

Environmental Management Plan for the construction, operation, maintenance, and decommissioning of the proposed Aroab scheme extension and upgrade, //Karas region.

Proponent:

Namibia Water Corporation Ltd
Private Bag 13389, Windhoek,
Tel: +264-6171 2093



Prepared by:



- P. O. Box 5303, Walvis Bay
- +264 81 142 2927
- info@greengain.com.na
- <https://www.greengain.com.na>

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Client: Namibia Water Corporation Ltd
Private Bag 13389, Windhoek,
Tel: +264 61 712 093

EAP: Green Gain Environmental Consultants cc
Joseph Kondja Amushila
Titus Shuuya

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LIST OF ACRONYMS

| | |
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| DEA: | Directorate of Environmental Affairs |
| DWA: | Directorate of Water Affairs |
| EAP: | Environmental Assessment Practitioner |
| ECC: | Environmental Clearance Certificate |
| ECO: | Environmental Control Officer |
| EIA: | Environmental Impact Assessments |
| EMP: | Environmental Management Plan |
| ERP: | Emergency Response Procedures |
| GMS: | Galvanised Mild Steel |
| GN: | Government Notice |
| HDPE: | High-Density Polyethylene |
| I&APs: | Interested and Affected Parties |
| 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 |
| PHE: | Public Health and Environmental Act |
| PM: | Project Manager |
| PPE: | Personal Protective Equipment |
| SCADA: | Supervisory Control and Data Acquisition |
| uPVC: | Unplasticized Polyvinyl Chloride |

1. INTRODUCTION AND BACKGROUND

1.1 Introduction

The Namibia Water Corporation (NamWater) Ltd, hereinafter referred to as the Proponent, supplies water to the Aroab village through the Aroab bulk water supply scheme. According to an assessment on water supply to the Aroab bulk water supply scheme in 2020, the current water supply to Aroab Village Council does not meet the current demand. Moreover, the existing collector reservoir and most of the existing pipelines are in a deteriorated state and need replacement. Henceforth, NamWater proposed the extension and the upgrade of the Aroab scheme to meet the current and future water demand and to ensure water supply security for the area. The proposed activities will trigger certain activities listed under No. 8 (8.5), and No. 10 (10.1) of Schedule 1 of the EIA Regulations (GN No. 30 of February 2012), therefore cannot be carried out without an EIA being undertaken. Green Gain Consultants cc has been appointed as an independent Environmental Assessment Practitioner (EAP) by NamWater, to conduct an Environmental Impact Assessment (EIA) for the construction, operation, maintenance, and decommissioning of the proposed Aroab Scheme extension and upgrading.

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 contains aspects of the proposed management and mitigation measures to be taken to address the negative environmental impacts and enhancement measures for the positive environmental impacts identified in the environmental scoping report. It also addresses the need for compliance monitoring of identified significant environmental impacts.

The EMP is therefore important in ensuring that the management actions arising from the EIA processes are clearly defined and implemented through all phases of the project life cycle. The EMP is not a standalone document; thus, it must be read in conjunction with the Scoping report. All personnel taking part in the planning, construction, operation, maintenance and decommissioning of the proposed Aroab Scheme extension and upgrading should be made aware of the contents of this EMP. The EMP is also a dynamic document that allows for the evaluation of the success or failure of management actions and to carry out reorientation of the relevant actions if deemed necessary. It should be noted that the EIA and 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.

1.2 Objectives of the EMP

This EMP has been compiled for the management of potential environmental impacts during the planning, design, operation, and decommissioning phases of the proposed infrastructure for the Aroab Scheme extension and upgrading. The EMP also includes best practices for the generic issues of construction management and supervision as well as the ongoing management and operation of the scheme.

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.

2. ROLES AND RESPONSIBILITIES

2.1 Project involvement

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

Table 1: Project team

| NO. | SPECIFIC PROJECT ROLE | ADDRESS AND CONTACTS |
|-----|---------------------------------------|---|
| 1. | Proponent | NamWater Ltd. Mr. Ashipala Nangolo Tel: +264 (61) 712 240 Email: anangolo@namwater.com.na Environmental Department: Mrs. Jolanda Kamburona Tel: +264 (61) 712 105 Email: KamburonaJ@namwater.com.na |
| 2. | Environmental Assessment Practitioner | Green Gain Consultants cc Mr. Joseph Amushila Cell: +264811422927 Email: info@greengain.com.na |
| 3. | Local Authority | Aroab Village Council Mr. Sindongo Valentinus Chief Executive Officer Tel: +264 (63) 63-280513 sbsindongo@gmail.com |

2.2 Responsible Parties

2.2.1 Proponent (NamWater)

The Proponent will play a pivotal role to ensure the successful implementation of this EMP. This can be achieved by designating an Environmental Control Officer (ECO) who should ensure the implementation of this EMP during the planning & design, construction, and decommissioning phase. As such, the Resident Engineer in collaboration with the designated ECO shall ensure that:

- a) The objectives of the EMP are met.
- b) The Designing Engineer is aware of this EMP and has applied relevant proposed mitigation measures outlined in this EMP.
- c) Take disciplinary actions in cases of transgressions and non-compliance.
- d) That all environmental impacts are managed according to the environmental principles of avoiding, minimizing, mitigating, and rehabilitation as contained in this EMP.
- e) Appropriate compliance monitoring is executed as outlined in Section 7 (7.1).
- f) Handle grievances in the prescribed manners as outlined in Section 9.
- g) Notify the Department of Water Affairs (DWA) and MEFT of any proposed changes to the scope of project and potential environmental impacts.

On the other hand, the Scheme Superintendent shall oversee the implementation of this EMP during the operation and maintenance phases. The Scheme Superintended shall ensure:

- That a copy of this EMP is always kept on site.
- That all employees involved in the operation and maintenance of the Aroab Scheme are aware of this EMP and provide brief training, where necessary.
- Review of the on-site environmental management and implementation of the EMP by the employees.
- Conduct compliance monitoring as outlined in section 7 (7.2) of this EMP.
- Keep a record of emergencies and take corrective actions as per Section 8.
- All operation and maintenance activities are in line with NamWater's Environmental Code of Conduct.
- Handle grievances in the prescribed manners as outlined in Section 9.
- Take appropriate disciplinary action against the Aroab Scheme employees in case of a transgression.

2.2.2 Design Engineer

The project Design Engineer was responsible for the preparation of the preliminary project report and design layouts. The Design Engineer will also be responsible for the preparation of the final project design report in accordance with this EMP.

2.2.3 Environmental Assessment Practitioner (EAP)

The EAP in collaboration with the NamWater Environmental team, is responsible for the compilation of an Environmental Scoping Report and 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.

2.2.4 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 this project. All appointed contractors and sub-contractors involved in the project shall ensure compliance with the EMP and its conditions, thus the RE and Project Manager (PM) must ensure that a copy of the EMP is given to all contractors involved. The contractor upon receiving this EMP, should ensure compliance to this 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 NamWater's Environmental Code of Conduct.
- Keeping a record of emergencies and taking corrective actions as per Section 8.
- Taking appropriate disciplinary actions against their employees in case of transgression.

3. 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.

3.1 Environmental awareness training

It is important to ensure that contractors, sub-contractors, and all Aroab Scheme 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 NamWater's Environmental Code of Conduct.

3.1.1 Construction phase

As part of tender requirements, contractors are obliged to educate their employees on the implementation of the EMP and NamWater's Environmental Code of Conduct. Every contractor should provide training to their employees regarding environmental issues related to construction. Training can be conducted via an onsite session before the commencement of any work. Employee information posters, outlining the environmental "do's" and "don'ts" (as per the environmental awareness training course) should be placed at prominent locations onsite. Records of such trainings should be kept by the contractor and submitted to the RE.

3.1.2 Operation and maintenance phase

The Scheme Superintendent should ensure that Aroab Scheme employees receive appropriate training on environmental issues pertaining to the operation and maintenance of the proposed upgrade and extension and to carry out their works in accordance with this EMP.

3.2 Recordkeeping

There should be an updated filing system for the Aroab Scheme, 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 RE during the construction phase and by the Scheme Superintendent during the operation phases, respectively.

3.3 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 NamWater and the contractor.

3.3.1 Method statements

The method statements are required especially during the construction phase to describe the scope of work intended by the contractor. This should be provided in a step-by-step description for the RE and/or PM or ECO to understand the contractor's intentions. This will enable them to assist in devising any mitigation measures, which would minimize environmental impact during these tasks. The method statements should also clearly stipulate mitigation methods of the intended works, against which the contractor's performance will be measured. In this case, the following method statements will be necessary during the construction phase:

- Details of the construction camps.
- Construction procedures.
- Materials and equipment to be used.
- How and where materials will be stored.
- The containment of accidental leaks or spills as prescribed by this EMP (Section 8.3.2: Emergency Response Procedures).
- Timeline and location of activities; and
- Any other information deemed necessary by the ECO/RE/PM.

The contractor must submit the method statement two weeks before the commencement of any construction activity. Work may not commence until the method statement has been accepted by the RE, PM and ECO and communicated to the workforce. The contractor shall, except in the case of emergency activities, allow 14 days for consideration and approval of the method statement. The RE, PM or ECO may require changes to the method statement if the proposal does not comply with the specifications or if, the proposal may result in damage to the environment more than that permitted by the specifications. Approved method statements shall be communicated to all relevant personnel.

3.3.2 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 RE 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 construction phase. The RE, PM and ECO shall issue disciplinary actions 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 NamWater's contract agreement.

The Scheme's Superintendent 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.

3.4 Environmental reports

The ECO shall prepare a completion report upon the completion of the construction phase. The completion report should indicate the environmental performance, compliance to the EMP, and matter of incidental.

Furthermore, 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 if the project is not complete within three years. The records will be required when applying for renewal of the ECC and NamWater will also have to indicate how the EMP was adjusted to make provision for improved mitigation measures and action plans.

4. LEGAL REQUIREMENTS

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

Table 2: Applicable National Laws

| LEGISLATION | PROVISION AND REQUIREMENTS |
|---|---|
| Constitution of the Republic of Namibia (1990) | <p>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:</p> <ul style="list-style-type: none"> • 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. <p>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”.</p> |
| Pollution Control and Waste Management Bill, 2003 | <p>This Bill serves to regulate and prevent the discharge of pollutants to air and water as well as provide for general waste management.</p> <p>The bill provides a framework for a multitude of administrations on pollution control and waste management in the country.</p> |
| Environmental Management Act No. 07 of 2007 | <p>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.</p> <p>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:</p> |

| | |
|--|---|
| | <p>No. 8.5 Construction of dams, reservoirs, levees, and weirs.</p> <p>No.10.1 The Construction of oil, water, gas and petrochemical and other bulk supply pipelines.</p> |
| Water Act 54 of 1956 and Water Resources Management Act 11 of 2013 | <p>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.</p> <p>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.</p> |
| Soil conservation Act 76 of 1969 | <p>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.</p> |
| Nature conservation Ordinance of 1975. | <p>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.</p> |
| Hazardous Substance Ordinance of 1974 | <p>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.</p> <p>Of relevance to the proposed project is the use of Chlorine in water treatment.</p> |
| Labour Act (No 11 of 2007) | <p>The Objectives of the National Labour Act are:</p> <ul style="list-style-type: none"> • 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. |

| | |
|--|---|
| | <ul style="list-style-type: none"> • 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 | <p>The objectives of the PHE Act are to.</p> <ul style="list-style-type: none"> • 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. <p>Provide for early detection of diseases and public health risks.</p> |
| 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 | <ul style="list-style-type: none"> • 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. |

5. 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 proposed upgrade and extension of the Aroab Scheme. It also outlines the responsibilities of each party involved in the project implementation during every phase. The project activities are classified according to the different operational processes and stages (planning & design, construction, operational, maintenance and decommissioning phase).

5.1 Planning and Design phase

This EMP aims to ensure best practices are implemented and environmental degradation is avoided through appropriate environmental protection and adherence to legal requirements. The EMP also ensures that the best alternative options are selected and implemented as recommended in the scoping report. Below are some of the recommended actions.

5.1.1 The recommended pipeline routes

There will be a new pipeline constructed to connect the new boreholes BH9114 and BH29115 with the collector reservoir in town. As such, different alternatives were identified during the project planning stage and assessed during the EIA study and recommendations were made for the most suitable alternatives. For the new pipeline from boreholes WW29114 and WW29115, two alternative routes were considered of which Route 2 was recommended due to the nature of the surrounding terrain and its easy accessibility.

Route 2 consists of the main pipeline route from BH29114 to the collector reservoir which is about 3.97 km and a feeder pipeline route from BH29115 to the main pipeline route, about 0.98 km. This makes the total length of Route 2 to be 4.95 km. The route passes through the camps of Farm Streitdamm and runs along the farm track. The terrain along this route gradually slopes up from BH29114 to the collector reservoir.

The main route crosses through a small shallow valley, about 25 m wide and through the main Aroab River which is about 70 m wide. The feeder pipeline route to BH29115 also crosses through a deep valley. The soil is excavatable at some point but becomes rocky at most places. The local occurring vegetation consists mainly of thorn bushes, shrubs, and herbaceous grass species which are sparsely distributed and, in some way, disturbed along the route due to its proximity to the existing farm track.



Figure 1: Scenic view along Route 2

5.1.2 Above ground pipeline vs below ground pipeline

Two alternative options were assessed whether to construct the proposed pipelines above or below ground. The pipeline replacement from boreholes WW7444, via WW7437, to the collector reservoir will be buried at the depth of approximately 0.6 m, next to the existing pipeline. The existing pipeline, which is also below ground, will not be exhumed but will instead be left intact to avoid interruption to the current water supply and any disturbances to the environment.

Due to the rocky nature of the local occurring soil, the main section of the new pipeline from borehole BH29114 to BH29115 via Route 2, will be laid on concrete pedestals above ground at a minimum height of 0.2 m as shown in Figure 6 of the scoping report. The section of the pipeline at the crossing of the Aroab River as well as within the townlands will be buried at depth of approximately 0.6 m.

5.1.3 Recommended pipeline materials

The preferred pipe material for the below ground pipeline is high density polyethylene (HDPE) whereas the preferred pipe material for the above ground pipeline is Galvanised Mild Steel (GMS). The GMS material is preferred for the above ground because it is strong, and it will not be damaged by external forces caused by the weather and animals.

5.1.4 New Reservoir

A new 500 m³ Abeco pressed steel collector reservoir will be erected next to the existing reservoir. The proposed tank will be 10.98 m wide, 9.76 m long and 4.88 m high (similar to tank in Figure 18 of the scoping report). The proposed steel collector reservoir can easily be designed, manufactured, transported, and installed by local suppliers. The design and construction of the foundations for the steel collector reservoir will be done by NamWater.

The existing reservoir will be decommissioned upon the completion of the new reservoir. NamWater will ensure that a switch over between the old and new reservoir is properly done to avoid any disruption of the water supply to the area.

5.1.5 Proposed mitigation measures

Table 3: Proposed mitigation measures during the planning and design phase

| Environmental Issue/Impacts | Source of Impact | Mitigation Measures | Responsibility |
|--|---|---|---------------------|
| <p>Suitable new pipeline routes</p> | <ul style="list-style-type: none"> - The proposed pipeline replacement from boreholes WW7444 and WW7437 will follow the existing route, hence no consideration for additional routes. However, the section of the pipeline entering the town is designed to follow the existing C16 road. - The proposed pipeline from boreholes BH29114 to BH29115 will follow Route 2 and will be above ground on concrete pedestals above ground at a minimum height of 0.2 m. | <ul style="list-style-type: none"> - Some sections of the pipeline replacement will be below ground, except for the sections on pedestals i.e., the new pipeline from borehole BH29114 to BH29115 via Route 2. The following measure must however be ensured: <ul style="list-style-type: none"> • The servitudes should be registered with the Deeds Registry Office for the pipeline replacement and for the new pipeline along Route 2. • Approval should also be obtained from the Roads Authority to route the pipeline within the road reserve. • NamWater should obtain consent from the owner of Farm Streidemm for the proposed pipeline route to enter the farmland and for access during construction and maintenance. • Provision should be made for entrances at farm camps to enable easy access during pipeline maintenance. | <p>RE and/or PM</p> |
| <p>The proposed pipeline crossings at</p> | <ul style="list-style-type: none"> - The new pipeline from boreholes BH29114 to BH29115 will cross over | <ul style="list-style-type: none"> - The new pipeline will be buried at the river crossings to prevent damage to the pipe during rainy seasons. | <p>RE and/or PM</p> |

| | | | |
|---|--|---|--|
| <p>watercourses and within the townlands</p> | <p>watercourses, including the main Aroab River. The pipeline also encroaches the townlands.</p> | <ul style="list-style-type: none"> - The pipeline section within the townlands will be also buried to avoid any limitation to the land use as well as to safeguard the pipeline from damages. - No structures are allowed within the servitude of these pipelines. - | |
|---|--|---|--|

5.2 Construction phase

5.2.1 Environmental specifications

The following specifications cover the requirements for controlling the impact of construction activities on the natural and social environment. Although the specifications below apply during the construction phase, many of the activities are similar to the operation, maintenance, and decommissioning activities, hence, these specifications, where applicable will apply to these project phases as well.

i. Construction camp

It is recommended that the existing NamWater yard in the town should be used as a storage yard during the construction phase. The site is big enough to accommodate the storage space and is already connected to the Municipal services i.e., freshwater, sewage, power, communication, etc.

However, should this site be found not suitable, the contractor should provide a method statement detailing the location, layout, lay-down yard, batching area, fuel storage, and other infrastructure. All construction vehicles should be parked at the dedicated parking area and no vehicle should be parked outside the designated area.

ii. Cement and concrete batching

The permitted location of a batching plant (including the location of cement stores and sand and aggregate stockpiles) shall be indicated on the Site layout plan and approved by the ECO or PM. Concrete shall not be mixed directly on the ground. Materials that can be used for this purpose are such as boards, plastic sheeting, or other protective materials.

iii. Access route

The existing maintenance roads should be used as far as possible. No off-road driving should be allowed. Provision must be made for one access road to the site to minimize disturbances from vehicle movement during the construction phase. Notices should be placed on visible locations in the vicinity of the construction site to warn the public of construction activities and indicate that heavy vehicles may be using the road. Contractor/s shall control the movement of all vehicles and plant machinery so that they remain on designated/demarcated routes. Any temporary roads required shall be decommissioned by the contractor/s and rehabilitated using stockpiled topsoil.

iv. Earthwork and trenching

Earthworks are to be phased so that no areas are left exposed for longer periods than necessary. This is especially important during the rainy season where runoff causes siltation downstream & overall erosion and loss of topsoil, etc. Trenches shall be re-filled to the same level as (or slightly higher to allow for settlement) the surrounding land surface to minimize erosion.

v. Construction site; ground level reservoir

The construction works must be conducted within a limited area to facilitate control and minimize impacts on the surrounding environment. The purpose of the fenced areas is to control construction and personnel activity within the designated areas and limit unauthorized access. The fences and other temporary construction infrastructure must be removed upon completion of the construction works. The contractor should ensure the following:

- That the clearance of vegetation is restricted to the working area.
- To always consider what machinery is appropriate for the task while minimizing the extent of environmental damage.
- The Contractor shall apply soil conservation measures to prevent erosion.
- Cleared vegetative material shall be collected and disposed of at the Aroab dumpsite. The disposal of vegetation by burying or burning is prohibited.

vi. No-go areas

All areas outside the 20-30 m working corridor along the pipeline route and the demarcated working areas of the pressed steel collector reservoir site should be considered as a 'no go' areas. The Contractor shall ensure that no unauthorized entry, stockpiling, dumping or storage of equipment or materials shall be allowed within the "no go" areas.

5.2.2 Proposed mitigation measures: Construction phase

Table 4: Potential negative impacts and proposed mitigation measures during the construction phase

| Environmental Issue/Impacts | Source of Impact | Mitigation Measures | Responsibility |
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| <p>Disturbance to local flora and fauna</p> | <ul style="list-style-type: none"> - Construction activities will cause vegetation clearance and disturb natural habitats, especially for small insects and ground burrowing animals. - Disturbance to vegetation may also occur because of vehicle movement and off-road driving. | <ul style="list-style-type: none"> - All disturbances will be limited to the existing NamWater pipeline maintenance zone (right of way width) which is 30 meters in extent and can be utilized as follows: <ul style="list-style-type: none"> • 10 meters on one side of the trench to accommodate soil piles and 20 meters on the other side (working side) of the trench to accommodate the layup area, the work area, and the travel area for vehicles. - Existing access routes should be used as far as possible. - Avoid trapping of small animals and injury to any animal crossing or found along the pipeline route. - All vehicles should be driven at a maximum speed limit of 20km/hour. - Signage with speed limit should be erected along the route. - Only prepare trenches in short sections sufficient to be worked for a short period i.e., a week, and avoid leaving empty trenches for periods. | <p>Contractor/s/ RE/ All drivers accessing the area including NamWater Employees</p> |

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| | | <ul style="list-style-type: none"> - Provide barricades around uncovered trenches to ensure the safety of animals and people. | |
| <p>Soil disturbances and contamination from bulk earthworks and civil works</p> | <ul style="list-style-type: none"> - The excavation of trenches and movement of construction vehicles will disturb the organisms in the soil and expose the soil to wind erosion. - Soil may also be contaminated from leaks and spills from construction vehicles and improper chemical handling. | <ul style="list-style-type: none"> - Topsoil must be carefully extracted and kept separate from construction waste for use as backfill materials. - Limit the movement of vehicles to the construction working site and make use of existing access routes. - Vehicle movement should be restricted to within the width of the “working zone” which will be within 20 meters on the one side of the trench as described and recommended above. - Vehicles should be equipped with drip trays to prevent oil and fuel spillages. - Ensure proper maintenance of the construction vehicles and machinery. - In the event of spillages, it should be reported to the ECO and RE immediately and cleaned as soon as possible, follow the spillage handling procedure presented in Table 10, response action during substance spillage. - Contaminated sand must be collected and disposed of at the Aroab dumpsite. | <p>Contractor/s</p> |

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| <p>Damage to geological resources</p> | <ul style="list-style-type: none"> - The alteration of topography due to excavations and bulk earthworks may disturb the surface geological settings. | <ul style="list-style-type: none"> - The disturbance of soil and geology associated with demolition and construction is inevitable. However, all site disturbances should be limited to the areas where structures will be constructed. - Stockpiles generated onsite must be used as backfilling materials rather than regarded as waste materials. | <p>Contractor/s</p> |
| <p>Fuel and lubricants spill or leaks at construction, refuelling, and storage sites</p> | <ul style="list-style-type: none"> - The poor handling and spillage of fuel, lubricants, and chemicals i.e., oil, grease from construction vehicles could contaminate the soil, surface water, and groundwater. | <ul style="list-style-type: none"> - There is a need for proper handling and storage of oil and fuel to ensure environmental protection. - The RE shall provide specifications for storage of all oils and fuels (secondary containment etc.) and procedures for refuelling vehicles, plants, and equipment. - All leakages and spillages of oil and grease should be contained, cleaned up, and disposed of at the Aroab dumpsite. - In the event of a hazardous spill: <ul style="list-style-type: none"> o Immediately implement actions to cease operations or reduce the spill. o Contain the spill. o Arrange implementation of the necessary clean-up procedures. o Collect contaminated soil, water and other materials and dispose of at Aroab dumpsite. - Drip trays should be provided for vehicles and machines with leakages. | <p>Resident Engineer /Contractor</p> |

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| | | <ul style="list-style-type: none"> - All construction vehicles must be serviced at the maintenance workshop and no offsite maintenance should be allowed. - A spill kit must be available at the construction 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 - If refuelling is to be done onsite, a bunding wall, big enough to contain 120% of the volume of the fuel tank should be constructed at fuel storage and transfer site/s. - Fire extinguishers must be available at all refuelling sites. Staff should be trained to handle such equipment. - Above ground fuel tanks should be on an impervious floor with bunding walls | |
| <p>Dust and air pollution</p> | <ul style="list-style-type: none"> - Excavation and construction-related activities i.e., cement mixing and backfilling will generate fugitive dust that will have a negative impact on the surrounding area and beyond. However, the worst case of dust pollution would be during windy conditions. | <ul style="list-style-type: none"> - Employ dust control measures such as: <ul style="list-style-type: none"> • Sprinkler all haulage roads and construction areas with water. • Mixing of cement should be done with a concrete mixture or in an enclosed space. • Trucks transporting construction materials such as sand and stones should be covered with a tarpaulin. | <p>Contractor/s</p> |

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| | <ul style="list-style-type: none"> - Trucks transporting construction material and construction residues to the dumping site will cause dust pollution to streets they would be passing through. - Other atmospheric pollution may result from fumes and noxious gases released from vehicles and construction equipment i.e., hydrocarbon vapours, carbon monoxide, and sulfur oxides released. | <ul style="list-style-type: none"> • Ensure proper maintenance of vehicles and equipment to minimize the release of fumes and other pollutants in the air. • All vehicles should be driven at a minimum speed limit of 60 km/hr in town and all construction vehicles and machinery must be roadworthy. • When the wind speed exceeds 40 km/h, the construction work must cease. | |
| <p>Waste generation</p> | <ul style="list-style-type: none"> - Construction activities will generate several types of solid wastes such as waste rocks, food refuse, trash, scrap materials, oily rags, and empty products containers. - Additionally, liquid waste from construction camps will be generated. - All these types of waste will have a negative impact on surrounding areas if not disposed of properly and regularly. - In addition, the process of transporting all construction debris | <ul style="list-style-type: none"> - All general waste generated at the site must be gathered and disposed to the Aroab waste disposal site. - Recyclable waste i.e., empty product containers, paper, plastic, etc., should be collected, sorted, and supplied to the recycling companies in Keetmanshoop. - Vehicles transporting waste should be sealed with a tarpaulin to avoid waste from being blown by wind and prevent dust emissions. - Provision must be made for sufficient portable ablution facilities during the construction period. - The recommended ratio is 2 toilets for every 25 people and separate water-closet for male and female as per the general health Regulations (GN 121. 1969). | <p>Contractor/s</p> |

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| | <p>may also disturb neighbouring areas and constitute a nuisance to residents around the site and may not be aesthetically acceptable.</p> | <ul style="list-style-type: none"> - The ablution facilities should be cleaned regularly with detergents and disinfectant soap. - The septic tanks should be emptied at the Aroab oxidation ponds once full or at least once a week. | |
| <p>Disturbance to the hydrology of the Aroab River</p> | <ul style="list-style-type: none"> - The proposed pipeline route will cross the valley of the Aroab River. | <ul style="list-style-type: none"> - The pipeline section crossing the river should be constructed in such a way as to avoid blockage of surface flows and associated bedload. - Riparian vegetation outside the pipeline route should not be cleared as far as possible. - No refuelling or fuel storage will be permitted within the Aroab Riverbank. - Drip trays should be provided for vehicles and machines with leakages and such vehicles should not be parked for long periods within the riverbank. - All leaks and spills of oil and grease should be contained, cleaned up, and disposed of at the Aroab dumpsite | <p>Contractor/s</p> |
| <p>Groundwater contamination</p> | <ul style="list-style-type: none"> - Given the nature of the aquifer, (Kalahari Sequence), the groundwater table is very susceptible to pollution from the surface activities. - The main impacts on groundwater associated with the pipeline construction could result from poor | <ul style="list-style-type: none"> - The Contractors should implement control measures on waste management and spill/leaks as outlined above. - No refuelling or fuel storage will be permitted within the watercourses. - Drip trays should be provided for vehicles and machines with leakages. - All construction vehicles must be serviced at the maintenance workshop and no offsite maintenance should be allowed. | <p>Contractor/s</p> |

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| | <p>handling of liquid waste and chemicals, fuel spills, or leaks.</p> | <ul style="list-style-type: none"> - Refuelling of vehicles and machinery should be done at a designed transfer site supported with a bunding wall, big enough to contain 120% of the volume of the fuel tank. - A spill kit must be available at the construction 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 | |
| <p>Land-use effects</p> | <ul style="list-style-type: none"> - The proposed pipelines are passing through farm camps and within the townlands. - Land use competitions could occur due to vehicle movement and other construction-related activities. - Other noticeable impacts could be noise, dust, and vibration generated from the construction site which could be a nuisance to the landowner, avifauna as well as wildlife and farm animals - The process of transporting all construction materials can also constitute a nuisance to residents in the access route. | <ul style="list-style-type: none"> - Permission should be obtained from the farm owner to access the farm camps. - Construction works should be limited to daylight and no work should be allowed during odd hours. - Construction materials i.e., pipes must be kept at the construction camps and only delivered when needed, rather than stacked onsite. - Only use designated access roads. - The construction site for the ground level reservoir is within a fenced of area, hence only authorized entry must be allowed. - The emissions of dust and vibration from construction activities will occur for a short time and will likely be insignificant since the pipeline route is far from residential areas. - The contractor must erect construction signage at the construction site. | <p>Contractor/s</p> |

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| | | <ul style="list-style-type: none"> - Construction vehicles must be driven by authorized drivers only. | |
| Disturbances from traffic movement | <ul style="list-style-type: none"> - Construction of the proposed pipeline and pressed steel collector reservoir will require a large-scale transport operation due to the delivery of materials and construction workers to and from the site. - Based on the experience of other similar projects, there will be a frequent movement of vehicles during the construction period. - Therefore, normal traffic movement, especially in the vicinity of the construction site and on the C16 road will be disrupted during the construction period. | <ul style="list-style-type: none"> - The contractor must erect construction signage at the construction site. - Construction vehicles must be driven by authorized drivers only and adhere to the authorized speed limits in town. - Heavy-duty vehicles and machinery must be tagged with reflective signs or tapes to maximize visibility and avoid accidents. - Revolving lights should be switched on when driving. | Contractor/s |
| Migrant construction workers and danger of HIV/AIDS and COVID-19 | <ul style="list-style-type: none"> - Migrant construction workers are likely to engage in casual relationships with locals. This may result in unplanned pregnancies, especially among school children, and may contribute to the spread of HIV/AIDS. | <ul style="list-style-type: none"> - Provide health education and awareness. - Qualified locals should be given priority. - Enforce Public Health COVID-19 General Regulations: Public and Environmental Health Act 2015 as amended. - Regular health check-ups. | Contractor/s |

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| | <ul style="list-style-type: none"> - Moreover, the movement of people from other parts of the country will contribute to the spread of the COVID-19 pandemic. | <ul style="list-style-type: none"> - Non-local employees should be encouraged to return to their original residential areas after completion of the contract. | |
| Safety and health hazards | <ul style="list-style-type: none"> - Occupational health hazards are expected particularly about the construction workers who will be present at the site. - Workers will be exposed to dust, vibrations, high noise levels, sun exposure (sunstroke), and dehydration during summer months. - The safety of the public may also be compromised by certain construction activities i.e., uncovered trenches, increase in traffic volume generation of dust, noise, and vibration. | <ul style="list-style-type: none"> - Construction workers must be provided with appropriate Personal Protective Equipment (PPE). - Employees must also be trained on the nature of their job and made aware of potential hazards at their workplace. - Ensure there is always a safety representative equipped with a First Aid kit at the construction site. All staff should know who the Safety Representative is. - The construction site must be barricaded and out of bound for the public and visitors. - All health and safety standards specified in the Health and Safety Regulations of the National Labour Act 11 of 1992 should be complied with. - The existing NamWater yard should be used as a storage yard, and for construction camps, and workshops. - Construction vehicles should be marked with appropriate signage. - Additional ablution facilities, including showers and a water closet with running water maybe required during the construction phase. The recommended ratio for toilets is 2 toilets for every 25 adults for separate for male and female as per the General Health Regulations (GN. 121 1969). | Contractor/s |

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| | | <ul style="list-style-type: none"> - The floor of the maintenance workshop should be covered with industrial mats to contain oil and grease from vehicles and equipment servicing. - All operations should be limited to daylight and music played should not be at the discomfort of the neighbours. | |
| <p>Impacts of temporary construction camps and workshops</p> | <ul style="list-style-type: none"> - The establishment of temporary construction camps will result in the generation of various types of waste. - Placing construction camps and workshops next to residential areas could result in a nuisance to the residents. | <ul style="list-style-type: none"> - Construction camps must be established on a site with impervious surfaces in line with Section 183 of the General Health Regulations (GN. 121 1969) and must be approved by the Aroab Village Council. - Construction camps must be equipped with ablution facilities, including showers and a water closet with running water. The recommended ratio for toilets is 2 toilets for every 25 adults for separate for male and female as per the General Health Regulations (GN. 121 1969). - The floor of the maintenance workshop should be covered with industrial mats to contain oil and grease from vehicles and equipment servicing. - All operations should be limited to daylight and music played should not be at the discomfort of the neighbors. - No alcohol may be permitted in the construction camps and workshops. - Fireplaces should be properly secured and controlled. | <p>Contractor/s</p> |

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| <p>Landscape and visual/aesthetic impacts</p> | <ul style="list-style-type: none"> - Visual impacts associated with the construction of the pipeline will occur because of the uncollected waste stockpile, unpacked construction materials, open trenches, and other facilities which makes the view of the site unappealing. | <ul style="list-style-type: none"> - Only prepare trenches in short sections sufficient to be worked for a short period i.e., a week and avoid leaving empty trenches for long periods. - The stripped topsoil must be backfilled carefully after the completion of the pipe laying. - Waste generated should be collected and disposed of weekly. Excess sand from trenches should be regarded as waste. - Construction materials should be properly stacked in one place. - The construction area and construction camps and workshops should be kept neat as far as possible. - Uncovered trenches should be barricaded with danger tapes to ensure public safety. | <p>Contractor/s</p> |
| <p>Water requirements and consumption</p> | <ul style="list-style-type: none"> - Construction activities will require a substantial amount of water. | <ul style="list-style-type: none"> - Employ water-saving measures such as: <ul style="list-style-type: none"> • The re-use of water for least important activities • The use water sparingly. • Avoid wastage, spillage, contamination, etc. | <p>Contractor/s</p> |
| <p>Mixing of cement</p> | <ul style="list-style-type: none"> - Pollution and contamination of the environment may occur as a result of improper handling of cement. | <ul style="list-style-type: none"> - Concrete shall not be mixed directly on the ground. Impermeable protective materials such as boards, plastic sheeting, mixing trays, etc., shall be used for this purpose. - The concrete batching works shall be always kept neat and clean. No batching activities shall occur on an unprotected substratum of any kind. | <p>Contractor/s</p> |

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| | | <ul style="list-style-type: none"> - Contaminated water from batching areas shall not overflow but must be collected, stored, and disposed of at a site approved by the RE, PM and ECO. - Unused cement bags shall be stored in weatherproof containers to prevent windblown cement dust and the contamination of water contamination rainfall or runoff events. - Used cement bags shall be disposed of regularly via the solid waste management system and shall not be used for any other purpose. - Care shall be taken to collect contaminated wash water from cleaning activities and dispose of it in a manner approved by the RE, PM and ECO. - In the case of bulk cement, suitable screening and containment shall be in place during storage, loading, and batching to prevent wind-blown contamination. - The contractor shall collect all contaminated water and fine material from exposed aggregate finishes and store it in sumps for disposal at an approved waste disposal site. - All visible remains of excess concrete and aggregate shall be removed on completion of the plaster or concrete pour work and disposed of. | |
| Fire outbreaks | <ul style="list-style-type: none"> - Construction activities such as welding, cooking, burning, etc., have the potential to cause fire outbreaks. This can be aggravated | <ul style="list-style-type: none"> - In terms of the Atmospheric Pollution Prevention Act (No. 45 of 1965), burning is not permitted as a waste disposal method. | Contractor |

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| | by the presence of flammable and combustible items i.e., fuel, vegetation, etc. | <ul style="list-style-type: none"> - Any fires that occur shall immediately be reported to the RE and/or PM. - Ensure a designated smoking area far from fire hazard areas such as the workshop and fuel storage areas and any areas where vegetation or other material could spread fire. - Cigarette butts must be disposed of in a designated container. - There must be a competent fire safety officer who shall be responsible for ensuring immediate and appropriate actions in the event of a fire and shall ensure that employees are aware of the procedures to be followed. - Contractor shall be equipped with appropriate basic fire-fighting equipment (e.g., fire buckets, extinguishers, fire beaters, etc.) always. - Open fires for cooking purposes are not allowed, except within the accommodation camp under controlled conditions. Alternative green energy sources should be provided. | |
| Criminal activities i.e., theft | - Construction materials and untended equipment kept onsite may attract criminals. | - Materials and equipment must be stored in locked rooms or placed in a way that does not attract criminals. | Contractor/s |
| Emergency response | - Emergency may occur at any point during the construction phase and may delay the project | - Emergencies shall be handled as per the Emergency Response Procedures (ERP) presented in Section 8. | RE and/or PM |

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| | implementation if not handled timely. | | |
| Handling of complaints and grievances | <ul style="list-style-type: none"> - Grievance may be received from residents regarding construction activities. | <ul style="list-style-type: none"> - All complaints and grievances shall be reported in the Form (see Annexure 3) and submitted to the RE. - The RE shall handle the grievance as per the Grievance response procedure presented in Section 8.4 | RE |
| Worker's Accommodation | <p>Accommodation of workers on site could lead to:</p> <ul style="list-style-type: none"> - Creation of new access roads, especially if workers are returning home late at night with poor visibility. - Unsanitary environment with production of domestic grey wastewater. - Fire breakouts. - Illegal hunting of wildlife at night. | <ul style="list-style-type: none"> - Labour force should be sourced locally where possible. The local labour force already resides in the area and would not need to be accommodated on site. - The labour force sourced outside of Aroab should not be accommodated on site but should rather rent accommodation establishments already existing in town. - Open fires are prohibited at the construction site. | RE or Contractor/s |

5.2.3 Proposed mitigation measures: Operation and maintenance phase

Table 5: Potential impacts and proposed mitigation measures during operation and maintenance phase

| Environmental Issue/Impacts | Source of Impact | Mitigation Measures | Responsibility |
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| Biophysical | Disturbance to local flora and fauna | <ul style="list-style-type: none"> ✓ Existing maintenance roads should be used as far as possible ✓ All vehicles should be driven at a minimum speed limit of 60 km/hr. | Scheme Superintendent |
| | Soil disturbances and contamination. | <ul style="list-style-type: none"> ✓ Soil disturbance from this activity is expected to be minimal. ✓ Contaminated soil must be cleaned up and disposed of appropriately at the Aroab dumpsite. | Scheme Superintendent |
| | Unattended pipe leaks in the wild could feed the germination of annuals and opportunistic plants which may include poisonous plants i.e., <i>Drimia Sanguinea</i> (slagkop) Such species could sprout faster than the perennial species and be the only green ones in the area, therefore tempting for farm animals | <ul style="list-style-type: none"> ✓ Water leaks should be attended as soon as possible. This can be ensured through regular inspection. | Scheme Superintendent |
| | Damage to geological resources. | <ul style="list-style-type: none"> ✓ Excavations will only be necessary for the repair of burst water pipes. Hence, disturbance from this activity is expected to be minimal. | Scheme Superintendent |

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| Fuel and lubricants spills or leaks. | <ul style="list-style-type: none"> ✓ All leakages and spillages of oil and grease should be contained, cleaned up, and disposed of at the Aroab dumpsite ✓ A spill kit must be available at the Aroab Scheme 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 | Scheme Superintendent |
| Dust and air pollution | <ul style="list-style-type: none"> ✓ 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. | Scheme Superintendent |
| Waste generation | <ul style="list-style-type: none"> ✓ 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. | Scheme Superintendent |
| Disturbance to the hydrology of the Aroab River. | <ul style="list-style-type: none"> ✓ No refueling or fuel storage should be permitted within the Aroab riverbank. | Scheme Superintendent |

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| | | <ul style="list-style-type: none"> ✓ All trenches excavated during pipeline maintenance must be filled properly, and the area must be levelled. | |
| | Groundwater contamination | <ul style="list-style-type: none"> ✓ Contaminated soil must be removed and disposed of at the Aroab dumpsite. ✓ No refuelling or fuel storage should be permitted within the Aroab Riverbank. | Scheme Superintendent |
| Socio-Economic | Land-use effects | <ul style="list-style-type: none"> ✓ Use existing maintenance roads as far as possible and no off-road driving should be allowed. ✓ NamWater should reach an agreement with the concerned farm owner to get permission to access the farm camps during maintenance. ✓ All vehicles should be driven on a minimum speed limit 80 km/hr. on gravel road and 60 km/hr in town. | Scheme Superintendent |
| | Disturbances from traffic movement. | <ul style="list-style-type: none"> ✓ 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. | Scheme Superintendent |
| | Safety, security, and health hazards. | <ul style="list-style-type: none"> ✓ 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. | Scheme Superintendent |

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| | Landscape impacts | <ul style="list-style-type: none"> ✓ Backfill all trenches/excavations ✓ Waste generated should be collected and disposed of regularly. | Scheme Superintendent |
| Nuisance | The potential source of a nuisance during the operation phase is excessive noise from running pumps, especially if not properly maintained | <ul style="list-style-type: none"> ✓ 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. | Scheme Superintendent |
| Public health and safety risks | <ul style="list-style-type: none"> - The Aroab Scheme staff are at risk of numerous risks such as. <ul style="list-style-type: none"> o Exposure to noxious gases emitted from the dosing system in cases of malfunctioning. o Presence of disease-carrying vectors i.e., flies, mosquitoes | <ul style="list-style-type: none"> ✓ 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. | Scheme Superintendent |
| Exposure to chemicals and hazardous substances | <ul style="list-style-type: none"> - The operation and maintenance of the Aroab Scheme will generate certain chemical substances i.e., <i>chlorine, flocculants, lime, carbon dioxide, etc.</i> <p>The risk of exposure can be aggravated by factors such as lack</p> | <ul style="list-style-type: none"> ✓ Compile an inventory of all hazardous substances at the workplace and implement hazard control measures as follow: <ul style="list-style-type: none"> • 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. | Scheme Superintendent |

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| | of awareness, lack of protection, physical fatigue, etc. | <ul style="list-style-type: none"> • 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. <p>✓ Warning signs must be placed in chemical storage rooms and chlorination rooms.</p> | |
| Waste generation | <p>- The operation of the Aroab Scheme will result in the generation of different types of waste from different plant operational activities such as:</p> <ul style="list-style-type: none"> • 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 | <p>✓ Compile an inventory of all types and quantities of waste generated at the site.</p> <p>✓ Provide adequate and separate waste handling facilities for each waste type at the site and ensure regular collection and disposal.</p> <p>✓ Follow the waste management hierarchy in managing waste, as follow: Avoid- Reduce- Reuse-Recycle- Recover- Treat- Dispose.</p> <p>✓ General household waste, debris from the screening process, building rubble, and worn-out non-metallic parts must be disposed of at the Aroab waste disposal site.</p> <p>✓ Metallic worn-out parts should be taken to the nearest scrap yards for recycling.</p> | Scheme Superintendent |

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| | <p>plant infrastructures, vehicles, and equipment.</p> <ul style="list-style-type: none"> • Lubricants from maintenance of vehicles and equipment. • Building rubble from renovations • Empty containers and packaging materials. | <ul style="list-style-type: none"> ✓ Empty containers which contained chemicals should be taken to the nearest Hazardous Waste site. | |
| Risk of fire | <ul style="list-style-type: none"> - Sources of fire outbreaks during operations could be electrical shocks and due to the presence of flammable and combustible items i.e., fuel. | <ul style="list-style-type: none"> ✓ 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. | Scheme Superintendent |
| Visual Impact | <ul style="list-style-type: none"> - Improper handling of waste in and around the site could compromise the aesthetic view of the place. | <ul style="list-style-type: none"> ✓ Ensure regular waste disposal, at least weekly. ✓ Ensure good housekeeping and routine maintenance of infrastructures and surroundings. | Scheme Superintendent |
| Increase in crime-related issues. | <ul style="list-style-type: none"> - The Aroab Scheme infrastructures i.e., fences, reservoirs, pumps, etc., are at risk of vandalism from the public. | <ul style="list-style-type: none"> ✓ 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. | Scheme Superintendent |

| | | | |
|--|--|---|-----------------------|
| | | <ul style="list-style-type: none"> ✓ Breaches in the fencing must be repaired immediately. | |
| Emergency response | <ul style="list-style-type: none"> - Emergency may occur any time during the operation and maintenance phase and may affect the water supply scheme operation and disrupt the quality and quantity of water supply to the area. | <ul style="list-style-type: none"> ✓ Emergencies shall be handled as per the ERP presented in Section 8. | Scheme Superintendent |
| Handling of complaints and grievances | <ul style="list-style-type: none"> - Grievance may be received from residents, customers with regards to operation or maintenance. | <ul style="list-style-type: none"> ✓ All complaints and grievances shall be reported in the Form (see Annexure 3) and submitted to the Scheme Superintendent. | Scheme Superintendent |
| Risk of fire | <ul style="list-style-type: none"> - Sources of fire outbreaks during operations could be electrical shocks and due to the presence of flammable and combustible items i.e., fuel. | <ul style="list-style-type: none"> ✓ 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. | Scheme Superintendent |

5.2.4 Proposed enhancement measures: Positive impacts

Table 6: Proposed enhancement measures for the envisaged positive impacts of the Aroab Scheme

| Environmental Issue/Impacts | Source of Impact | Enhancement measures | Responsibility |
|-------------------------------------|--|--|--|
| Job opportunities for locals | <ul style="list-style-type: none"> - The proposed project will create job opportunities both direct and indirect for locals in technical and non-technical fields such as civil, electrical, mechanical, security, etc. | <ul style="list-style-type: none"> - 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. | RE/PM/Contractors |
| Business opportunities | <ul style="list-style-type: none"> - The construction works will create business opportunities for consultants, building contractors, and local suppliers of building materials. - Other local businesses such as guesthouses and street vendors will also benefit indirectly from the construction works. | <ul style="list-style-type: none"> - 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. | Central Procurement Board of Namibia (CPB), NamWater internal Procurement Committee. |
| Water supply security | <ul style="list-style-type: none"> - One of the significant positive impacts that will result from the proposed project is the improved water security of the supply to the | <ul style="list-style-type: none"> - Develop a water demand plan for the supply area. | Scheme Superintendent |

| | | | |
|-------------------------------------|---|--|---|
| | <p>area. Hence, the increased storage capacity will ensure a reliable supply of safe drinking water to Aroab village until 2036.</p> <ul style="list-style-type: none"> - The increased water supply due to the demand will put the source under pressure if not properly managed. | <ul style="list-style-type: none"> - 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. - NamWater should incorporate a system to smoothen the final product water as requested by the Aroab Village Council. | |
| <p>Economic contribution</p> | <ul style="list-style-type: none"> - The improved water supply will contribute to the growth of the local economy by attracting investments and development in the area. - During the construction of the proposed pipeline, ground reservoir, and associated infrastructure, it is expected that the local economy will be beneficially impacted by increased temporary employment opportunities and business opportunities. | <ul style="list-style-type: none"> - Approval for all economic developments in the town should be subjected to the water demand management plan of the Aroab Scheme to avoid future demand challenges. - 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. | <p>Aroab Village Council/ Area Manager Business South</p> |

6. DECOMMISSIONING AND REHABILITATION

6.1 Decommissioning of the existing supply pipeline

Once the new pipeline has been commissioned, the old pipeline will be decommissioned, and a switchover will be done without causing any interruption of the water supply. The typical ways to decommission pipelines are dismantling and local decommissioning. The existing below ground supply pipeline from boreholes WW7444 and WW7437 will be left in the ground to avoid any disturbance to the environment.

6.1.1 Abandoning of pipeline in the ground

The existing pipeline will not be removed but will instead be left in the ground. Leaving the pipeline in the ground will minimize disturbance to the surrounding environment. Removing the pipeline in totality also proves costly for the proponent at this given time. The following measures should be applied:

- A servitude should be registered for the section of the abandoned pipe.
- Additionally, the abandoned pipeline route should be marked using beacons. This will safeguard future developments from building on top of the pipeline which might affect the stability of structures.

6.1.2 Decommissioning of the existing reservoir

The existing ground level reservoir will be decommissioned once the new reservoir is commissioned, and a switchover will be done without causing any interruption of the water supply. The structural demolishing of the existing reservoir will generate steel and metals waste. Steel and metals waste should be taken to local scrapyards in Keetmanshoop town.

6.2 Decommissioning of the proposed 500 m³ Abeco pressed steel collector reservoir

The decommissioning of the new proposed new 500m³ Abeco pressed steel collector reservoir and the associated infrastructure is not foreseen in the immediate future. However, should the decommissioning of the proposed reservoir or its components become pertinent at any stage, an EIA study should be undertaken and EMP should be prepared before the commencement of any decommissioning works. The EMP should entail the following components:

- 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.

6.3 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. Upon commencing of construction works, the ECO, RE and PM shall conduct a site inspection and instruct the responsible contractor to do the following:

- Removal of all waste produced to be disposed of appropriately.
- Rehabilitate the disturbed areas and refill of excavations.
- Clean up all spills and leave the area safe and tidy.

During the operation phase, the Scheme Superintendent shall conduct a site inspection after every maintenance work and ensure rehabilitation of disturbed areas. Rehabilitation measures during the operation 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 their 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.

Table 7: Rehabilitation management actions

| PARAMETER | REHABILITATION MANAGEMENT ACTION | RESPONSIBILITY |
|-----------------------|---|-------------------------|
| Overall | Progressive rehabilitation shall be undertaken to minimise the amount of disturbance time. The disturbed area will be re-profiled to original or stable contours, re-establishing surface drainage lines and other land features. | Construction Contractor |
| Infrastructure | All temporary infrastructure, signage and other installations other than those required for environmental, or safety reasons shall be removed once backfilling and tie-ins are completed. | Construction Contractor |
| Waste | All waste materials (e.g. bags, pegs, skids, pillows) shall be removed from the construction areas once backfilling and tie-ins are completed. | Construction Contractor |
| Soils | Compaction relief shall be undertaken by scarifying or ripping as required along the contours, followed by raking and levelling. | Construction Contractor |
| Erosion | The beds of watercourses to be restored to the original gradient and the bank to the natural contours post disturbance. | Construction Contractor |
| Erosion | Backfill crown to be graded and shaped as closely as practicable to pre-existing contours and flow patterns of riverbed and riparian zone. | Construction Contractor |

| | | |
|----------------|--|-------------------------|
| Erosion | Banks to be reinstated in a manner that minimises erosion potential and does not alter natural streamflow - this may include the installation of rock gabions, rip rap, cement/s and hessian bags. | Construction Contractor |
|----------------|--|-------------------------|

7. 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.

7.1 Monitoring during the construction phase

Monitoring of all activities during the construction period will be under the responsibility of the Contractor, whose environmental performance will be controlled by the PM and the ECO or NamWater's Environmental Section.

Table 8: Monitoring plan during construction

| Element | Location | Type of monitoring | Frequency of monitoring | Purpose of monitoring |
|--|--|---|--|---|
| Dust | At the construction sites | Visual monitoring | During periodic site visits | To ensure adherence to environmental protection requirements |
| Wastewater flows generated at the construction sites | At the construction sites | Visual monitoring | During monthly site visits | To ensure adherence to environmental protection requirements |
| Collection of solid waste | At the construction sites | Visual monitoring | During periodic site visits | To ensure adherence to environmental protection requirements |
| Use of dangerous materials (paints with heavy metals, lead compositions, asbestos-cement slabs, pipes, inflammable, toxic substances, etc.) | At the construction sites with the right documentation | Visual monitoring and study of documentation | Monthly | To ensure adherence to environmental protection requirements |
| Protective measures at the construction site | At the construction sites with the right documentation | Visual monitoring | Monthly | To ensure adherence to environmental protection and safety requirements |
| Earth restoration after excavation works | At the construction sites | Visual monitoring | After construction works | To ensure adherence to environmental protection requirements |
| Noise & vibrations resulting from equipment work | Project area/close to settlements | Portative noise metering device | During periodic site visits, daily | To ensure adherence to environmental protection requirements |
| Traffic operation /movement | At the construction sites | Visual monitoring of machinery and trucks carrying construction materials | During periodic site visits | To ensure adherence to environmental protection requirements |
| Vehicle and pedestrian safety when there are no construction activities | At the construction sites | Visual monitoring by supervisor | On daily basis during the construction phase | To ensure adherence to requirements |

7.2 Monitoring during the operation phase

During the operation phase, the Scheme Superintendent must ensure that compliance monitoring is conducted at various intervals/frequencies throughout the Aroab Scheme operational life span as indicated in the table below.

Table 9: Monitoring plan during the operation 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 (<i>Chlorine level, N.T.U, pH, Conductivity, and Temperature</i>). -Microbiological/ bacteriological quality (<i>Free Chlorine, Heterotrophic Plate count, Total Chlorine, Coliforms & Faecal Coliforms</i>). | -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 planning & design, construction, operation, maintenance, and decommissioning of the envisaged Aroab Scheme. | Implementation of specified measures and compliance to the EMP and other relevant legal requirements. | Biannual environmental report to MEFT. |

8. EMERGENCY RESPONSE PLAN

This section provides an emergency response plan which entails the types and effects of emergencies associated with the proposed Aroab Scheme as well as procedures and actions to be taken in case of emergency during the construction, operation, and maintenance of the Aroab Scheme.

8.1 Types and effects of emergencies

Emergencies can occur at any time or place during the construction, operation, and maintenance of the Aroab Scheme. 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
- Construction accidents
- Fire outbreak
- Power failures
- Equipment failure

8.2 Sources of emergencies

The above-mentioned emergencies maybe occur as a result of accidents, faulty maintenance, and/or negligent operation. These factors and their relationships to the construction, operation, and maintenance of the proposed Aroab Scheme are detailed below:

8.2.1 Accidents

Accidents may occur during construction, operation or maintenance works and can cause an unavoidable interruption to the Aroab Scheme works, personal injury, and/or property damage.

8.2.2 Faulty maintenance

Faulty maintenance may cause unexpected breakdowns on the Aroab Scheme which may have a direct bearing on its operation and the life span of the infrastructure. Good maintenance will result in the infrastructure performing throughout the design period; however, poor maintenance or faulty maintenance will shorten the expected life of the infrastructure. Although some breakdowns can be repaired during a 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 Aroab Scheme.

8.2.3 Negligent operation

Certain operational procedures need to be followed to ensure the satisfactory performance of the Aroab Scheme. Not following procedures correctly, results in the established procedures constituting negligent operation. The negligent operation 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 Scheme Superintendent shall ensure routine maintenance of Aroab Scheme equipment, keep an extra supply of parts that require frequent replacements and ensure to always stock enough chemicals to maintain operations for at least a month.

8.3 Emergencies response procedures

8.3.1 Response priorities

Depending on the nature of the emergency, the following response plan must be implemented as an integral part of the Aroab Scheme 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 (always First)
- Protection of the Environment
- Protection of Assets

8.3.2 Emergency response procedures

Table 10: Emergency response procedures during construction, operation, and maintenance

| NO. | Type of Emergency | Response actions | Responsible |
|-----|---|--|-------------------------|
| 1. | Substance spill i.e., concrete, oil, chemicals, etc. | <ul style="list-style-type: none"> - 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 Aroab dumpsite - 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 RE and record it in the logbook. - A spill kit must be available at the construction site (during construction phase) and at the Aroab Scheme (during the operation phase) 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 | - Contractor |
| 2. | Variation in water flow due to lack of or limited availability at the source | <ul style="list-style-type: none"> - 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. <ul style="list-style-type: none"> • Should any emergency arise, NamWater should inform the Aroab Village Council immediately. 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. | - Scheme Superintendent |

| | | | |
|-----------|--|---|-------------------------|
| | | <ul style="list-style-type: none"> • Make every effort to develop a fair and equitable system for allocating water to the customers. • Investigate alternative water supply measures to critically affected consumers such as schools, hospitals. | |
| 3. | Power failure | <ul style="list-style-type: none"> - 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. <ul style="list-style-type: none"> • 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 | - Scheme Superintendent |
| 4. | Fire outbreak | <ul style="list-style-type: none"> - Follow the holistic Fire Approach as presented in Annexure 3 | - Scheme Superintendent |
| 5. | Chemical leakage i.e., chlorine leak | <ul style="list-style-type: none"> - In case of Chlorine or CO₂ gas leakage <ul style="list-style-type: none"> • 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. | - Scheme Superintendent |

| | | | |
|----|---|---|--|
| 6. | Accident i.e., injury to a person | <ul style="list-style-type: none"> - The priority after a construction accident should be to seek medical attention for an injured person. - Assess the injured person's condition. - Notify the First Aid Person - Assist the First Aid Personnel - Record in the incident report form. - Report incident to the Scheme Superintendent. | <ul style="list-style-type: none"> - Contractor/Scheme Superintendent |
| 7. | Equipment failure i.e., pumps failure, loss of pressure, etc. | <ul style="list-style-type: none"> - The Aroab Scheme is designed with limited automation, thus there should always be an Operator on duty. - In case of faulty pumps: <ul style="list-style-type: none"> • First analyze 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. | <ul style="list-style-type: none"> - Scheme Superintendent |

8.4 Grievance response procedure

All grievances should be submitted through the completion of the grievance registration form as presented in Annexure 5 and submitted to the RE and/or PM during the construction phase and to the Scheme Superintendent during the operation and maintenance phase.

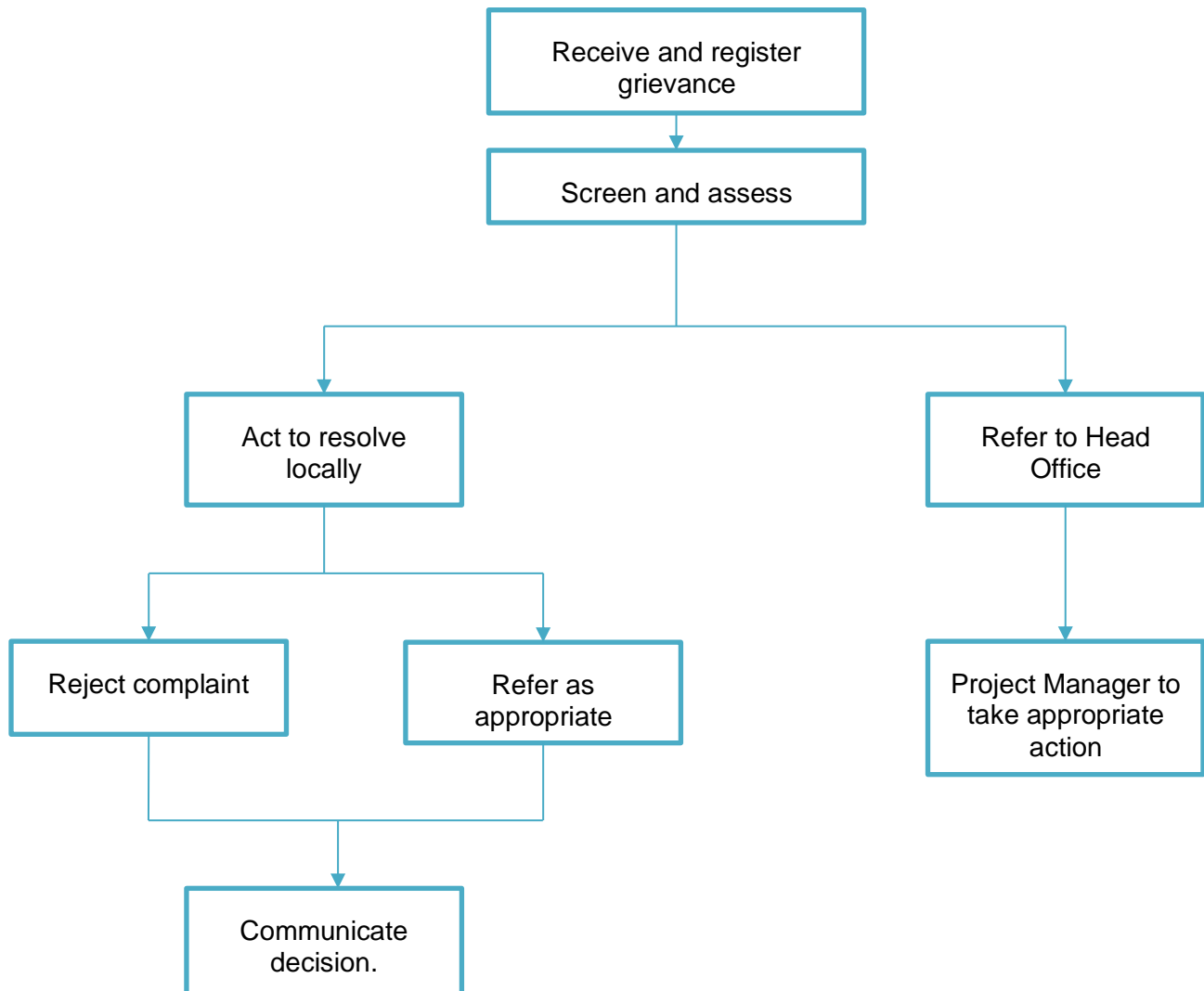


Figure 2: Grievance response procedure

Upon receipt of the registered grievance forms, the RE and/or PM or Scheme Superintendent shall screen and assess to either act to solve the grievance locally or refer it to head office. If the grievance is referred to the head office, the line manager should make the appropriate decision. If the grievance is to be solved locally, it should either be rejected or handled appropriately of which the decision should be communicated to the aggrieved person.

9. CONCLUSION

The preparation of this EMP is based on the current information provided, any changes or deviation with regards to the proposed pipeline route and /or the proposed ground level reservoir site shall trigger changes to this EMP. If all mitigation measures are implemented as outlined in the EMP, it is anticipated that the consequences and/or probability of the predicted negative impacts will be managed/reduced.

Although the implementation of this EMP requires a multitude of administration, NamWater should play a pivotal role in the implementation as outlined in this report. NamWater should also ensure proper coordination with all parties involved in the project activities during all project phases. NamWater shall also ensure to avail necessary resources (i.e., human, financial, etc.,) and training to enable the full implementation of this EMP. The implementation of this EMP can be combined with NamWater's Environmental Code of Conduct. 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 proposed Aroab Scheme, during the planning & design, construction, operation and maintenance, and decommissioning phase, thus a copy of this EMP shall be kept onsite always. It is a legally binding document, thus, any deviation or transgression from this EMP is punishable by law as per the Environmental Management Act 07 of 2007. Parties responsible for transgressing may be held responsible for any rehabilitation that may need to be undertaken.

10. ANNEXURE

10.1 Annexure 1: Environmental compliance monitoring checklist

10.2 Annexure 2: Fire response procedures

10.3 Annexure 3: Incident / Accident report form

10.4 Annexure 4: Grievances register form

10.5 Annexure 5: NamWater's Environmental Code of Conduct

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 ASPECT/IMPACT | ENVIRONMENTAL COMPLIANCE (AS PER EMP REQUIREMENT?) | | Remarks (specify the location, a good practice observed, causes of non-conformity, and proposed action) |
|-----------------------------|--|----|---|
| | YES | NO | |
| 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 3: Fire Response Procedures

Things you must-do if you discover a fire!!!



STEP 1

- Do not panic
- Press the nearest alarm button
- Rescue any person in immediate danger, if safe to do so



STEP 2

- If possible, commence fighting the fire
- Call fire brigade



STEP 3

- Leave the building by the nearest emergency exit
- Ensure all other personnel are warned along the way
- Do not stop to collect personal belongings
- Do not use lifts, use stair ways



STEP 4

- Report to the assembly point
- Do not return to the building until authorized to do so

Annexure 4: Incident / Accident Report Form

This form is to be completed in case of an environmental incident and shall be forwarded to the Project's RE during the construction phase and NamWater's Environment Section during the operation and maintenance phase.

Note: This form is not intended to replace other NamWater'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? <input type="checkbox"/> Yes <input type="checkbox"/> No | |

| Section 3. INCIDENT DETAILS | |
|--|--|
| Type of Incident: | <input type="checkbox"/> Spill <input type="checkbox"/> Waste/rubbish <input type="checkbox"/> Wildlife disturbance <input type="checkbox"/> Vegetation disturbance/damage <input type="checkbox"/> Acid Sulphate Soils disturbance <input type="checkbox"/> Cultural Heritage disturbance/damage <input type="checkbox"/> Chemicals/herbicide Use <input type="checkbox"/> Water pollution/contamination <input type="checkbox"/> Nuisance (noise, air quality) <input type="checkbox"/> 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. NAMWATER ENVIRONMENT OFFICE ONLY

| | | | |
|--|--|----------------------------|--|
| Assessed Level of Potential or Actual Harm: | | | |
| Is an Investigation Required? <input type="checkbox"/> Yes <input type="checkbox"/> No | | Investigation Team: | |
| FOLLOW UP ACTION: | | | |
| | | | |
| COMMENTS | | | |
| | | | |
| Name: | | Position: | |
| Signature: | | Date: | |

Annexure 5: Grievances Register Form.

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

Annexure 6: NamWater environmental code of conduct

What is an Environmental Code of Conduct?

It is a set of rules that everybody has to follow to minimize 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 SUPERINTENDENT/CONTRACTOR 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 inquiry 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 SUPERINTENDENT/CONTRACTOR. The PERSON that does not understand must keep asking until he/she can 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 SUPERINTENDENT/CONTRACTOR.
3. Report to your SCHEME SUPERINTENDENT/CONTRACTOR if you see a stranger or unauthorized 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 SUPERINTENDENT/CONTRACTOR.

5. Never climb over any fence or enter private property without permission of the landowner or your SCHEME SUPERINTENDENT/CONTRACTOR.
6. Do not remove any vehicle, machinery, equipment, or any other object from the construction site without the permission of your SCHEME SUPERINTENDENT/CONTRACTOR.
7. Keep clear of blasting sites. Follow the instructions of your SCHEME SUPERINTENDENT/CONTRACTOR.
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 waste.

General Waste includes wastepaper, 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 of in allocated refuse disposal containers, bins, or bags.
14. Never overfill any waste container. Inform your SCHEME SUPERINTENDENT/CONTRACTOR if you notice a nearly full container.
15. Do not litter.
16. Do not bury litter or rubbish in the backfilled 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 SUPERINTENDENT/CONTRACTOR 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 SUPERINTENDENT/CONTRACTOR 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 SUPERINTENDENT/CONTRACTOR 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 SUPERINTENDENT/CONTRACTOR.
34. Do not change the 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 SUPERINTENDENT/CONTRACTOR 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 SUPERINTENDENT/CONTRACTOR 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 SUPERINTENDENT/CONTRACTOR.
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 SUPERINTENDENT/CONTRACTOR.

Working Hours

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

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 SUPERINTENDENT/CONTRACTOR.
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 license 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 SUPERINTENDENT/CONTRACTOR. Vehicles may only be driven on demarcated construction roads. Drivers should always use three-point 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 SUPERINTENDENT/CONTRACTOR. if you see an unsupervised fire at the campsite or construction site.

Dealing with Environmental Complaints

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

Jolanda Kamburona

Tel: 061 71-2105

Cell: 081 217 8116

E-mail: KamburonaJ@namwater.com.na

OR

Fillemon Aupokolo

Tell: 061-71 2095

Cell: 081 325 3301

Email: AupokoloF@namwater.com.na