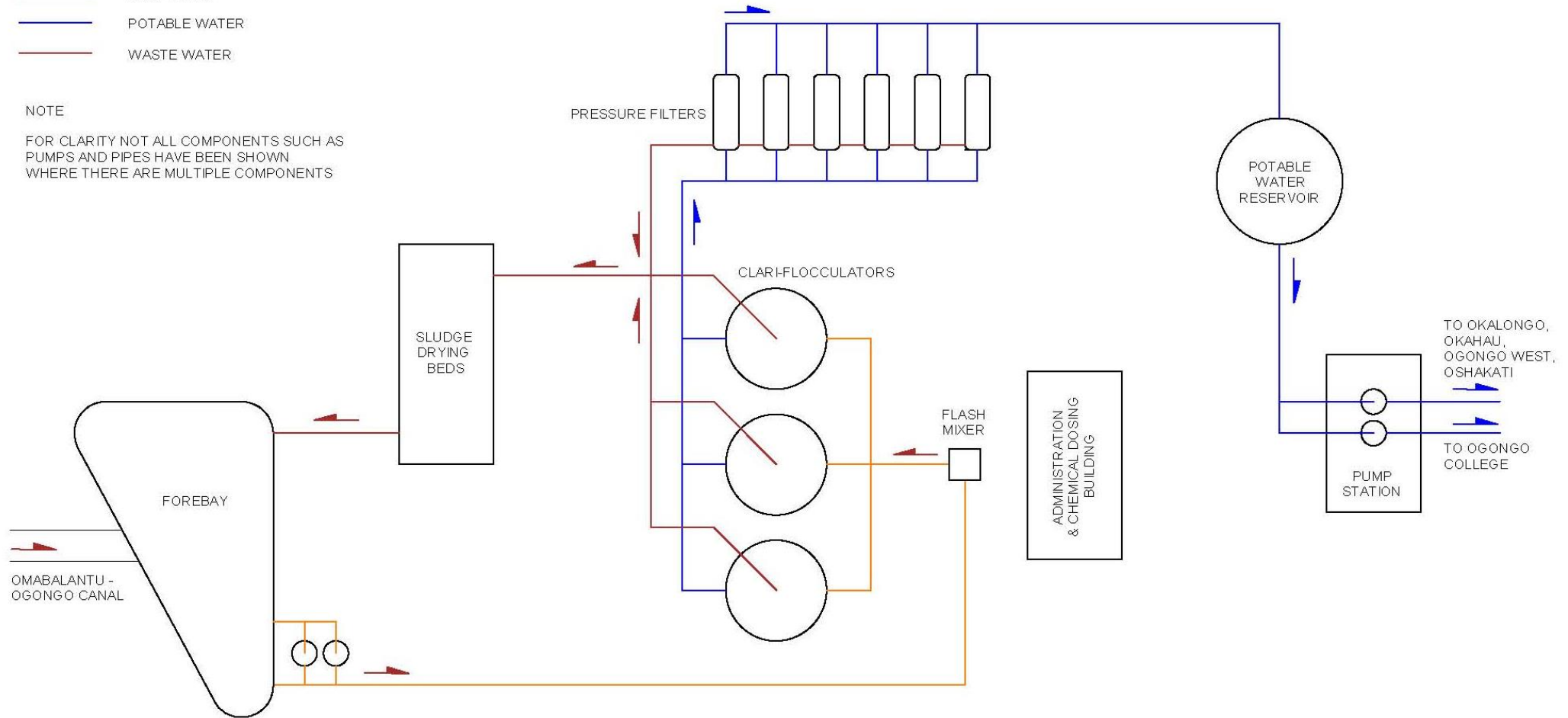


Figure 3: Schematic Layout of the Ogongo Purification Plant

4. BRIEF DESCRIPTION OF THE RECEIVING ENVIRONMENT

The baseline description provided below focuses on the receiving environment:

4.1 Climate

The CNWSA: Zone 4 area has a semi-arid climate, which is characterised by hot summers and semi cool winter's (Mendelsohn *et. al.*, 2000).

4.1.1 Precipitation

The wettest months in Zone 4 are November and March, whereas the driest months are from May to October. July is typically the driest month in the Zone while January is the wettest. The CNWSA: Zone 4 Area has an annual average rainfall of 350-450 mm (Mendelsohn, *et al.*, 2002).

4.1.2 Temperature

The temperatures are highest on average in October, and mid-year, the average temperature reaches the lowest average temperature of the whole year. The maximum summer temperatures are expected to be between 34 °C to 36 °C on average winters in this area have a minimum temperature of between 6 °C to 8 °C, (Mendelsohn *et. al.*, 2002).

4.2 Geology

The geological properties for CNWSA: Zone 4 is part of the much larger Kalahari Basin covering parts of Angola, Namibia, Zambia, Botswana and South Africa. It contains very thick series of rocks of various ages. The Geology of CNWSA Zone 4 area is found in the northern Cuvelai hydrogeological Basin (Christelis, *et. al.*, 2011).

The Cuvelai hydrogeological Basin is bordered in the south and west by the surface water divide running from Otavi to Outjo. Groundwater within the basin flows towards the Etosha Pan, due to the structure of the basin and because as the pan, the deepest point, is the base level of the groundwater flow system.

A major part of this northbound groundwater flow is shallow, and discharges south-east of Namutoni through numerous springs along the southern margin of the Etosha Pan and through the bottom of the pan from where it rapidly evaporates (Christelis, *et. al.*, 2011).

4.3 Natural Fauna and Flora

The CNWSA: Zone 4 area supports unusual cases of wildlife such as Helmeted Guinea fowl (*Numida meleagris*), Riverrine rabbit (*Bunolagus monticularis*), Lion (*Panthera Leo*) and Leopard (*Panthera pardus*).

Tree and savannah landscape dominates the CNWSA: Zone 4, however the areas closer to the oshana pans are devoid of woodland. Tree types found in the area include the camelthorn tree (*Acacia erioloba*), baobab tree (*Adansonia digitata*), bird plum (*berchemia discolor*), marula (*Sclerocarya birrea*) with a combination of mopane woodlands (*Colophospermum mopane*) and shrub lands, saline Kalahari sands support Mopane scrubland and various larger trees. Grass types such as crabgrass (*digitaria*), Wool grass (*Antheophora*), African lovegrass (*Eragrostis*), creeping panic grass (*Brachiaria*) are found in the area (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 4 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 4 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 4 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 4 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

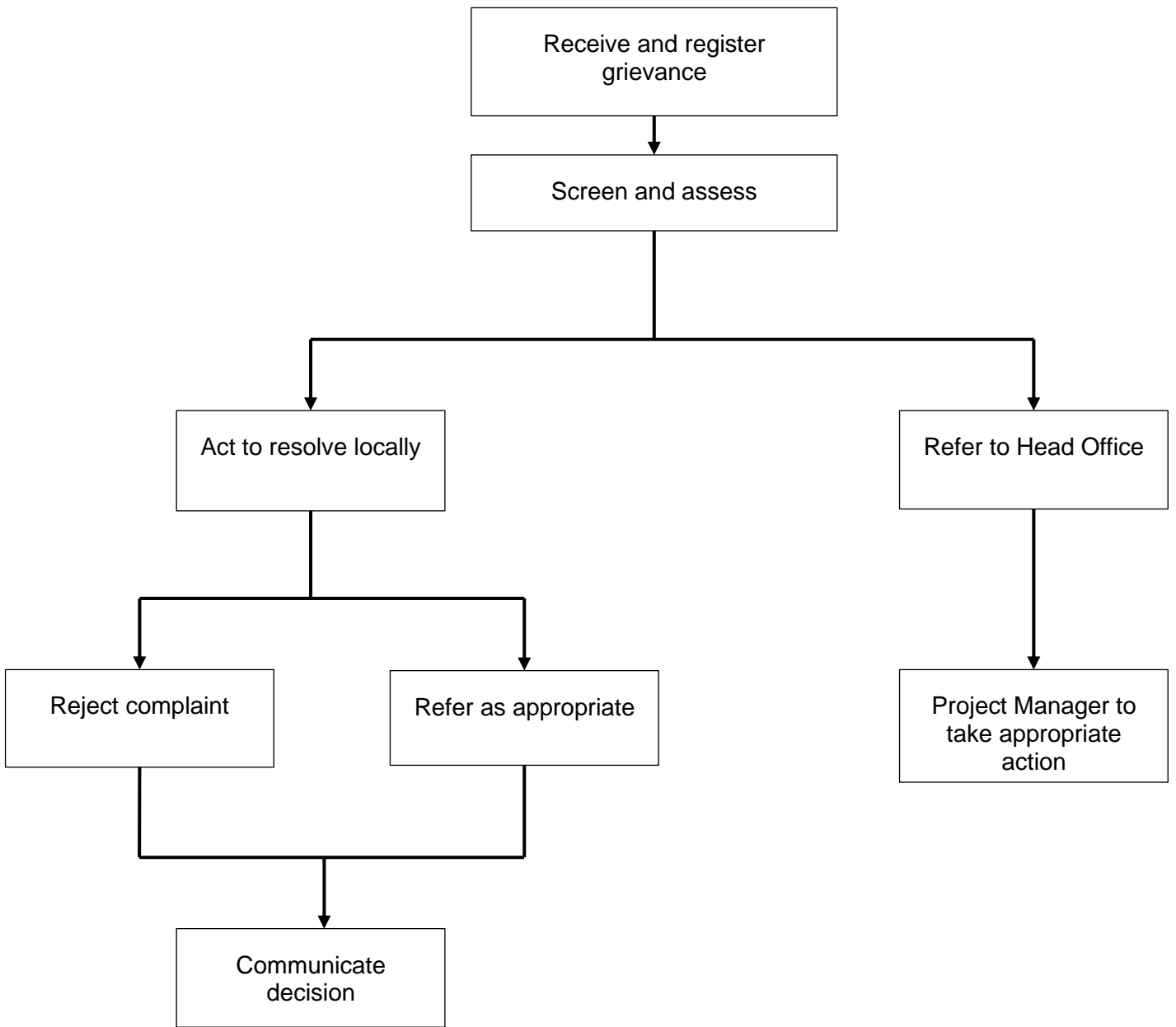
Tell: 061-71 2105

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:
<p>Details of grievance: (Date, location, persons involved, frequency of occurrence, effects of ensuing situation, etc)</p>	
Name of person recording grievance:	Cell number:
Proposed date of response:	
Signature of recording person:	Signature of complainant:
Date of redress:	
Decision and action:	