

OMARASSA-OMATJENNE-OTJIWARONGO WATER SUPPLY SCHEME

ENVIRONMENTAL MANAGEMENT PLAN

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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
MET	Ministry of Environment 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 Omarassa-Omatjienne-Otjiwarongo 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 and Tourism (MET: DEA).

An Environmental Clearance Certificate (ECC) was originally issued in 2017 and this EMP serves as an application for the renewal of the ECC.

2. INTRODUCTION

Otjiwarongo town is located in the Otjozondjupa Region and is supplied with water through the Omarassa-Otjiwarongo and the Omatjenne-Otjiwarongo groundwater schemes. The Omatjenne scheme provides water mainly to the Otjiwarongo Municipality as well as the Omatjenne Agricultural Research Station and private consumers along the pipeline scheme. The Omarassa-Otjiwarongo Scheme is a groundwater scheme supplying potable water mainly to the Municipality of Otjiwarongo with a few users along the pipeline.

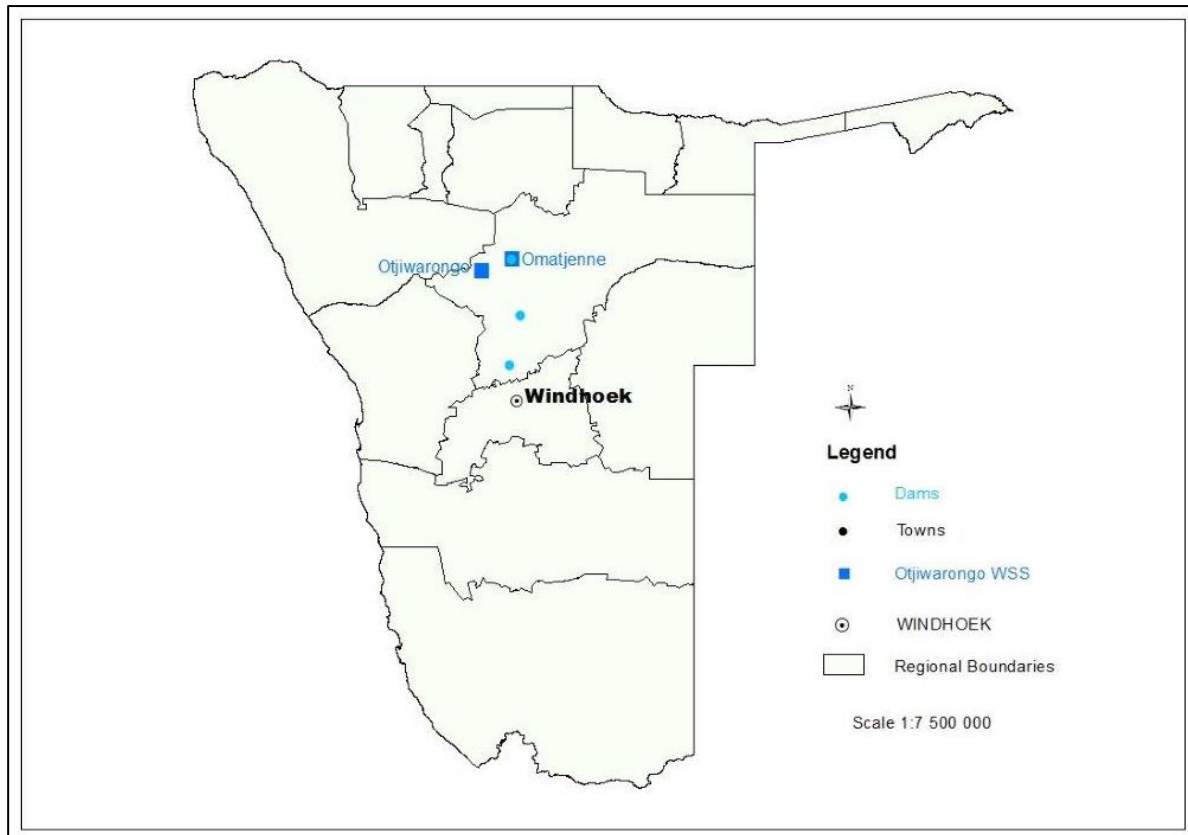


Figure 1: Omarassa-Omatjenne-Otjiwarongo Location Map

3. EXISTING OMARASSA-OMATJENNE-OTJIWARONGO WATER SUPPLY INFRASTRUCTURE

3.1 Water Source

3.1.1 Omarassa-Otjiwarongo Scheme

The Omarassa-Otjiwarongo Scheme is a groundwater scheme supplying potable water mainly to the Municipality of Otjiwarongo. The Omarassa-Otjiwarongo Groundwater Scheme was developed in the Otjiwarongo Marble Aquifer (OMA) North East of Otjiwarongo to supply water to Otjiwarongo.

The scheme consists of thirteen boreholes (see table below for borehole numbers) installed with electric submersible pumps, discharging into three respective pipelines, i.e. Janhelpman, Okaputa and Capricorn lines. The above pipelines meet at “Drukwerk”, from where the water is boosted to Otjiwarongo.

The boreholes can be operated in manual and automatic modes. In both manual and automatic mode, the pumps are stopped at the pre-set time programmed into the PLC.

The boreholes are between 63 m and 126 m deep. The strongest 4 boreholes yield 25 m³/h each and the remaining boreholes yield between 2.5 and 20 m³/h.

3.1.2 Omatjenne-Otjiwarongo Scheme

Omatjenne-Otjiwarongo is a groundwater scheme supplying potable water mainly to the Otjiwarongo Municipality as well as the Omatjenne Agricultural Research Station and private consumers along the pipeline scheme.

The scheme consists of an earth dam and nine boreholes (see table below for borehole numbers) installed with electric submersible pumps, discharging into one pipeline which is boosted several times up to the Terminal Reservoir at Otjiwarongo. In addition to the main boosted line, a second line from borehole WW 6301 (Hoasis) feeds directly into the Terminal Reservoir.

The boreholes can be operated in manual and automatic modes. In both manual and automatic mode, the pumps will be stopped at the pre-set time programmed into the PLC.

The boreholes are between 30 m and 210 m deep. The strongest borehole yields 45 m³/h and the remaining boreholes yield between 10 and 30 m³/h.

3.1.3 Otjiwarongo Scheme

Otjiwarongo is a scheme supplying potable water to the Municipality of Otjiwarongo. In 2007/08, 1 435 200 m³ were sold from this scheme. This scheme comprises of terminal reservoirs only which are supplied from the Omarassa-Otjiwarongo and Omatjenne-Otjiwarongo scheme pipelines.

The schematic layouts of the existing infrastructure are indicated in **Figure 2** below.

3.2 Water Quality

3.2.1 Omarassa-Otjiwarongo Scheme

The quality of water at Omarassa-Omatjenne-Otjiwarongo-West Scheme was evaluated for compliance with the NWQS and the NWQG. According to the NWQG the water can be classified as Group B.

A chlorine gas installation is installed with Alldos dosing equipment.

3.2.2 Omatjenne-Otjiwarongo Scheme

The quality of water at the Gainatseb-Khorixas Scheme was evaluated for compliance with the NWQS and the NWQG. According to the NWQG the water at Buffelshoek, Kilo 9 and Otjitazu can be classified as Group B.

A chlorine gas installation at the Buffelshoek, Kilo 9 and Otjitazu reservoirs are installed with Alldos dosing equipment.

3.2.3 Otjiwarongo Scheme

The quality of water at the Gainatseb-Khorixas Scheme was evaluated for compliance with the NWQS and the NWQG. According to the NWQG the water at Buffelshoek, Kilo 9 and Otjitazu can be classified as Group B.

The chlorine gas installations at the 10 405 m³ and 1 860 m³ reservoirs is installed with Alldos equipment and Grundfos booster pumps.

3.3 Pipe Work

3.3.1 Omarassa- Otjiwarongo Scheme

The pipework from the boreholes to the terminal reservoir in Otjiwarongo consists of class 12 and 18 fibre cement (FC) pipelines ranging from 125 to 350 mm diam. and class 6 and 9 uPVC pipelines ranging from 110 to 200 mm diam.

As-built scheme information indicates a construction date of 1980 and the pipelines are most probably in operation for up to 28 years. It was confirmed that some of the younger boreholes in the scheme and some uPVC pipelines were installed between 1996 and 1997.

The capacities of the 110, 125, 150, 200, 250, 300 and 350 mm diam. pipes at a velocity of 1 m/s are 28, 44, 63, 113, 175, 255 and 344 m³/h respectively.

3.3.2 Omatjenne-Otjiwarongo Scheme

The pipe work from the boreholes to the concrete ground collecting reservoir consists of 520 m of 90 mm diam. uPVC CL6 pipe, 2100 m of 150 mm diam. steel pipe, 11300 m of 200 mm diam. FC CL12 pipe and 3300 m of 250 mm diam. FC CL12 pipe.

The capacities of the 90, 150, 200 and 250 mm diam. pipes at a velocity of 1 m/s are 22, 63, 113 and 175 m³/h respectively.

3.4 Reservoirs

3.4.1 Clear Water Reservoirs

3.4.1.1 Omarassa-Otjiwarongo Scheme

The storage facility consists of a 1 205 m³ concrete ground reservoir. This reservoir is secured and permanently closed.

3.4.1.2 Omatjenne-Otjiwarongo Scheme

The storage facility consists of the following three reservoirs:

- A 285 m³ concrete ground reservoir at Buffelshoek. This reservoir is secured and permanently closed.

- A 255 m³ concrete ground reservoir at Kilo 9. This reservoir is secured and permanently closed.
- A 1 405 m³ concrete ground reservoir at Otjitazu. This reservoir is secured and permanently closed.

3.4.1.3 Otjiwarongo Scheme

The storage facility consists of the following two reservoirs:

- A 1 860 m³ concrete ground reservoir (partly underground) at Otjiwarongo, which is permanently closed.
- A 10 405 m³ concrete ground reservoir at Otjiwarongo. This reservoir is secured and permanently closed.

3.4.2 Raw Water Reservoirs

The Otjitazu (estimated 40 000 m³) and Omatjenne (estimated 5 mil m³) earth dams are located on the Omatjenne water supply scheme. These dams can only be used for aquifer recharge after rains when the dams have water.

3.5 Power Supply and Control System

3.5.1 Omarassa- Otjiwarongo Scheme

To control the boreholes according to the water demand in Otjiwarongo and to prevent over-abstraction from the boreholes themselves, the three lines are closed and opened via automatically actuated valves. All boreholes are equipped with local controls to stop and start according the pipeline pressure at the boreholes. Further to their end-of-line valves at the booster station at Drukwerk, the Janhelpman and Okaputa pipelines have intermediate pressure break valves installed, which work in series with the end-of-line valves. Communication between the intermediate pressure break valves and the end-of-line valves is accomplished via digital radios.

In principal, the operation can be split into two control components. The first component consists of the boreholes and actuated valves, which are controlled to keep the 1 205 m³ reservoir at Drukwerk full. The second component consists of the booster pumps, which transfer the water from the 1 205 m³ reservoir to the 10 405 m³ reservoir at Otjiwarongo.

Telemetry is used to signal a “low level” at the Otjiwarongo 10 405 m³ reservoir to the Drukwerk booster control system. The duty pump of the booster station will start to transfer water as soon as the 1 205 m³ reservoir is filled by 80% or more. It will stop only if either the level in the 1 205 m³ reservoir has dropped below 10%, or if the level of the 10 405 m³ reservoir at Otjiwarongo has reached its “full set-point” (90%).

When the level of the 1 205 m³ reservoir at Drukwerk drops below 80%, the end-of-line actuated valves on the respective pipelines are opened and the intermediate actuated valves are also opened via a telemetry signal. Pressure sensors at the boreholes detect the decrease in pipeline pressure. This “low pressure” signal will activate the borehole pumps on each line, thereby discharging water into the 1 205 m³ reservoir at Drukwerk Booster station. When the level of the 1 205 m³ reservoir at Drukwerk has reached its “full set-point” (80%), the intermediate and end-of-line valves will close and cause the pressure in the pipeline to rise. This “high pressure” signal will stop the borehole pumps on each line.

The Drukwerk booster station is equipped with a permanent by-pass line. This line was installed to facilitate any maintenance work to be done on the reservoir requiring the reservoir to be taken out of operation. The booster station would then run in-line with the boreholes pumps.

Each of the boreholes is equipped with a MCC. Electric power is supplied from pole-mounted transformers with a single TP meter in a meter kiosk located near each borehole. Electricity is supplied by NamPower.

The Omarassa-Otjiwarongo scheme is linked to the Otjiwarongo area office via telemetry and can be monitored and controlled remotely.

The reservoir is controlled by a level switch and there were no indications of overflowing resulting in water production losses.

3.5.2 Omatjene-Otjiwarongo Scheme

The three boreholes at Omatjenne dam and the three boreholes close to Buffelshoek feed into the 285 m³ Buffelshoek reservoir. The booster pumps at Buffelshoek pump water to the 255 m³ Kilo 9 reservoir. The booster pumps at Kilo 9 pump the water to the 1 405 m³ Otjitazu reservoir. All three booster pump stations are controlled from the control room at the Otjiwarongo area office. Borehole WW 10660 feeds water directly into the supply line to Otjitazu reservoir and borehole WW 6293 feeds directly into the Otjitazu reservoir and is also controlled from the control room at the Otjiwarongo area office.

Electric power is supplied from pole-mounted transformers with a single TP meter in a meter kiosk located near each borehole. Electricity is supplied by NamPower.

The Omatjenne-Otjiwarongo scheme is linked to the Otjiwarongo area office via telemetry and can be monitored and controlled remotely.

3.6 Scheme Processes/Operation

There is a fulltime NamWater scheme operator at each scheme, who does checks on a daily basis whether all the systems are functional. The scheme has been electrified and automated with timer switches.

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.

4. BRIEF DESCRIPTION OF THE RECEIVING ENVIRONMENT

The baseline description provided below focuses on the receiving environment:

4.1 Climate

Otjiwarongo has a semi-arid climate with hot summers and mild winters.

4.1.1 Precipitation

Rainfall in the area is highly sporadic as is the case for most of Namibia, with the first rains occurring in October and November followed by a dry spell in December. Annual rainfall is experienced as heavy down pours usually in January to April, with an annual average rainfall of 457 mm.

4.1.2 Temperature

The area is often hot, with an average temperature of 20.3 °C (Mendelsohn *et al.*, 2009).

4.2 Geology

The Brandberg, Erongo and Waterberg groundwater area includes the Waterberg in the north-east and stretches down to the Atlantic coast in the south-west. It covers most of the western part of the Otjozondjupa Region and the northern Erongo Region. Otjiwarongo is situated on the eastern edge of the area. The Sandstone unit (Unit 5) occurs in the Otjiwarongo area south of the Waterberg Fault, where they belong to the flat-lying aeolian Etjo Formation of the Karoo Sequence (Christelis *et al.*, 2011).

Damaran meta-sediments have been intruded by granites in a broad zone between Otjiwarongo and Okahandja and the coast (Christelis *et al.*, 2011).

4.3 Natural Fauna and Flora

Animal life is highly diverse in the Otjiwarongo surrounds. The dense bush on the slopes is inhabited by Damara Dik-Dik (*Madoqua kirkii*), klipspringer (*Oreotragus oreotragus*), kudu (*Tragelaphus strepsiceros*) and leopard (*Panthera pardus*). The Otjiwarongo surrounds is also home to giraffe (*Giraffa Camelopardalis*), eland (*Taurotragus oryx*), gemsbok (*Oryx gazelle*) and hartebeest (*Alcelaphus buselaphus*), impala (*Aepyceros melampus*), blue wildebeest (*blue wildebeest*), zebra (*Equus zebra*) and springbok (*Antidorcas marsupialis*). Other than leopard, one will find predators such as cheetahs (*Acinonyx jubatus*), some small cat species, hyenas (*Proteles cristata*) and jackals (*Canis mesomelas*) (Bernard *et al.*, 1998).

The Otjiwarongo surrounds is home to about 200 birds, including ostrich (*Struthio camelus*), Kori bustard (*Ardeotis kori*) and birds of prey such as the secretary bird, the Cape vulture (*Gyps coprotheres*), lappetfaced (*Torgos tracheliotos*) and whitebacked vulture (*Gyps africanus*), black eagle (*Ictinaetus malaiensis*) and bateleur (*Terathopius ecaudatus*). Then there are the more uncommon species like Rüppell's parrot (*Poicephalus rueppellii*), rockrunner (*Achaetops pycnopygius*) and Hartlaub's francolin (*Pternistis hartlaubi*) (Bernard *et al.*, 1998).

Otjiwarongo is located in the Thornbush (or Acacia tree and Shrub) Savanna biome of the Otjozondjupa Region. The Acacia Tree and Shrub Savanna biome is typically characterised by large, open expanses of grasslands dotted with Acacia trees (Mendelsohn, *et al.*, 2009). The proposed project area is dominated by typical xeromorphic Thornbush Savanna with dominant woody plants generally consisting of *Acacia reficiens*, *Terminalia sericea*, *Boscia albitrunca*, *Grewia*, *Dichrostachys cinerea*, *Acacia erioloba* and *Acacia mellifera*. Understory vegetation is relatively sparse, although ephemeral forbs are present following a rainy season.

5. THE LEGAL ENVIRONMENT

A legal review was done and the key laws of concern include those which protect the ecological integrity of the Omarassa-Omatjenne-Otjiwarongo 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 Omarassa-Omatjenne-Otjiwarongo 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 Omarassa-Omatjenne-Otjiwarongo 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 1: 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"> Establish regular reporting procedures on maintenance 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. Review, and if necessary, revise maintenance manual. Establish emergency procedures guidelines for the blockage/failure, flooding, contaminant removal and disinfection, power failure and fire of the scheme. Implement the response procedures when emergency incident occurs. Complete the incident report checklist in the case of emergency and keep with monitoring records for submission. Undertake annual education course for all operational staff. 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 Omarassa-Omatjenne-Otjiwarongo 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 deposal 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 been 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 Murangi

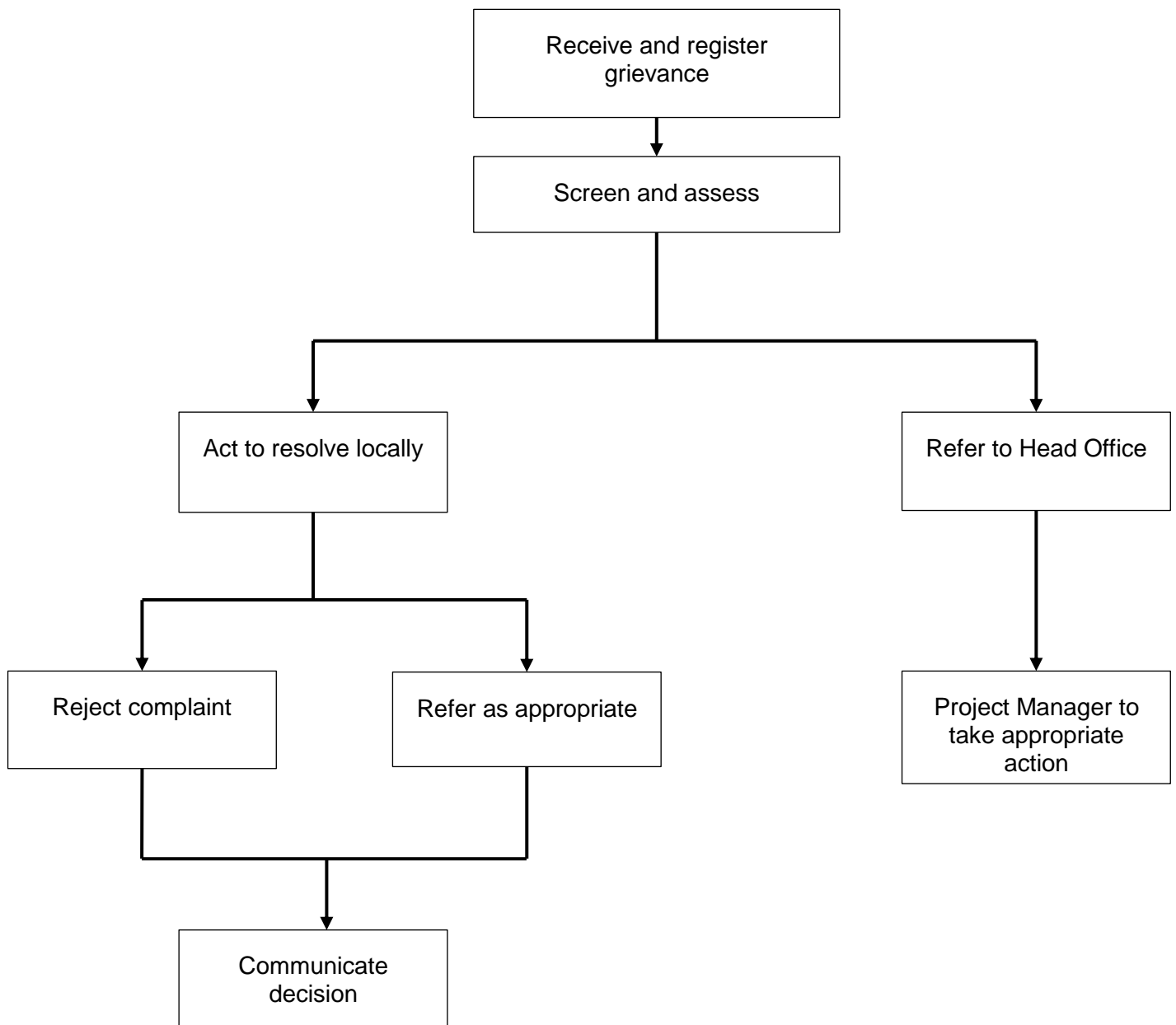
Tell: 061-71 2105

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:	