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# Environmental Management Plan for the Proposed Construction and Operation of a Sewage Treatment Plant at Osona Village, Otjozondjupa Region

**EMP**

**Final**

**27 January 2022**

**Preferred Land Development Holdings**

**GCS Project Number: 21-0901**

**Client Reference: OVD Sewage Plant**



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Sewage Treatment Plant at Osona Village, Otjozondjupa Region**

**Environmental Management Plan**



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An EMP is one of the most important outputs of the EA process as it synthesises all the proposed mitigation and monitoring actions, set to a timeline and with specific assigned responsibilities. It provides a link between the impacts identified in the Environmental Impact Assessment (EIA) Process and the required environmental management on the ground during project implementation and operation. It is important to note that an EMP is a legally binding document and a person who contravenes the provisions of this EMP may face imprisonment and/or a fine. This EMP is a living document and should be amended to adapt to project changes and/or environmental conditions and feedback from compliance monitoring.

The purpose of this document is therefore to guide environmental management throughout the following life-cycle stages of the proposed development, pre-operation (planning and design), construction, operation, and decommissioning.

The following phases are addressed in this EMP:

- **Planning and design (Pre-operation)** - the period, prior to the commencement of the construction phase, during which preliminary legislative and administrative arrangements are carried out in preparation of the proposed activities;
- **Construction** - the period during which construction of the proposed sites and associated infrastructure will be ongoing;
- **Operation** - the period during which the sewage treatment plant and associated infrastructure will be operational.
- **Decommissioning** - Should the development be closed; this phase will be implemented.

### 1.3 Environmental Assessment Practitioner (EAP)

GCS Water Environmental Engineering Namibia (Pty) Ltd (“GCS” hereafter) has been appointed by Preferred Land Development Holdings (PLDH or the proponent) as independent environmental consultants to conduct the required Environmental Assessment (EA) which includes compiling an EMP for the proposed development. The EMP is to be submitted with the scoping EA report as supporting documents to the application for an Environmental Clearance Certificate (ECC) to the Environmental Commissioner at the Department of Environmental Affairs (DEA) of the Ministry of Environment, Forestry and Tourism (MEFT). The EMP will also be used by Contractors as well as the Proponent in guiding them during the proposed operations to ensure that impacts on the environment are limited or avoided altogether.

## 1.4 Legal Requirements

The contents of the EMP must meet the requirements Section 8 (j) of the EIA Regulations. The EMP must address the potential environmental impacts of the proposed activity on the environment throughout the project life cycle. It must also include a system for assessment of the effectiveness of monitoring and management arrangements after implementation. The proponent therefore has the responsibility to ensure that the proposed activity as well as the EIA process conforms to the principles of the EMA and must ensure that any contractors appointed by them also comply with such principles.

Table 1-1 below lists the requirements of an EMP as stipulated by Section 8 (j) of the EIA Regulations.

**Table 1-1: Applicable and relevant Namibian legislations and guidelines for the EA process**

Legislation	Permit/Approval/Requirement	Contact Details
Environmental Management Act 2007 Environmental Impact Assessment (EIA) Regulations (EIAR) (GG No. 4878)	Amendments (required every 3 years) to this EMP will require an amendment of the ECC for these developments.  Activities listed in Government Notice (GN) No. 29 of GG No. 4878 require an ECC.	Mr Damian Nchindo  Department of Environmental Affairs, Ministry of Environment, Forestry and Tourism  Tel: 061 284 2701
Water Act 54 of 1956	Prohibits the pollution of underground and surface water bodies (S23 (1)).  Liability of clean-up costs after closure/abandonment of an activity (S23 (2)).	Mr Witbooi (Department of Water Affairs):  Tel: (061) 208 7226
Water Resources Management Act No.11 of 2013	The act provides for the management, protection, development, use and conservation of water resources; and provides for the regulation and monitoring of water services and to provide for incidental matters. The objects of this Act are to:	

Legislation	Permit/Approval/Requirement	Contact Details
	Ensure that the water resources of Namibia are managed, developed, used, conserved and protected in a manner consistent with, or conducive to, the fundamental principles set out in Section 66 - protection of aquifers, Subsection 1 (d) (iii) provide for preventing the contamination of the aquifer and water pollution control (Section 68).	
Forestry Act 12 of 2001	The Act provides for the management and use of forests and related products / resources. It offers protection to any living tree, bush or shrub growing within 100 metres of a river, stream or watercourse on land that is not a surveyed erven of a local authority area. In such instances, a licence would be required to cut and remove any such vegetation.  These provisions are only guidelines.	If there are trees within the proposed footprint of the project area that need to be removed, the proponent should notify the local Forestry Department of the number and/or type of trees to be removed and apply for permit to remove protected tree species.

## 1.5 Assumptions and Limitations

This EMP has been drafted with the acknowledgment of the following assumptions and limitations:

- This EMP has been drafted based on the scoping-level Environmental Impact Assessment (EIA) inclusive of a desktop hydrogeological assessment for the proposed development. No additional specialist studies were included as part of the assessment; and
- The mitigation measures recommended in this EMP document is based on the risks/impacts in the scoping report which were identified based on the provided project description and site investigation. Should the scope of the project change, the risks will have to be reassessed and mitigation measures provided accordingly.

## 1.6 Report Structure

This EMP lays out the management actions for the proposed development activities. The EMP addresses the following phases:

- **Planning and design (Pre-operation)** - the period, prior to the commencement of the construction phase, during which preliminary legislative and administrative arrangements are carried out in preparation of the proposed activities;
- **Construction** - the period during which construction of the proposed sites and associated infrastructure will be ongoing;
- **Operation** - the period during which the sewage treatment plant and associated infrastructure will be operational.
- **Decommissioning** - Should the development be closed; this phase will be implemented.

## 2 ROLES AND RESPONSIBILITIES

PLDH (the Proponent) is ultimately responsible for the implementation of the EMP. The Proponent may delegate this responsibility at any time, as they deem necessary, from planning and design to operation and maintenance phase and decommissioning phase (if considered). The delegated responsibility for the effective implementation of this EMP will rest on the following key individuals which may be fulfilled by the same person:

- Proponent's Representative
- Environmental Control Officer

### 2.1 Proponent's Representative

If the Proponent does not personally manage all aspects of the planning and design, construction and operation and maintenance phase activities and decommissioning, referred to in this EMP, they should assign this responsibility to a suitably qualified individual referred to in this plan as the Proponent's Representative (PR). The Proponent may decide to assign the role of a PR to one person for both phases. Alternatively, the Proponent may decide to assign a separate PR for each component i.e. planning and design, construction, operation and maintenance and decommissioning phase. The PR's responsibilities are included in **Table 2-1** below.



**Table 2-1: Responsibilities assigned to the Proponent's Representative for planning and design, construction, operation and maintenance and decommissioning phases**

Responsibility	Project Phase
Managing the implementation of this EMP and updating and maintaining it when necessary	Throughout the lifetime of the project
Management and monitoring of individuals and/or equipment on-site in terms of compliance with this EMP	Throughout the lifetime of the project
Issuing fines for contravening EMP provisions	Throughout the lifetime of the project

## 2.2 Environmental Control Officer

The Proponent should assign the responsibility of overseeing the implementation of the whole EMP on the ground from the planning and design phase to operation and maintenance phase to a designated person, referred to in this EMP as the Environmental Control Officer (ECO). The Proponent may decide to assign this role to one person for both phases or may assign separate individual ECOs to oversee EMP implementation during each phase. The ECOs will have the following responsibilities:

- Management and facilitation of communication between the Proponent, PR and Interested and Affected Parties (I&APs) with regard to this EMP;
- Conducting site inspections (recommended minimum frequency is monthly during construction and bi-annually during operation) of all areas with respect to the implementation of this EMP (monitor and audit the implementation of the EMP);
- Advising the PR on the removal of person(s) and/or equipment not complying with the provisions of this EMP;
- Making recommendations to the PR with respect to the issuing of fines for contraventions of the EMP; and
- Undertaking an annual review of the EMP and recommending additions and/or changes to this document.

### 3 ENVIRONMENTAL MANAGEMENT PLAN ACTIONS

#### 3.1 Key Potential environmental impacts to be managed

From the EA, the following key potential impacts have been identified per project phase and are summarised in **Table 3-1** below. The full impact description is presented in the tables under subchapter 3.2 to 3.5 as well as in the Scoping Report.

**Table 3-1: Summary of key potential environmental impacts per project phase**

	Project Phase	Potential impacts identified in the EA
1	Pre-Construction	Biodiversity
2	Construction	Surface and groundwater contamination, soil erosion and safety, archaeological, health and safety, dust, noise, waste, and social impacts.
3	Operation	Soil, surface and groundwater, odour, waste, health and safety and hazardous substance handling and storage.

The aim of the management actions of the EMP is to avoid potential impacts where possible. Where impacts cannot be avoided, measures are provided to reduce the significance of these impacts.

Management actions recommended to manage the potential impacts rated in the EA carried out for the proposed development are presented in the following tables. The management actions were compiled based on the four project phases:

- Planning and design phase (pre-construction) (**Table 3-2**);
- Construction (**Table 3-3**);
- Operation and maintenance phase management actions (**Table 3-4**);
- Decommissioning (**Table 3-5**).

The responsible persons at PLDH should assess these commitments in detail and should acknowledge their commitment to the specific management actions detailed in the table of the next subchapters.

### 3.2 Phase 1: Planning and Design Management Actions

The management requirements detailed in **Table 3-2** need to be carried out before any activities commence on site while necessary preliminary legislative and administrative arrangements are made in preparation for the proposed activities on site.

**Table 3-2: Planning and design management actions**

Aspect	Management Requirement
EMP Implementation	<ul style="list-style-type: none"> <li>• The proponent should appoint a Proponent's Representative (PR) that will act as their on-site implementing agent.</li> <li>• This person should be responsible to ensure that the Proponent's responsibilities are executed in compliance with relevant legislation and this EMP.</li> </ul>
Biodiversity	<ul style="list-style-type: none"> <li>• Vegetation should be cleared only where absolutely necessary and if cleared, numbers of protected, endemic and near endemic species removed should be documented.</li> <li>• Trees and plants protected under the Forest Act No 12 of 2001 are not to be removed without a valid permit from the local Department of Forestry.</li> </ul>
Stormwater	<ul style="list-style-type: none"> <li>• Stormwater drainage system to be included within the design of the plant.</li> </ul>

### 3.3 Phase 2: Construction Phase Management Actions

The management actions for the construction phase during which the construction activities will take place are listed in Table 3-3.

**Table 3-3: Construction phase management actions**

Environmental Feature	Impact	Management Actions
EMP training	Lack of EMP awareness and the implications thereof	<ul style="list-style-type: none"> <li>Employees appointed for construction work must ensure that all personnel are aware of necessary health, safety, and environmental considerations applicable to their respective work.</li> </ul>
Monitoring	EMP non-compliance	<ul style="list-style-type: none"> <li>The ECO or the Proponent/Proponents Representative should monitor the implementation of this EMP.</li> <li>The Proponents Representative should inspect the site throughout the construction phase at least on a monthly basis.</li> <li>Bi-annual audits should be conducted of site activities by an external ECO.</li> </ul>
Waste Management	Visual impact and soil contamination	<ul style="list-style-type: none"> <li>The construction site should always be kept tidy.</li> <li>All domestic and general waste produced daily should be cleaned and contained daily.</li> <li>No waste may be buried or burned.</li> <li>Waste containers (bins) should be emptied regularly and removed from site to the nearest municipal waste disposal site.</li> <li>All recyclable waste needs to be taken to the nearest recycling depot.</li> <li>Hazardous and domestic / general waste must be disposed separately and at the appropriate facilities.</li> <li>Construction workers should be sensitised to dispose of waste in a responsible manner and not to litter.</li> <li>No waste may remain on site after the completion of the project.</li> </ul>
Hazardous Waste	Soil and groundwater contamination	<ul style="list-style-type: none"> <li>All heavy construction vehicles and equipment on site should be provided with a drip tray.</li> <li>All heavy construction vehicles should be maintained regularly to prevent oil leakages.</li> </ul>

Environmental Feature	Impact	Management Actions
		<ul style="list-style-type: none"> <li>• Maintenance and washing of construction vehicles should take place only at a designated workshop area.</li> </ul>
Wastewater	Surface and Groundwater contamination	<ul style="list-style-type: none"> <li>• Use of the toilets instead of the veld must be strictly adhered to.</li> <li>• If grey water can be collected from ablution facilities at the contractors' camp it should be recycled and:               <ul style="list-style-type: none"> <li>○ Used for dust suppression;</li> <li>○ Used to water vegetable gardens or to support a small nursery in local communities (as and when agreed upon by such communities); and/or</li> <li>○ Used to clean equipment.</li> </ul> </li> <li>• All run off materials such as wastewater and other potential contaminants should be contained on site and disposed of in accordance with municipal wastewater discharge standards, so that they do not reach to ground or surface water systems.</li> <li>• Wastewater (excluding sewage) should be drained into lined / impermeable catch pits, big enough for daily / weekly usage without overflowing. Water from these catch pits should be removed from site to the nearest wastewater treatment facility by an approved wastewater removal company.</li> </ul>
Soil	Soil contamination	<ul style="list-style-type: none"> <li>• Spill control preventative measures should be put in place to manage soil contamination.</li> <li>• An impermeable liner should be laid down (particularly beneath cement mixers) on the site area in order to prevent contaminants from reaching to surrounding soils and eventually groundwater systems.</li> <li>• Potential contaminants such wastewater should be contained on site and disposed of in accordance with municipal wastewater discharge standards so that they do not contaminate surrounding soils.</li> </ul>

Environmental Feature	Impact	Management Actions
		<ul style="list-style-type: none"> <li>• Contaminants such as hydrocarbons should be stored, handled, and managed appropriately. These must be collected on site and disposed at an appropriate facility that is licenced to receive such waste.</li> <li>• Soil contamination should be monitored on site daily by PR and monthly by ECO.</li> <li>• ECO(s) should ensure that the contractor have sufficient number of drip trays available on-site and that these are utilised in the event of leakage from construction trucks or vehicles.</li> <li>• Contaminated soils onsite that may have resulted from leakage/spillage construction vehicles or equipment should be removed to a depth dependent on the size of the spill and replaced with clean soil. The contaminated soil should be removed and disposed at a designated landfill site suitable to receive contaminated soil.</li> <li>• Visual soil assessment for signs of contamination at vehicle holding, parking and activity areas.</li> <li>• Place oil drip trays under parked construction vehicles and hydraulic equipment at the site.</li> </ul>
Soil	<p>Soil interflow processes</p> <p>Soil structure and land capability</p> <p>Soil quality</p>	<ul style="list-style-type: none"> <li>• Only excavate areas applicable to the project area.</li> <li>• Backfill the material in the same order it was excavated to reduce contamination of deeper soils with shallow oxidised soils.</li> <li>• Cover excavated soils with a temporary liner to prevent contamination.</li> <li>• Keep the site clean of all general and domestic wastes.</li> <li>• All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is essential.</li> <li>• Exposed soils to be protected using a suitable covering or revegetating.</li> </ul>

Environmental Feature	Impact	Management Actions
		<ul style="list-style-type: none"> <li>• Existing roads should be used as far as practical to gain access to the site.</li> <li>• Have emergency fuel and oil spill kits on site.</li> </ul>
Biodiversity	Loss of Biodiversity	<ul style="list-style-type: none"> <li>• Trees with a trunk size of 150 mm and bigger should be surveyed, marked with paint (readily visible), and protected.</li> <li>• The Proponent should only remove trees/plants within the actual footprint of the specific project activities. Trees/plants that are not within the footprint should be left to preserve biodiversity in the area.</li> <li>• If cleared, the numbers of protected, endemic and near endemic species removed should be documented.</li> <li>• Trees and plants protected under the Forest Act No 12 of 2001 are not to be removed without a valid permit from the local Department of Forestry.</li> </ul>
Dust and noise	Nuisance impacts	<ul style="list-style-type: none"> <li>• The contractor(s) should suppress dust associated with construction activities by using a reasonable amount of water as required.</li> <li>• If feasible, wastewater should be treated to an acceptable water quality level, so that it can be used for dust suppression, if needed.</li> <li>• Noise levels during construction activities should be kept within the allowable standards for urban areas.</li> <li>• Noise levels should adhere to the SANS restrictions on noise.</li> <li>• Work hours should be restricted to between 08h00 and 17h00 due to the use of heavy equipment, power tools and the movement of heavy vehicles.</li> <li>• Noisy equipment should be shut down when not in use (when not needed) to avoid unnecessary noise on site.</li> </ul>

Environmental Feature	Impact	Management Actions
		<ul style="list-style-type: none"> <li>• Workers performing noisy tasks should be rotated regularly (work on shifts) to avoid exposing them to excessive noise for a long period of time in a day.</li> <li>• Workers should be equipped with personal protective equipment (PPE) such as earplugs to reduce noise exposure.</li> <li>• Workers should ensure that they wear the necessary PPE at all times on work sites.</li> </ul>
Health and Safety	Health and safety impacts	<ul style="list-style-type: none"> <li>• The contractor(s) should ensure that all personnel are provided with personal protective equipment (PPE), such as coveralls, gloves, safety boots, safety glasses and hard hats at all times.</li> <li>• Workers should ensure that they wear the PPE at all times on work sites.</li> <li>• No workers should be allowed to drink alcohol during working hours.</li> <li>• No workers should be allowed on site if under the influence of alcohol.</li> <li>• An appropriate location should be indicated on the site for the parking of construction and operation vehicles.</li> <li>• No unauthorised access should be allowed to the construction sites.</li> </ul>
Construction labourers	General health and safety	<ul style="list-style-type: none"> <li>• The Proponent should ensure that locals from the surrounding areas are employed for any unskilled labour.</li> <li>• Construction labourers should not be recruited on-site.</li> <li>• A suitable number of portable toilets (i.e., easily transportable) should be available on site.</li> <li>• Separate ablutions should be available for men and women and should clearly be indicated as such.</li> <li>• Sewage waste needs to be removed on a regular basis to the nearest approved sewage disposal site.</li> <li>• Workers responsible for cleaning the toilets should be provided with latex gloves and masks.</li> </ul>



Environmental Feature	Impact	Management Actions
		<ul style="list-style-type: none"> <li>• No workers may reside on-site for the entire duration of the construction period. Only a security guard will be allowed to sleep on-site (if there will be any).</li> <li>• The Proponent or contractor should draft a Communication Plan, which should outline as a minimum the following: <ul style="list-style-type: none"> <li>• How stakeholders, who require ongoing communication for the duration of the construction period, will be identified and recorded and who will manage and update these records.</li> <li>• How these stakeholders will be consulted on an ongoing basis.</li> </ul> </li> <li>• Provision should be made for a grievance mechanism - outlining how concerns will be lodged/recorded and how feedback will be delivered, inclusive of further steps of arbitration in the event that feedback is deemed unsatisfactory.</li> <li>• Stakeholders need to be informed of the communication plan once drafted to ensure they are aware of the relevant communication channels.</li> </ul>
Water	Groundwater contamination	<ul style="list-style-type: none"> <li>• No wastewater / effluent should be allowed to leave the site premises without proper control.</li> <li>• These should be disposed of in accordance with municipal wastewater discharge standards.</li> <li>• Regular maintenance and monitoring of construction equipment and vehicles should be done to detect early spills or leakages.</li> <li>• An emergency plan should be available for major / minor spills at the construction site during operation activities (with consideration of air, groundwater, soil, and surface water).</li> <li>• Groundwater impact awareness training should be provided to the employees involved in this phase.</li> </ul>

Environmental Feature	Impact	Management Actions
Archaeology	Loss of heritage resources	<ul style="list-style-type: none"> <li>• Should a heritage site or archaeological site be uncovered or discovered during the construction phase of the project, a “chance find” procedure should be applied in the order they appear below:               <ul style="list-style-type: none"> <li>○ If operating machinery or equipment, stop work;</li> <li>○ Demarcate the site with danger tape;</li> <li>○ Determine GPS position if possible;</li> <li>○ Report findings to the construction foreman;</li> <li>○ Report findings, site location and actions taken to superintendent;</li> <li>○ Cease any works in immediate vicinity;</li> <li>○ Visit site and determine whether work can proceed without damage to findings;</li> <li>○ Determine and demarcate exclusion boundary;</li> <li>○ Site location and details to be added to the project’s Geographic Information System (GIS) for field confirmation by archaeologist;</li> <li>○ Inspect site and confirm addition to project GIS;</li> <li>○ Advise the National Heritage Council of Namibia (NHCN) and request written permission to remove findings from work area; and</li> <li>○ Recovery, packaging and labelling of findings for transfer to National Museum.</li> </ul> </li> <li>• Should human remains be found, the following actions will be required:               <ul style="list-style-type: none"> <li>○ Apply the chance find procedure as described above;</li> <li>○ Schedule a field inspection with an archaeologist to confirm that remains are human;</li> <li>○ Advise and liaise with the NHCN and Police; and</li> </ul> </li> <li>• Remains will be recovered and removed either to the National Museum or the National Forensic Laboratory.</li> </ul>

Environmental Feature	Impact	Management Actions
Noise	Nuisance impacts	<ul style="list-style-type: none"> <li>• Work hours should be restricted to between 08h00 and 17h00 where construction involving the use of heavy equipment, power tools and the movement of heavy vehicles is less than 500 m from residential areas. If an exception to this provision is required, all residents within the 500 m radius should be given 1 week's written notice.</li> </ul>
Rehabilitation	Visual impact	<ul style="list-style-type: none"> <li>• Upon completion of the construction phase consultations should be held with the local community/property owner(s) regarding the post-construction use of remaining excavated areas (if applicable).</li> <li>• In the event that no post-construction uses are requested, all excavated/degraded areas need to be rehabilitated as follows: <ul style="list-style-type: none"> <li>○ Excavated areas may only be backfilled with clean or inert fill. No material of hazardous nature (e.g. sand removed with an oil spill) may be dumped as backfill.</li> <li>○ Rehabilitated excavated areas need to match the contours of the existing landscape.</li> <li>○ The rehabilitated area should not be higher (or lower) than nearby drainage channels. This ensures the efficiency of revegetation and reduces the chances of potential erosion.</li> <li>○ Topsoil is to be spread across excavated areas evenly.</li> <li>○ Deep ripping of areas to be rehabilitated is required, not just simple scarification, so as to enable rip lines to hold water after heavy rainfall.</li> </ul> </li> <li>• Ripping should be done along slopes, not up and down a slope, which could lead to enhanced erosion.</li> </ul>
Topsoil	Loss of topsoil and associated opportunity costs	<ul style="list-style-type: none"> <li>• When excavations are carried out, topsoil<sup>1</sup> should be stockpiled in a demarcated area.</li> </ul>

<sup>1</sup> Topsoil is defined here as the top 150mm of surface material, which accounts for the seedbank.

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Environmental Feature	Impact	Management Actions
		<ul style="list-style-type: none"><li>• Stockpiled topsoil should be used to rehabilitate post-construction degraded areas and/or other nearby degraded areas if such an area is located a reasonable distance from the stockpile.</li></ul>

### 3.4 Phase 4: Operational Phase Management Actions

The table below (Table 3-4) presents the management action for the operational phase.

**Table 3-4: Operational phase management actions**

Environmental Feature	Impact	Management Actions
EMP Training	Lack of EMP awareness and the implications thereof	<ul style="list-style-type: none"> <li>All contractors appointed for maintenance work at the site must ensure that all personnel are aware of necessary health, safety, and environmental considerations applicable to their respective work.</li> </ul>
Personnel	Recruitment of qualified personnel	<ul style="list-style-type: none"> <li>Suitably qualified and/or skilled personnel should be appointed to run the plant as required (which may include processing technicians, mechanical technicians and electrical technicians) based on the technology employed and the relevant expertise required to ensure efficient operation of the plant.</li> </ul>
Water	Surface and groundwater contamination	<ul style="list-style-type: none"> <li>Contaminated runoff from the various operational activities should be prevented from entering any surface or ground water bodies.</li> <li>Ensure that surface water accumulating on-site are channelled and captured through a proper storm water management system to be treated in an appropriate manner before disposal into the environment.</li> <li>Disposal of waste from the various activities should be properly managed.</li> <li>Contain the newly exposed soil using soil bags, soil savers or suitable geotextile.</li> <li>Vegetate areas where heavy machinery was used to excavate the soils to prevent erosion.</li> <li>Establish where excavated soils will be placed, and if the area is suitable to receive the excavated soils.</li> <li>Cover excavated soils with a suitable cover / temporary liner to prevent contamination.</li> <li>Only excavate areas applicable to the project area.</li> </ul>

Environmental Feature	Impact	Management Actions
		<ul style="list-style-type: none"> <li>• Hydraulic monitoring of stormwater systems to ensure that the system operates as per design specifications.</li> <li>• Vegetate areas where heavy machinery was used to excavate the soils to prevent erosion.</li> <li>• Ensure the sewer system is monitored for leakages.</li> <li>• Routine visual inspections of sewer infrastructure and resident parking areas for signs of soil contamination.</li> <li>• Have emergency fuel &amp; oil spill kits on site.</li> <li>• Groundwater monitoring of known boreholes in the area, to determine if there is an impact. Mitigation measures should then be formulated.</li> </ul>
Waste	Environmental Pollution	<ul style="list-style-type: none"> <li>• The sludge produced should be disposed at a registered waste dumpsite.</li> <li>• No waste may be buried or burned on site or anywhere else.</li> </ul>
Odour	Odour impact	<ul style="list-style-type: none"> <li>• Plant should be located at least 250 meter away from the nearest house.</li> <li>• Regular inspection of the system to detect failures in the system early in order to take remedial action accordingly.</li> <li>• Should the odour become significant odour abatement measures should be implemented.</li> </ul>
Health and Safety	Operational Health and Safety	<ul style="list-style-type: none"> <li>• Operators at the site should be provided with awareness training about the risks associated with the associated operational activities.</li> <li>• During the works conducted, workers should be properly equipped with personal protective equipment (PPE) such as coveralls, gloves, safety boots, safety glasses etc.</li> </ul>

Environmental Feature	Impact	Management Actions
		<ul style="list-style-type: none"> <li>• All open water structures that are on ground level should be fitted with hand rails to prevent the possibility of operators falling into these structures.</li> <li>• Chlorination equipment must be contained in the appropriate way in a separate building away from other chemicals.</li> <li>• All relevant safety signage and equipment must be available on site.</li> </ul>
Hazardous Substance Handling and Storage	Health and safety	<ul style="list-style-type: none"> <li>• Emergency preparedness plans, safety equipment and emergency clean up procedures must be in place in case of a spillage.</li> <li>• Hazardous waste, including emptied chemical containers (e.g. liquid chlorine, sodium hypochlorite) and other chemicals used for disinfection in the operational phase should be safely stored on site where they cannot be reached and used by the unsuspecting and uniformed locals for personal use.</li> <li>• No waste should be improperly disposed of on site or its surroundings, i.e. unapproved waste sites.</li> </ul>

### 3.5 Decommissioning Phase

Should the proposed sewage treatment facility be decommissioned the impacts and mitigation measures discussed during the construction phase apply.

## 3.6 Recommendations for Monitoring

### 3.6.1 Groundwater monitoring

It is proposed that a monitoring programme be implemented to monitor both the water quality and quantity at the site. The monitoring programme is divided into two phases:

- Phase 1: Monitoring during any expansion and construction activities (temporary monitoring); and
- Phase 2: Permanent monitoring surrounding higher risk infrastructure (long term or for a period after the activity).

#### 3.6.1.1 Phase 1 monitoring

It is proposed that during the construction phase (or any expansion activity at the site) monitoring focuses on active excavation and equipment / heavy machinery parking or housing areas. Regular visual inspections of these areas need to be undertaken. Moreover, placement and monitoring of drip trays underneath parked construction vehicles will help to determine which vehicles need to be repaired/taken off-site to prevent contamination while in service.

#### 3.6.1.2 Phase 2 monitoring

The vadose zone and groundwater table are the only identified receptors of potential pollution. Monitoring should focus on obvious signs of pollution at the chosen WWTW site (i.e. chemical leakages/spills, clogging and overland runoff and flow of sewage etc.). Moreover, monitoring the downstream wellfield boreholes should be sufficient to determine if there is any seepage from the WWTWs.

### 3.6.2 Monitoring duration and responsibility

In terms of monitoring duration, permanent groundwater monitoring is proposed until the decommissioning phase of the development. The monitoring can be carried out by the proponent, to ensure that the impact on the environment is limited. Quarterly groundwater monitoring is proposed.

### 3.6.3 EMP Compliance Monitoring

In order to prevent and minimize the above-mentioned environmental impacts, the following site monitoring measures need to be done:

- Monitor whether provisions as set out in the EMP has been complied with.
- Non-compliance is to be recorded and discussed at weekly site meetings and timeous remedial actions taken.
- Should complaints be received regarding specific non-compliance matters continued communication should be held with the aggrieved parties until the matters are clarified.



## 4 CONCLUSION

Based on the recommendation given in this EMP, GCS is confident that the proposed activities, as described in **Chapter 2** of the scoping report may be granted an Environmental Clearance Certificate, provided that the EMP is implemented and that all the legal requirements pertaining to this development are complied with.