ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR THE CONTINUED OPERATION AND MANAGEMENT OF THE EXISTING ORANJEMUND WATER SUPPLY SCHEME (ABSTRACTION AND TREATMENT)

Prepared for

Oranjemund Town Council
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Prepared by

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DOCUMENT INFORMATION

PROJECT:	Continued operation and management of Oranjemund Water Supply Scheme (Abstraction of Water From 10 x Boreholes and 1 x Felhman Well and Treatment for Urban, Irrigation and Industrial purposes).
Location:	Oranjemund, //Karas Region
Client:	Oranjemund Town Council
EAP:	Green Gain Environmental Consultants cc Joseph Kondja Amushila
Report Type:	Environmental Management Plan
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LIST OF ACRONYMS

DEA:	Directorate of Environmental Affairs
DWA:	Directorate of Water Affairs
EAP:	Environmental Assessment Practitioner
ECC:	Environmental Clearance Certificate
ECO:	Environmental Compliance Officer
EIA:	Environmental Impact Assessments
EMP:	Environmental Management Plan
ERP:	Emergency Response Procedures
GDP:	Gross Domestic Product
GN:	Government Notice
I&APs:	Interested and Affected Parties
MAFWLR:	Ministry of Agriculture, Fisheries, Water & Land Reform
MEFT:	Ministry of Environment, Forestry, and Tourism
MoHSS:	Ministry of Health and Social Services
MSDS:	Material Storage Data Sheet
NamPower:	Namibia Power Corporation
NamWater:	Namibia Water Corporation
OFRB:	Orange-Fish River Basin
ORTC:	Oranjemind Town Council
PHE:	Public Health and Environmental Act
PM:	Project Manager
PPE:	Personal Protective Equipment
SCADA:	Supervisory Control and Data Acquisition

1. INTRODUCTION AND BACKGROUND

1.1 Introduction

Oranjemund is a famous diamond mining town located along the Atlantic Ocean on the southwest corner of Namibia in //Kharas region. Historically, the town was proclaimed a protected area “the Sperrgebiet (German, meaning "Prohibited Area"). The “Sperrgebiet” was proclaimed a national park in June 2004 and is now renamed Tsau ǁKhaeb National Park.

The coastal towns of Namibia such as Oranjemund pre-dominantly depends on groundwater for their economics activities. The town is dependent on underground water resources and supply from ten (10) boreholes and one (1) Felhman located in the paleo channel on the upstream side of the northern bank of Orange River. The formation of the paleo channel over hundreds of years resulted in the formation of an alluvial aquifer which is largely for Riverbank Filtration.

Green Gain Consultants cc has been appointed as an independent Environmental Assessment Practitioner (EAP) by ORTC, to undertake an environmental assessment to investigate, evaluate and report all potential impact that the water abstraction may have on the bio-physical and social environment with the overall aim of environmental protection and sustainability.

This Environmental Management Plan (EMP) was prepared in line with Section 8 (j) of the EIA Regulations (GN 30 of February 2012), and the proponent’s terms of reference. The EMP is therefore important in ensuring that the management actions arising from the assessment processes are clearly defined and implemented through all phases of the project life cycle. As a result, the EMP recommends mitigation measures to ensure that the recommended water abstraction activities and associated activities are conducted in an environmentally friendly manner, and in accordance with the provisions of the Environmental Management Act and EIA regulations.

1.2 Environmental Management Requirements

In terms of Section 27 (2) of the Environmental Management Act (Act No. 7 of 2007) hereinafter referred to as 'EMA', and Environmental Impact Assessment Regulation (Government Notice No. 30 of 2012), has listed activities that may not be undertaken without an Environmental Clearance Certificate as follows.

Table 1: Listed activities triggered

Activity	Applicability
"8.1 The abstraction of ground or surface water for industrial or commercial purposes. or	The project entail the abstraction water for commercial purposes
"8.2 The abstraction of groundwater at a volume exceeding the threshold authorised in terms of a law relating to water resources"	The abstraction of water exceeds the threshold authorised in terms of Water Resource Management Act.

ORTC was with an Environmental Clearance Certificate (ECC01288), issued 2021-04-13 and expired on 2024-04-13. To meet the statutory requirements, the Oranjemund Town Council has appointed Green Gain Consultants cc to update the Environmental Management Plan (EMP) and subsequently apply for the renewal of the expired ECC and amendment of the ECC to include the Water treatment activities.

1.3 Objectives of the EMP

The purpose of the EMP is to identify potential environmental and social impacts associated with the Oranjemund Water Supply Scheme which consist of water abstraction and treatment. The objective of the EMP is to prevent / minimize (where possible), unacceptable and adverse environmental, social or economic impacts that may arise from the proposed development. Overall, the EMP aims to prevent any negative impact/s (real, potential or perceived) that may result from the proposed water abstraction activities.

The specific objectives of this EMP are:

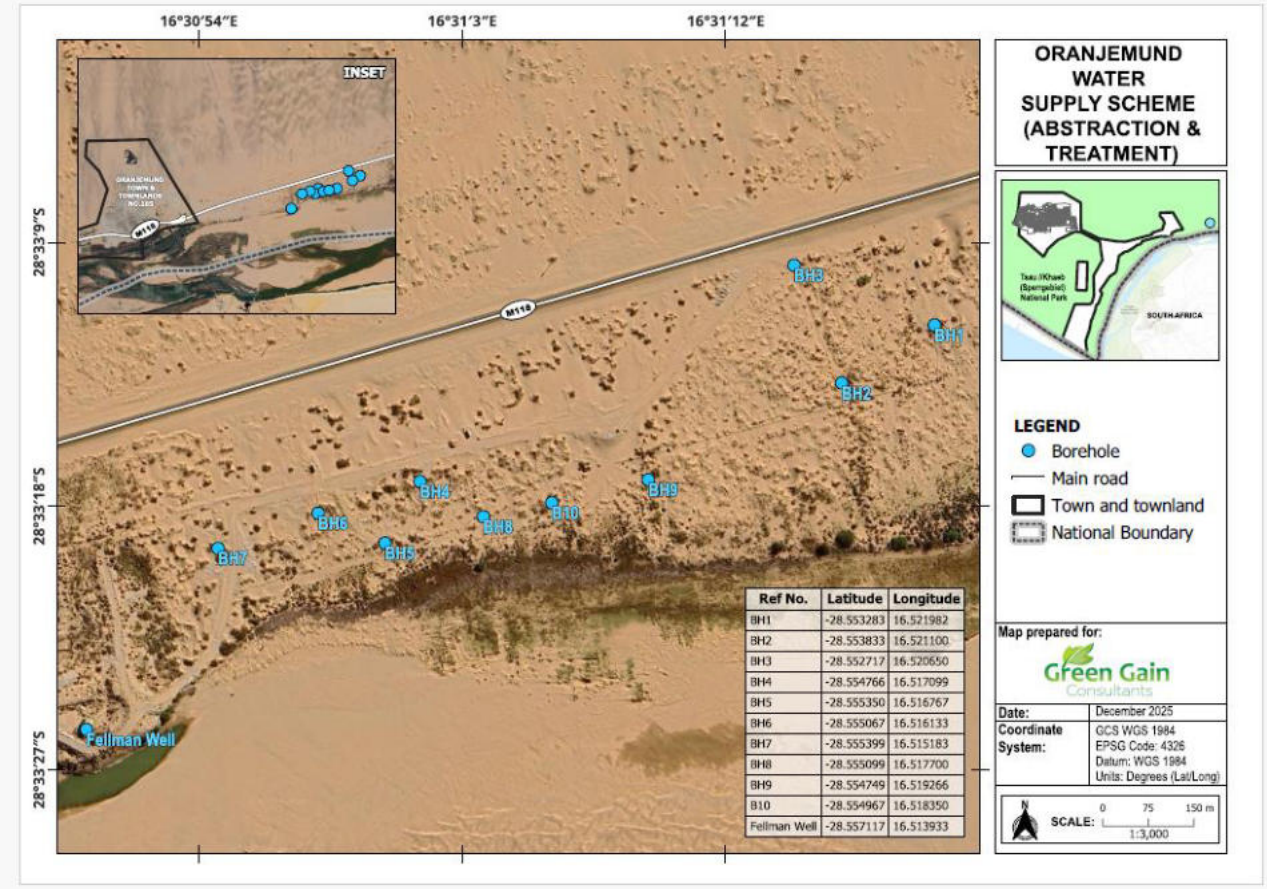
- Present measures to avoid, lessen and mitigate adverse impacts on various environmental components, and enhance the value of environmental components where possible.
- Define the roles and responsibilities for the implementation of environmental management and mitigation measures.
- Explain the need for compliance with regulatory provisions and guidelines.
- Explain procedures for compliance monitoring and reporting to the relevant competent and regulatory authorities.
- Present procedures for the possible decommissioning and required environmental rehabilitations.

The EMP outlines specific roles and responsibilities for the proponent (ORTC and sub-contractors) and non-compliance is punishable. It should be noted that the EMP is a legally binding document between the proponent and Ministry of Environment, Forestry and Tourism (MEFT) and implementation of the recommended management actions is mandatory.

2. PROJECT DESCRIPTION

2.1 Water Abstraction

Water is abstracted from ten (10) boreholes and one (1) Felhman located in the Paleo channel on the upstream side of the northern bank of Orange River as shown in following figures below.



Ref No.	Latitude	Longitude
BH1	-28.553283	16.521982
BH2	-28.553833	16.521100
BH3	-28.552717	16.520650
BH4	-28.554766	16.517099
BH5	-28.555350	16.516767
BH6	-28.555067	16.516133
BH7	-28.555399	16.515183
BH8	-28.555099	16.517700
BH9	-28.554749	16.519266
B10	-28.554967	16.518350
Fellman Well	-28.557117	16.513933

Figure 1: ***Aerial view of the borehole and felhmann well field at Oranjemund***

Description of boreholes

BH #6	S 28°33'30"	E 16°31'062"	29.71	
BH #7	S 28°33'286"	E 16°31'026"	34.42	
BH #8	S 28°33'321"	E 16°31'006"	28.14	
BH #9	S 28°33,324'	E 16°30,911'	37.32	
BH #10	S 28°33,324'	E 16°30,911'	37.32	
Fehlman Well +	S 28°33'427"	E 16°30'836"	17.05	

Borehole number	GPS Coordinates		Borehole Depth	
	Latitude	Longitude		
BH #1	S 28°33'197"	E 16°31'319"	25.90	
BH #2	S 28°332'30"	E 16°31'266"	21.09	
BH #3	S 28°33'163"	E 16°31'239"	33.78	
BH #4	S 28°33'285"	E 16°31'156"	32.02	
BH #5	S 28°33'298"	E 16°31'101"	27.19	

2.2 Source of water

Water drilling activities started early in the 19th century with the operation of “Bohrkolonne” by the German colonial government. The mining for diamond deposits of Oranjemund commenced with water abstraction along the Northern banks of the Orange River. To date, there are 10 active boreholes and one (1) Felhman well that supply water to the diamond town for various activities.

The groundwater abstraction points are located on the upstream northern bank of the river of Sir Ernest Oppenheimer Bridge. Water is pumped to the central Swartkops reservoir from where it is fed to the town reservoirs by gravity flow, where it is distributed to the town of Oranjemund and Namdeb Mine Area 1 Reclamation Plant.

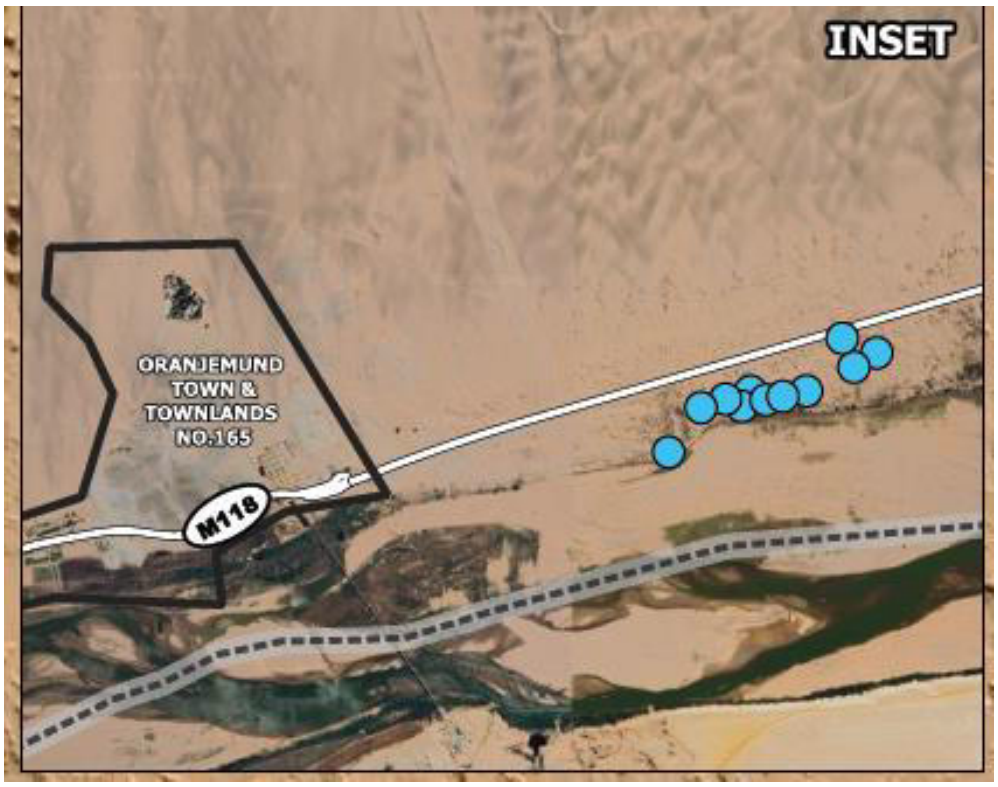


Figure 2: Water abstraction sites

The current town water demand is 14,932 m^3/day which translated to 5,375,641 m^3/yr. The current 10 boreholes and Felhman well have a combined capacity of 7,405,200 m^3/year (20,570m^3/day) which is above the town demand. With increase in the population and economic activities, water demand is also expected to increase.

2.3 Water treatment and distribution

The water abstracted from boreholes is pumped into the central Swartkops reservoirs where it get chlorinated and before is fed by gravitation to the town reservoirs and further distributed.

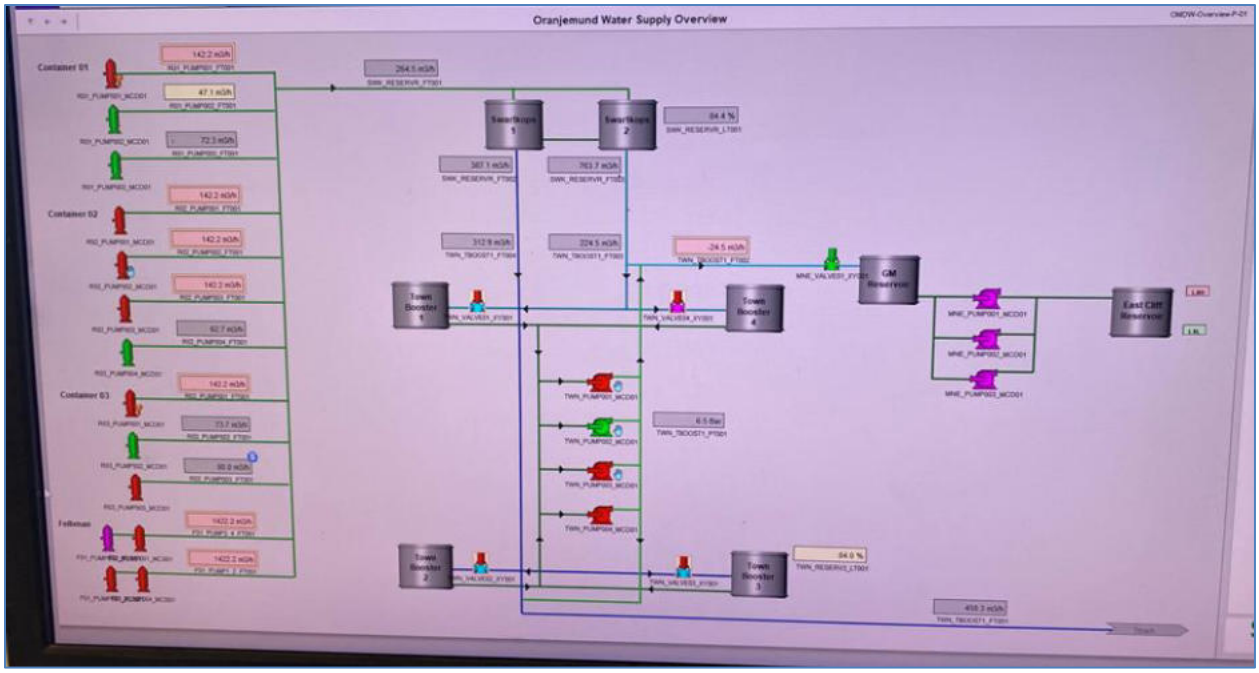


Figure 3: Water Treatment scheme layout

2.4 Implications of water abstraction

The most risk associated with groundwater abstraction is the potential of over abstraction. Hence, to ensure the conservation, protection and sustainable utilization of groundwater resource, it is important to understand the geohydrology characteristics of the aquifer in order to determine observation points and frequency for groundwater monitoring which eventually determines the aquifer's response to abstraction and subsequently the sustainability of abstraction rates. Unfortunately, such studies require huge resources investment, and time.

The ground water of the Cuvelai Basin of the north central Namibia is extensively studied and the dynamic of the ground water is to a large extend known (BGRDWAF, 1999,2010). However, the same cannot be said with the southern Orange-Fish River Basin (OFRB) where Oranjemund is located.

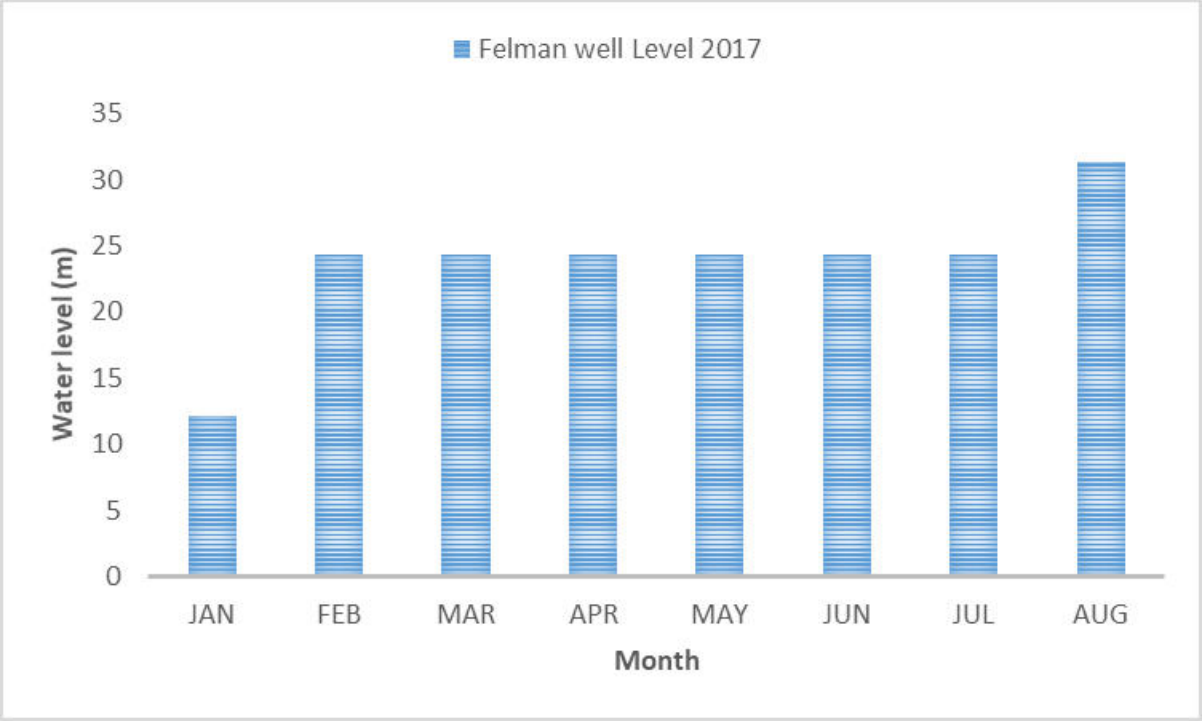


Figure 4: Water level in the Felhman well 2017

According to Orange Senqu River Commission (ORASECOM) through a report titled "Orange River Integrated Water Resources Management Plan"2007, the ground water potential and natural recharge of Namibia are not fully determined. Tordiffe, EAW. 2010 indicated that there are only 20 monitoring boreholes in the OFRB which cover an area of 120,000 km^2 which translates to about one (1) borehole per 17 000 Km^2. The study concluded that, "groundwater monitoring

stations within the OFRB are hardly adequate to make any reasonable assessment of the groundwater dynamics within the basin or even in parts thereof". Furthermore, there are no groundwater monitoring boreholes at Oranjemund that could help understand the dynamics of groundwater fluctuation other than recharge from rainfall.

However, it's not all doom and gloom, analysis from record of abstraction and level of Felhman well does not show a declining trend in yield but rather normal fluctuating trends, which at this point can only correlate to rainfall patterns (note Figures below) where it peaks in January and recharge is estimated to happen from August, with the rise of Felhman well and, the rise in fluctuation of December abstraction. Henceforth, the current abstraction rates do not seem to pose threat to the aquifer.

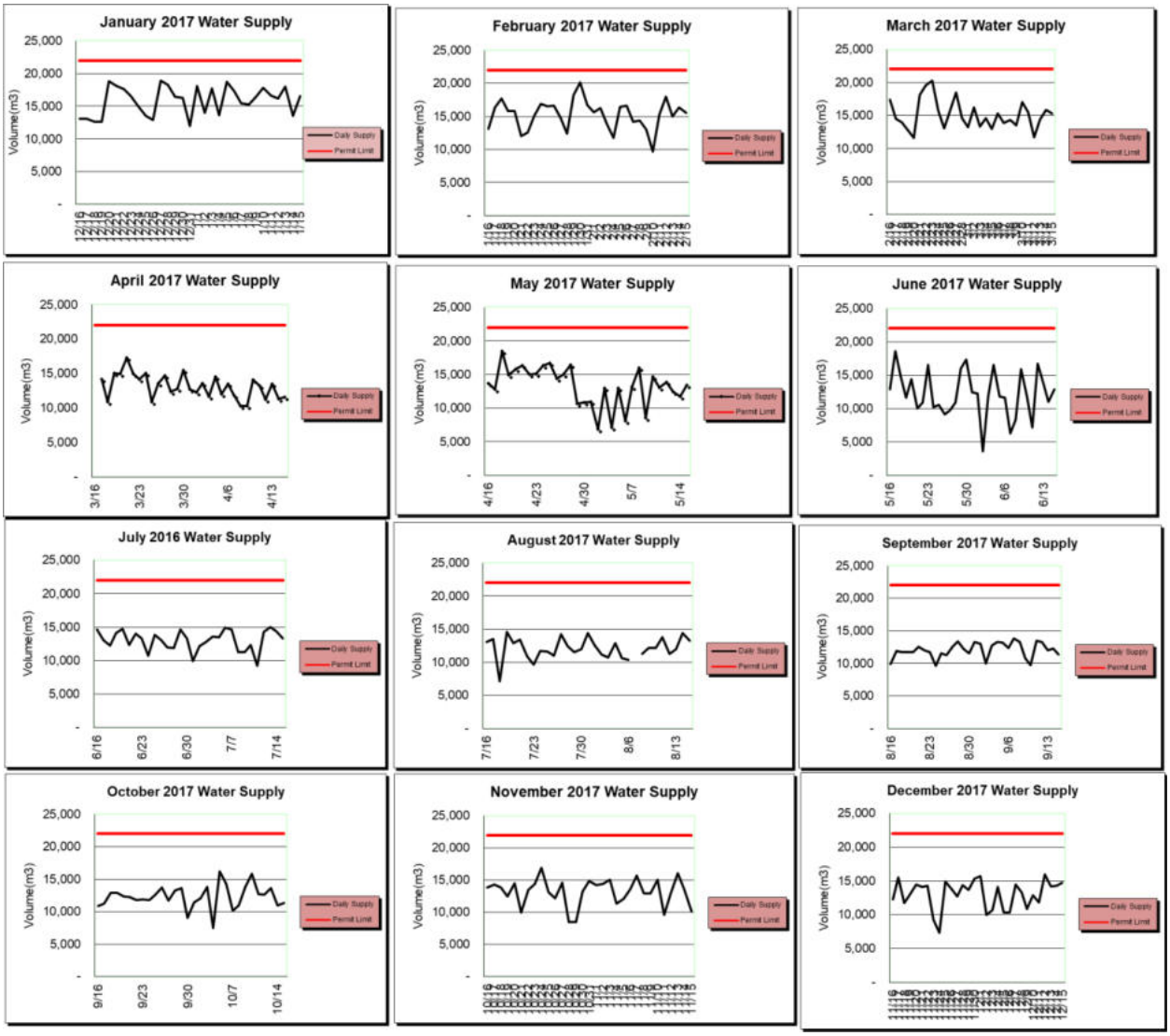


Figure 5: Daily water obstruction for Oranjemund Town Council

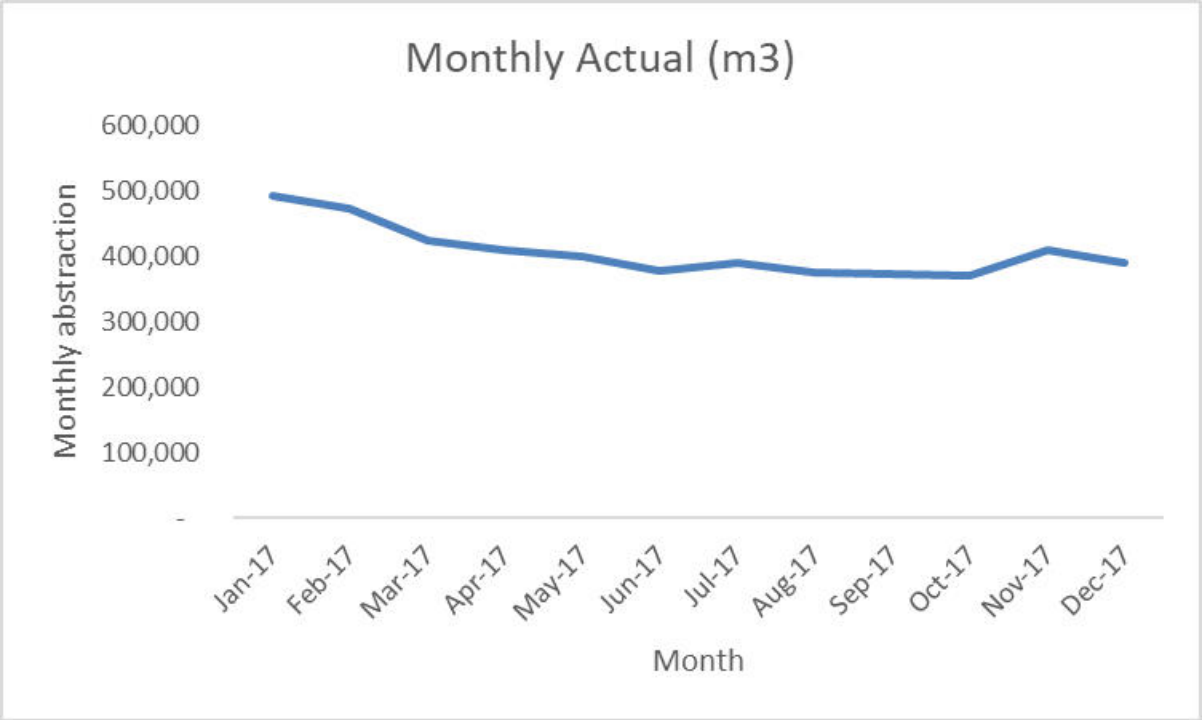


Figure 6: Monthly water abstraction for Oranjemund Town Council

With the above, this study presents an opportunity for the implementation of an adequate monitoring station at Oranjemund in order to ensure comprehensive understanding of ground water dynamics of the aquifer for it sustainability.

3. ROLES AND RESPONSIBILITIES

3.1 Project Involvement

The implementation of the EMP requires various role players, each with specific responsibilities to ensure that the proposed activity is operated and maintained in an environmentally sound manner.

Table 2: Project team

No.	SPECIFIC PROJECT ROLE	ADDRESS AND CONTACTS
1.	Proponent	**Oranjemund Town Council** Mrs. Hilaria Shivute Tel: +264 (63) 233500 Head: Water Care Email: hilaria.kafita@ormdtc.com.na Mr. Ruben Shivute Tel: +264 (63) 233500 Email: ruben.shivute@ordmtc.com
2.	Environmental Assessment Practitioner	**Green Gain Consultants cc** Mr. Joseph Amushila Cell: +264811422927 Email: info@greengain.com.na
3	Environmental Compliance Officer/s (ECO)	**Ministry of Environment, Forestry &Tourism (MEFT) – Department of Environmental Affairs (DEA)**

3.2 Responsible Parties

3.2.1 Proponent (ORTC)

The proponent shall assume overall responsibility to ensure implementation of the EMP and will be held accountable against the remedial measures outlined herein. It is recommended that the client should appoint a Project Manager who will be responsible for monitoring of daily operations.

The specific responsibilities of the Proponent are as follows:

- Appoint a Project Manager to oversee the daily onsite activities.
- Liaise closely with the Site Manager and ECO on any environmental management issues, incidents or emergencies.
- Ensure that all activities on and around the site are conducted in accordance with the requirements of the EMP at all times.
- Ensure that all sub-contractors and visitors to the site are conversant with the requirement of the EMP, relevant to their roles on site.
- Shall develop a communication strategy between The Proponent, Project Manager, workers, the ECO and any other relevant stakeholder.
- Shall develop an organisational structure to ensure that:
    - ❖ There are clear channels of communication;
    - ❖ There is an organisational hierarchy for effective implementation of the EMP;
    - ❖ Conflicting or contradictory instructions are eliminated;
    - ❖ Ensure that all instructions and official communications regarding environmental matters shall follow the organisational structure as determined; and
    - ❖ Ensure that that EMP requirements are assigned to specific people positions with the capacity and experience required for implementation.

3.2.2 The Project Manager

The Project Manager (PM) should:

- Ensure that each team recruited to work at the sites, adheres to the EMP;
- Ensure that a copy of the EMP is always kept on site and as it may be requested by authorities conducting spot checks at any time.
- Ensure that all staff attend an induction session before commencement of any work on site and that they are adequately informed of the requirements of the EMP;

- Take special care to prevent irreversible damage to the environment;
- Ensure that activities are within the boundaries of the proposed farming area.

3.2.3 Environmental Assessment Practitioner (EAP)

The EAP in collaboration with the ORTC Environmental team, is responsible for the compilation of an EMP and submission of such reports to the competent authority (DWA) as well as the regulatory authority (MEFT). In addition, the EAP will apply for the Environmental Clearance Certificate (ECC) on behalf of the proponent.

3.2.4 The Environmental Compliance Officer (ECO)

The ECO refers to the party responsible for the environmental monitoring and auditing to ensure that the provisions of the EMP are complied with. The ECO shall have adequate environmental knowledge to understand and interpret the EMP and pertaining environmental aspects associated with the project. The specific tasks of the ECO are as follows:

- To undertake all monitoring and auditing activities in-order to ensure compliance with the EMP.
- Conduct inspections and monitoring at reasonable intervals (e.g. every month, quarterly or annually), throughout the duration of the project. Depending on the risks, some projects may require regular inspections.
- Issue compliance or non-compliance orders to the proponent, contractors/sub-contractors.
- Compile compliance Reports pertaining to any non-compliance incident/s, and a Rehabilitation Report following the conclusion a specific activity.

3.2.5 The contractor and sub-contractors

It is expected that various contractors and sub-contractors will be appointed at various stages and for various tasks during the phases of the project. All appointed contractors and sub-contractors involved in the project shall ensure compliance with the EMP and its conditions, thus the Project Manager must ensure that a copy of the EMP is given to all contractors involved. The contractor upon receiving this EMP, should ensure compliance to the EMP by:

- Undertaking their activities in an environmentally sensitive manner and within the context of this EMP.
- Undertaking good housekeeping practices during the duration of their activities.

- Ensuring that adequate environmental awareness training takes place in the language best understood by the employees.
- Making provision for induction of the ORTC Environmental Code of Conduct.
- Keeping a record of emergencies and taking corrective actions.
- Taking appropriate disciplinary actions against their employees in cases of transgressions.

4. ENVIRONMENTAL MANAGEMENT REQUIREMENTS

The successful implementation of this EMP will depend on various factors such as training and awareness, enforcement, good record keeping, and reporting.

4.1 Environmental awareness training

It is important to ensure that contractors, sub-contractors, and all ORTC employees have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and minimization of environmental harm.

To achieve this, all parties involved during the construction, operation, maintenance, and decommissioning phases should be briefed on their obligation towards environmental protection in terms of the EMP before any work commences. The training should also cover the actions outlined in the emergency response plan as well as ORTC Environmental Code of Conduct.

4.1.1 Operation and maintenance phase

The Proponent should ensure that ORTC employees receive appropriate training on environmental issues pertaining to the operation and maintenance of the proposed activity and to carry out their works in accordance with this EMP. All instructions and official communications shall follow the organisational structure as determined by the Proponent. Based on the adopted structure, it is essential that responsibilities outlined are assigned to specific parties with adequate capacity and experience required to implement the EMP.

4.2 Recordkeeping

There should be an updated filing system for the ORTC Water Abstraction, where method statements, environmental incidents reports, training records, audit reports, and public complaints register are kept. It is advised that photographs of the site should be taken as a visual reference. The grievance register must be kept by the PM during the operational & maintenance phase, respectively.

4.3 Enforcements

This EMP upon approval by MEFT shall be a legally binding document, thus, the commitment and co-operation of the identified responsible person(s) will ensure effective implementation of the EMP. Adherence to this EMP will ensure that the environmental impacts associated with the project will be mitigated to a greater extent thus promoting sustainable development. The EMP

will be enforced in accordance with the provisions of Section 8 (j) of the Environmental Management Act 07 of 2007 through a contract between ORTC and the contractor.

4.3.1 Non-compliance and disciplinary actions

In cases of transgressions and non-compliance to the EMP, the following actions may be taken against the transgressor.

- Disciplinary actions
- Legal actions
- Termination of contract

The ORTC and PM in collaboration with the designated ECO will ensure that the EMP is fully complied with by the appointed contractor and employees during the phases of the project. The disciplinary actions should be issued based on the severity of the environmental damages and the nature and extent of the transgression/non-compliance. In addition, the proponent may also institute legal actions against the transgressor i.e., withholding of the contract retention money from the contractor until the transgression is rectified or terminate the entire contract for non-compliance, in line with the Public Procurement Act 15 of 2015 and ORTC contract agreement.

The PM will ensure compliance during the operation and maintenance phase. Non-compliance or transgression shall result in disciplinary actions being taken against the transgressor. Transgressions should be recorded in a dedicated register and filed accordingly.

4.4 Environmental reports

The proponent shall ensure regular monitoring of project activities during all project phases and keep records. These records may be required by the competent authority when deemed necessary or for the renewal of the ECC. The records will be required when applying for renewal of the ECC and ORTC will also have to indicate how the EMP was adjusted to make provision for improved mitigation measures and action plans.

5. LEGAL REQUIREMENTS

The EMP implementation shall be guided by the legislative framework as briefly presented in the table below.

Table 3: Applicable National Laws

LEGISLATION	PROVISION AND REQUIREMENTS
Constitution of the Republic of Namibia (1990)	Articles 91 (c) commands the state to actively promote and sustain the environmental welfare of the nation by formulating and institutionalizing policies to accomplish the sustainable objectives which include: • Guarding against overutilization of biological natural resources, • Limiting over-exploitation of non-renewable resources, • Ensuring ecosystem functionality, • Protecting Namibia's sense of place and character. • Maintain biological diversity. • Pursuing sustainable natural resource use. Article 95(i) recites: "The State shall actively promote… maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future".
Pollution Control and Waste Management Bill, 2003	This Bill serves to regulate and prevent the discharge of pollutants to air and water as well as provide for general waste management. The bill provides a framework for a multitude of administrations on pollution control and waste management in the country.
Environmental Management Act No. 07 of 2007	Ensuring that the significant effects of activities on the environment are considered carefully and in time. To promote the sustainable management of the environment and the use of natural resources by establishing principles for decision-making on matters affecting the environment. **Of relevance to this project are the following listed activities, as provided in Section 27 of the Environmental Impact Assessment Regulations of 2012, which includes:** No. 8.1 & 8.2

Water Act 54 of 1956 and Water Resources Management Act 11 of 2013	The Water Resources Management Act 11 of 2013 is present 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 utilization and pollution. This Act further provides provision for the control, conservation, and use of water for domestic, agricultural, urban, and industrial purposes. In addition, the Act gives provisions that pertain to license or permit that required abstracting and using water as well as for discharge of effluent.
Soil conservation Act 76 of 1969	The objectives of the Soil Conservation Act 76, 1969 are to make provision for the combating and prevention of soil erosion, and the conservation, protection, and improvement of the soil, the vegetation, and the sources and resources of the water supplies.
Nature conservation Ordinance of 1975.	The Nature Conservation Ordinance Section 14 protects and preserves wild animal life, fisheries, wild plant life and objects of geological, archaeological, historical and other scientific interest and for the benefit and enjoyment of the inhabitants of Namibia.
Hazardous Substance Ordinance of 1974	This Ordinance provides for the control of toxic substances and is thus also relevant for pollution control. It covers the manufacturing, sale, use, disposal, dumping, importing, and exporting of hazardous waste.
Labour Act (No 11 of 2007)	The Objectives of the National Labour Act are: • To establish a comprehensive labour law for all employers and employees; to entrench fundamental labour rights and protections. • Regulate basic terms and conditions of employment. • To ensure the health, safety, and welfare of employees; to protect employees from unfair labour practices. • To regulate the registration of trade unions and employers' organizations; to regulate collective labour relations. • To provide systematic prevention and resolution of labour disputes.
Public Health and Environmental Act, 2015	The objectives of the PHE Act are to. • Promote public health and wellbeing. • Prevent injuries, diseases, and disabilities. • Protect individuals and communities from public health risks. • Encourage community participation to create a healthy environment. Provide for early detection of diseases and public health risks.
The Occupational Safety and Health Act No. 11 of 2007	• Advocates for employee and public safety, health • In the working context "SAFETY" implies "free from danger"
Employment Service Act 8 of 2011	To provide for the establishment of the National Employment Service; to impose reporting and other obligations on certain employers and institutions; to provide for the licensure and regulation of private employment agencies, and to deal with matters incidental thereto.

Atmospheric Pollution Prevention Ordinance 11 of 1976	To provide for the prevention of the pollution of the atmosphere and matters incidental thereto. The Ordinance deals with administrative appointments and their functions; the control of noxious or offensive gases; atmospheric pollution by smoke, dust control, motor vehicle emissions; and general provisions.
Pollution Control and Waste Management Policy, 2003	The bill provides a framework for a multitude of administrations on pollution control and waste management in the country. Each authority identified by the bill shall play its respective role.
Basel and Rotterdam Convention, Framework Convention on Climate Change	Agreed to ensure environmentally sound management of hazardous waste and other wastes through the reduction of their movements, to reduce their impacts on human health and the environment.
Stockholm Convention on Persistent Organic Pollutants	Emphasizes the restriction and elimination of persistent organic pollutants especially the disposal of industrial and medical chemicals. It also provides information for future establishments to re-use, reduce and recycle waste with environmentally friendly technologies e.g., autoclaving. It was adopted in 2001 and entered into force on May 17, 2004.
MEFT Policy on HIV & AIDS	MEFT has recently developed a policy on HIV and AIDS. In addition, it has also initiated a program aimed at mainstreaming HIV and gender issues into environmental impact assessments.
National Heritage Act No. 27 of 2004	The Act is aimed at protecting, conserving, and registering places and objects of heritage significance.
Local Authorities Act No. 23 of 1992	The Local Authorities Act prescribes how a town or municipality should be managed by the Town or Municipal Council.
Roads Ordinance 17 of 1972 and its amendments	• Section 36.1 regulates rails, tracks, bridges, wires, cables, subways, or culverts across or under proclaimed roads • Section 37.1 deals with Infringements and obstructions on and interference with proclaimed roads.

6. MANAGEMENT OF IDENTIFIED IMPACTS

This section outlines the proposed mitigation measures to avoid, prevent and mitigate and/or enhance the identified potential impacts associated with the project activity. It also outlines the responsibilities of each party involved in the project implementation during the project phases.

6.1 Operational and maintenance phase

Table 4: Potential impacts and proposed mitigation measures during operation and maintenance phase

Environmental Issue/Impacts	Source of Impact	Mitigation Measures	Responsibility
Biophysical	Disturbance to local flora and fauna	✓ Existing maintenance roads should be used as far as possible ✓ All vehicles should be driven at a minimum speed limit of 60 km/hr.	Proponent
	Soil disturbances and contamination.	✓ Soil disturbance from this activity is expected to be minimal. ✓ Contaminated soil must be cleaned up and disposed of appropriately at the ORTC disposal site.	Proponent
	Unattended pipe leaks in the wild could feed the germination of annuals and opportunistic plants	✓ Water leaks should be attended as soon as possible. This can be ensured through regular inspection.	Proponent
	Damage to geological resources.	✓ Excavations will only be necessary for the repair of burst water pipes. Hence, disturbance from this activity is expected to be minimal.	Proponent

	Fuel and lubricants spills or leaks.	✓ All leakages and spillages of oil and grease should be contained, cleaned up, and disposed of at the ORTC disposal site ✓ A spill kit must be available on site and there must be at least one person with appropriate authority who is trained in hazmat response. ✓ Refuelling vehicles should be equipped with specific vehicle spill kits and re-fuelling area must be on concrete bund. ✓ Ensure all vehicle and machinery must be well serviced and leak inspection are done. ✓ Provide drip trays to stationary vehicle and machinery. ✓ Storage of fuel, oil and lubricants must be kept on bunded structure ✓ In the event of an oil spill, collect the contaminated soil, store it in drums and dispose of at appropriate waste disposal site (e.g. ORTC disposal site).	Proponent
	Dust and air pollution	✓ All vehicles and machinery must be roadworthy and driving speed limits should be adhered to. ✓ Maintenance and repair will be concessionary, hence the limited impacts. ✓ All silencing mechanisms on all equipment must be in a good state of repair. ✓ All routine maintenance shall be restricted to daylight hours. ✓ Provide dust masks and ear muffs to all employees operating in a dusty or noisy environment	Proponent

	Waste generation	✓ General household waste should be disposed of in the municipal refuse bins for disposal. ✓ Worn-out parts can be collected and sent to the local scrap yards. ✓ All empty disinfectants containers should be sent to the local recycling companies or properly cleaned before re-use. ✓ Hazardous waste such as used oil, paints, unused chemicals, etc., should be collected separately and sent to the nearest hazardous waste approved site.	Proponent
	Disturbance to the hydrology & Water abstraction	✓ All trenches excavated during pipeline maintenance must be filled properly, and the area must be levelled. ✓ To avoid contamination of underground water ✓ Do not abstract more than the approved allocation as indicated in the permit ✓ Install automatic measuring gauge to monitor abstraction ✓ Carry out periodic pumping yield to assess aquifer sustainability	Proponent
	Groundwater contamination	✓ Contaminated soil must be removed and disposed of at the ORTC disposal site. ✓ No refuelling or fuel storage should be permitted within any watercourses.	Proponent
	Ecology	✓ Create a tree database for monitoring ✓ Monitor borehole yields in proximity	Proponent
Socio-Economic	Land-use effects	✓ Use existing maintenance roads as far as possible and no off-road driving should be allowed.	Proponent

		✓ All vehicles should be driven on a minimum speed limit 80 km/hr. on gravel road and 60 km/hr in town.	
	Disturbances from traffic movement.	✓ All vehicles should be driven at a minimum speed limit of 80 km/hr on the gravel road and 60 km/hr in town. ✓ Use existing maintenance roads as far as possible.	Proponent
	Safety, security, and health hazards.	✓ Employees should be equipped with appropriate PPE. ✓ All trenches should be covered after completion of maintenance work. ✓ Uncovered trenches must be barricaded with a caution tape and restricted access encouraged.	Proponent
	Alcohol and Drug use & HIV/AIDS	✓ Provide awareness on the dangers and health impacts of alcohol and drug use. ✓ All employees must be screen with the breathalyser to avoid intoxicated personnel on site. ✓ Provide HIV / AIDS awareness at induction ✓ Avail Condoms at the project site.	Proponent
	Landscape impacts	✓ Backfill all trenches/excavations ✓ Waste generated should be collected and disposed of regularly.	Proponent
Nuisance	The potential source of a nuisance during the operation phase is excessive noise from running pumps, especially if not properly maintained	✓ The pumps are to be housed in one single room, hence the noise generated will not be emitted to the surrounding. ✓ The combined noise produced in the pump station should not exceed 85dBA as recommended by the National Labour Act.	Proponent

Public health and safety risks	- The ORTC employees on site are at risk of numerous risks such as. o Exposure to noxious gases emitted from the dosing system in cases of malfunctioning. o Presence of disease-carrying vectors i.e., flies, mosquitoes	✓ Maintenance staff must be made aware of potential occupational health hazards associated with their jobs. ✓ Employees must be equipped with appropriate PPE suitable for each task undertaken. ✓ Keep the area clean and tidy by removing waste and unwanted vegetation. ✓ Operate within the prescribed working days and hours as per the Namibian Labour laws and regulations. ✓ Develop a Health and safety Plan (should be part of the induction) ✓ Train staff/employees on personnel safety and how to handle equipment and machinery ✓ Provide protective gear (helmets, safety straps, hand gloves etc.) ✓ Train and provide first aid kits ✓ Only qualified personnel must be allowed to operate special machine/instruments ✓ No employee must be allowed to be onsite without PPE; ✓ Adequate safety signs must be displayed on site.	Proponent
Exposure to chemicals and hazardous substances	- The operation and maintenance of the project activity will generate certain chemical substances i.e., *chlorine, flocculants, lime, carbon dioxide, etc.*	✓ Compile an inventory of all hazardous substances at the workplace and implement hazard control measures as follow: • All chemicals and disinfectants must be handled and stored in accordance with their respective Material Safety Data Sheet (MSDS) provided by the manufacturers/suppliers. • Employees must be equipped with chemical-resistant PPE when handling chemicals.	Proponent

	The risk of exposure can be aggravated by factors such as lack of awareness, lack of protection, physical fatigue, etc.	• Provide training to all staff to create awareness of the danger of chemical exposure and possible response measures in case of accidents. • First aid kit must be kept at the plant and must be accessible to all staff. • Ensure regular inspection of the disinfection system and storage rooms to detect and report leakages. • Empty containers which contained chemicals can be reused for the same purpose or returned to authorized recycling companies and should not be discard as waste materials. ✓ Warming signs must be placed in chemical storage rooms and chlorination rooms.	
Waste generation	- The operation of the project activity will result in the generation of different types of waste from different plant operational activities such as: • Debris from raw water screening and the inlet works. • General household waste from office operations and operator houses. • Wear-off parts from maintenance and repair of	✓ Compile an inventory of all types and quantities of waste generated at the site. ✓ Provide adequate and separate waste handling facilities for each waste type at the site and ensure regular collection and disposal. ✓ Follow the waste management hierarchy in managing waste, as follow: **Avoid- Reduce- Reuse-Recycle- Recover- Treat-Dispose.** ✓ General household waste, debris from the screening process, building rubble, and worn-out non-metallic parts must be disposed of at the ORTC disposal site. ✓ Metallic worn-out parts should be taken to the nearest scrap yards for recycling.	Proponent

	plant infrastructures, vehicles, and equipment. • Lubricants from maintenance of vehicles and equipment. • Building rubble from renovations • Empty containers and packaging materials.	✓ Empty containers which contained chemicals should be taken to the nearest Hazardous Waste site.	
Risk of fire	- Sources of fire outbreaks during operations could be electrical shocks and due to the presence of flammable and combustible items i.e., fuel.	✓ Ensure that all firefighting devices are in good working condition and are serviced. ✓ Holistic fire protection and prevention plan are needed. This plan must include an emergency response plan, firefighting plan, and spill recovery plan. ✓ Maintain regular site, mechanical and electrical inspections, and maintenance. ✓ Clean-up and contain all oil spills/leaks.	Proponent
Visual Impact	- Improper handling of waste in and around the site could compromise the aesthetic view of the place.	✓ Ensure regular waste disposal, at least weekly. ✓ Ensure good housekeeping and routine maintenance of infrastructures and surroundings.	Proponent
Increase in crime-related issues.	- The project activity infrastructures i.e., fences, reservoirs, pumps, etc., are at risk of vandalism from the public.	✓ Provide security around the site and ensure regular inspections for all plant infrastructures. ✓ Ensure proper and regular maintenance of the perimeter fence around the site.	Proponent

		✓ Breaks in the fencing must be repaired immediately.	
Handling of complaints and grievances	- Grievance may be received from residents, customers with regards to operation or maintenance.	✓ All complaints and grievances shall be reported and submitted to the proponent.	Proponent
Risk of fire	- Sources of fire outbreaks during operations could be electrical shocks and due to the presence of flammable and combustible items i.e., fuel.	✓ Ensure that all firefighting devices are in good working condition and are serviced. ✓ Holistic fire protection and prevention plan are needed. This plan must include an emergency response plan, firefighting plan, and spill recovery plan. ✓ Maintain regular site, mechanical and electrical inspections, and maintenance. ✓ Clean-up and contain all oil spills/leaks.	Proponent
Heritage Resources	- Reduce the impacts borehole drilling and associated earthworks on heritage resources/artefacts	✓ Heritage remains or artefacts discovered on site must be reported to the National Museum (+264 61 276800) or the National Forensic Laboratory (+264 61 240461). ✓ No artefacts must be removed or be interfered with prior to authorisation from the Namibian National Heritage Council (NHC) ✓ Recovery of heritage remains or artefacts discovered and removal thereof should be directed by the National Museum	Proponent & PM
Rehabilitation	- To ensure that all disturbed areas are rehabilitated	✓ All areas disturbed because of the borehole drilling activities should be cleaned up and rehabilitated	Proponent & PM

6.2 Proposed enhancement measures: Positive impacts

Table 5: Proposed enhancement measures for the positive impact of the project

Environmental Issue/Impacts	Source of Impact	Enhancement measures	Responsibility
Job opportunities for locals	- The proposed project will create job opportunities both direct and indirect for locals in technical and non-technical fields. - Recruit locals for unskilled labour.	- The priority must be given to locally qualified and unqualified people given the local unemployment rate and job scarcity. Women must be given the same opportunities as men. - Recruitment should include both men and women.	Proponent
Business opportunities	- Where possible, procure materials from local suppliers. - Other local businesses such as guesthouses and street vendors will also benefit indirectly from the construction works.	- Qualified Namibian construction companies should be given a fair chance to compete in the bidding process, which will be done in accordance with the Public Procurement Act 15 of 2015. - Construction materials should be sourced locally as far as possible to enhance the local economy.	Proponent
Water supply security	- One of the significant positive impacts that will result from the proposed project is the improved water security of the supply to the area.	- Develop a water demand plan for the supply area.	Proponent

	- The increased water supply due to the demand will put the source under pressure if not properly managed.	- A contingency plan must be in place to ensure water supply in case of an emergency. - Ensure timely fixing of leaks and breaks on the pipeline to minimise water supply interruptions. - Residents must be sensitised to use water sparingly.	
Economic contribution	- The improved water supply will contribute to the growth of the local economy by attracting investments and development in the area.	- The priority must be given to locally qualified and unqualified people given the local unemployment rate and job scarcity. Women must be given the same opportunities as men.	Proponent

7. DECOMMISSIONING AND REHABILITATION

7.1 Decommissioning of the water supply pipeline

Should the decommissioning of the water scheme components become pertinent at any stage, this EMP should be updated to reflect the following changes:

- The nature of the envisaged decommissioning and rehabilitation process
- Types and nature of components to be decommissioned i.e., buildings, piping, etc.
- Types and quantity of waste to be produced.
- Proposed waste management strategy.
- Responsibilities of each party to be involved in the decommissioning process.
- Envisaged environmental rehabilitation procedures.

7.2 Rehabilitation

Rehabilitation is defined as the process of taking all the necessary actions to repair the damaged environment in-order to make the land suitable for other uses or to simply beautify the affected area. In this case, the rehabilitation will entail clean-up, treatment, or restoration of contaminated areas (e.g., contaminated soils by oil or fuel spills, concrete spills, etc.) and refilling of excavated pits with the overburden.

During the operational phase, the PM/Proponent shall conduct a site inspection after every maintenance and ensure rehabilitation of disturbed areas. Rehabilitation measures during the operational phase must include:

- Clean up all soil polluted during maintenance work and disposal to an appropriate waste dump site.
- Remove all windblown litter once maintenance has seized.
- Remove all potential hazards (i.e., the sewerage pit) and ensure the area is left safely and neatly.
- Any temporary work camps setup should be dismantled, and the area rehabilitated as far as practicable, to its original state.
- Driving vehicles on newly rehabilitated areas should be prohibited.
- Temporary access roads not required for long term maintenance access should be closed and rehabilitated to a condition compatible with the surrounding land use.
- Signage should be erected where access routes are to be retained but are not public access.

8. ENVIRONMENTAL MONITORING

To ensure continual improvement in environmental performance and reduce adversity of potential negative impacts, it is advisable to keep monitoring the identified environmental receptors.

8.1 Monitoring during the operation phase

During the operational phase, the Water Care Unit must ensure that compliance monitoring is conducted at various intervals/frequencies throughout the operational life span as indicated in the table below.

Table 6: Monitoring plan during the operational phase

The issue to be monitored	Monitoring Objectives	What needs to be monitored	Frequency and means of Monitoring
Production and distribution losses	Prevent water wastage and ensure water conservation.	-Overflows, leakages, pipe bursts, etc.	Daily/Weekly inspections and meter reading
Occupational health risks	Ensure health and safe working condition	Chemical exposure and presence of health hazards	Daily physical observations.
Water quality	Supply of safe and quality drinking water in line with the Water Quality Guidelines of the Water Act.	-Physical quality of raw, settled, and treated water (*Chlorine level, N.T.U, pH, Conductivity, and Temperature*). -Microbiological/ bacteriological quality (*Free Chlorine, Heterotrophic Plate count, Total Chlorine, Coliforms & Faecal Coliforms).*	-Daily sampling and testing. -Once a month sampling and laboratory testing
Water Balance	Ensure water security of the supply area.	Production figures vs. sales figures and demand management	Monthly water balance checks.
Waste management	Prevent environmental pollution and contamination.	Litter chemical storage & handling, cleanliness, Chemical composition of sludge.	-Daily inspections and physical observation. -Quarterly sludge testing for chemical composition checks.
Implementation of the EMP	Ensure compliance to this EMP and adherence to the regulative measures during operation, maintenance, and decommissioning of the project activity.	Implementation of specified measures and compliance to the EMP and other relevant legal requirements.	Biannual environmental report to MEFT.

9. EMERGENCY RESPONSE PLAN

This section provides an emergency response plan which entails the types and effects of emergencies associated with the project as well as procedures and actions to be taken in case of emergency during the operational and maintenance phases.

9.1 Types and effects of emergencies

Emergencies can occur at any time or place during the operational and maintenance phases of the project. These emergencies may affect the operations and disrupt the quality and quantity of water supply to the area. Some of the emergencies identified are as follows:

- Substance spillage i.e., oil, concrete, chemicals, etc.
- Variation in water flow
- Accidents
- Power failures
- Equipment failure

9.2 Sources of emergencies

The above-mentioned emergencies maybe occur because of accidents, faulty maintenance, and/or negligent operations. These factors and their relationships to the operation, and maintenance of the activity are detailed below:

9.2.1 Accidents

Accidents may occur during operations or maintenance works and can cause an unavoidable interruption to the water supply, personal injury, and/or property damage.

9.2.2 Faulty maintenance

Faulty maintenance may cause unexpected breakdowns on the project which may have a direct bearing on its operation and the life span of the infrastructure. Good maintenance will result in the infrastructure performing well; however poor maintenance or faulty maintenance will shorten the expected life of the infrastructure. Although some breakdowns can be repaired during regularly scheduled repair program and probably do not represent an emergency, the regular occurrence of such breakdowns will affect the continued satisfactory operation of the project.

9.2.3 Negligent operation

Certain operational procedures need to be followed to ensure the satisfactory performance of the project. Not following procedures correctly, results in the established procedures constituting

negligent operations. The negligent operations may also result from a lack of knowledge to operate the components. Although the negligent operation may not be as readily noticeable as faulty maintenance, the emergency condition resulting from it could be more severe because it could affect operations before being discovered. The PM shall ensure routine maintenance of project equipment's, keep an additional supply of parts that require frequent replacements and ensure to always stock enough chemicals to maintain operations for at least a month.

9.3 Emergencies response procedures

9.3.1 Response priorities

Depending on the nature of the emergency, the following response plan must be implemented as an integral part of the project routine operations to lessen the severity of the emergency. All response actions should be geared toward the following priorities in the order below.

- Safety of People
- Protection of the Environment
- Protection of Assets

9.3.2 Emergency response procedures

Table 7: Emergency response procedures during operation and maintenance

NO.	Type of Emergency	Response actions	Responsible
1.	**Substance spill** i.e., concrete, oil, chemicals, etc.	- Cease operations and control the spill at the source first. - Contain the spillage/leakage with appropriate containers i.e., drip trays, sumps, etc., and in an approved manner to the satisfaction of the RE. - Clean the affected area with water or an approved cleaning product. - The contaminated soil should be removed and disposed of at the ORTC disposal site - Repair vehicle or machinery with leakage. If it cannot be repaired, such vehicle or machinery should not be used until it is safe to do so. - Report the incident to the PM and record it in the logbook. - A spill kit must be available at the project site and there must be at least one person with appropriate authority who is trained in hazmat response. - Refuelling vehicles should be equipped with specific vehicle spill kits.	- Water Care Unit
2.	**Variation in water flow** due to lack of or limited availability at the source	- All consumers should be encouraged to always store enough potable water to meet their emergency needs. - In case of emergency, the following actions should be taken. • Should any emergency arise, the Council would then keep the public well informed on the water supply situation and provide information on what customers can do to conserve and prepare for many inquiries. • Isolate the raw water and emergency storage sump by closing the respective valves. • Ensure that the pumps on the feed pipeline are off. • The reservoir should always be filled up to 70% daily. • Make every effort to develop a fair and equitable system for allocating water to the customers.	- Water Care Unit

		• Investigate alternative water supply measures to critically affected consumers such as schools, hospitals.	
3.	**Power failure**	- Ensure there is an emergency power supply capable of maintaining minimum water treatment operations. - The emergency power equipment should be checked at least monthly to ensure that they remain in good operating condition. - Provide a log to document a monthly check of emergency power supply operation. - List name and number of power supplier. - In case of power loss. • investigate if the power failure is local (site) or the entire town. • If the entire town, contact Namibia Power Corporation (NamPower). • If locally, inspect the source of power loss, restart the main switch. • If necessary, inform critical customers. • Record source of power shortage in the power supply logbook	- Water Care Unit
4.	**Chemical leakage** i.e., chlorine leak	- In case of Chlorine or CO_2 gas leakage • Make sure storerooms are built according to legal requirements for the storage of chlorine with appropriate ventilation. • Wear a face mask with a B2P3 filter. • Evacuate all persons in the affected room. • Shut down all the dosage system valves. • Check information on the dosage system control panel. • Isolate the faulty dosage system and replace the gas cylinder with the leak. • Record in the incident report form.	- Water Care Unit
5.	**Accident** i.e., injury to a person	- The priority after an accident should be to seek medical attention for an injured person. - Assess the injured person's condition. - Notify the First Aid certified person	- Water Care Unit

		- Assist the First Aid Personnel - Record in the incident report form. - Report incident to the PM/Proponent.	
6.	**Equipment failure i.e.,** pumps failure, loss of pressure, etc.	- In case of faulty pumps: • First analyse the source of emergency by checking information displayed on the SCADA system. • Check the flow rate of each pump to identify the fault. • Ensure that the standby pump is switched on.	- PM/Proponent

9.4 Grievance response procedure

All grievances should be reported to the ORTC relevant Division in the following channel

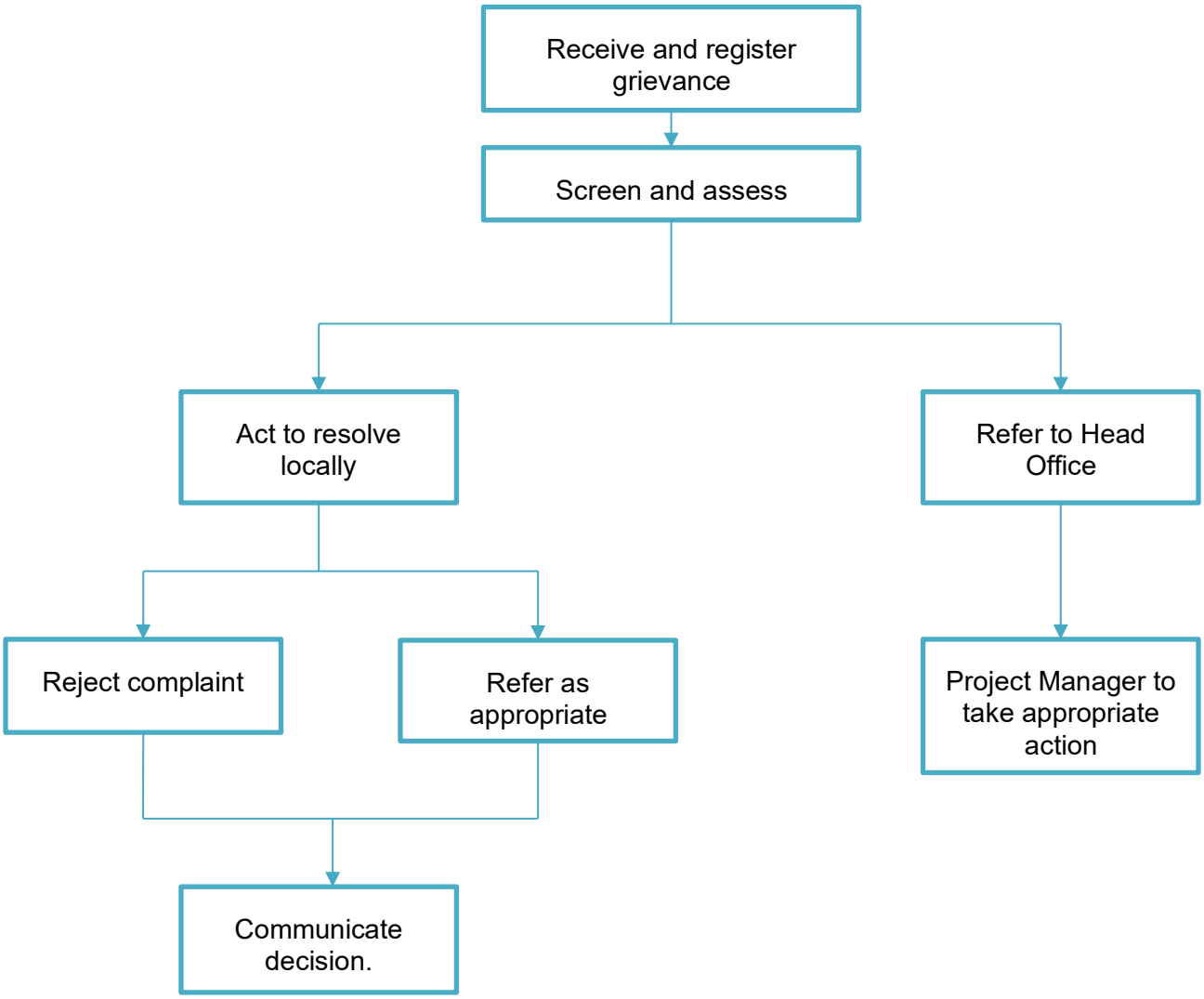


Figure 7: Grievance response procedure

Upon receipt of the registered grievance forms, the PM or Proponent shall screen and asses to solve the grievance. The grievance should either be rejected or handled appropriately of which the decision should be communicated to the aggrieved person.

10. CONCLUSION

Oranjemund Town Council intents to renew the water abstraction permit within the recommended sustainable yield of up to 7.4 Mm^3/a. The renewal is vital as it is the only water source for the town of Oranjemund. The water will be used for:

- Domestic water requirements for the about 11,000 inhabitants,
- Industries (mining and others), and
- Irrigation (food production)

However, the project must be cognisant of sustainable development, especially for the conservation the aquifer to ensure its sustainability. Water in Namibia is a scarce resource that requires optimal use. The following conclusion were made:

1. The water abstraction has been constant over the years, with raise in the level of the Felhmann well. This is an indication that the abstraction rate is not harming the safe yield of the aquifer.
2. For the continuous water abstraction from the aquifer, the ORTC should work together with the Ministry of Agriculture, Fisheries, Water and Land Reform (MAFWLR), to determine the following aquifer values:
    - Average transmissivity value
    - Storativity
    - The aquifer through flow and
    - The annual safe yield.

Although the implementation of this EMP requires a multitude of administration, ORTC should play a pivotal role in the implementation as outlined in this report. ORTC should also ensure proper coordination with all parties involved in the project activities during all project phases. ORTC shall also ensure to avail necessary resources (i.e. human, financial, etc.,) and training to enable the full implementation of this EMP. Monitoring of certain environmental parameters must be conducted regularly as outlined in this EMP. Environmental biannual reports must be kept available for possible submissions to the MEFT and ensure the renewal of the project's ECC.

Upon approval by the MEFT, this EMP should be used as an on-site reference document for the project site operational, maintenance and decommissioning phase. Thus, a copy of this EMP shall be kept onsite always. It is a legally binding document and any deviation or transgression from this EMP is punishable by law as per the Environmental Management Act 07 of 2007. .

11. ANNEXURE

11.1 Annexure 1: Environmental compliance monitoring checklist

11.2 Annexure 2: Incident / Accident report form

11.3 Annexure 3: Grievances register form

Annexure 1: Environmental Compliance Monitoring Checklist

The following checklist should be used during the compliance monitoring.

PART 1: ADMINISTRATIVE INFORMATION

Project Title:			Date:
Project location:	Reporting period	Individual Preparing Checklist:	
Region:		Department:	
Scheme Superintendent:		Phone No.:	

PART 2: ENVIRONMENTAL ASPECTS

	ENVIRONMENTAL COMPLIANCE (AS PER EMP REQUIREMENT?)		
ENVIRONMENTAL ASPECT/IMPACT	***YES***	***NO***	***Remarks*** *(specify the location, a good practice observed, causes of non-conformity, and proposed action)*
Waste management			
Water quality testing			
Water balance check			

PART 3: RECOMMENDATION

FOR EACH ITEM CHECKED IN PART 2, DESCRIBE THE CORRESPONDING CONTROLS TO BE IMPLEMENTED TO REDUCE POTENTIAL ENVIRONMENTAL IMPACTS (e.g., spill prevention, erosion controls, air emission controls including dust suppression, selection of materials, etc.). Provide details of the activities and impacts for each box and the proposed mitigations. Include attachments where appropriate. Use the same number system for your input.

ECO: Signature: _____ Date: _____

Scheme Superintendent: Signature: _____ Date: _____

Annexure 4: Incident / Accident Report Form

This form is to be completed in case of an environmental incident and shall be forwarded to the Proponent during the operational and maintenance phase.

Note: This form is not intended to replace other ORTC"s internal reporting procedures.

Section 1. GENERAL DETAILS	
Date: **Time:** am / pm	**Reported By:** **Name:** **Position:** **Company:** **Phone:**

Section 2. RESPONSIBLE PARTIES	
Name:	**Phone:**
Company Name:	**Email:**
Witness Details (if applicable)	
Name:	**Phone:**
Witness Statement Taken? ☐ **Yes** ☐ **No**	

Section 3. INCIDENT DETAILS		
Type of Incident:	☐ **Spill** ☐ **Waste/rubbish** ☐ **Wildlife disturbance** ☐ **Vegetation disturbance/damage** ☐ **Acid Sulphate Soils disturbance**	☐ **Cultural Heritage disturbance/damage** ☐ **Chemicals/herbicide Use** ☐ **Water pollution/contamination** ☐ **Nuisance (noise, air quality)** ☐ **Other:**
Incident Description		
Immediate Response Actions Taken:		

Section 4. CONTRIBUTING FACTORS AND PREVENTATIVE ACTIONS (to be completed by Manager/Supervisor)			
Cause, Circumstances, and Contributing Factors:			
Measures that were in place to prevent this type of incident:			
Measures to be implemented to prevent/minimize this type of incident from occurring again			
Comments:			
Name:		**Position:**	
Company:		**Signature:**	**Date:**

Section 5. ORTC ENVIRONMENT OFFICE ONLY	
Assessed Level of Potential or Actual Harm:	
Is an Investigation Required? ☐ Yes ☐ No	**Investigation Team:**
FOLLOW UP ACTION:	
COMMENTS	
Name:	**Position:**
Signature:	**Date:**