ENVIRONMENTAL MANAGEMENT PLAN

APP - 007104

Operations of an Existing Rearing and Laying Facility on a Portion of the Remainder of Portion 812 of Farm Stampried 132, Stampriet, Hardap Region

ECT
ENVIRONAM CONSULTANTS TRADING

ENVIRONMENTAL MANAGEMENT PLAN FOR THE OPERATIONS OF AN EXISTING REARING AND LAYING FACILITY ON A PORTION OF THE REMAINDER OF PORTION 812 OF FARM STAMPRIED 132, STAMPRIET, HARDAP REGION

PROJECT DETAILS

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ABBREVIATIONS

AIDS	Acquired Immuno-Deficiency Syndrome
PR	Proponent's Representative
EA	Environmental Assessment
ECC	Environmental Clearance Certificate
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
GG	Government Gazette
GIS	Geographic Information System
GN	Government Notice
GPS	Global Positioning System
HIV	Human Immuno-deficiency Virus
I&APs	Interested and Affected Parties
SAR	Southern Africa Railways CC
NHC	National Heritage Council
Reg.	Regulation
S	Section

1. INTRODUCTION

Maranatha Hatchery Enterprises (Pty) Ltd has established a rearing and laying facility operation on a Portion of the remainder of Portion 812 of Farm Stampried 132, located in Stampriet within the Hardap Region of Namibia. The operation is built upon a foundation of clearly defined, physically separated rearing and production phases, a model designed to uphold stringent biosecurity and maintain genetic integrity.

The current breeding stock of approximately 9,940 birds is distributed across dedicated rearing and production houses, which adheres to recognised commercial standards for flock management, nutrition, and health.

Central to the facility's operational control is the integration of the EEGsactly management system, a data-driven platform that enables real-time performance monitoring, production forecasting, and informed decision-making. Furthermore, Maranatha Hatchery Enterprises has implemented a comprehensive risk management framework. This includes robust biosecurity protocols to protect flock health and a strategic dual-supplier contingency plan, involving primary supplier Ross Africa and secondary supplier Sovereign Foods, to safeguard against potential disruptions in the parent stock supply chain. Collectively, these elements establish Maranatha Hatchery Enterprises as a professionally managed, resilient operation capable of supporting consistent production and future growth.

In terms of section 27 of the Environmental Management Act (EMA), 2007 (Act 7 of 2007) listed activities may not be undertaken without an Environmental Clearance Certificate (ECC). The existing operations of the rearing and laying facility require an Environmental Clearance Certificate from the Ministry of Environment, Forestry and Tourism, in particular the Office of the Environmental Commissioner.

In ensuring compliance to the provisions of the EMA, the Proponent has appointed Environam Consultants Trading (ECT) to undertake the process of applying for the ECC on their behalf.

2. ENVIRONMENTAL MANAGEMENT PLAN

Key to the issuance of an Environmental Clearance Certificate is the submission of an Environmental Management Plan (EMP) which provides for a description of how an activity might impact on the natural environment in which it occurs and clearly sets out commitments

from the proponent on how identified impacts will be avoided, minimised and managed so that they are environmentally acceptable. An EMP is one of the most important outputs of the Environmental Assessment process as it synthesises all of the proposed mitigation and monitoring actions, set to a timeline and with specific assigned responsibilities. As part of the application for the ECC, Environam Consultants Trading has developed an EMP that will outline the appropriate actions to be undertaken in mitigation of potential negative environmental impacts.

The EMP will normally cover a broader spectrum of actions from the planning and design phase, construction, to the operation and maintenance phase, right up to the decommissioning phase. The operations on this site are ongoing hence this EMP will only focus on the operation and maintenance, as well as the decommissioning phases of this development.

3. PROJECT DESCRIPTION

The Rearing and Laying facility in poultry farming refers to the two primary types of housing used in egg production. The one house is used for rearing young birds (pullets) until they are ready to lay eggs, and the other is used to house the mature laying hens during their egg-producing cycle. Although modern systems are evolving, with some innovative designs now combining both phases in a single facility, Maranatha Rearing and laying facility operates the conventional two-house system method, where birds are raised in one facility and then moved to another for egg production.

3.1 Rearing Site

The rearing site consists of two environmentally controlled houses (House 1 and House 2) dedicated to the development of breeding stock prior to production placement. The current stock levels at the rearing house are as follows:

- Female breeding stock: approximately 8,640 birds
- Male breeding stock: approximately 1,300 birds

These rearing houses contain chicks from day-old to about 16 to 21 weeks of age. During the rearing phase, birds are managed according to established breeder management standards, with specific emphasis on body weight uniformity, skeletal development, vaccination protocols, and controlled feeding programmes. These measures are designed to ensure optimal sexual maturity and long-term production performance once transferred to the laying site (production site). The goal is to raise healthy pullets that are well-prepared for their future life as layers.

The rearing process flow is as follows:

a) Arrival and Brooding (Days 1-7):

The process begins with day-old chicks from a specialized hatchery. Upon arrival, they are placed in a warm, controlled environment. To help them find food and adjust, a biodegradable mat is often placed in the cage for the first week. Essential vaccinations are administered, and chicks are typically fed a high-protein (around 20%) starter diet.

b) Growing (Weeks 1-16):

A critical management task during this time is beak trimming, performed to prevent feather pecking and cannibalism in the adult flock. Throughout this phase, feed formulations and lighting schedules are meticulously controlled to ensure the pullets gain the proper body weight by week 16.

3.1 Laying Site

At around 16 weeks, the pullets are transferred to the laying site or production site, where they will remain for their egg-laying period, typically until 72 weeks of age or older. The laying site comprises two breeder houses (House 1, 2, 3 and 4) per rearing house, allocated for fertile egg production. Each production house accommodates approximately 4,000 female breeding birds, stocked at densities aligned with commercial breeder guidelines. Stocking levels in production are intentionally lower than in rearing, reflecting standard industry practices that prioritise fertility, hatchability, and sustained egg production and quality, and hen health over the laying cycle.

The laying process flow is as follows:

a) Stimulating Production (Week 18-22:

Around 18 weeks of age, two key changes trigger the onset of laying. The daily light exposure is increased, which stimulates the hen's reproductive system. Simultaneously, the diet is switched from a growth formula to a layer feed with adjusted levels of protein (12-

15%) and, crucially, a much higher concentration of calcium to support strong eggshell formation. The first eggs appear, and production quickly ramps up.

b) Peak and Post-Peak Production:

The flock typically reaches peak production, with more than 90% of hens laying daily, at around 30-32 weeks of age. This high rate gradually declines over time.

c) Molting for a Second Cycle:

When production falls to about 50% (around 60-70 weeks), the proponent may choose to molt the flock. Molting is a controlled resting period where feed and light are reduced, causing hens to stop laying and shed feathers. This rejuvenates their systems, and after about 10 weeks, they return to a second, though slightly lower, peak of production (around 80%). A flock may be molted once or twice before being removed from the layer house at 100 to 130 weeks of age.

3.1 Post-Laying (Processing & Depopulation)

This phase describes the journey of the egg from the laying site to the consumer and the preparation of the house for the next flock.

a) Egg Processing:

After collection, eggs are transported to a processing facility where they undergo several steps.

- *Washing:* Eggs are washed with water that is warmer than the egg itself to create positive pressure inside the shell, preventing any bacteria from being drawn in through the pores. They are then dried and often lightly oiled to preserve freshness.
- *Candling and Grading:* Eggs pass over bright lights in a process called "candling," which allows inspectors to check internal quality (air cell size, yolk position, and white clarity) without breaking the shell. They are also automatically weighed and sorted into standard size categories like small, medium, large, and extra large.
- *Packaging:* The graded eggs are carefully placed into cartons designed to cushion them and protect against odors. They are typically packed with the blunt end up to keep the air cell centered.

b) Distribution and Cold Chain:

From the processing facility, eggs are moved into the "cold chain"—a continuous system of refrigerated storage and transport. They are shipped in specialized refrigerated trucks to distribution centers and then to retailers, all while maintaining a consistent temperature of 45°F (7°C) or below to ensure quality and safety.

c) End of Lay and Depopulation:

When the flock reaches the end of its productive life (around 70+ weeks), the hens are depopulated from the house. This triggers the start of a new cycle, as the now-empty facility undergoes thorough cleaning and disinfection once again, preparing for the arrival of the next generation of day-old chicks.

4. WASTE MANAGEMENT

The most waste from a rearing and laying facility primarily consists of manure. In addition, process-specific waste such as wastewater, mortality, feathers and spilled feed is produced during operations. Effective management is crucial not only for regulatory compliance but also for transforming these materials from an environmental challenge into a valuable resource. The primary waste streams include:

- **Manure**: Primary waste; feces, urine, feathers, feed, and bedding (if used).
- **Wastewater**: From cleaning, egg washing, and washing down facilities.
- **Mortality**: Birds that die from disease, injury, or natural causes.
- **Process Losses**: Spilled feed, broken eggs, bedding material (e.g., wood shavings).
- **Other Losses**: Gaseous emissions from manure decomposition.

4.1 Organic Solids

Once collected, the raw waste must be treated to neutralize pathogens and reduce volume. There are several primary methods used such as incineration, rendering, composting and alkaline hydrolysis. While landfill disposal is an option, it is often less preferred due to the environmental impacts, if not properly designed. If the organic solid waste must be landfilled, it should be done in adequately lined landfills with leachate and gas collection systems.

Private waste management companies are also being consulted for possible waste removal, transport and safe disposal solutions of the waste in compliance with national legislation. As a short-term solution, the Maranatha Rearing and laying facility uses the burial method to dispose of organic solids, they are looking at the installation of an incinerator as a long-term organic solids waste management solution.

i. Incineration

During incineration, the organic waste is fed into a high-temperature incinerator. The material is burned at temperatures exceeding 800°C, reducing it to sterile ash. The volume is reduced by up to 90%. The remaining ash can often be sent to a landfill or, in some cases, used as a soil additive (though this is less common with rearing and laying waste due to high mineral content from shells). Incineration ensures complete pathogen destruction. The drawbacks are high energy cost. Air emissions must be carefully scrubbed to meet environmental standards.

4.2 Liquid Waste

Wastewater from the rearing and laying operations is often high in organic matter, nitrogen, phosphorus, pathogens, and may contain residual antibiotics or disinfection chemicals. The wastewater from the facility is disposed of at the oxidation ponds of the Stampriet Village Council. The wastewater goes through a treatment process before final disposal. Liquid effluent is pre-treated by passing the effluent through an enclosed drainage system with screens and grease traps to remove solids and fats before further treatment.

All floor drains and cleaning runoff flow first through a series of screens or a "rotary drum screen". This captures large solids (feathers, shell fragments, egg contents) that escaped the initial collection. These solids are screened out and added to the organic waste stream. The screened water flows into a large holding tank (an equalization basin). This allows the flow to stabilize. Cleaning happens in batches, so the water might be very dirty early in the morning and cleaner in the early afternoon. The equalization tank mixes it all together to provide a consistent quality for the treatment system.

Air is bubbled through the water to encourage beneficial bacteria to consume the organic pollutants (breaking down the biological oxygen demand or BOD). The water then moves to a clarifier where fine particles (sludge) settle to the bottom. This sludge is often pumped back to the organic waste stream. If the water is too acidic or alkaline from cleaning chemicals, it is neutralized. The treated water, now significantly cleaner, is discharged to the collector sump before it is moved to the oxidation ponds.

5 RECEIVING ENVIRONMENT

This section lists the most important environmental characteristics of the project area and provides a statement on the potential environmental impacts.

5.1 Climate

Classification of climate:	Semi-arid climate
Average rainfall:	Rainfall in the area is averaged to be between 150 to 250mm per year.
Variation in rainfall:	Variation in rainfall is averaged to be between 50 to 60% per year.
Average evaporation:	Evaporation in the area is averaged to be between 3200 to 3400mm per year.
Water Deficit:	Water deficit in the area is averaged to be between 2100 and 2300mm per year.
Temperatures:	Highest temperatures are measured in January with an average daily maximum of 25.1°C; the coldest temperatures are measured in July with an average daily maximum of 12.4°C.
Precipitation:	Sporadic and unpredictable, high intensity, highly localised storm events between October and April does occur. Evaporation exceeds precipitation by approximately 90%.
Wind Pattern:	Based on the regional wind patterns, the dominant wind direction is from the north and north-northeast of the project site.

The Stampriet area and its surroundings can be classified as a water deficit area with annual evaporations exceeding the mean annual rainfall by far. Summer rainfall dominates precipitation in the form of thundershowers and seasonal run off events might occur in the form of flash floods.

The aridity of the region causes the water resource to be a scarce commodity and has to be conserved and protected from pollution at all cost. Groundwater in the area is an important source of potable water for the town.

5.2 Topography and Drainage

The site is relatively flat with a gentle slope to the south. The landscape is classified as being in the Kalahari Sandveld, which is characterized by palaeo dunes and pans. The site is located within the catchment of the Auob River, an ephemeral river draining in an eastern direction. This river is situated approximately 3.5km southeast of the site.

The relief of the Auob River remains intact, and allows good drainage from the site and its surroundings. Drainage from the site is well developed and runoff takes place to the south and southeast.

5.3 Hydrogeology of the Area

Surface geology at the site consists of red dune sand of the Kalahari, less than 1m thick. Shale and mudstone of the Ecca Group (Karoo Sequence) underlies the dune sand cover. All of the underlying formations are classified as hard rock formations. Groundwater flow would be mostly along fractures, faults (secondary porosity) and other geological structures present within the formations.

The project site falls within the Stampriet Artesian Basin (SAB), a groundwater protection zone managed by the Department of Water Affairs (DWA) in the Ministry of Agriculture, Water and Forestry. The Stampriet Artesian Basin (SAB) is a transboundary groundwater resources which Namibia shares by Botswana and South Africa. Groundwater recharge in the Stampriet Artesian Basin very limited. The Stampriet Artesian Basin is recharge by several ephemeral river channels such as the Nossob, Seeis, Auob and Olifants Ephemeral Rivers (RBS, 2018).

The groundwater occurrence within the Stampriet Artesian Basin (SAB) is associated with the upper Kalahari Group and in the underlying Karoo Sequences. The three main aquifers in the SAB in Namibia are in the Kalahari Beds, the Auob Sandstone and the Nossob Sandstone. The average thickness of the Kalahari Aquifer is 100 m, that of the Auob 80 m, and that of the Nossob 25 m (JICA 2002).

In the southeastern part of the Namibian SAB, the Kalahari sediments are considerably thicker, reaching about 250 m in the 'Pre-Kalahari Valley'. The Auob Sandstone Aquifer and the Nossob Sandstone Aquifer lie in the Ecca Group of the lower Karoo Sequence and are separated by shale layers of the Mukorob Member, which is overlaid by Rietmond Shale and Sandstone. The Auob and Nossob Aquifers are confined and free flowing in the Auob Valley from Stampriet and further downstream, as well as in the Nossob Valley around Leonardville. Water levels elsewhere in boreholes in the artesian aquifers are subartesian. Several springs are located in the eastern outcrop of the Kalkrand Basalt in the northwest. Groundwater also occurs in the Kalahari layers across the basin and in the Prince Albert Formation of the Karoo Sequence.

According to the Department of Water Affairs and Forestry, (2001) and the International Hydrological Programme of the United Nations Educational Scientific and Cultural Organisation (UNESCO, 2016), water in the area is used for human consumption, stock watering and increasingly for irrigation and tourism / hospitality establishment purposes. Although agriculture and tourism / hospitality both have economic advantages of creating more rural jobs job opportunities, these economic activities if managed poorly can be great source of groundwater pollution from the use of fertilisers and poor selection of kraals locations with respect to the exiting boreholes in the agricultural sector to the poor management of wastewater and disposal of solid waste in the tourism / hospitality sectors.

Groundwater flow from the site can be expected into a southerly direction; however local drainage patterns may vary due to groundwater abstraction in the area. According to the Department of Water Affairs (DWA) database, water is utilized in the area with 7 boreholes known of within a 1km radius. Depth to water table is expected to be less than 60m below ground level (mbgl).

The town of Stampriet relies on water supply via pipelines from the Stampriet Water Supply Scheme. The scheme consists of a number of boreholes in and around the town.

The area does fall within the Stampriet Subterranean groundwater control area, as defined by law in the Artesian Water Control Ordinance of 1955. This means that government controls the exploration and usage of it.

6 PROJECT LOCALITY

The Maranatha Rearing and Laying Facility (24.2894°S: 18.3794°E) is situated on a Portion of the remainder of Portion 812 of Farm Stampried 132, located in Stampriet within the Hardap Region of Namibia. The facility is surrounded by undeveloped agricultural farmland. Refer to **Figure 3** to **Figure 7** for the locality depiction of Farm Stampried 132 and a portion of Portion 812 where the facility is situated.

Figure 1: Locality map of Stampriet

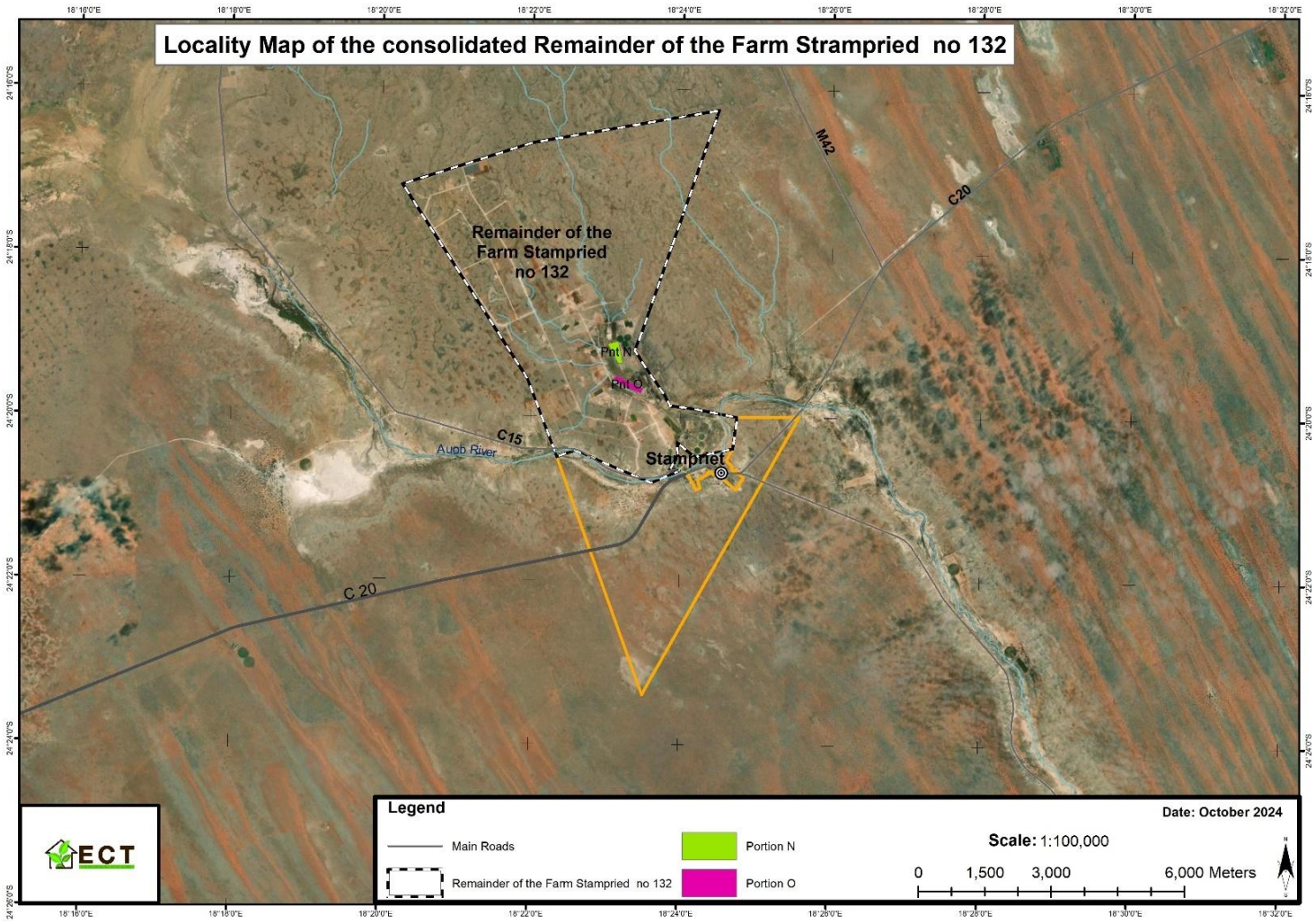

Figure 2: Location of Farm Stampried No. 132

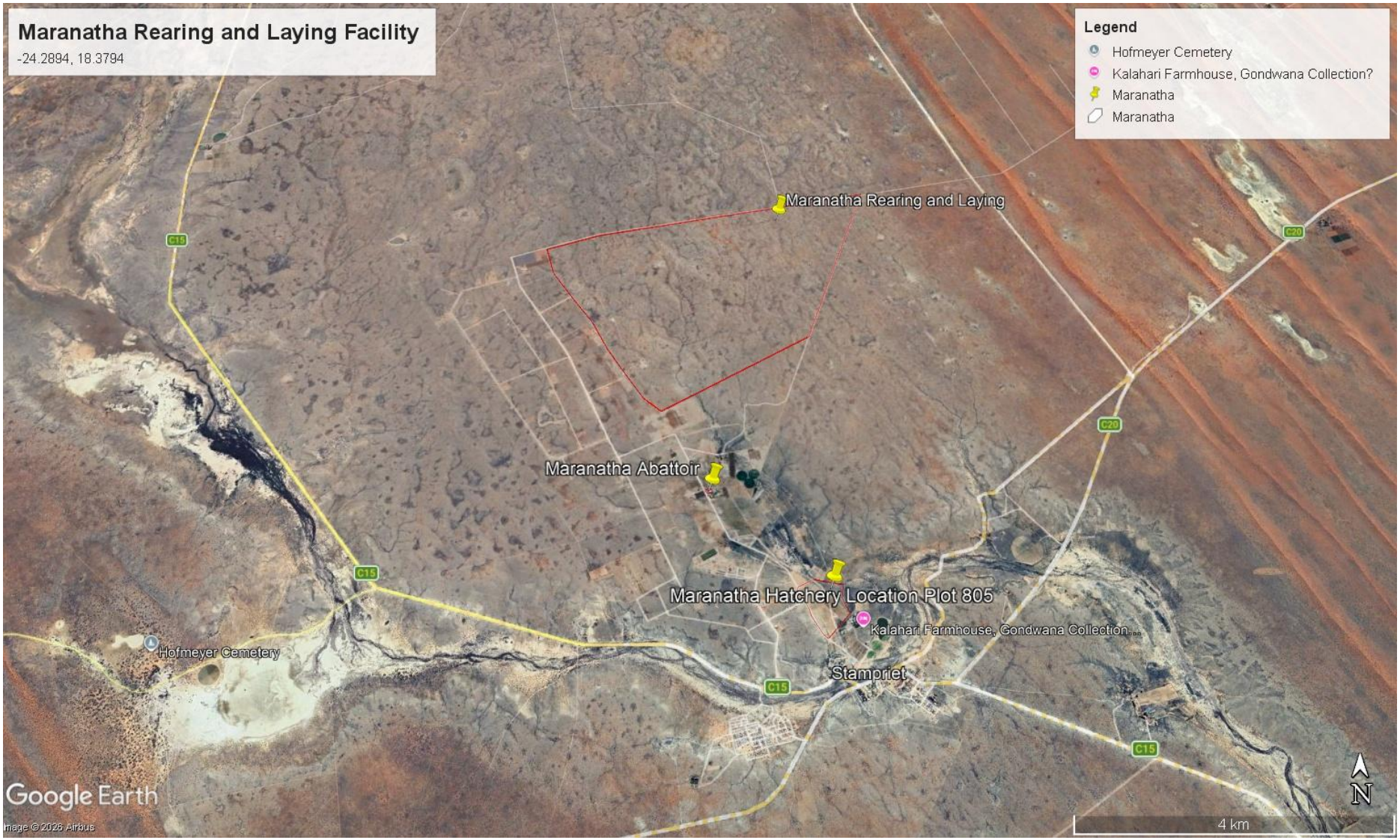

Figure 3: Locality of Maranatha Rearing and Laying Facility (Google Map, 2025)

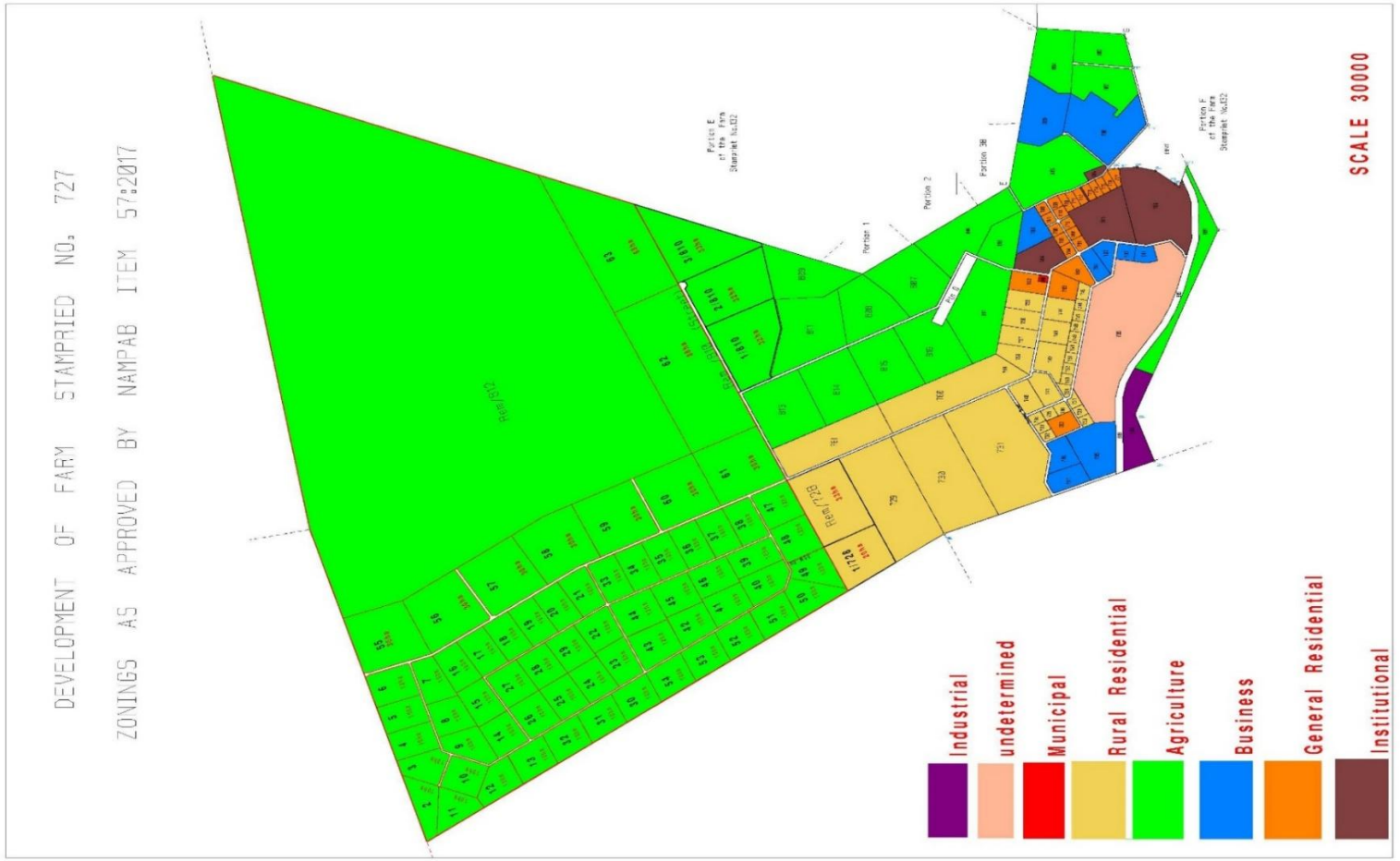

Figure 4: Zoning map of project location

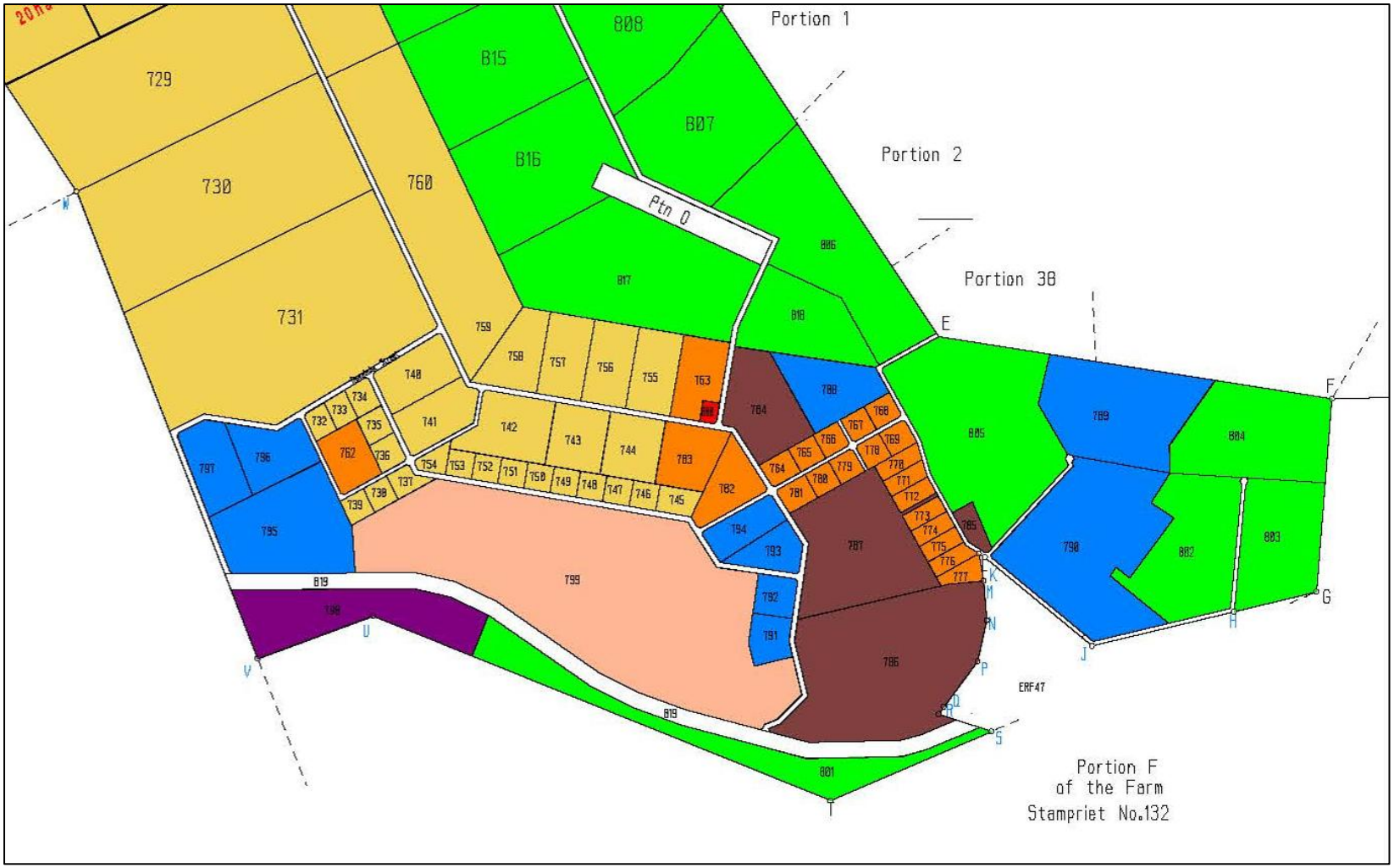

Figure 5: Zoning map (zoomed in)

7 APPLICABLE LEGISLATION

Legal provisions that have relevance to various aspects of these developments are listed in **Table 1** below. The legal instruments, applicable corresponding provisions and relevance details are provided.

Table 1: Legal provisions relevant to this development

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
The Constitution of the Republic of Namibia as Amended	Article 91© provides for duty to guard against "the degradation and destruction of ecosystems and failure to protect the beauty and character of Namibia." Article 95(l) deals with the "maintenance of ecosystems, essential ecological processes and biological diversity" and sustainable use of the country's natural resources.	Sustainable development should be at the forefront of this development.
Environmental Management Act No. 7 of 2007 (EMA)	Section 2 outlines the objective of the Act and the means to achieve that. Section 3 details the principle of Environmental Management	The development should be informed by the EMA.
EIA Regulations GN 28, 29, and 30 of EMA (2012)	GN 29 Identifies and lists certain activities that cannot be undertaken without an environmental clearance certificate. GN 30 provides the regulations governing the environmental assessment (EA) process.	**Activity 8.1** The abstraction of ground or surface water for industrial or commercial purposes. **Activity 8.2** The abstraction of groundwater at a volume exceeding the threshold authorised in terms of a law relating to water resources. **Activity 8.6** Construction of industrial and domestic wastewater treatment plants and related pipeline systems. **Activity 9.2** Any process or activity which requires a permit, licence or other form of authorisation, or the modification of or changes to existing facilities for any process or activity which requires an amendment of an existing permit, licence or

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
		authorisation or which requires a new permit, licence or authorisation in terms of a law governing the generation or release of emissions, pollution, effluent or waste.
The Stampriet Town planning Scheme	The Stampriet Town planning Scheme applies to the area as indicated on the scheme maps and corresponds with the Townlands Diagram for Stampriet Town and Townlands.	The Remainder of Farm Stampried No. 132 falls within the area of the scheme.
Convention on Biological Diversity (1992)	Article 1 lists the conservation of biological diversity amongst the objectives of the convention.	The project should consider the impact it will have on the biodiversity of the area.
Draft Procedures and Guidelines for conducting EIAs and compiling EMPs (2008)	Part 1, Stage 8 of the guidelines states that if a proposal is likely to affect people, certain guidelines should be considered by the proponent in the scoping process.	The EMP should incorporate the aspects outlined in the guidelines.
Pollution Control and Waste Management Bill	This bill is currently in preparation and is included as a guideline only.	Of particular relevance to the development are parts 2, 7 and 8.
Forestry Act (No 2 of 2001)	The Act stipulates that there be a general protection of the receiving and surrounding environment.	The Act specifies that no living tree, bush, shrub, or indigenous plants within 100m from any river, stream or watercourse, may be removed without the necessary license.
Soil Conservation Act (No 76 of 1969)	This Act deals with the combating and prevention of soil erosion. It states that the soil should be conserved, protected and improved.	Proper mitigation measures should be followed during the implementation phases of the project.
Namibia Vision 2030	Vision 2030 states that the solitude, silence and natural beauty that many areas in Namibia provide are becoming sought after commodities and must be regarded as valuable natural assets.	Care should be taken that the development does not lead to the degradation of the natural beauty of the area.
The Ministry of Environment and Tourism (MET) Policy on HIV & AIDS	MET has recently developed a policy on HIV and AIDS. In addition, it has also initiated a programme aimed at mainstreaming HIV and gender issues into environmental impact assessments.	The proponent and its contractor have to adhere to the guidelines provided to manage the aspects of HIV/AIDS.

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
Local Authorities Act No. 23 of 1992	The Local Authorities Act prescribes the manner in which a town or municipality should be managed by the Town or Municipal Council. Sections 34-47 make provision for the aspects of water and sewerage.	The development has to comply with the provisions of the Local Authorities Act.
Labour Act no 11 of 2007	Chapter 2 details the fundamental rights and protections. Chapter 3 deals with the basic conditions of employment.	Given the employment opportunities presented by the development, compliance with the labour law is essential.
Public and Environmental Health Act of 2015	The Act serves to protect the public from nuisance and states that person may not cause a health nuisance or may not permit to exist on a land or premises owned or occupied by him or her, or of which he or she is in charge, a health nuisance or other condition liable to be injurious or dangerous to health.	The proponent should ensure that health nuisances are avoided.
Nature Conservation Ordinance no 4 of 1975	Chapter 6 provides for legislation regarding the protection of indigenous plants	Indigenous and protected plants have to be managed within the legal confines.
Atmospheric Pollution Prevention Ordinance (No. 11 of 1976).	The Ordinance objective is to provide for the prevention of the pollution of the atmosphere, and for matters incidental thereto.	All activities on the site will have to take due consideration of the provisions of this legislation.
Roads Ordinance 17 of 1972	This Ordinance consolidates the laws relating to roads.	The provisions of this legislation have to be taken into consideration in as far as access to the development site is concerned.
Roads Authority Act, 1999	Section 16(5) of this Act places a duty on the Roads Authority to ensure a safe road system.	Some functions of the Roads Ordinance 17 of 1972 have been assigned to the Roads Authority.
Water Resources Management Act 11 of 2013.	• A permit application in terms of Sections 72(1) of the Water Act is required for the disposal of industrial or domestic waste water and effluent. • Section 44 (1): a licence for abstraction and use of	Obligation not to pollute surface water bodies. The following licences are required in terms of the Water Resources Management Act: • Licence to abstract and use water;

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
	water, to be obtained from the Minister.	• Groundwater disposal licence; • Borehole licence.

8 ROLES AND RESPONSIBILITIES

Maranatha Hatchery Enterprises (Pty) Ltd (the proponent) is ultimately responsible for the implementation of the EMP, the proponent may however delegate this responsibility through its life cycle. The delegated responsibility for the effective implementation of this EMP will rest on the following key individuals:

- Proponent's Representative;
- Environmental Control Officer; and
- Contractor (Operations and Maintenance).

9 PROPONENT'S REPRESENTATIVE

The Proponent should assign the responsibility of managing all aspects of the operations (including all contracts for work outsourced) to a designated member of staff, referred to in this EMP as the Proponent's Representative (PR). The PR's responsibilities are shown in **Table 2** below:

Table 2: PR's responsibilities

Making sure that the necessary approvals and permissions laid out in **Table 1** are obtained/adhered to;
Suspending/evicting individuals and/or equipment not complying with the EMP;
Issuing fines for contravening EMP provisions.

10 ENVIRONMENTAL CONTROL OFFICER

The PR should assign the responsibility of overseeing the implementation of the whole EMP on the ground during the operation and maintenance phases to a designated member of staff, referred to in this EMP as the Environmental Control Officer (ECO). The proponent may also outsource this component to an independent Environmental Consultant. The ECO will have the following responsibilities outlined in **Table 3**:

Table 3: ECO's responsibilities

• Management and facilitation of communication between the Proponent, PR, the contractors, and Interested and Affected Parties (I&APS) with regard to this EMP;
• Monitor and audit the implementation of the EMP;
• Submitting bi-annual reports to the Environmental Commissioner.
• Assisting Contractors in finding solutions with respect to matters pertaining to the implementation of this 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.

11 CONTRACTOR

Contractors appointed by the Proponent are automatically responsible for implementing all provisions contained within the relevant chapters of this EMP. Contractors will be responsible for the implementation of this EMP applicable to any work outsourced to subcontractors. **Table 4** refers to those contractors appointed during the operation and maintenance phase. In order to ensure effective environmental management, the aforementioned chapters should be included in the applicable contracts for outsourced operation and maintenance work.

The tables in the following chapter detail the management measures associated with the roles and responsibilities that have been laid out in this chapter.

12 MANAGEMENT ACTIONS

The aim of the management actions in this chapter 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.

The following table provide the management actions recommended to manage the potential impacts:

- Operation and maintenance phase management actions (**Table 4**).

The responsible persons at the Proponent's team should assess these commitments in detail and commit to the specific management actions, where indicated in the tables below.

13 ASSUMPTIONS AND LIMITATIONS

This EMP has been drafted based on the brief for the rearing and laying facility on a portion of Portion 812 of Farm Stampried 132, as presented by the proponent. ECT will not be held responsible for the potential consequences that may result from any alterations to the information presented.

14 OPERATION AND MAINTENANCE PHASE

The management actions included in **Table 4** below apply during the operation and maintenance phase of this development.

Table 4: Operation and maintenance management actions

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Lack of environmental knowledge among employees	• All employees and contractors are required to attend onsite Environmental Awareness/Training prior to commencing work on site. • Follow-up Environmental Awareness/Training may be required from time to time as new employees commence work or for specific activities that may potentially impact the environment. • The rearing and laying facility manager is to maintain accurate records of any training undertaken. • The ECO shall monitor the rearing and laying facility manager's compliance with the requirement to provide sufficient environmental awareness training to all site staff. • Training is to cover all aspects of the EMP and procedures to be followed
Monitoring	• An Environmental Control Officer should monitor the implementation of the EMP. • The Environmental Control Officer should inspect the site on a regular basis (preferably monthly or bi-monthly). • Biannual reports are to be submitted to the Ministry of Environment, Forestry and Tourism. • The above functions may be outsourced to an Independent Environmental Practitioner.

Air Quality	**General emissions:** • Dust suppression equipment need to be onsite to water down dusty road. • Speed bumps or traffic speed signs need to be erected to reduce speeding onsite that could result in the generation of dust. • Regular maintenance of vehicles to address wear of tires and breaks. Optimal engine combustion will allow for "cleaner" exhaust emissions. • If the soil is compacted, open areas should be ripped, fertilised and re-vegetated as soon as possible using suitable grass species. **Emissions from the rearing and laying facility:** • Promptly and properly handle and dispose of solid waste, such as manure, carcasses, and wastewater to prevent the release of odoriferous compounds and pollutants. • Address emitted odors by managing the source, such as by treating organic by-products or implementing biofilters on exhausts. • Where necessary, use technologies like biofilters and air scrubbers to treat air exiting the facility, reducing pollutants like ammonia and hydrogen sulfide. • Manage wastewater efficiently through regular maintenance of wastewater systems. **Indoor air quality:** • Ensure adequate ventilation to dilute and remove airborne contaminants. Use high-quality air filters to capture particulates, which can carry airborne viruses and microbes. • Maintain appropriate temperature and humidity levels, which are crucial for controlling airborne pathogens and maintaining worker and product safety. • Regularly sample and test the air for microorganisms and pollutants to identify areas needing improvement and ensure the effectiveness of control measures. • Use air cleaners or other methods to create clean air zones within production areas to protect workers.

Infrastructure services	• Maintain a strict one-way flow of materials (from "clean" to "dirty" areas) to prevent cross-contamination. This applies to personnel, equipment, and ventilation airflow. • It is recommended that alternative and renewable sources of energy be explored and introduced into the proposed development to reduce dependency on the grid. • Solar geysers and panels, and biogas should be introduced to provide for general lighting and heating of water and buildings. • Other 'green' technologies to reduce the proposed development's dependency on fossil fuel should be explored where possible. • Designs and building materials should be as such to reduce dependency on artificial heating and cooling in order to limit the overall energy necessities. • Water saving mechanisms should be incorporated within the proposed development's design and plans in order to further reduce water demands. • Re-use of treated waste water should be considered wherever possible to reduce the consumption of potable water. • Introduce energy management systems, in the development, as well as energy saving awareness to encourage energy wastage. • Implement a written Cleaning and Disinfection (C&D) policy using approved detergents and disinfectants. • Regularly test the effectiveness of your C&D protocols. • Perform Minimum Inhibitory Concentration (MIC) tests on new disinfectant batches to ensure they are effective against the specific microorganisms (e.g., *Aspergillus, E. coli*) present in the rearing and laying facility. • Keep drains clean. • Adhere to water quality guidelines in terms of The Water Resources Management Act 11 of 2013.
Generation of noise.	Although the rearing and laying facility is situated in an agricultural farmland away from residential "sensitive receptors", the following noise management controls must be ensured:

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
	• The site workers and contractors will adhere to the requirements of the Labour Act Nr 11 of 2007 regarding hearing protection and noise control measures. • Regular maintenance of vehicles, back-up generators, ventilation fans, feeding machines, and other mechanical equipment. • All equipment and machinery should be fitted with adequate silencers. • Enforce a policy that engines must be switched off when vehicles are not in use. • No sound amplification equipment such as sirens, loud hailers or hooters are to be used on site except in emergencies and no amplified music is permitted on site. • Enclose noisy operations or place them within dedicated rooms to isolate the noise source. • Implement careful handling methods to minimize stress and noise caused by frightened animals. • Organize catching and transport logistics to minimize unnecessary vehicle manoeuvring and impact noise from cages or pallets. • If work is to be undertaken outside of normal work hours, permission must be obtained from the ECO and the rearing and laying facility manager. • Conduct noisy activities, like litter removal or generator testing, during normal daytime working hours. No noisy work is to be conducted over the weekends or on public holidays.

Surface and Ground Water	• A no-go buffer area of at least 50 m should be allocated to nearby streams or drainage lines in the area. • Implementing water-saving technologies, such as high-pressure hoses for cleaning, to reduce the overall volume of wastewater generated. • Removing large organic solids (i.e., feathers, large organic matter) through screens and sieves to reduce the initial organic load. • Separating fats, oils, and grease and suspended solids through methods like flotation and settling. • No dumping of waste products of any kind in or in close proximity to streams or drainage lines. • Contaminated runoff from the various operational activities such as liquid effluent, greases, fuels, oils etc. should be prevented from entering any surface or ground water bodies, and where these occur, that they are appropriately and immediately dealt with. • 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. • No wastewater should be discharged directly into the environment. • All toilets must be flush-type and be linked to their own French Drain/Septic Tank. • Users to be educated not to flush foreign objects down the toilet. • The service infrastructure should be designed and constructed by suitably qualified engineering professionals. • Develop and implement a preventative maintenance plan for the service infrastructure. • Drip trays must be placed underneath heavy vehicles and machinery when not in use to contain all oil that might be leaking from this equipment. • Should it be necessary to wash equipment this should be done at an area properly suited and prepared to receive and contain polluted water.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
	• Disposal of waste from the various activities should be disposed of properly at the designated landfill. • Prevent fuel spills: look at work practices, staff training, equipment and storage. • Consider the use of environmentally friendly degreasers for washing and cleaning. • In the instance of an accidental fuel spill, the spill should be contained as far as possible. • Implementing a robust monitoring program for both treated effluent quality and nearby groundwater boreholes to ensure early detection of any contamination.

Waste management.	• Develop a waste management plan. • Take note that hazardous waste includes litter, mortalities, ash, empty hazardous chemical substance containers, soil and material (e.g., cloths) contaminated by hazardous chemical substances, etc. • The waste management plan should consider the type of waste, description, source, storage, disposal method, disposal facility and responsible person. **The implementation of the waste management plan should ensure:** • Waste segregation (separating solid and liquid waste) at the source. • Installation of sufficient waste bins, skips or bulk containers, where necessary. • All containers (bins, skips or bulk containers) shall be kept in a clean and hygienic manner. • Containers (bins, skips or bulk containers) utilised for the disposal of general and hazardous waste must be demarcated accordingly. • Waste material may only be temporarily stored at areas demarcated for such storage. • Waste from the facility shall be stored in designated leak-proof containers. It should also be refrigerated where necessary to prevent decomposition and odour issues. • Wastewater form the facility must be thoroughly treated before discharge. • General and hazardous waste should always be stored and disposed of separately. • General and hazardous waste should be disposed of in appropriately demarcated bins. Bins are then emptied into appropriately demarcated skips or bulk containers once a day or more often, if required. • Use on-site or approved off-site incinerators to thermally destroy waste, this reduces volumes and eliminates pathogens. • Skips or bulk containers for general waste should be removed to a nearby landfill site on a weekly basis or more often, if required.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
	• If waste from the facility must be landfilled, it should only be done in adequately lined landfills with leachate and gas collection systems. Safe disposal certificates should be requested from landfill sites with every waste disposal. • These safe disposal certificates should be kept on file to illustrate compliance with the cradle to grave principle. • Permits are to be obtained from relevant authorities to allow landfilling. • The ECO shall monitor the compliance with the cradle to grave principle.

Biosecurity	• Ensure controlled access to rearing and production sites. • Ensure strict segregation of staff, equipment, and vehicle movement between sites. • Implement scheduled sanitation and disinfection protocols. • Maintain comprehensive vaccination programmes and ongoing flock health monitoring Note: The management of chicken mortalities should be included in the waste management plan. **Temporary storage of mortalities:** • The temporary storage area for mortalities must be a covered area that has access control, preventing the unlawful removal of mortalities. In the event of temporary storage, mortalities must be stored in sealed bins prior to disposal. **Disposal of mortalities:** • Mortalities must be disposed of as soon as possible. **Disposal of mass mortalities in the event of a disease outbreak:** • Notify the state vet. • The state vet must visit the site. • The state vet will place the property, or the specific chicken site or house that is infected, under quarantine. • Depending on the disease and severity, the chickens can be slaughtered on site or transported to a hatchery with a permit. • Alternatively, mortalities can be covered with lime and buried.
Run off of contaminated water	• The rearing and laying facility is cleaned after each cycle. • High-pressure hoses should be used in the washing of the facility and equipment, to minimise the amount of water used. • Wash and sanitise the facility and equipment with biodegradable soaps and disinfectants.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
	• Use biodegradable soaps and disinfectants in the footbath and showers. • Use biodegradable soaps and disinfectants for washing of vehicles. • Do not dispose the wash water from cleaning the rearing and laying facility into the environment.
Stormwater management	• Clean storm water runoff from the surrounding environment must be channelled away from "dirty" areas. These "dirty" areas include chemicals storage areas and all waste storage areas. • Clean storm water should be diverted and kept in the environment surrounding the site. • Storm water measures should be inspected on a regular basis in order to ensure that the structures are functional and not causing soil erosion. • Where necessary place culverts underneath road foundations.

Hazardous substances	• Identify all chemical substances used onsite including fuel, greases, vaccines, detergents etc. • Obtain the material safety data sheet of each of these chemical substances. • Ensure that the material safety data sheets have sufficient information to enable the user to take the necessary measures to protect his/her health and safety and that of the environment. • Material Safety Data Sheets for all hazardous chemical substances must be readily available on site. • Develop and implement a dangerous goods management plan based on the material safety data sheets of all identified chemical substances and the Hazardous Substances Ordinance (No. 14 of 1974). • Keep a stock inventory register of all chemicals in the store. • Powders must be stored above liquids. • Proper storage of chemicals in a lockable, well-ventilated building. • Ensure adequate access control for the storage area. • Storage areas for hazardous chemicals are to comply with standard fire safety regulations. • Safety signage including “No Smoking”, “No Naked Lights” and “Danger”, and product identification signs, are to be clearly displayed in areas housing chemicals. • Appropriate equipment to deal with emergency spill incidents is to be readily available on site. This includes fire extinguishers, spill kits for hydrocarbon spills, drip trays for equipment and/or machinery leaks, drums or containers for contaminated water. • Chemicals are to be properly labelled and handled in a safety conscious manner. • All personnel handling hazardous chemicals and hazardous materials are to be issued with the appropriate Personal Protective Equipment (PPE). • Ensure that diesel or fuel tanks are in a bunded area with capacity of holding 110% of the total storage volume. • The removal of only the daily-required amount of chemicals to be used from the shed.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
	• If refuelling on site or from drums, the ground must be protected and proper dispensing equipment is to be used i.e. hand pumps and funnels. Drums may not be tipped to dispense fuel. • Use of drip trays during filling of machinery or equipment. Drip trays should be emptied into secondary containers on a regular basis. • Ensure that any spilled chemical cannot exit the designated storage area by constructing a berm or bump at the exit, or store chemicals in a spill tray. • Immediately clean all spillage of fuels, lubricants and other petroleum-based products. • The contaminated material must be disposed of in accordance with the waste management procedure. • No hazardous chemical must be discarded in the sewage or storm water system. • Train staff on the use of chemicals in accordance with the risks as described in the material safety data sheets. • Soil contaminated with hazardous chemical substances shall be treated as hazardous waste and removed from site.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Hydrocarbon pollution of soil, surface – and groundwater.	• Inspection and maintenance of equipment, generators and vehicles owned by the proponent shall take place on a regular basis. • Designated personnel shall inspect vehicles (such as those that belong to the proponent) on entering the facility to ensure vehicles are in sound condition. This will reduce the risk of oil or diesel spillages. • Equipment, generators and vehicles are to be repaired immediately upon developing leaks. • Generators must be stored on a concrete floor in a bunded area. • Drip trays shall be supplied for all repair work undertaken on machinery on site. • Drip trays are to be utilised during daily greasing and re-fuelling of machinery and to contain incidental spills and pollutants. • Drip trays are to be inspected daily for leaks and effectiveness and emptied when necessary. This is to be closely monitored during rain events to prevent overflow. • Appropriate equipment to deal with emergency spill incidents is to be readily available on site. This includes fire extinguishers, spill kits for hydrocarbon spills, drip trays for equipment and/or machinery leaks, drums or containers for contaminated water. • Soil contaminated with hazardous substances, fuel or oil shall be treated as hazardous waste and removed from site. • If refuelling on site or from drums, the ground must be protected and proper dispensing equipment is to be used i.e. hand pumps and funnels. Drums may not be tipped to dispense fuel. • All liquid fuels (petrol and diesel) are to be stored in tanks or containers with lids.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Unsanitary conditions on site.	• Sufficient ablution facilities shall be provided – minimum of 1 toilet per 15 workers. The location of toilets is to be approved by the ECO prior to site establishment, but shall be located within 100m of any work point. • Ablution facilities shall be inspected and maintained to prevent or minimise blockage and leakages. • Ablution facilities are to be serviced weekly or more frequently if required. • Toilets should have properly closing doors and should have toilet paper at all times. • Awareness of the importance of proper hygiene should be created among employees. • Excreting anywhere other than in the toilets shall not be allowed. • A septic tank system should be considered instead of French drains.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Outbreak of poultry diseases.	• Quarantine affected zone, notify vet, conduct rapid testing. • Enhance protocols by disinfecting footbaths, enforcing PPE, limiting access and prioritizing egg handling hygiene to prevent pathogen spread via eggs. • Isolate sick birds; consider partial culling of only affected unit if biosecure and risk-assessed • Apply zoning to create separate epidemiological units. • Remove all organic matter; use advanced methods like compressed air foam systems and verify with microbiological sampling. • Focus on decontaminating egg belts, collection areas, and processing equipment at the laying site. • Chicks from another farm should not be mixed with chicks from the rearing and laying facility. • Access control to and from the premises and access to the premises should only be by prior arrangement. • Review biosecurity plan, conduct regular audits, implement vaccination programs. • Never permit contaminated equipment from other poultry farms in the buildings. • Clean and sanitise the facility and equipment after each cycle with biodegradable soaps and disinfectants. • Monitoring and auditing of processes by a contracted veterinarian or State Vet.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Inefficient and redundant use of electricity.	• Ensure that all employees have been informed on the importance of natural resources (proper environmental training and awareness). • Inspect operations regularly to determine areas of improvement with regards to resource consumption. • Monitoring of resource consumption. • Identify areas where resource consumption can be minimised. • Set targets to try and minimise resource consumption. • Identify technologies and practices that may reduce resource consumption. • Implementation of technologies and practices that can reduce resource consumption. • Save electricity by turning off lights and computers when leaving the office. • Halogen light bulbs convert approximately 80% of the energy used into heat rather than light. Replace spent light bulbs with energy saving CFLs (compact fluorescent lights) or newer and more efficient LEDs (light-emitting diodes).

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Inefficient and redundant use of water.	• Ensure that all employees have been informed on the importance of natural resources (proper environmental training and awareness). • Regular Monitoring of resource consumption by supervisors. • Inspect operations regularly to determine areas of improvement with regards to resource consumption. • Regular maintenance and inspection of equipment such as hose pipes, to prevent leaks. • Identify areas where resource consumption can be minimised. • Set targets to try and minimise resource consumption. • Identify technologies and practices that may reduce resource consumption. • Implementation of technologies and practices that can reduce resource consumption. • Use high pressure hoses to clean the facility and equipment. • Regular inspection and maintenance of all boreholes, water tanks, toilets, water pipes and taps. • Leaking water tanks, taps, toilets and pipes must be repaired immediately. • Running water taps and pipes may not be left unattended. • Each time you flush the toilets approximately 20 litres of water is used, therefore use the toilets wisely. • All pipe, hose and tap connections are to be fitted with correct and appropriate plumbing fittings. • Ensure that Water Abstraction permits are in place and kept current.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Wastewater & Effluent	• Discharge of wastewater into the environment is prohibited. • The septic tank system shall be kept in a good state of repair at all times. • Seepage of the septic tank into the underground should be avoided at all costs. • Obtain relevant permits for the installation of septic tank system. • Ensure effluent and wastewater are treated before they are disposed of. • Ensure any wastewater and effluent meets the Water Quality Guidelines in terms of the Water Resources Management Act, 2013. • In the instance that they become full, effluent should be disposed of at a proper sewage works e.g., Stampriet Village Council Wastewater Works. • Official arrangements to that effect should be in place (in writing).
Visual and Sense of Place	• The structures on the site have to be aesthetically pleasing and designed to blend in with the natural surrounds. • It is recommended that more 'green' technologies be implemented within the architectural designs and building materials of the structures where possible in order to minimise the visual prominence of such a development within the more natural surrounding landscape. • Natural colours and building materials such as wood and stone should be incorporated as well as the use of indigenous vegetation in order to beautify the development.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Health, Safety and Security	• Ensure that all personnel are properly trained depending on the nature of their work. • Provide for a first aid kit and properly trained personnel to apply first aid when necessary. • A wellness program should be initiated to raise awareness on health issues, especially the impact of sexually transmitted diseases. • Provide free condoms in the workplace. • Facilitate access to Antiretroviral medication. • Restrict unauthorised access to the site and implement access control measures • Clearly demarcate dangerous areas and no-go areas on site. • Staff and visitors to the site must be fully aware of all health and safety measures and emergency procedures. • The proponent must comply with all applicable occupational health and safety requirements.
Social	• Ensure locals enjoy priority in terms of job opportunities for skills that are available locally, to the extent possible. • Ensure local procurement where commodities are available locally.
Traffic	• Limit and control the number of access points to the site. • Ensure that road junctions have good sightlines. • Adhere to the speed limit. • Implement traffic control measures where necessary. • Minimise the movement of heavy vehicles during peak time.
Townplanning	• Ensure compliance to the Stampriedt Village Town Planning Scheme. • Project footprint to be limited to the approved Erf/Portion boundaries.

15 DECOMMISSIONING PHASE

The viability of the establishment of the rearing and laying facility is based on the increased demand for chicken in Namibia. This is driven by an ever-increasing population and a high reliance of food imports from outside of the country. It is therefore highly unlikely that the facility will be decommissioned and closed in the foreseeable future. However, if closure is considered, an extensive closure and rehabilitation plan will be drafted and sent to the Environmental Commissioner prior to commencement.

16 REFERENCE

Fresh Fruit Farming Poultry Production Business Plan. 2021.

SMS, 2013. Shangoni Management Services (Pty) Ltd. Expansion of the Roodekraal free-range chicken farm.

Appendix A – Water Quality Guidelines

ANNEXURE

Water Quality Standards for Effluent

Effluent to be discharged or disposed of in areas with potential for drinking water source contamination; international rivers and dams and in water management and other areas				
			Special Standard	**General Standard**
DETERMINANTS	**UNIT**	**FORMAT**	**95 percentile requirements**	
PHYSICAL REQUIREMENTS				
Temperature	° C		Not more than 10^0C higher than the recipient water body	
Turbidity	NTU		< 5	< 12
pH			6,5-9,5	6,5-9,5
Colour	mg/litre Pt		< 10	< 15
Smell			No offensive smell	
Electric conductivity 25 °C	mS/m		< 75 mS/m above the intake potable water quality	
Total Dissolved Solids	mg/litre		< 500 mg/litre above the intake potable water quality	
Total Suspended Solids	mg/litre		< 25	< 100
Dissolved oxygen	% saturation		>75	>75
Radioactivity	units		below ambient water quality of the recipient water body	
ORGANIC REQUIREMENTS				
Biological Oxygen Demand	mg/litre	BOD	< 10	< 30
Chemical Oxygen Demand	mg/litre	COD	< 45	< 100
Detergents (soap)	mg/litre		< 0.2	< 3
Fat, oil & grease, individual	mg/litre	FOG	nil	< 2.5
Phenolic compounds	µg/litre	as phenol	< 0.01	< 0.10
Aldehyde	µg/litre		< 50	< 100
Adsorbable Organic Halogen	µg/litre	AOX	< 50	< 100
INORGANIC MACRO DETERMINANTS				
Ammonia (NH_4 – N)	mg/litre	N	< 1	< 10
Nitrate (NO_3 - N)	mg/litre	N	< 15	< 20
Nitrite (NO_2 - N)	mg/litre	N	< 2	< 3
Total Kjeldahl Nitrogen (TKN)	mg/litre	N	< 18	< 33
Chloride	mg/litre	Cl	< 40 mg/litre above the intake potable water quality	< 70 mg/litre above the intake potable water quality
Sodium	mg/litre	N	< 50 mg/litre above the intake potable water quality	<90 mg/litre above the intake potable water quality
Sulphate	mg/litre	SO_4	< 20 mg/litre above the intake potable water quality	< 40 mg/litre above the intake potable water quality
Sulphide	µg/litre	S	< 0.05	< 0.5
Fluoride	mg/litre	F	1,0	2,0
Cyanide (Free)	µg/litre	CN	< 30	< 100
Cyanide (recoverable)	µg/litre	CN	< 70	< 200
Soluble Ortho phosphate	mg/litre	P	< 0.2	3,0
Zinc*	mg/litre	Zn	1	5

Effluent to be discharged or disposed of in areas with potential for drinking water source contamination; international rivers and dams and in water management and other areas				
			Special Standard	**General Standard**
DETERMINANTS	**UNIT**	**FORMAT**	**95 percentile requirements**	
INORGANIC MICRO DETERMINANTS				
Aluminium	µg/litre	Al	< 25	< 200
Antimony	µg/litre	Sb	< 5	< 50
Arsenic	µg/litre	As	< 50	< 150
Barium	µg/litre	Ba	< 50	< 200
Boron	µg/litre	B	< 500	< 1000
Cadmium*	µg/litre	Cd	< 5	< 50
Chromium, (hexavalent)	µg/litre	Cr	< 10	< 50
Chromium, Total*	µg/litre	Cr	< 50	< 1000
Copper*	µg/litre	Cu	< 500	< 2000
Iron	µg/litre	Fe	< 200	< 1000
Lead*	µg/litre	Pb	< 10	< 100
Manganese	µg/litre	Mn	< 100	< 400
Mercury*	µg/litre	Hg	< 1	< 2
Nickel	µg/litre	Ni	< 100	< 300
Selenium	µg/litre	Se	< 10	< 50
Strontium*	µg/litre	Sr	< 100	< 100
Thallium	µg/litre	Ti	< 5	< 10
Tin*	µg/litre	Sn	< 100	< 400
Titanium	µg/litre	Ti	< 100	< 300
Uranium*	µg/litre	U	< 15	< 500
*Total for Heavy Metals (Sum of Cd,Cr,Cu,Hg,Pb	µg/litre	Cd,Cr,Cu, H g & Pb	< 200	< 500
UNSPECIFIED COMPOUNDS FROM ANTHROPOGENIC ACTIVITIES				
Agricultural chemical compounds	µg/litre		Any in-/organic compound recognized as an agro-chemical is to be avoided or reduced as far as possible. Maximum acceptable contaminant levels will be site specific, dependent on chemical usage and based the water quality of the recipient water body	
Industrial and mining chemical compounds, including unlisted metals and persistent organic pollutants	µg/litre		Any in-/ organic compound recognized as an industrial chemical including unlisted metals is to be avoided or reduced as far as possible. Maximum acceptable contaminant levels will be site specific dependent on chemical usage and based the water quality of the recipient water body	
Endocrine Disruptive Compounds (EDC)	µg/litre		Any chemical compound that is suspected of having endocrine disruptive effects is to be avoided as far as is possible. Maximum acceptable contaminant levels will be site specific dependent on chemical usage and based the water quality of the recipient water body.	
Hydrocarbons (Benzene, Ethyl Benzene, Toluene and Xylene	µg/litre		Below detection level	Below detection level
Organo-metallic compounds: methyl mercury, tributyl tin (TBT), etc.	µg/litre		Below detection level	Below detection level
DISINFECTION				
Residual chlorine	mg/litre		< 0.1 Dependent on recipient water body	< 0.3 Dependent on recipient water body

Effluent to be discharged or disposed of in areas with potential for drinking water source contamination; international rivers and dams and in water management and other areas				
			Special Standard	**General Standard**
DETERMINANTS	**UNIT**	**FORMAT**		
BIOLOGICAL REQUIREMENTS (Algae and parasites)				
Further treatment of the effluent dependent on: 1. the water quality of the recipient water body if any 2. the distance from any point of potable water abstraction 3. an acceptable maximum contaminant level downstream of the point of discharge 4. the exposure to human and animal consumption downstream of the point of discharge 5. any reuse option that may be implemented.				
MICROBIOLOGY				
Further treatment of the effluent are dependent on: 1. the water quality of the recipient water body if any 2. the distance from any point of potable water abstraction 3. an acceptable maximum contaminant level downstream of the point of discharge 4. the exposure to human and animal consumption downstream of the point of discharge 5 any water reuse option that may be implemented.				

ANNEXURE

Table 1. Water Quality Guidelines and Standards for Potable Water

Specifications for water quality intended for human consumption from the source and piped water supply					
Status				**Ranges and upper limits**	
Interpretation				**(Ideal guideline)**	**(Acceptable Standard)**
DETERMINANTS	**Unit**	**Format**	**Concern**	**95 Percentile Requirement**	
PHYSICAL AND ORGANOLEPTIC REQUIREMENTS					
Temperature	**° C**		**E**	**Ambient temperature**	
Colour	**PTU**	**or mg/litre**	**E**	**10**	**<15**
Taste			**O,E**	**No objectionable taste**	
Odour			**O,E**	**No objectionable odour**	
Turbidity (treated surface water)	**NTU**	**or TU**	**H,I**	**< 0,3**	**< 0,5**
Turbidity (groundwater)	**NTU**	**or TU**	**H,I**	**< 0,5**	**<2**
pH @ 20 °C	**pH**		**I**	**6.0 to 8,5**	**6 to 9**
Electric Conductivity @ 25 °C	**mS/m*** **	**E.C.**	**H,I**	**< 80**	**< 300**
Total Dissolved Solids	**mg/litre**		**H,I**	**< 500**	**< 2 000**
INORGANIC MACRO DETERMINANTS					
Ammonia	**mg/litre**	**N**	**H**	**< 0.2**	**< 0.5**
Calcium	**mg/litre**	**Ca**	**I**	**< 80**	**< 150**
Chloride	**mg/litre**	**Cl**	**H,I**	**< 100**	**< 300**
Fluoride	**mg/litre**	**F**	**H**	**< 0.7**	**< 2,0**
Magnesium	**mg/litre**	**Mg**	**H**	**< 30**	**< 70**
Nitrate	**mg/litre**	**N**	**H**	**< 6**	**< 11**
Nitrite	**mg/litre**	**NO_2**	**H**	**< 0.2**	**< 0.5**
Potassium	**mg/litre**	**K**	**H**	**< 25**	**< 100**
Sodium	**mg/litre**	**Na**	**H.I**	**< 100**	**< 300**
Sulphate	**mg/litre**	**SO_4**	**H,O**	**100**	**< 300**
Asbestos (fibres longer than 10 μm)	**Fibres/litre**		**H**	**<500 000**	**< 1000 000**
INORGANIC MICRO DETERMINANTS					
Aluminium	**μg/litre**	**Al**	**H**	**< 25**	**< 100**
Antimony	**μg/litre**	**Sb**	**H**	**< 5**	**< 50**
Arsenic	**μg/litre**	**As**	**H**	**<10**	**< 50**
Barium	**μg/litre**	**Ba**	**H**	**0,5**	**< 2**
Beryllium	**μg/litre**	**Be**	**H**	**< 2**	**< 5**
Bismuth	**μg/litre**	**Bi**	**H**	**< 250**	**< 500**
Boron	**μg/litre**	**B**	**H**	**< 300**	**< 500**
Bromide	**μg/litre**	**Br**	**H**	**< 500**	**< 1 000**
Cadmium	**μg/litre**	**Cd**	**H**	**< 5**	**< 10**
Cerium	**μg/litre**	**Ce**	**H**	**<1 000**	**<2 000**
Cesium	**μg/litre**	**Cs**	**H**	**< 1 000**	**< 2 000**
Chromium Total	**μg/litre**	**Cr**	**H**	**< 50**	**< 100**
Cobalt	**μg/litre**	**Co**	**H**	**< 250**	**< 500**
Copper	**μg/litre**	**Cu**	**H**	**< 500**	**< 2 000**

Specifications for water quality intended for human consumption from the source and piped water supply					
Status				**Ranges and upper limits**	
Interpretation				**(Ideal guideline)**	**(Acceptable Standard)**
DETERMINANTS	**Unit**	**Format**	**Concern**	**95 Percentile Requirement**	
INORGANIC MICRO DETERMINANTS					
Cyanide (free)	**µg/litre**	**CN^-**	**H**	**< 20**	**< 50**
Cyanide (recoverable)	**µg/litre**	**CN^-**	**H**	**< 70**	**< 200**
Iron	**µg/litre**	**Fe**	**H,E**	**< 200**	**< 300**
Lead	**µg/litre**	**Pb**	**H**	**<10**	**< 50**
Manganese	**µg/litre**	**Mn**	**H**	**< 50**	**< 100**
Mercury	**µg/litre**	**Hg**	**H**	**< 1**	**<2**
Nickel	**µg/litre**	**Ni**	**H**	**< 50**	**< 150**
Selenium	**µg/litre**	**Se**	**H**	**< 10**	**< 50**
Thallium	**µg/litre**	**Ti**	**H**	**< 5**	**< 10**
Tin	**µg/litre**	**Sn**	**H**	**<100**	**<200**
Titanium	**µg/litre**	**Ti**	**H**	**< 100**	**< 300**
Uranium	**µg/litre**	**U**	**H**	**< 3**	**< 15**
Vanadium	**µg/litre**	**V**	**H**	**< 100**	**< 500**
Zinc	**µg/litre**	**Zn**	**H**	**< 1 000**	**< 5 000**
Organo-metallic compounds	**µg/litre**	**-**	**H**	**below detection limit**	**below detection limit**
ORGANIC DETERMINANTS					
Dissolved Organic Carbon	**mg/litre**	**DOC-C**	**H**	**< 5**	**<10**
Phenol compounds	**µg/litre**	**phenol**	**H**	**< 5**	**< 10**
DISINFECTION AND DISINFECTION BY-PRODUCTS					
Bromodichloromethane (Part of THM)	**µg/litre**		**H**	**< 20**	**< 50**
Bromoform (Part of THM)	**µg/litre**		**H**	**< 40**	**< 40**
Chloroform (Part of THM)	**µg/litre**		**H**	**< 20**	**< 100**
Dibromomonochloro-methane (Part of THM)	**µg/litre**		**H**	**< 20**	**< 100**
Trihalomethanes (Total)	**µg/litre**	**THM**	**H**	**< 100**	**< 150**
Bromate	**µg/litre**		**H**	**< 5**	**< 10**
Chloramines	**mg/litre**	**Cl_2**	**H**	**< 2**	**< 4**
Chlorine dioxide	**µg/litre**		**H**	**< 400**	**< 800**
Chlorite	**µg/litre**		**H**	**< 400**	**< 4000**
Chlorate	**µg/litre**		**H**	**< 200**	**< 700**
Haloacetic acids	**µg/litre**		**H**	**not detected**	**< 60**
Chlorine, free, after 30 min; GENERAL	**mg/litre**	**Cl_2**	**H,I**	**0,1 – 0,5**	**0,1 - 3,0**
Chlorine, free, after 30 min; SPECIFIC	**mg/litre**	**Cl_2**	**Turbidity: < 0,3 NTU**	**0,1**	**0,1 - 3,0**
Chlorine, free, after 30 min; SPECIFIC	**mg/litre**	**Cl_2**	**Turbidity: > 0,3 NTU**	**0,5**	**0,1 - 3,0**
Chlorine, free, after 60 min; SPECIFIC	**mg/litre**	**Cl_2**	**Turbidity: >1,0 NTU**	**1,0**	**0,1 - 3,0**

Specifications for water quality intended for human consumption from the source and piped water supply					
Status				**Ranges and upper limits**	
Interpretation				**(Ideal guideline)**	**(Acceptable Standard)**
DETERMINANTS	**Unit**	**Format**	**Concern**	**95 Percentile Requirement**	
BIOLOGICAL REQUIREMENTS					
Algae					
Chlorophyll α	**µg/litre**		**E,O**	**< 1**	**< 2**
Blue-green algae	**cells**	**/ml**	**H,O**	**< 200**	**<2 000**
Mycrocystin	**µg/litre**		**H**	**< 0.1**	**< 1**
Geosmin	**ηg/litre**		**E, H**	**< 15**	**< 30**
2-Methyl Iso Borneal (2 MIB)	**ηg/litre**		**E, H**	**< 15**	**< 30**
OTHER DETERMINANTS					
Agricultural chemical compounds			**H**	**Any organic compound recognized as an agro-chemical should be in accordance with the WHO and EPA requirements.**	
Industrial chemical compounds			**H**	**Any organic compound recognized as an industrial chemical should be in accordance with the WHO and EPA requirements.**	
Endocrine disruptive chemicals			**H**	**Any chemical compound that is suspected of having endocrine disruptive effects shall be in accordance with the WHO and EPA requirements.**	
RADIOACTIVITY				**95 Percentile Requirement**	
Gross alpha activity	**Bq/litre**		**H**	**< 0.2**	**< 0.5**
Gross beta activity	**Bq/litre**		**H**	**< 0.4**	**< 1.0**
If Gross alpha and beta is above specification calculate Dose based on individual radionuclide concentrations	**mSv/a**		**H**	**≤ 0.04**	**≤ 0.1**
ANALYSIS QUALITY CHECK* **					
Ion balance: Total anions			**-**	**< 3 -Tolerance = 0.2 m equivalent 3-10 – Tolerance 2% on +- balance 10-800 – Tolerance 5% on +- balance**	
TDS Balance: determined / calculated	**ratio**		**-**	**~ 1**	**~ 1**
Ratio TDS / EC (EC as µS/cm)	**ratio**		**-**	**~ 0,66**	**0,55 – 0,7**

"Concern" refers to impact if the limit is transgressed: H = health concern; O = organoleptic effect;
I = effect on infrastructure, structural; E = aesthetic effect

* Based on a viral cell culture-dependent method and not on cell culture-independent methods (e.g. PCR)

** Indicative of faecal pollution having occurred, even when the residual disinfectant levels are safe.

*** Comply with SANAS Guidelines

Table 2: Microbiological and Biological Requirements

MICROBIOLOGICAL REQUIREMENTS APPLICABLE TO ALL POTABLE WATER					
Microbiology	**cfu**			**95 percentile**	**1 of samples maximum**
Heterotrophic bacteria HPC or TCC	**counts**	**/ml**		**100 at 37^0 C**	**1 000 at 37^0 C**
Total Coliform	**counts**	**/100 ml**	**H**	**0**	**5**
E.Coli	**counts**	**/100 ml**	**H**	**0**	**1**
Entrerococci	**counts**	**/100 ml**	**H**	**0**	**1**
Somatic Coliphage	**counts**	**/100 ml**	**H**	**0**	**1**
Clostridium perfrigens inclusive spores	**counts**	**/100 ml**	**H**	**0**	**1**
Enteric viruses	**viral count***	**/10 L**	**H**	**0**	**1**
Parasites (Protozoa) applicable to all potable water				**95 percentile**	**99 percentile**
Giardia lamblia	**cysts**	**/100 litre**	**H**	**0**	**1**
Cryptosporidium	**oocysts**	**/100 litre**	**H**	**0**	**1**
Giardia lamblia and Giardia lamblia (Grab sample)	**cysts or oocysts**	**/10 L**	**H**	**0**	**0**

Table 3: Special Requirements for the Protection of Infrastructure

Specifications for water quality intended for human consumption from the source and piped water supply for the protection of infrastructure against corrosion					
Status				**Ranges and upper limits**	
Interpretation				**(Ideal guideline)**	**(Acceptable Standard)**
DETERMINANTS	**Unit**	**Format**	**Concern**	**95 Percentile requirement**	
CORROSIVE AND SCALING PROPERTIES					
Calcium Carbonate Precipitation Potential	**mg/litre**	**CCPP**	**I**	**4 - 5**	**3 - 6**
Alkalinity/Sulphate/ Chloride Ratio	**Equi-valents**	**Corrosivet y Ratio**	**I**	**With SO_4 and Cl above 50 mg/litre Ratio=(Alk/50)/(SO_4/48+Cl/35.5) > 5.0 Water is Stable Ratio= (SO_4/48+Cl/35.5)/(Alk/50) > 0.2 Water is Corrosive**	
Total Hardness (Ca & Mg)	**mg/litre**	**$CaCO_3$**	**I**	**<200**	**< 400**

Table 4: Frequency of Microbiological Monitoring for Bulk Water Supply

Size of population served	Turbidity 95%**	Frequency of sampling
> 250 000	< 0,5 NTU	**Thrice weekly *** **
100 001 – 250 000	< 1,0 NTU	**Twice weekly**
50 001 – 100 000	< 1,0 NTU	**Once weekly**
10 001 – 50 000	< 1,0 NTU	**Three times every month**
< 10 000 reticulated	< 1,0 NTU	**Once every 1 month***
< 10 000 non-reticulated	**1 – 2 NTU**	**Once every 1 month***

* Upon complaints by the consumers or of medical practitioners and after incidents such as pipe breaks, the frequency should be increased until the situation has returned to original counts and been declared safe;

** Average or 95 percentile turbidity of the water supplied

*** The frequency should be stepped up by one extra sampling per week for every 100 000 residents (including the estimated number of visitors residing within the area at any time) in the area served, over and above 250 000.

General Information

1. The area being monitored shall be defined by the Minister in consultation with the Minister responsible for health and, where applicable, relevant officials from the Regional and Local Authorities;
2. At the time of sampling the operator shall also take a “free chlorine” reading of the same water under examination but prior to sampling for microbiological sampling, whilst using a portable device designed for that purpose and accepted by the Minister; this ‘reading’ is to be recorded and reported together with the results from the microbiological analyses;
3. As for field ‘screening’ of water supplies for microbiological contamination there exist portable devices designed for that purpose and accepted by the Minister; these ‘readings’ are to be recorded and reported together with the results from the microbiological analyses;
4. The results of the microbiological monitoring together with the free chlorine readings is to be reported as per mutual agreement to the ultimate supplier (bulk water supplier, Local Authority, or any other supplier) for remedial action where required, and to the Minister for record and monitoring purposes and follow up actions;
5. The costs of routine monitoring shall be borne by the authority commissioning the monitoring;

Methodology for Sampling and Analyses

The methodologies followed for sampling and during transit and storage of samples prior to analysis shall be as prescribed.

1. Preferably samples are to be taken in borosilicate glass bottles with a glass or polypropylene screw-cap lid;
2. Where this is not feasible or practical polyethylene bottles with internal seal and with screw-lid can be used;
3. Samples shall, as far as practical, be analysed within 24 hours of sampling;
4. Where there are special requirements for the period between sampling and analysis to be less than 24 hours, such requirement should be attended to as far as is practical;
5. Samples are to be kept and stored, even during transit, at as low a temperature as is practically manageable, whilst preventing the risk of the sample freezing;
6. The sample shall be kept away from light and shielded from sunlight, to reduce chances of micro-/biological growth to a minimum;
7. The use of preservation chemicals should be considered, planned and executed with extreme care;
8. Where sample preservation is appropriate or required an extra smaller volume sample should be taken so as to not upset any other analyses that are affected by the preservation chemical(s);
9. Certain determinants may be monitored ‘in the field’ at the time of sampling; such field-data are to be measured in a receptacle or container different from the sample container; data so obtained shall be recorded as “field measurement” and cannot replace laboratory analysis for the parameters concerned;
10. The methodologies followed for physical, chemical and microbiological analysis shall be in agreement with the specifications listed in the latest edition of the SANS 241, Drinking Water Standards, published by the SABS.
11. The cost of routine, regulatory inspections and monitoring, for the purpose of fulfilling the provisions of this regulation shall borne by the service provider.