

## **Environmental Impact Assessment (EIA) Study for the Establishment of Urban Agricultural Activities on Extension 5 in Karibib, Erongo Region**



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## **EXECUTIVE SUMMARY**

Karibib Town Council (hereinafter referred to as The Town Council, KTC or Proponent) proposes to establish an urban agriculture on Extension 5 located about 2km southwest of Karibib Town (within the Townlands). The plots stretch from the edge of the Town until about 1km from Navachab Mine.

The establishment of agricultural projects is however one of the listed activities in the 2012 EIA Regulations of the Environmental Management Act No. 7 of 2007 that that may not be undertaken without an Environmental Clearance Certificate (ECC). Subsequently, to ensure that the proposed activity is compliant with the national environmental legislation the project had to appoint an independent environmental consultant to undertake the required Environmental Assessment (EA) process and apply for the ECC on their behalf.

It is for this reason that Excel Dynamic Solutions (Pty) Ltd has been appointed by the Proponent to undertake the EA and apply for the ECC. The application for the ECC was compiled and submitted to the Ministry of Environment, Forestry and Tourism (MEFT). Upon submission of an Environmental Scoping Assessment (ESA) Report and draft Environmental Management Plan (EMP), an ECC for the proposed project will be considered by the Environmental Commissioner at the MEFT's Department of Environmental Affairs and Forestry (DEAF).

### **Public Consultation**

#### **Public Consultation Activities**

Regulation 21 of the EIA Regulations details steps to be taken during a public consultation process and these have been used in guiding this process. The public consultation process assisted the Environmental Consultant in identifying all potential impacts and aided in the process of identifying possible mitigation measures and alternatives to certain project activities. The communication with I&APs about the proposed projects was done through the following means and in this order to ensure that the public is notified and afforded an opportunity to comment on the proposed project:

- Registration of pre-identified stakeholders and interested & affected parties (I&APs) and updating the list throughout the environmental assessment process.
- A Background Information Document (BID) containing brief information about the proposed facility was compiled and circulated to relevant pre-identified authorities (stakeholders), and upon request to all new registered I&APs,

- Project Environmental Assessment notices were published in *The Namibian newspaper* and *New Era* dated 21 and 28 April 2022, inviting the public to register as I&APs and submit their comments/concerns.
- Site notices (A3) were placed at the Karibib Town Council notice Office, Usab Community Hall, OK Foods and Woermann Brock Community board notice boards. The notices were informing members of the public of the EIA process and register as I&APs, as well as submit comments.

**Potential Impacts identified**

The following impacts were identified:

Positive impacts:

- Local socio-economic development through the employment during the crop production leading to income generation.
- The production of the crops and eventual food in the Town will ensure food security in the Town and certain parts of the Erongo Region.
- Increase in agriculture skills and technological development in the agriculture sector,

Negative impacts:

- Soil and water pollution: improper handling of wastewater or fertilisers may lead to pollution of surrounding soils and eventually water resources systems
- General environmental pollution through mishandling of project related waste.
- Impact on water resources (groundwater) through over-abstraction to supply the agricultural and related activities onsite.
- Loss of biodiversity through the removal of vegetation that may be found within the planned site of the Extension.
- Vehicular traffic: potential increase in local traffic due to site activities.
- Health and safety: improper handling of site materials and equipment may cause health and safety risks.
- Archaeological or cultural heritage impact through uncovering of unknown objects on site (when carrying out earthworks).

The potential negative impacts were assessed, and mitigation measures provided accordingly.

## RECOMMENDATIONS AND CONCLUSIONS

The potential impacts that are anticipated from the proposed project activities were identified, described, and assessed.

The interested and affected parties (stakeholders) were consulted as per the EMA and its 2012 EIA Regulations (Section 21 to 24). This was done via *The Namibian and New Era* newspapers (on 21 and 28 April 2022).

### Recommendations

The following impacts have been assessed and the assessment found that the negative impacts have a low, slightly medium and medium ratings. Therefore, the effective and monitoring of the implementation of the recommended management and mitigation measures provided in the EMP can reduce the significance from “slightly medium” to “low”, and “medium” to “low”, and where possible, bring the significance to negligible over time. The aim will be to reduce to low and maintain this impacts’ significance in the long run and bring the impact under control. These management and mitigation measures are provided under chapter 7 of this ESA report, and as management actions in the draft EMP.

The assessment is therefore deemed sufficient and concludes that no further detailed assessments are required to the ECC application.

The assessment of negative impacts provided the following concluding ratings (pre- and post-mitigation):

- Soil and water pollution from improper handling of wastewater or fertilisers - *medium (pre-mitigation) and low (post-mitigation)*.
- General environmental pollution through mishandling of project related waste - *medium (pre-mitigation) and low (post-mitigation)*.
- Impact on water resources (groundwater) through over-abstraction - *slightly high (pre-mitigation) and medium (post-mitigation)*.
- Loss of biodiversity through the removal of vegetation that may be found within the planned site of the Extension - *medium (pre-mitigation) and low (post-mitigation)*.
- Vehicular traffic: *potential increase in local traffic due to site activities - medium (pre-mitigation) and low (post-mitigation)*.

- Health and safety - *medium (pre-mitigation) and low (post-mitigation)*.
- Archaeological or cultural heritage - *medium (pre-mitigation) and low (post-mitigation)*.

It is therefore, recommended that the proposed activities be granted an environmental clearance, on the emphasis that:

- All the management and mitigation measures provided herein and in the Draft EMP are effectively and progressively implemented and monitoring with annual auditing.
- The Proponent and all their personnel or contractors comply with the legal requirements governing their project and its associated activities and ensure that project permits and or approvals required to undertake specific site activities are obtained and renewed as stipulated by the issuing authorities.
- Environmental Compliance monitoring reports should include groundwater monitoring, compiled and submitted to the DEAF every 6 months from the date of ECC issuance.

### **Conclusions**

The Proponent and their workers and contractors to effectively implement the recommended management and mitigation measures to protect both the biophysical and social environment throughout the project duration.

Monitoring of the environmental components described in the impact assessment should be conducted by the Proponent and applicable Competent Authority. This is to ensure that all potential impacts identified in this study and other impacts that might arise during implementation are properly identified in time and addressed. Lastly, should the ECC be issued, the Proponent will be expected to be compliant with the ECC conditions as well as legal requirements governing the project and its related activities.

### **Limitations**

EDS warrants that the findings and conclusion contained herein were accomplished in accordance with the methodologies set forth in the Scope of Work and Environmental Management Act (EMA) of 2007. These methodologies are described as representing good customary practice for conducting an Environmental Impact Assessment of a property for the purpose of identifying recognized environmental conditions. There is a possibility that even with

the proper application of these methodologies there may exist on the subject property conditions that could not be identified within the scope of the assessment, or which were not reasonably identifiable from the available information. The Consultant believes that the information obtained from the record review and during the public consultation processes concerning the proposed irrigation activities/works is reliable. However, the Consultant cannot and does not warrant or guarantee that the information provided by the other sources is accurate or complete. The conclusions and findings set forth in this report are strictly limited in time and scope to the date of the evaluations. No other warranties are implied or expressed.

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**Appendix B:** Curricula Vitae (CV) for the Environmental Assessment Practitioner (EAP) - *uploaded to the ECC Portal separately as required*

**Appendix C:** ESA Process Notification in the newspapers (*New Era* and *The Namibian*) and Public notices- ***uploaded to the ECC Portal separately as required***

### LIST OF ABBREVIATIONS

Abbreviation	Meaning
BID	Background Information Document
CV	Curriculum Vitae
DEAF	Department of Environmental Affairs and Forestry
DI	Drip Irrigation
EA	Environmental Assessment
EAP	Environmental Assessment Practitioner
ECC	Environmental Clearance Certificate
EDS	Excel Dynamic Solutions
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
ESA	Environmental Scoping Assessment
GG	Government Gazette
GN	Government Notice
I&APs	Interested and Affected Parties
MAWLR	Ministry of Agriculture, Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism
KTC	Karibib Town Council
PPE	Personal Protective Equipment
Reg, S	Regulation, Section
TOR	Terms of Reference

### KEY TERMS AND DEFINITIONS

Term	Definition
<b>Alternative</b>	A possible course of action, in place of another that would meet the same purpose and need of the proposal.
<b>Baseline</b>	Work done to collect and interpret information on the condition/trends of the existing environment.
<b>Biophysical</b>	That part of the environment that does not originate with human activities (e.g., biological, physical and chemical processes).
<b>Cumulative Impacts/Effects Assessment</b>	In relation to an activity, means the impact of an activity that in it may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.
<b>Decision-maker</b>	The person(s) entrusted with the responsibility for allocating resources or granting approval to a proposal.
<b>Ecological Processes</b>	Processes which play an essential part in maintaining ecosystem integrity. Four fundamental ecological processes are the cycling of water, the cycling of nutrients, the flow of energy and biological diversity (as an expression of evolution).
<b>Environment</b>	As defined in Environmental Management Act - the complex of natural and anthropogenic factors and elements that are mutually interrelated and affect the ecological equilibrium and the quality of life, including – (a) the natural environment that is land, water and air; all organic and inorganic matter and living organisms and (b) the human environment that is the landscape and natural, cultural, historical, aesthetic, economic and social heritage and values.
<b>Environmental Management Plan</b>	As defined in the EIA Regulations (Section 8(j)), a plan that describes how activities that may have significant environments effects are to be mitigated, controlled, and monitored.
<b>Interested and Affected Party (I&amp;AP)</b>	In relation to the assessment of a listed activity includes - (a) any person, group of persons or organization interested in or affected by an activity; and (b) any organ of state that may have jurisdiction over any aspect of the activity. Mitigate - practical measures to reduce adverse impacts. Proponent – as defined in the Environmental Management Act, a person who proposes to undertake a listed activity. Significant impact - means an impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.
<b>Fauna and Flora</b>	All the animals and plants (vegetation) found in an area.
<b>Mitigation</b>	The purposeful implementation of decisions or activities that are designed to reduce the undesirable impacts of a proposed action on the affected environment.

Term	Definition
<b>Monitoring</b>	Activity involving repeated observation, according to a pre-determined schedule, of one or more elements of the environment to detect their characteristics (status and trends).
<b>Nomadic Pastoralism</b>	Nomadic pastoralists live in societies in which the husbandry of grazing animals is viewed as an ideal way of making a living and the regular movement of all or part of the society is considered a normal and natural part of life. Pastoral nomadism is commonly found where climatic conditions produce seasonal pastures but cannot support sustained agriculture.
<b>Proponent</b>	Organization (private or public sector) or individual intending to implement a development proposal.
<b>Public Consultation/Involvement</b>	A range of techniques that can be used to inform, consult, or interact with stakeholders affected by the proposed activities.
<b>Scoping</b>	An early and open activity to identify the impacts that are most likely to be significant and require specialized investigation during the EIA work. Can, also be used to identify alternative project designs/sites to be assessed, obtain local knowledge of site and surroundings, and prepare a plan for public involvement. The results of scoping are frequently used to prepare a Terms of Reference for the specialized input into full EIA.
<b>Terms of Reference (ToR)</b>	Written requirements governing full EIA input and implementation, consultations to be held, data to be produced and form/contents of the EIA report. Often produced as an output from scoping.
<b>Urban Agriculture</b>	The cultivation, processing and distribution of agricultural products in urban and suburban areas. Community gardens, rooftop farms, hydroponic, aeroponic, and aquaponic facilities, and vertical production are all examples of urban agriculture. T

## 1 INTRODUCTION

The agricultural sector supports 70% of the country's 2.5 million persons. However, the sector is characterized by scarce productive land and fragile soils, coupled with erratic rainfall regime. Persistent periods of draught over the past 20 years have made access to natural resources for agricultural production even harder.

Urban agriculture has become increasingly popular across the world that includes a variety of activities: community gardens and fruit orchard, home gardens and veggie patches, urban forest, public open spaces, reserves, urban forest and recreational landscaping. Urban agriculture differs from traditional agriculture as it is integrated into densely populated areas with limited land for food production and recreation space. Urban agriculture can bring diverse vegetative structures back into urban system, support local biodiversity, and provide ecosystem services across fragmented habitats and spatial levels that in turn can reduce the impact of climatic variability (Dhakal *et al.*, 2015).

Private and public institutions have find ways to reduce reliance on food such as fruits and vegetables produced by others, and as such they decide to utilize part of their land to produce food. These initiatives are not only aimed at food production but also to create opportunities for their residents through agricultural activities (income generation and skills development) while ensuring food security for local economic development. This Report has been compiled for the Karibib Town Council that is embarking on establishing urban agricultural activities within its Townlands.

Following the Free Training of Environmental Health Officers (EHO) and representatives by Excel Dynamic Solutions (Pty) Ltd (EDS) from 12 local authorities in November 2021, EDS had requested the Town Council to share with EDS some of their existing facilities or planned projects that are listed activities in the Environmental Management Act (EMA) No. 7 of 2007 and its 2012 EIA Regulations requiring Environmental Clearance Certificates (ECCs). EDS then offered to assist the KTC with one project of their choice to obtain an ECC at no cost to the Local Authority. Therefore, to ensure compliance with the environmental legal requirements, the Town Council has chosen the establishment of urban agricultural activities within on Extension 5 of its Townlands.

## 1.1 Project Background

Karibib Town Council (hereinafter referred to as The Town Council, KTC or Proponent) proposes to establish an urban agriculture on Extension 5 located about 2km southwest of Karibib Town (within the Townlands). The plots stretch from the edge of the Town until about 1km from Navachab Mine. The locality of the planned site is shown on the map in Figure 1-1.

Town planning activities and establishment such activities (urban agriculture) as proposed are one of the listed activities that require an EIA study and Environmental Management Plan (EMP) according to Section 27 (1) of the Environmental Management Act (EMA) (No. 7 of 2007) and its 2012 Environmental Impact Assessment (EIA) regulations as follows:

### *“5. LAND USE AND DEVELOPMENT ACTIVITIES*

- *5.1 The rezoning of land from  
(d) Use for nature conservation or zoned open space to any other land use.*

### *7. AGRICULTURE AND AQUACULTURE ACTIVITIES*

#### Associated activities

### *8. WATER RESOURCES DEVELOPMENT*

- *Listed Activity 8.1: Abstraction of ground or surface water for industrial or commercial purposes.*
- *Listed Activity 8.7: Irrigation schemes for agriculture excluding domestic irrigation.”*

Subsequently, to ensure environmental management compliance of the proposed activities in the Town, the Proponent requires an Environmental Scoping Assessment (ESA) and Environmental Management Plan (EMP) developed and to apply for the project activities' ECC. The application for an ECC and the EMP will be submitted by Excel Dynamic Solutions (Pty) Ltd (EDS) to the Department of Environmental Affairs and Forestry (DEAF), Ministry of Environment, Forestry and Tourism (MEFT) for evaluation and consideration of the ECC.

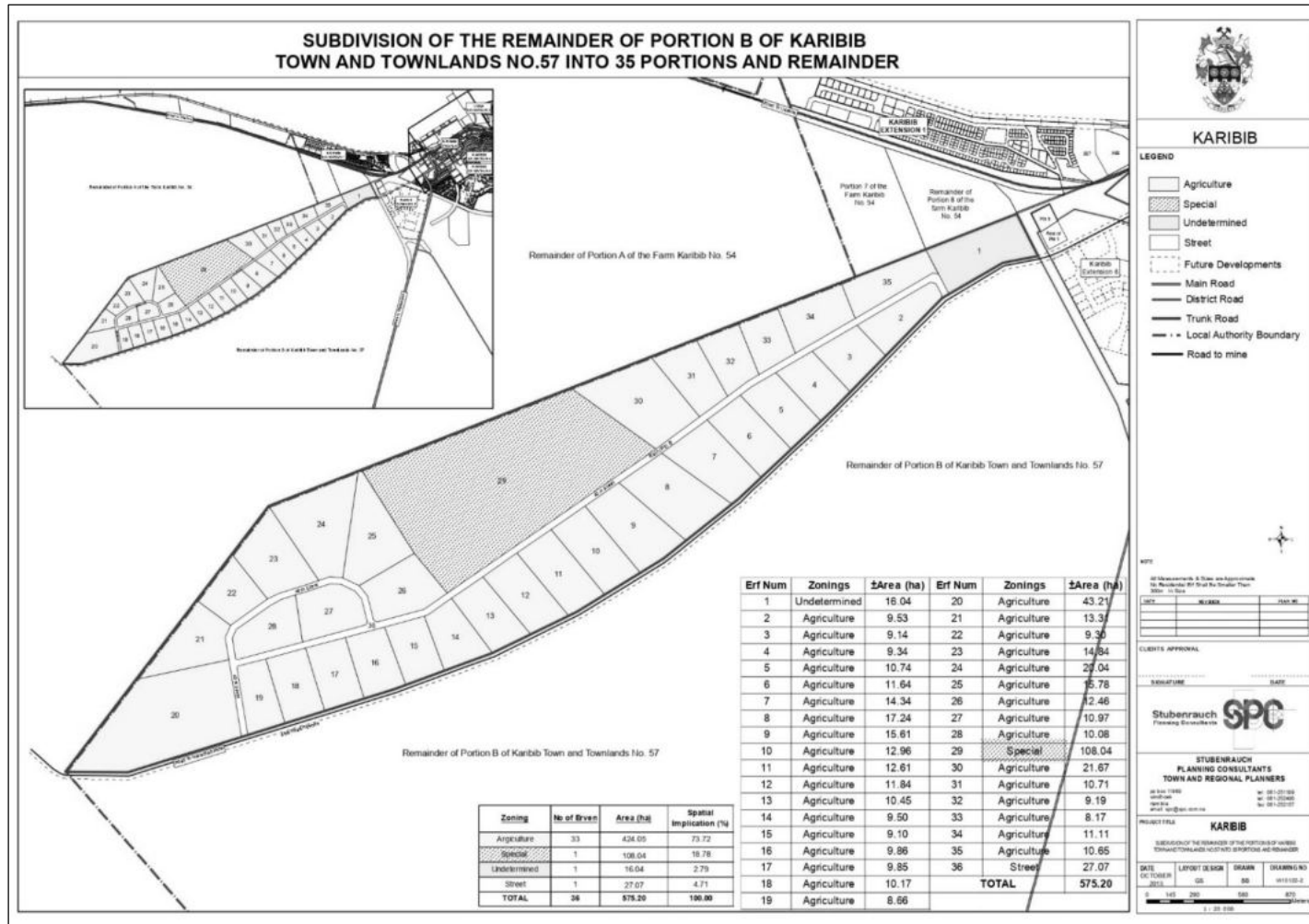


Figure 1-1: Locality map of the proposed urban agriculture establishment in Karibib

## 1.2 Terms of Reference (TOR), Scope of Work and Document Contents

There were no formal Terms of Reference (TOR) provided by the Proponent with regards to the required EIA Study (the Environmental Scoping Assessment (ESA) for this proposed project). Therefore, this Study has been commissioned and conducted according to the EMA No. 7 of 2007, and its 2012 EIA Regulations, whereby the proposed irrigation and associated works and activities is one of the listed activities in these Regulations of the EMA that may not be undertaken without an ECC. The listed activities that are relevant to proposed project are as follows:

- *"Listed Activity 8.1: Abstraction of ground or surface water for industrial or commercial purposes.*
- *Listed Activity 8.7: Irrigation schemes for agriculture excluding domestic irrigation."*

Subsequently, an application for the Environmental Clearance Certificate (ECC) accompanied by the Background Information Document (BID) was submitted to MEFT. Furthermore, an ESA process will need to be undertaken, completed, and an ESA Report and draft EMP compiled and submitted to the Department of Environmental Affairs and Forestry (DEAF) of the MEFT for evaluation and consideration of ECC issuance.

The purpose of the ESA and subsequent issuance of the ECC is to ensure that the proposed project activities are undertaken in an environmentally friendly and sustainably manner, through the effective implementations of recommended environmental management and mitigation measures to minimize the adverse identified impacts while maximizing the positive impacts.

This Report has been compiled as a required output of an environmental assessment process after the ECC application has been submitted to the Competent Authority. The ESA Report, together with the draft EMP and all its appendices will be submitted to the DEAF for evaluation.

Apart from the introductory chapter, this Report covers the following chapters:

- Project description and associated activities - (Chapter 2).
- Project alternatives considered (that were found to be environmentally friendly and technically feasible) - Chapter 3).
- The legal requirements governing the proposed project and its related activities, i.e., the legislations that the proposed development will need to comply with (Chapter 4).
- The relevant pre-project environmental conditions (environmental and social baseline) of the project site and surrounding area as presented under Chapter 5.



- The Public Consultation Process undertaken to inform, invite and engage the public (stakeholders and interested & affected parties) on the proposed project- Chapter 6.
- The presentation and assessment of key potential identified impacts associated with the proposed development (Chapter 7) - This chapter presents both the positive and negative (adverse) as well as cumulative impacts, assessment methodology and the assessment of the negative impacts. The mitigation measures in the form of management and mitigation action plans, with timeframe and implementation responsibilities are given in draft Environmental Management Plan (EMP) under Appendix A.
- The recommendations and conclusions to the environmental assessment are presented under Chapter 8, while Chapter 9 is a list of data sources (literature) consulted for the assessment.

### **1.3 The Need for the Proposed Project (Motivation)**

Namibia is almost 100% self-sufficient in red meat production but imports 60% of its total grain food requirements and 90 percent of its horticultural commodity consumption requirements. The main agricultural enterprises are livestock (cattle, sheep, and goats); grain crops (maize, millet, wheat, barley, and sorghum). However, commercial farming can be a challenging business especially in a dry country such as Namibia. The current weather changes have not been easy hence adding to sustainability constraints. To ensure food security, income generation for itself and skills development for its residents, the KTC is embarking on a mission to establish urban agricultural activities within its Townlands.

The proposed agricultural activities will not only result in crop production leading to successful income generation, but also the creation of employment opportunities and skills transfer to the locals who will be working at the site. These will both contribute to the socio-economic development in and around the Town.

### **1.4 Appointed Environmental Assessment Practitioner**

To satisfy the requirements of the EMA and its 2012 EIA Regulations, the Proponent appointed an independent team of Environmental Consultants at Excel Dynamic Solutions (Pty) Ltd (hereinafter referred to as EDS, The Consultant or Environmental Assessment Practitioner (EAP)) to conduct the required ESA process on their (Proponent's) behalf. The findings of the ESA process are incorporated into this Report. The ESA Report and the draft EMP as well as

associated documents will be submitted as part of an application for an ECC to the Environmental Commissioner at MEFT.

The ESA project is headed by Mr. Nerson Tjelos, a qualified and experienced Geoscientist and experienced Environmental Assessment Practitioner with (EAP). The ESA process and this Report and the draft EMP were conducted and compiled by Ms. Fredrika Shagama, respectively. Ms. Shagama is a qualified and experienced hydrogeologist & EAP with over 7 years of experience in water and environmental consulting and a member of the Namibian Hydrogeological Association and International Association of Hydrogeologists. She is also registered as a Practitioner with the Environmental Assessment Professionals of Namibia (EAPAN). The curriculum vitae (CV) for Ms. Shagama is presented in Appendix B.

The following chapter is presentation of the proposed project activities, in terms of project inputs, process, outputs and resources in project phases.

## 2 PROJECT DESCRIPTION: AGRICULTURAL ACTIVITIES

This chapter comprises of the planned project activities as well as services infrastructure and resources required to commercially grow crops and produce food on Extension 5 agricultural plots. The proposed irrigation methods for the planned activities will probably be a Drip system. These methods are explained in detailed later in this chapter as well as under the Alternatives chapter.

Upon issuance of the ECC and obtaining the necessary and required documentations, the Proponent will then prepare for the actual works on the plots. The following subheadings are a presentation of the planned project activities/requirements in terms of input, processes, and outputs. The description of these project activities will ease the identification of the potential impacts, particularly the negatives impact for which are the focus of the ESA.

The project activities are provided as follows.

### 2.1 Planning Phase

Once the ECC is issued, administrative and technical tasks completed, and the Town Council is ready, the establishment works, and associated activities will commence.

The required resources and services that will not require contractors will be provided by the Town Council during the establishment and operational stages of the project.

### 2.2 Project Input and Resources Requirements

In terms of inputs and resources to undertake the proposed agricultural activities, the following will be required:

- Some trucks, equipment and machinery, structures, and ablution facilities.
- Drip irrigation controllers, sprinkler heads, pumps, nets, and poles.
- Storage facilities for project equipment and materials as well as containers (water, fuel, and other supplies).

In terms of services infrastructure and human resources, the following will be required:

**2.2.1 Project Personnel and Accommodation**

The number of project personnel (staff) for setting up the project site is not yet known as this will be dependent on the human resources need by the appointed establishment contractor. Similarly, the number of people to be employed for the actual agricultural works cannot be determined at this stage. The project staff will be accommodated in the Town, therefore, no need for onsite accommodation.

**2.2.2 Water Supply Requirements**

There are already installed water pipelines on the plots, awaiting connections to the established plots. The Town Council personnel also indicated that there is a borehole on one of the plots towards the northeastern side of the site. Therefore, it would also be considered to supply the project in future.

**2.2.3 Power supply**

The plan is to utilize solar power during the operation phase of the plots.

**2.2.4 Sanitation**

A pit latrine system with septic tanks will be considered for the project. A sewage removal and management contractor will be appointed to ensure that the systems are maintained, and waste disposed of as deem necessary.

**2.2.5 Site Access (Roads)**

The site is accessible from the Town via the Navachab road and then a well-maintained unpaved single track sandy roads within the plots.

**2.2.6 Health and safety**

All project workers (for all the site project phases) will be well equipped with personal protective equipment (PPE) while performing tasks on site. Each plot will be equipped with a first aid kit.

**2.2.7 Accidental Fire management**

The project working sites and vehicles will be equipped with fire extinguishers.

**2.2.8 Site Fencing**

The plots are already fenced off to limit unauthorized access as well as safety and security.

## 2.3 Site Clearing and Establishment Phase

The site is covered by sparse and dense vegetation in some areas. During this phase, earth works will be carried out in certain areas of the project site to install the necessary services infrastructure. The general site works will include site establishment (soil excavation) and surveying. There will be some movement of heavy vehicle and equipment on and around the site area.

## 2.4 Operational and Maintenance Phase

It is within this phase that the agricultural and associated activities will be undertaken, and maintenance of the agricultural (plots) fields and equipment done by the Proponent (and or their appointed maintenance contractors).

### 2.4.1 Description of the Proposed Irrigation Method

#### A. Drip Irrigation (DI)

According to Brouwer *et al.*, (1985), drip (trickle) irrigation involves dripping water onto the soil at very low rates (2-20 litres/hour) from a system of small diameter plastic pipes fitted with outlets called emitters or drippers. Water is applied close to plants so that only part of the soil in which the roots grow is wetted, unlike surface and sprinkler irrigation, which involves wetting the whole soil profile. With drip irrigation water, applications are more frequent (usually every 1-3 days) than with other methods and this provides a very favourable high moisture level in the soil in which plants can flourish (Figure 2-1).

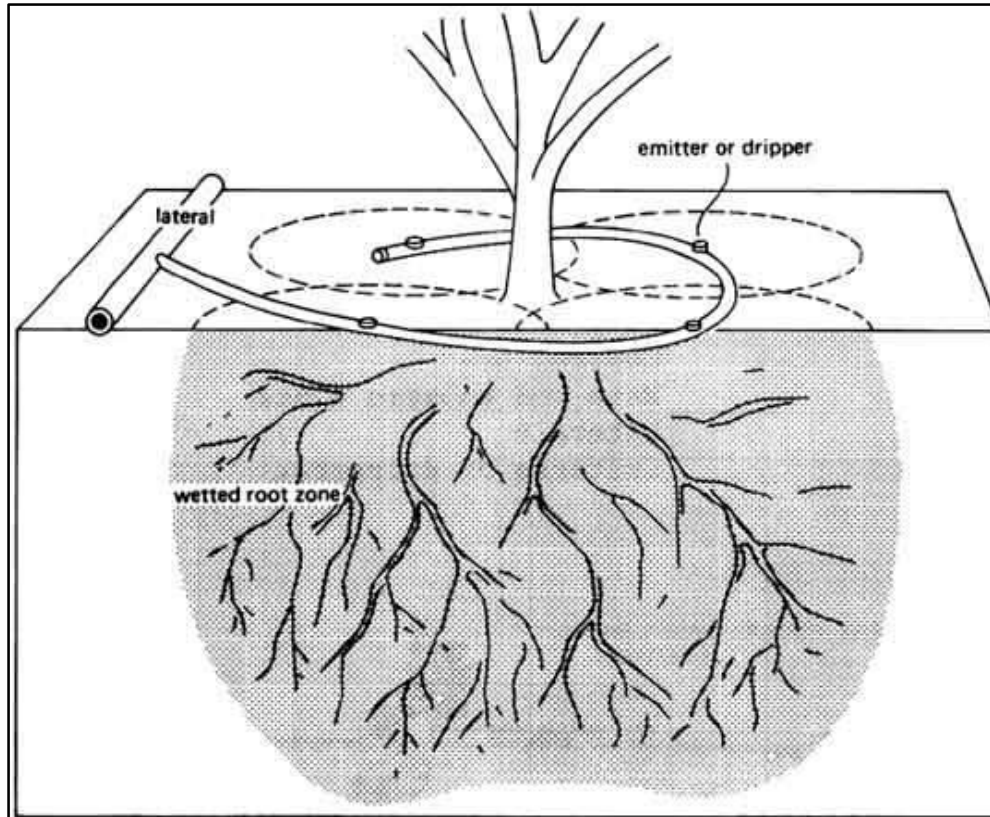


Figure 2-1: Drip irrigation method, with only the part of the soil in which the roots grow is wetted (Brouwer et al., 1985)

A typical Drip irrigation system, as seen on the layout in Figure 2-2 contains:

- A pump unit,
- Control head,
- Main and submains,
- Laterals, and
- Emitters or drippers.

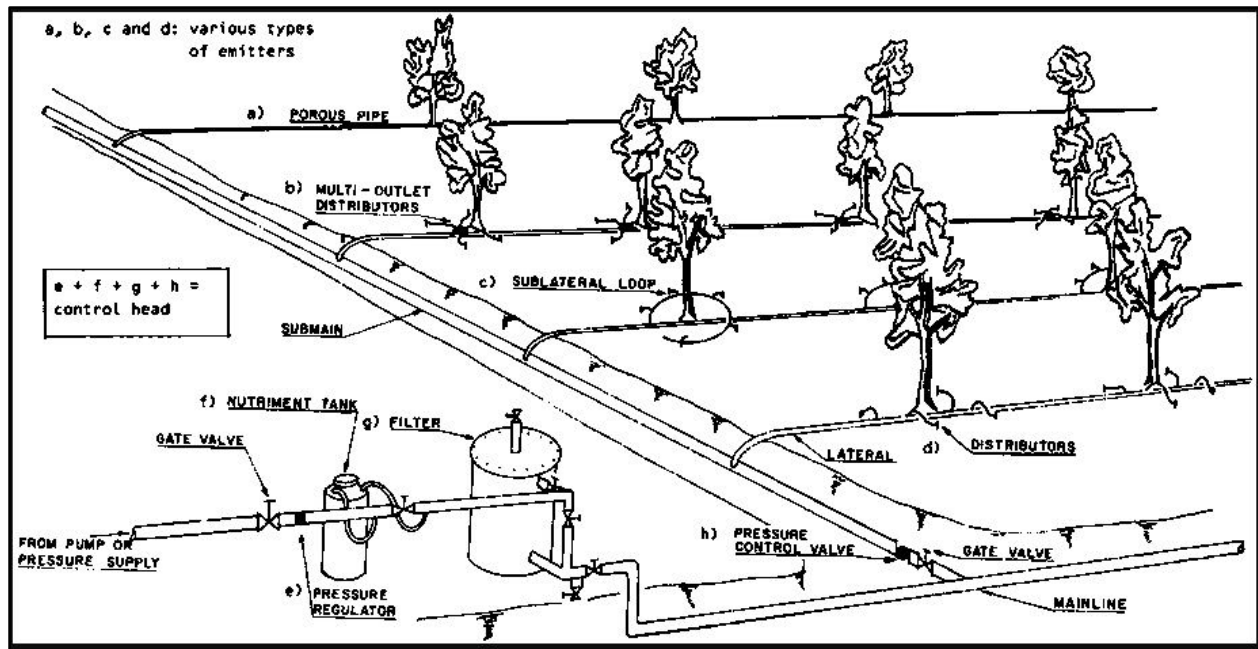


Figure 2-2: A typical example of a Drip irrigation system layout (Brouwer et al., 1985)

## 2.4.2 Crop Production Care and Water Use and Management

The operational works will entail the following in terms of crop growth and production:

- Weed and nutrients (fertilizer application) control, and
- Insect, and pest management as well as diseases control.

Furthermore, operations will also include some actions for water use and management:

- Pumping water from the site boreholes and where necessary pumped from Town water supply,
- Frequent measuring and recording of water volumes to monitor water use and for management purposes, and
- Monitoring of onsite water storage reservoir to ensure safety and manage possible water leakages.

## 2.4.3 Harvesting and Processing

After the planting and growth period, the crop will then be carefully harvested, packaged for the market, and sold to local customers (residents) and where necessary, sold to outsiders and travellers.

It is currently expected that the harvest (site produce) will be transported from site to consumers on a weekly basis, but mainly dependent on consumer demand and delivery agreements.

## **2.5 Decommissioning of Project Activities**

Due to the nature of irrigation projects, where the project life span is based on the reliability of resources, such as water availability. Given the fact that there would always be a need for food in the country, a complete decommissioning of the project activities is not anticipated at this stage.



### 3 PROJECT ALTERNATIVES

Alternatives are defined as the “*different means of meeting the general purpose and requirements of the activity*” (EMA, 2007). This section will highlight the different ways in which the project can be undertaken and to identify the alternative that will be the most practical, but least damaging to the environment is identified.

Once the alternatives have been established, these are examined by asking the following three questions:

- (a) What alternatives are technically and economically feasible?**
- (b) What are the environmental effects associated with the feasible alternatives?**
- (c) What is the rationale for selecting the preferred alternative?**
- (d) The alternatives considered for the proposed development are discussed in the following subsections.**

#### 3.1 Types of Alternatives Considered

##### 3.1.1 The "No-go" Alternative

The “No-go” alternative is the option of not proceeding with the activity, which typically implies a continuation of the status quo. In this case, this would mean, no abstraction of water from the boreholes and associated benefits.

Should the proposed project not be allowed to go ahead, the food supply and income generation by the residents would not continue. Added to this, income for the Proponent and employment will not be generated and created, respectively, leading to underutilization of the Townlands and poor socio-economic development in the Town.

The “no action” alternative simply implies that the status quo remains, and nothing happens. Discontinuing the irrigation proposal would mean that none of the potential impacts (positive and negative) identified would occur. The current land use for the proposed site would also remain unchanged.

Considering the above losses, the “no-action/go” alternative was not considered a viable option.

##### 3.1.2 Irrigation Method: Suitability

Testing of the various methods (systems) under the prevailing local conditions provides the best basis for a sound choice of irrigation method (Green Team Consultants, 2019 cited Brouwer, *et*

al, (2001)). There commonly used irrigation methods are surface, sprinkler or drip, basin, furrow, or border. The suitability of these methods depends mainly on the following factors:

- Natural conditions: These include soil type, slope, climate, and water availability.
- Type of crop: Surface irrigation can be used for all types of crops. Sprinkler and drip irrigation, because of their high capital investment per hectare, are mostly used for high value cash crops, such as vegetables and fruit trees. They are seldom used for the lower value staple crops. Drip irrigation is suited to irrigating individual plants or trees or row crops such as vegetables and sugarcane. It is not suitable for close growing crops (e.g., rice).
- Type of technology: The type of technology affects the choice of irrigation method. In general, drip and sprinkler irrigation are technically more complicated methods. The purchase of equipment requires high capital investment per hectare. To maintain the equipment a high level of 'know-how' must be available. Also, a regular supply of fuel and spare parts must be maintained which, together with the purchase of equipment. Surface irrigation systems - in particular, small-scale schemes usually require less sophisticated equipment for both construction and maintenance (unless pumps are used).
- Previous experience with irrigation: The choice of an irrigation method also depends on the irrigation tradition within the region or country. Introducing a previously unknown method may lead to unexpected complications,
- Required labour inputs: Surface irrigation often requires a much higher labor input - for construction, operation, and maintenance - than sprinkler or drip irrigation. Surface irrigation requires accurate land levelling, regular maintenance, and a high level of farmers' organization to operate the system. Sprinkler and drip irrigation require little land levelling; system operation and maintenance are less labor-intensive.
- Costs and benefits: Before choosing an irrigation method, an estimate must be made of the costs and benefits of the available options. On the cost side not only the construction and installation, but also the operation and maintenance (per hectare) should be considered. These costs should then be compared with the expected benefits (yields).

### 3.1.3 Irrigation Method: Technology

The different irrigation methods are listed and briefly described below according to Centre for Disease Control and Prevention (2016) and Brouwer, et al (1985):

- **Surface:** *Water is distributed over and across land by gravity, no mechanical pump involved.*
- **Centre pivot irrigation also known as Sprinkler irrigation:** *this method is like natural rainfall. Water is pumped through a pipe system and then sprayed onto the crops through rotating sprinkler heads. In other words, water is distributed by a system of sprinklers that move on wheeled towers in a circular pattern. This system is common in flat areas of the United States.*
- **Drip (sometimes referred to as trickle irrigation):** *With drip irrigation, water is conveyed under pressure through a pipe system to the fields, where it drips slowly onto the soil through emitters or drippers which are located close to the plants. Only the immediate root zone of each plant is wetted. Therefore, this can be a very efficient method of irrigation.*
- **Lateral move irrigation:** *Water is distributed through a series of pipes, each with a wheel and a set of sprinklers, which are rotated either by hand or with a purpose-built mechanism. The sprinklers move a certain distance across the field and then need to have the water hose reconnected for the next distance. This system tends to be less expensive but requires more labor than others.*
- **Sub-irrigation:** *Water is distributed across land by raising the water table, through a system of pumping stations, canals, gates, and ditches. This type of irrigation is most effective in areas with high water tables.*
- **Manual irrigation:** *Water is distributed across land through manual labor and watering cans. This system is very labor intensive.*

#### **3.1.4 Preferred for or Justification of the Irrigation Method**

The Proponent has presented to irrigation methods that are considered for the agricultural activities in the Town is Drip irrigation systems.

According to the comparisons of the two irrigation methods/techniques above, the two methods have more common aspects in terms of technology requirements. The only major difference is in the water demand, with the Drip irrigation system being more water conserving compared to Centre Pivot. Drip irrigation is further also considered as the most suitable when water is scarce (Brouwer, 1985). Although the two methods may have some disadvantages associated with their applications. Therefore, with that said, the Drip system will be used.

**3.1.5 Project Location and Land Ownership**

The location is strategically chosen as it is also the Proponent's property, and the land can be used for agriculture and this include crop production. The location is also chosen because there are existing boreholes well within proximity of the plots. The location can be considered environmentally friendly because there will be no need to clear a significant number of trees that may be protected because the area earmarked for agricultural activities is mainly covered by shrubs only.

**3.1.6 Water Supply Source**

The water source that will be used for the proposed activities would be groundwater. There are already installed water pipelines on the plots, awaiting connections to the established plots. The Town Council personnel also indicated that there is a borehole on one of the plots towards the northeastern side of the site. Therefore, it would also be considered to supply the project in future.

**3.1.7 Power Supply Source**

The main or preferred power supply is renewable energy (solar) given the climatic conditions and open areas of the site to establish solar panels.

The above presented project activities and associated resources are governed by certain polices, laws, regulations, etc. (legal framework). These are in terms of local, regional, national and at some extent, international. The applicable legal framework to the proposed project and its activities are provided under chapter 4. The legal framework that requires permitting and or licensing prior to project implementation are provided as such under the draft EMP.

## 4 LEGAL FRAMEWORK: LEGISLATION, POLICIES AND GUIDELINES

A review of applicable and relevant Namibian legislation, policies, and guidelines to the proposed development is given in this section. This review serves to inform the project Proponent, Interested and Affected Parties, and the decision-makers at the DEAF of the requirements and expectations, as laid out in terms of these instruments, to be fulfilled to establish the proposed agricultural activities.

### 4.1 The Environmental Management Act (No. 7 of 2007)

The Act aims at promoting sustainable management of the environment and use of natural resources. The Environmental Management Act (EMA) is broad; it regulates land use development through environmental clearance certification and/or Environmental Impact Assessments. The Act provides for the clearance certification for surface or groundwater abstractions for industrial or commercial purposes to protect water resources. It further stipulates requirements to complete the required documentation to obtain an Environmental Clearance Certificate (ECC) for permission to undertake this activity. The following Sections of the EIA Regulations that are relevant to this project are:

- *“Regulation 8.1: Abstraction of ground or surface water for industrial or commercial purposes.*
- *Regulation 8.7: Irrigation schemes for agriculture excluding domestic irrigation.*
- *Regulation 9.2 Any process or activity which requires a permit, license or other form of authorization, or the modification of or changes to existing facilities for any process or activity which requires an amendment of an existing permit, license, or authorization or which requires a new permit license or authorization in terms of a law governing the generation or release of emissions, pollution, effluent, or waste.”*

Other applicable legal obligations to the proposed irrigation activities are presented in **Table 2**.

**Table 4-1: The list of applicable national and international legislations governing the proposed project and related activities**

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
<b>NATIONAL, REGIONAL AND LOCAL</b>		
<p>The Constitution of the Republic of Namibia, 1990 as amended</p>	<p>The Constitution of the Republic of Namibia (1990 as amended) addresses matters relating to environmental protection and sustainable development. Article 91(c) defines the functions of the Ombudsman to include:</p> <p><i>“...the duty to investigate complaints concerning the over-utilisation of living natural resources, the irrational exploitation of non-renewable resources, the degradation and destruction of ecosystems and failure to protect the beauty and character of Namibia...”</i></p> <p><i>Article 95(l) commits the state to actively promoting and maintaining the welfare of the people by adopting policies aimed at the:</i></p> <p><i>“...Natural resources situated in the soil and on the subsoil, the internal waters, in the sea, in the continental shelf, and in the exclusive economic zone are property of the State.”</i></p>	<p>By implementing the environmental management plan, the establishment will be in conformant to the constitution in terms of environmental management and sustainability.</p> <p>Ecological sustainability will be main priority for the proposed development.</p>
<p>The Regional Councils Act (No. 22 of 1992)</p>	<p>This Act sets out the conditions under which Regional Councils must be elected and administer each delineated region. From a land use and project planning point of view, their duties include, as described in section 28 “to undertake the planning of the development of the region for which it has been established with a view to physical, social, and economic characteristics, urbanisation patterns, natural resources, economic development potential, infrastructure, land utilisation pattern and sensitivity of the natural environment.</p> <p>The main objective of this Act is to initiate, supervise, manage, and evaluate development.</p>	<p>The relevant Regional Councils are Interested &amp;Affected Parties and must be consulted during the Environmental Assessment (EA) process. The project site area falls under the Erongo Regional Council; therefore, they should be consulted.</p>

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
Water Act No. 54 of 1956	To consolidate and amend the laws relating to the control, conservation and use of water for domestic, agricultural, urban and industrial purposes; to make provision for the control, in certain respects, of the use of sea water for certain purposes; for the control of certain activities on or in water in certain areas; for the control of activities which may alter the natural occurrence of certain types of atmospheric precipitation; for the control, in certain respects, of the establishment or the extension of townships in certain areas; and for incidental matters.	This Act (Government Gazette 5367) has been passed by Parliament, but it has not yet been brought into force. The Regulations have been passed in December 2016 but have not yet been promulgated. Therefore, the Regulations of the 1956 Water Act still apply.
Water Resource Management Act No 11 of 2013	Details on who and how water may be used. Section 45 describes “a person must not abstract/ irrigate and use water from a water resource unless the person holds a license issued by the Minister that authorises the abstraction and use of water from that water source.	The 2013 Water Act restricts water abstraction activities (for commercial purposes) without an authorised licence.  The protection (both quality and quantity/abstraction) of water resources should be a priority.
Fertilizers Farm Feeds and Agricultural Remedies Act No. 36 of 1947 and its 2007 Regulation	To provide for the appointment of a Registrar of Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies; for the registration of fertilizers, farm feeds agricultural remedies and stock remedies; to regulate or prohibit the importation, sale, acquisition, disposal or use of fertilizers, farm feeds, agricultural remedies and stock remedies; to provide for the designation of technical advisers and analysts; and to provide for matters incidental thereto.	The Proponent should ensure that they obtain relevant permits or licenses from the Directorate of Agricultural Extensions and Engineering Services of the Ministry of Agriculture, Water and Land Reform (MAWLR)
Soil Conservation Act No. 76 of 1969	The Act makes provision for the prevention and control of soil erosion and the protection, improvement and conservation of soil, vegetation and water supply sources and resources, through directives declared by the Minister.	Duty of care must be applied for soil conservation management measures must be included in the EMP.

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
Forestry Act No. 12 of 2001	<p>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.</p> <p>These provisions are only guidelines.</p>	<p>Should there be trees within the actual footprint of the site that need to be removed; the Proponent should notify the nearest Department of Environmental Affairs and Forestry (Forestry Division) at MEFT. The number and/or type of trees to be removed to allow establishment works should also be submitted to DEAF. Should these trees be of a protected species, the permit to remove them should be applied from the nearest Forestry office.</p>
Public Health Act (No. 36 of 1919)	<p>Section 119 states that “no person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health.”</p>	<p>The Proponent and all its employees or contractors should ensure compliance with the provisions of these legal instruments.</p>
Health and Safety Regulations GN 156/1997 (GG 1617)	<p>Details various requirements regarding health and safety of labourers.</p>	
Public and Environmental Health Act No. 1 of 2015	<p>The Act serves to protect the public from nuisance and states that no person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health.</p>	<p>The Proponent and their contractors should ensure that the project infrastructure, vehicles, equipment, and machinery are designed and operated in a way that is safe, or not injurious or dangerous to public health and that the noise and dust emissions which could be considered a nuisance remain at acceptable levels.</p> <p>The Proponent should ensure that the public as well as the environmental health is preserved and remain uncompromised.</p>



Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
<p>Atmospheric Pollution Prevention Ordinance (No.11 of 1976)</p>	<p>This ordinance provides for the prevention of air pollution.</p>	<p>Measures should be instituted to ensure that dust emanating from site establishment activities and operations is kept at acceptable levels. In other words, the proposed project and related activities should be undertaken in such a way that they do not pollute or compromise the surrounding air quality. Mitigation measures should be put in place and implemented on site.</p>
<p>Hazardous Substance Ordinance, No. 14 of 1974</p>	<p>The ordinance provides for the control of toxic substances. It covers manufacture, sale, use, disposal and dumping as well as import and export. Although the environmental aspects are not explicitly stated, the ordinance provides for the importing, storage, and handling.</p>	<p>The Proponent should handle and manage the storage and use of hazardous substances on site so that they do not harm or compromise the site environment</p>
<p>Petroleum Products and Energy Act (No. 13 of 1990) Regulations (2001)</p>	<p>Regulation 3(2)(b) states that “No person shall possess or store any fuel except under authority of a licence or a certificate, excluding a person who possesses or stores such fuel in a quantity of 600 litres or less in any container kept at a place outside a local authority area.</p>	<p>The Proponent should obtain the necessary authorization from the MME for the storage of fuel on-site in tanks of capacity more than 600 litres.</p>
<p>Road Traffic and Transport Act, No. 22 of 1999</p>	<p>The Act provides for the establishment of the Transportation Commission of Namibia; for the control of traffic on public roads, the licensing of drivers, the registration and licensing of vehicles, the control and regulation of road transport across Namibia's borders; and for matters incidental thereto. Should the Proponent wish to undertake activities involving road transportation or access onto existing roads, the relevant permits will be required.</p>	<p>Mitigation measures should be provided for since the project activities will make use of the public roads.</p> <p>An access road permit from the main road providing access to the project site should be applied for.</p>

Legislation/Policy/ Guideline	Relevant Provisions	Implications for this project
National Heritage Act No. 27 of 2004	The Act makes provision for the protection and conservation of places and objects of heritage significance and the registration of such places and objects. Part V Section 46 of the Act prohibits removal, damage, alteration, or excavation of heritage sites or remains, while Section 48 sets out the procedure for application and granting of permits such as might be required in the event of damage to a protected site occurring as an inevitable result of development. Part VI Section 55 Paragraphs 3 and 4 require that any person who discovers an archaeological site should notify the National Heritage Council. Section 51 (3) sets out the requirements for impact assessment.	The Proponent should ensure compliance with this Acts' requirements. The necessary management measures and related permitting requirements must be taken. This done by consulting with the National Heritage Council of Namibia.
The National Monuments Act (No. 28 of 1969)	The Act enables the proclamation of national monuments and protects archaeological sites.	
Labour Act (No. 6 of 1992)	The Ministry of Labour, Industrial Relations and Employment is aimed at ensuring harmonious labour relations through promoting social justice, occupational health and safety and enhanced labour market services for the benefit of all Namibians. This ministry insures effective implementation of the Labour Act no. 6 of 1992.	The Proponent should ensure that the project establishment and operations and maintenance, do not compromise the safety and welfare of workers.

The legal requirements above have been listed and explained as per their relevance to the project. The project is being carried in a specific environment that may be affected in terms of its biophysical and social features. Thus, the environmental baseline (receiving environment) of the project area is presented under the next chapter.

## 5 THE RECEIVING ENVIRONMENT

The proposed agricultural activities will be undertaken in specific environmental and social conditions, and it is crucial to understand these pre-project conditions of the environment. This will aid in laying down background "information" of the status quo and future projections of environmental conditions after the implementation of the project. This also aids in identifying the sensitive environmental and social features that may need to be protected through the effective implementation of impact specific management and mitigation measures.

The baseline information has also been complemented by review of existing different and relevant data sources conducted in the Region and immediate surroundings of the site. The information has been complemented by raw data obtained from observations made on site and project area.

The summary of selected biophysical and social baseline information about the project site area is given below.

### 5.1 Climate

According to Stubenrauch Planning Consultants (2016), the town of Karibib and surroundings are situated in a semi-desert climate, with low rainfall and high evaporation. Evaporation rates are between 2,330 and 2,440mm per year. The annual average rainfall recorded between 1967 and 1983 was 244mm, 180mm between 1980 and 2002 and 215mm between 2008 and 2010. Rainfall in the area is highly variable in terms of volume and its distribution. The average annual temperature is more than 22.3°C, with an average maximum temperature of between 34 and 36°C, and an average winter month minimum of between 25 and 28°C.

The Karibib rainfall information sourced from World Weather Online (2022) for the period of 2009 to 2021 as shown in Figure 5-1 shows the highest rainfall recorded in February 2012 at 577mm which lasted for 21 days. The second highest rainfall was in January 2011 recorded at 507mm, where it rained for 22 days.

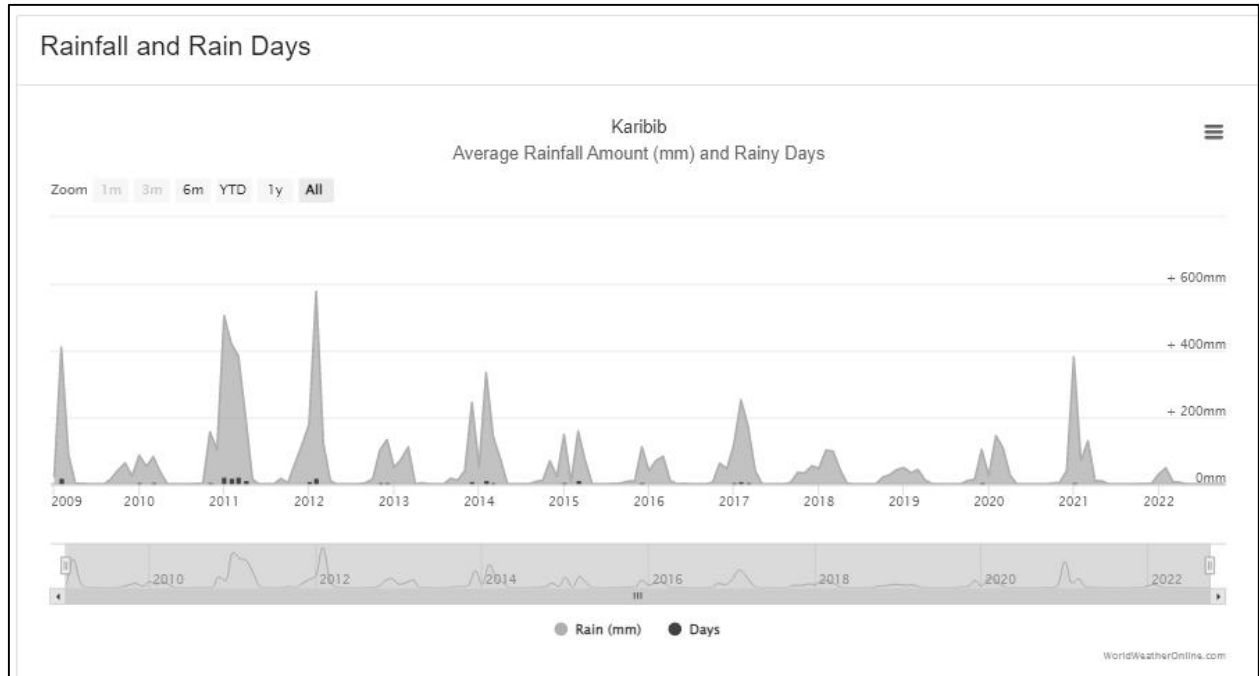


Figure 5-1: The rainfall and rain days chart for Karibib (World Weather Online, 2022)

The monthly average rainfall is shown in Figure 5-2 indicates that February has the highest average rainfall of 185 mm followed by January and March with 123mm and 124mm, respectively.

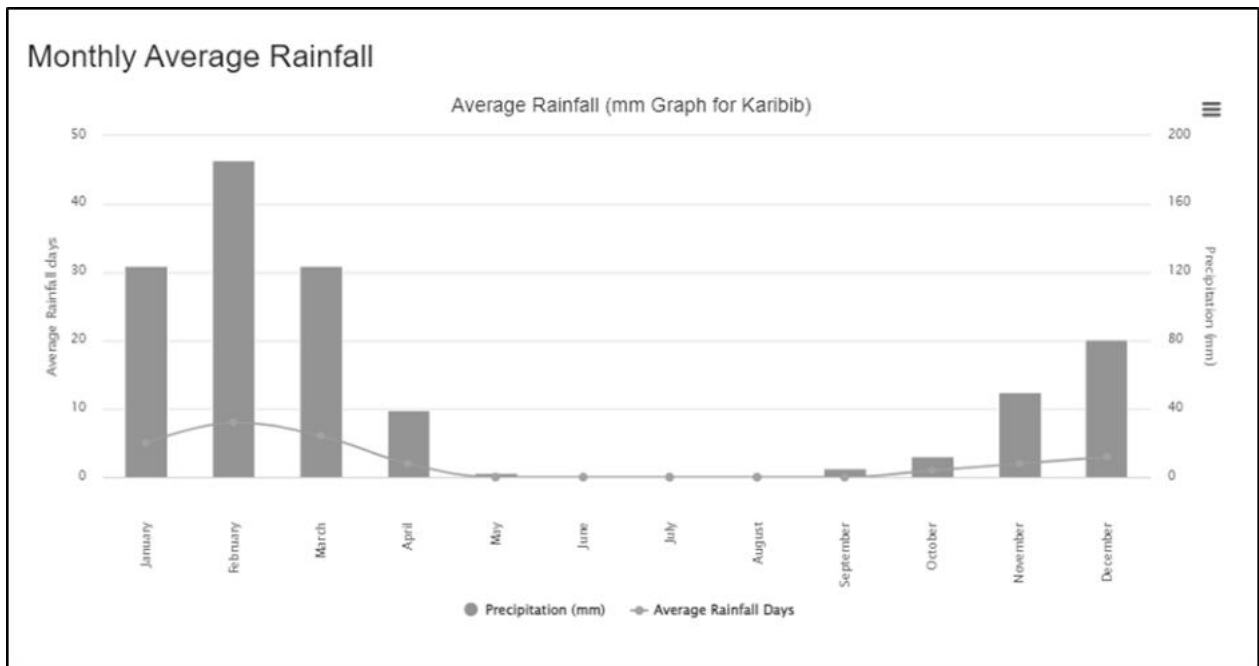


Figure 5-2: The monthly average rainfall chart for Karibib (World Weather Online, 2022)

The average temperatures of Karibib ranges between 16-26°C, with October and May, being the hottest and coldest months with 35°C and 8°C, respectively (World Weather Online, 2022). Figure 5-3 and Figure 5-4 show the maximum, minimum, and average and monthly average temperatures for Karibib.

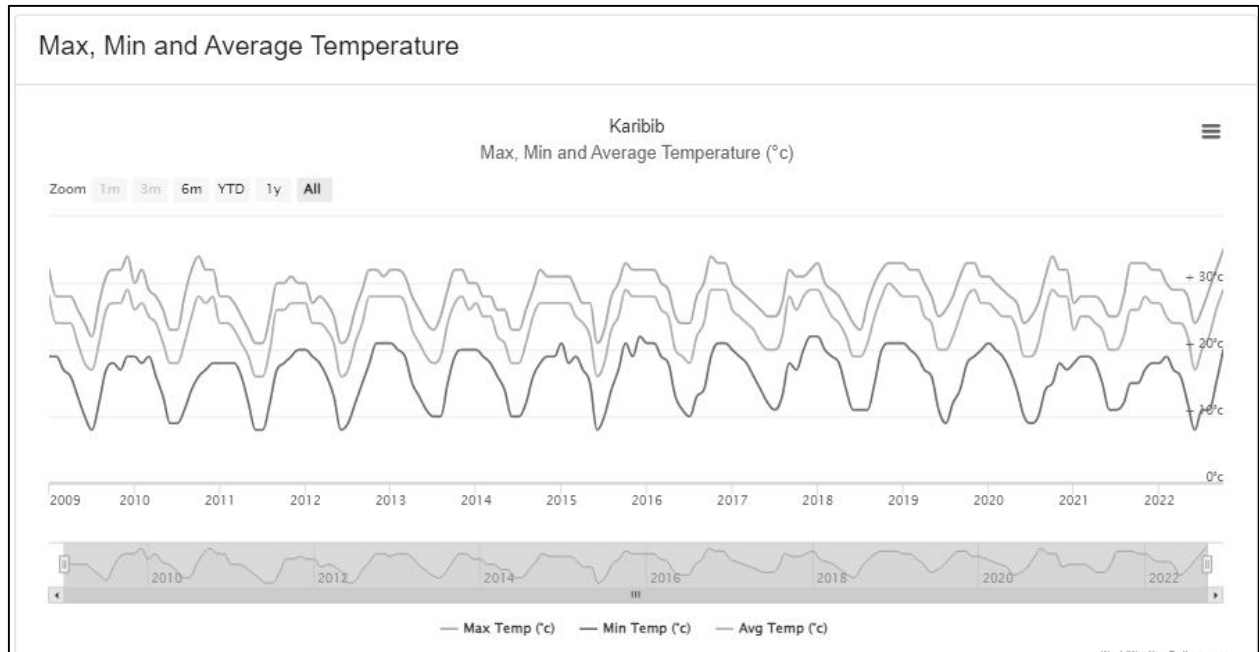


Figure 5-3: The maximum, minimum and average temperature for Karibib (World Weather Online, 2022)

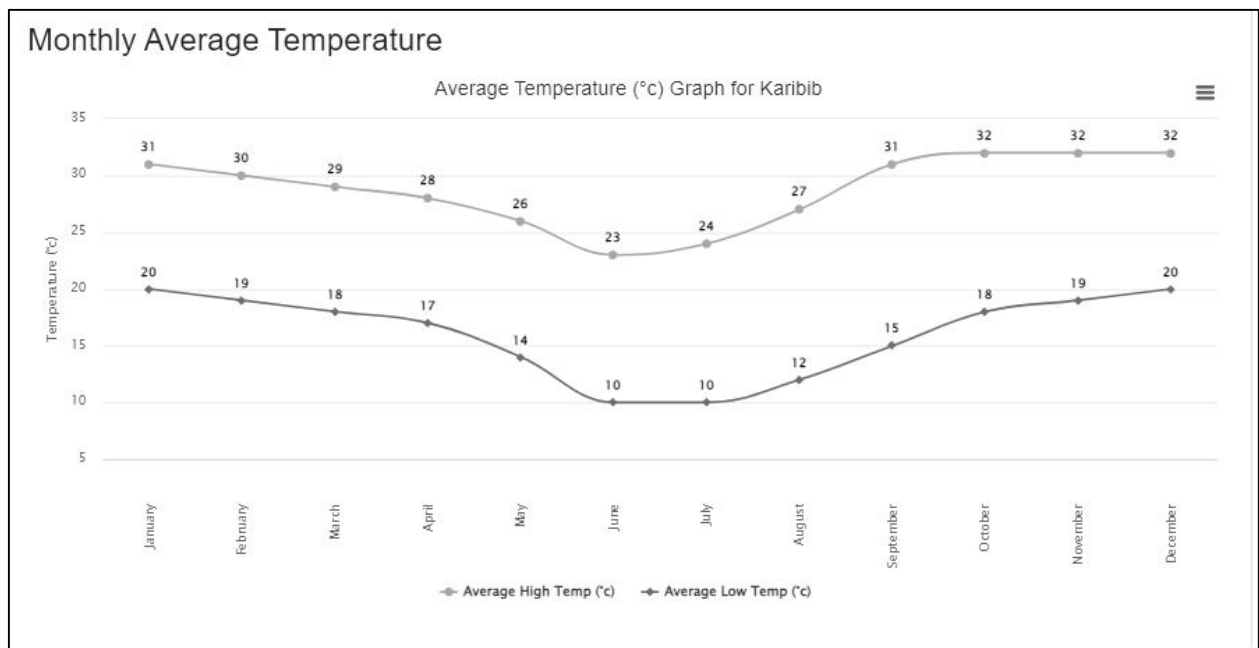


Figure 5-4: The monthly average temperatures for Karibib (World Weather Online, 2022)

### 5.2 Landscape and Topography

The landscape of the Site and Karibib area is referred to as the Central-Western Plains and according to Mendelsohn et al (2002), the Central-Western Plains landscapes stretching back from the coast, this broad area of plains extends inland for about 450km in places. The plains were largely formed by erosion cutting back into higher ground and carving out the catchment areas of several major rivers, such as the Khan, Omaruru, Swakop and Ugab.

In terms of topography, the Site is relatively flat with an elevation ranging from 1,000 to 1,300m above mean sea level - Figure 5-5. There are some mountains to the far south, north, and east and to the immediate west of the plots - Figure 5-6.

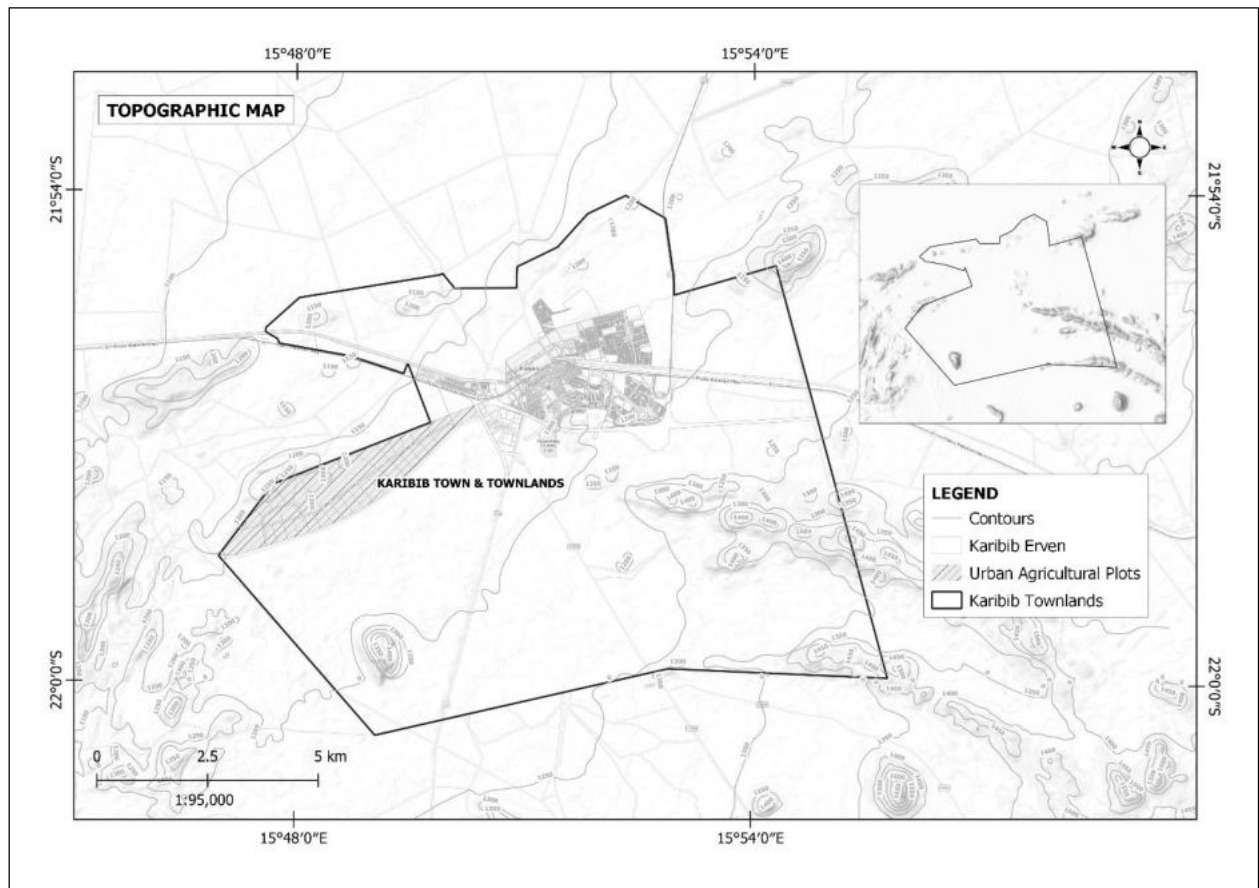


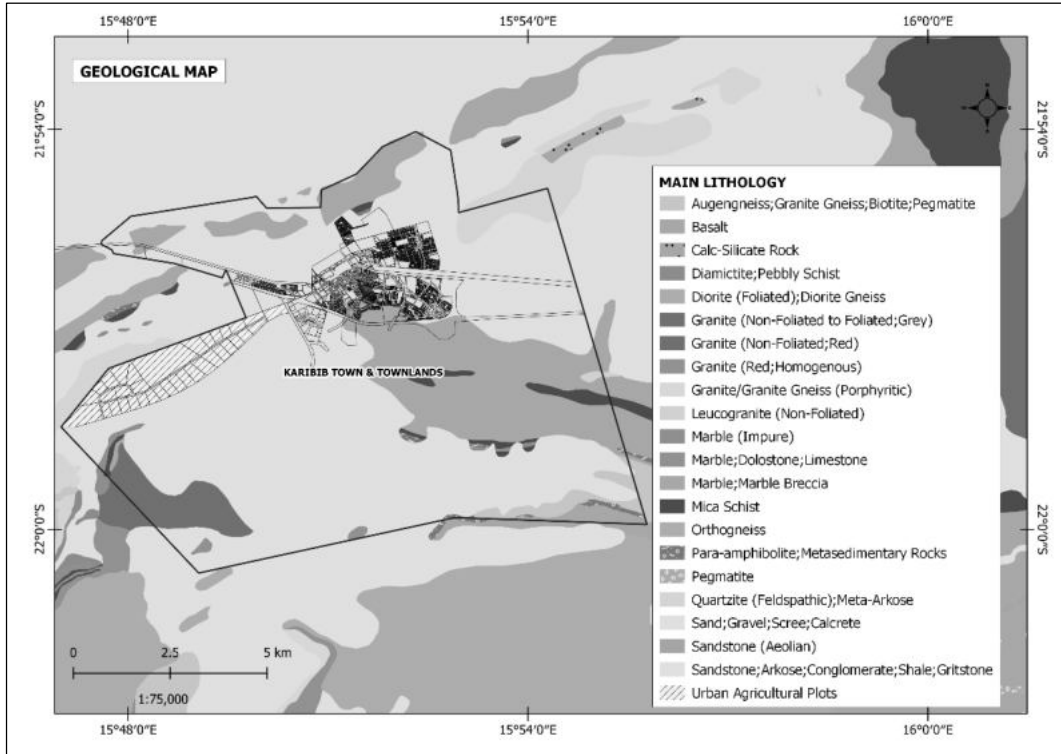
Figure 5-5: The topography project site and surrounding areas



**Figure 5-6: The topography around the Site (view to the northwest)**

### **5.3 Geology and Soils**

The geology of the Site is characterized and dominated by the Damara Sequence. This sequence underlies most of central and northern Namibia. The Damara Sequence and consist of metamorphic rocks like mica schist, traversed by micaceous quartzite (Lohe *et al.*, 2021). The geology map of the project Site and surrounding areas is shown in Figure 5-7. The map indicates that the Site is underlain by a thin layer of unconsolidated sediments (alluvium, sand, gravel and calcrete). These sediments are then underlain by rock units of sandstone, schist and shale and quartzite to the southwest.



**Figure 5-7: The general geology map for the area**

The dominant soils on and around the site area are Petric Calcisols and rock outcrops (Figure 5-8). According to Mendelsohn et al (2002), Petric part of the soil type indicates soils with a solid layer at a shallow depth that remains hard even when wet. Calcisols are soils found in depressions or other low-lying areas of the landscape, and typically contain accumulations of calcium carbonate, often in a cemented form called calcrete (Mendelsohn et al., 2002).



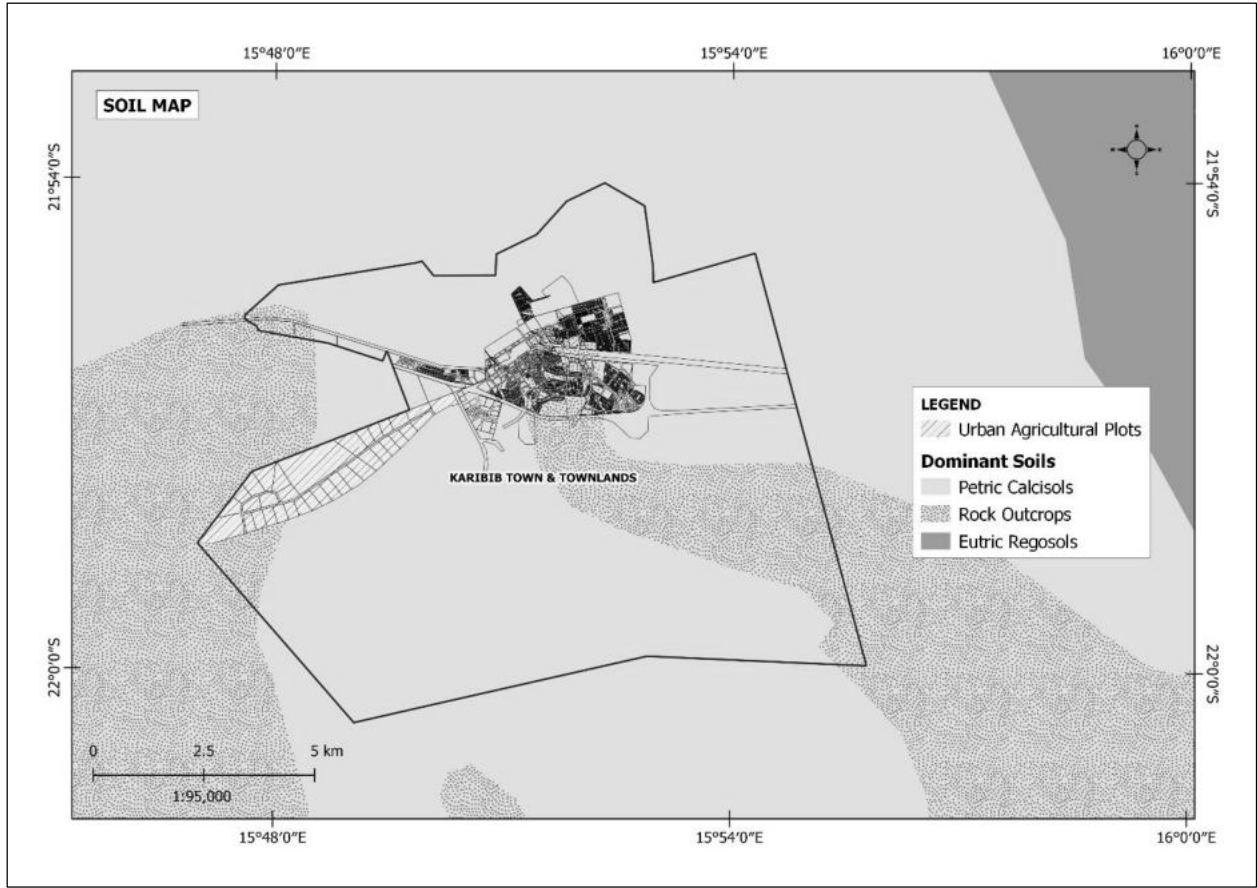


Figure 5-8: The map of site soils and surroundings

The site soils are reddish brown sandy loamy and gravel at the streams flow paths, possibly owing to a high content of iron and or manganese as shown in Figure 5-9 below.



Figure 5-9: The common soils on the plots

### 5.3.1 Hydrology and Hydrogeology

#### A. Hydrology (Surface water)

There is not much water on the surface in Namibia, as the little rain that falls either evaporates, seeps into the ground or is rapidly drained by ephemeral rivers that dominate natural surface water systems inside the country. The only perennial water systems (rivers) that can hold surface water are extremely varied, ranging from great rivers that define the country's borders, to a host of smaller rivers and channels that flow at varying frequencies. There is no perennial river within the project area nor Erongo Region a large.

#### B. Hydrogeology (Groundwater)

From the hydrogeological classification in Namibia, Karibib area falls within the Central Namib - Windhoek Area Groundwater Basin that stretches from Windhoek in the east and to the Atlantic Ocean in the west. The Ugab and Kuiseb rivers form the northern and southern boundaries (Christelis and Struckmeier, 2011). The hydrogeological units in the area comprise of limestone, dolomite and marble. The groundwater potential of fractured aquifers in the Swakop Group of the Damara Sequence is generally low. However, the carbonates (dolomite, limestones and marbles) are of moderate potential and at properly selected targets like fracture zones and karstified contact zones, high yields can be found depending on the amount of rainfall and associated weathering and recharge. Apart from direct infiltration of rainwater, recharge of the aquifer in the area occurs through leakage (floodwaters during good to heavy rains) from the rivers that appear to provide good quality water (Christelis and Struckmeier, 2011).

According to SLR Namibia (2013), the Karibib Formation consists of an interbedded succession of dark grey marble, ribbon marble that is made up of thin alternating layers of light and dark grey marble, sedimentary marble breccias, grey phyllitic dolomite and laminae of calcretised-silicate rock. The marble band characteristics makes it the most productive aquifer in the area. Furthermore, the main aquifer in the Karibib area is the fractured and slightly karstified, marble band of Karibib Formation, which belongs to the geosynclinal Damara Supergroup. This potential of this aquifer is mainly towards the eastern parts of Karibib such as the Okatji Marble Mine (Farm Okatjimukuju 55) which explains the moderate (good) yield of the Farm borehole. When pumped, the Farm borehole yields 2.5m<sup>3</sup> per hour which is equivalent to 2,500 liters per hour (GCS Water & Environmental Consultants, 2016).

Groundwater within the adjacent project area is hosted in fractured, fissured and karstified aquifers and rock units with little groundwater potential as shown in Figure 5-10. The latter is partly due to the generally unfavourable aquifer properties of Damara Sequence rocks (intact /

compacted or without faults, fractures or ideal contact zones to allow groundwater flow and storage).

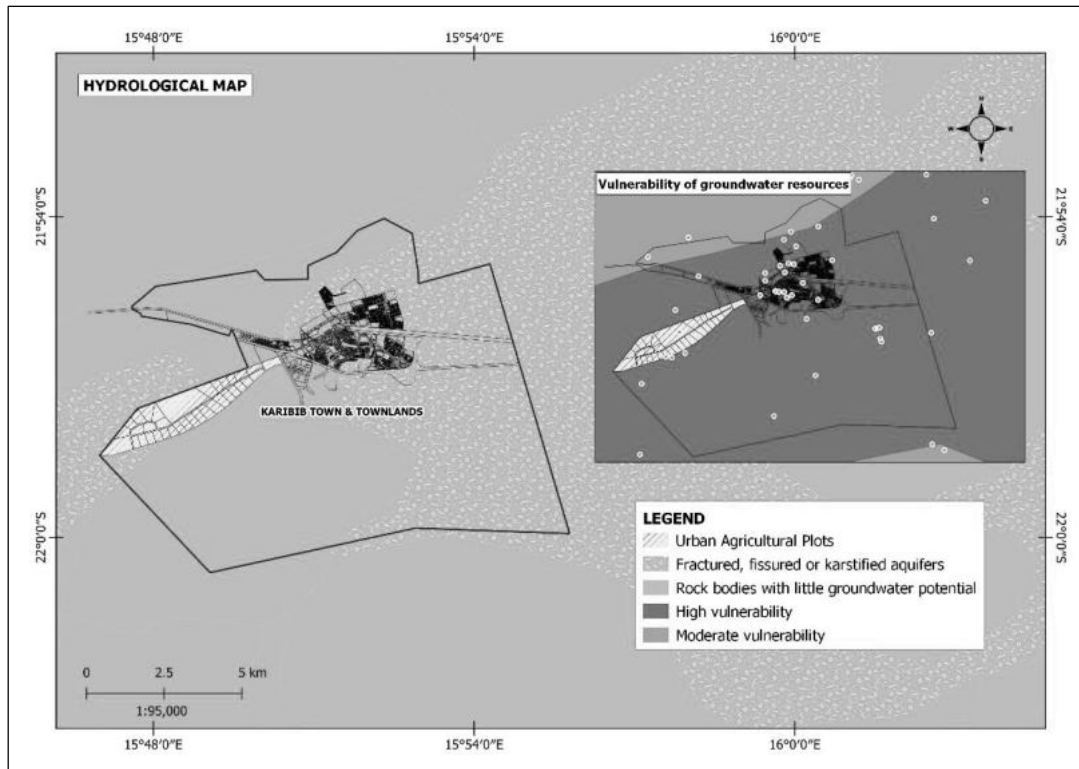


Figure 5-10: The groundwater map of project site

## 5.4 Terrestrial Biodiversity: Flora and Fauna

### 5.4.1 Fauna

The Karibib area in general is regarded as “moderate” in overall (all terrestrial species) diversity while the overall terrestrial endemism in the area on the other hand is “high” (Mendelsohn et al. 2002 as cited by Cunningham, 2022). The overall diversity and abundance of large herbivorous mammals (big game) is viewed as “moderate” with 3-4 species expected – e.g. gemsbok, kudu, mountain zebra and springbok – while overall diversity and density of large carnivorous mammals (large predators) is viewed as “moderate” with 4 species expected – e.g. leopard, cheetah, spotted and brown hyena (Mendelsohn et al. 2002 as cited by Cunningham, 2022).

#### 5.4.1.1 Reptile Diversity

About 75 species of reptiles are expected to occur in the Karibib area with 34 species being endemic – i.e. 45.3% endemic. These consist of at least 30 snakes (1 blind snake, 2 thread snake, 2 Python, 2 burrowing snakes and 23 typical snakes), 11 of which are endemic (33.3%) to

Namibia, 2 tortoises, 1 terrapin, 42 lizards (1 worm lizard, 10 skinks, 6 Old World lizards, 2 plated lizards, 1 girdled lizard, 1 monitor lizard, 3 agamas, 1 chameleon and 17 geckos), 23 (54.8%) of which are endemic to Namibia. Skink's (10 species), Old World lizards (6 species) and gecko's (17 species) are the most numerous lizards expected from the general area. Namibia with approximately 129 species of lizards (Lacertilia) has one of the continents richest lizard fauna (Griffin, 1998a). Geckos have the highest occurrence of endemics in the general area with 13 of the 17 species (76.5%) expected and/or known to occur in the area, being endemic to Namibia, (Cunningham, 2022).

#### 5.4.1.2 Amphibian Diversity

About 7 species of amphibians are expected to occur in suitable habitat in the Karibib area. The area is under represented, with 2 toads, and 1 species each for rubber, puddle, bullfrog, sand and platanna known and/or expected (i.e. potentially could be found in the area) to occur in the area. Of these, 2 species are endemic (*Poyntonophrynus (Bufo) hoeschi* and *Phrynomantis annectens*) (Griffin 1998b) and 1 species is classified as "near threatened" (*Pyxicephalus adspersus*) (Du Preez and Carruthers 2009) – i.e. high level (42.9%) of amphibians of conservation value from the general area, (Cunningham, 2022).

#### 5.4.1.3 Mammal Diversity

About 87 species of mammals known and/or expected to occur in the general Karibib area, 9 species (10.3%) are classified as endemic. Rodents (of which 5 species – 18.5% – are endemic) and bats (of which 1 species is classified as rare) are the groups least studied. Species of greatest concern in the general area are those viewed as rare in Namibia – i.e. Namibian wing-gland bat and Southern African hedgehog – and species classified as vulnerable (cheetah, leopard, Hartmann's mountain zebra, giraffe) and near threatened (African straw-coloured fruit bat, Commerson's roundleaf bat, striped leaf-nosed bat, brown hyena) by the IUCN (2020). Another important and unique species, although not observed, but known to occur in the general area, is the endemic Kaokoland slender or black mongoose (Cunningham, 2022).

### 5.4.2 Flora

The general Karibib area is viewed as an area of importance for local endemic plant species, especially the Erongo Mountains with between 26-35 endemic species (Mendelsohn et al. 2002). The overall plant diversity (all species) in the general Karibib area is estimated at between 150-299 species and the Erongo Mountain area between 400-499 species (Mendelsohn et al. 2002).

These estimates are limited to “higher” plants as information regarding “lower” plants is sparse. The greatest variants affecting the diversity of plants are habitat and climate with the highest plant diversity generally associated with high rainfall areas. Pockets of high diversity are found throughout Namibia in “unique” habitat – often transition zones – e.g. mountains, inselbergs, etc. Plant endemism, other than the Erongo Mountains, is viewed as “medium to high” – with between 6-15 endemics expected from the general area (Mendelsohn et al. 2002). Furthermore, Mendelsohn et al. (2002) views the overall plant production as medium to low in the general Karibib area and high in the Erongo Mountains, the availability of hardwoods as medium and the grazing and browse as average in the general area. Bush thickening (encroachment) is viewed as problematic between Karibib and Omaruru with *Acacia reficiens* (red-bark Acacia) the dominant problem species (Bester 1996, Cunningham 1998, Mendelsohn et al. 2002 as cited by Cunningham, 2022).

The site medium to densely vegetation of overgrown grass cover, shrubs and young trees of camelthorn species of *Acacia erioloba*, *Acacia Reficiens* and *Boschia*. The typical vegetation observed onsite is shown in Figure 5-11.



**Figure 5-11: Some densely distributed and scattered young shrubs and young trees within the plots site**

The map of the vegetation on and around the project site is shown in Figure 5-12, indicating that the site is characterized by shrubland of the central escarpment.

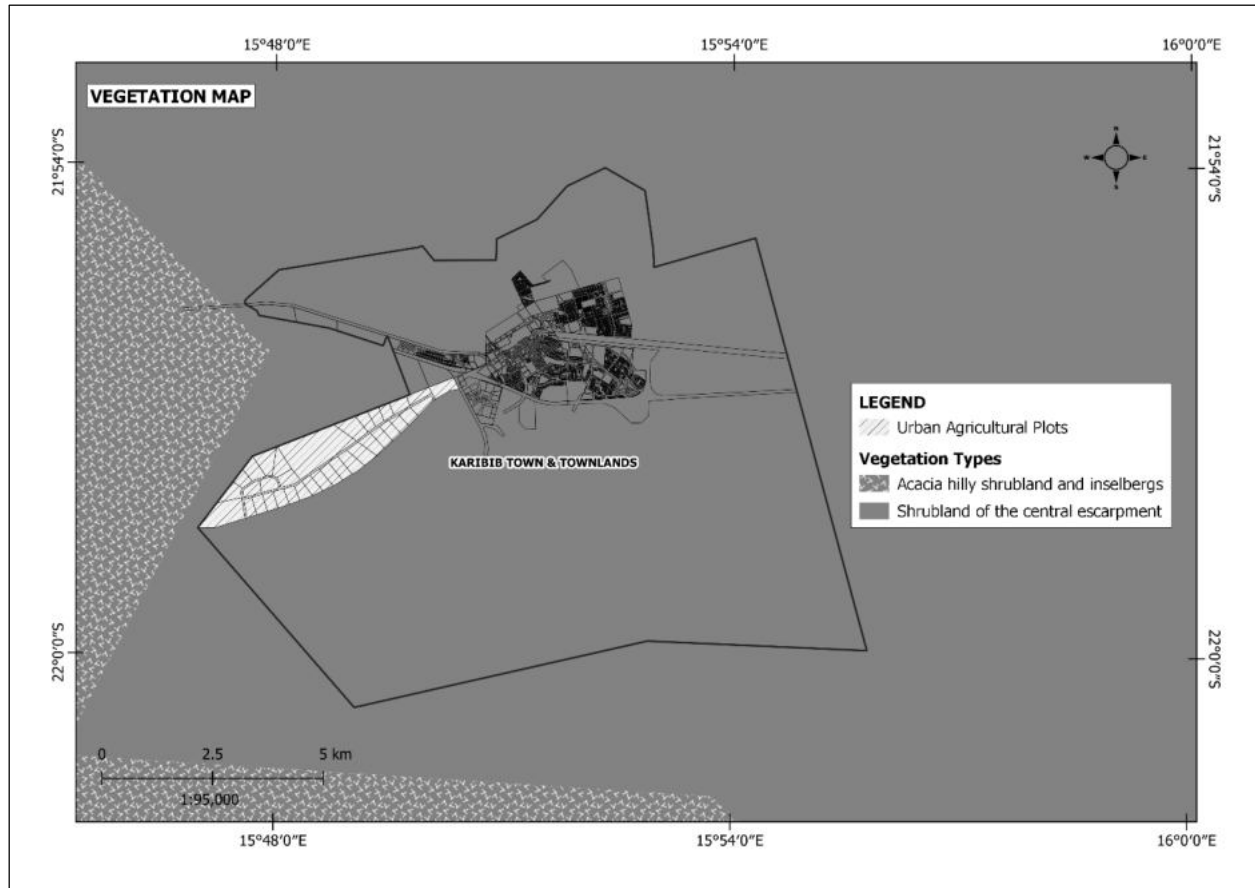


Figure 5-12: The vegetation map of the site area

### 5.5 Heritage and Archaeology

At the time of this assessment, there was not nationally or locally recognized archaeological sites recorded within the site (plots).

There is a possibility that unrecorded or undiscovered archaeological features or artefacts may be discovered during site establishment. In the event of an archaeological findings, the procedures outlined in the National Heritage Act, No. 27 of 2004 are to be followed. Section 55 (4) of the National Heritage Act, No. 27 of 2004, requires that any archaeological or paleontological object or meteorite discovered are reported to the National Heritage Council as soon as practicable.

## 5.6 Surrounding Land Uses

The site is bordered to the northeast by the Karibib Town, to the east by some farms, to the immediate east-southeast by the Navachab road. The Navachab mine is found on the southwest of the plots site and to the west are mountains and farms beyond the mountains, etc.

## 5.7 Socio-Economic Status

### 5.7.1 Demography

The Karibib constituency has a population of 13,320 in 2011 up from 12,084 in 2001, implying that the town had grown by 10.2% in the ten-year period (NSA, 2014). This was less than for the national (15.4%) and regional (40.1%) and Walvis Bay (28%) growth rates over the same period (NSA, 2014). Growth since 2011 has been robust according to municipal officials and other sources. Walvis Bay also had a relatively high growth rate between 2001 and 2011 and has continued with robust growth since then.

### 5.7.2 Economic Activities

The economic activities of the Erongo Region, including the project area (Karibib) are summarized as follows:

- Tourism: the Erongo Region offers some of the most spectacular and popular tourist destinations as well as a variety eco-, wildlife, cultural and adventure tourism opportunities.
- Agriculture and Farming: from a local perspective, agriculture plays a main economic role in the area outside the Town as most people depend on subsistence (livestock) for income at a communal and commercial level, as well as some crop farming with small-scale gardening.
- Mining: Mineral mining and mining operations are moderately held activities in the Erongo Region. Mining activities are common in the Erongo Region and provides livelihood to many of the Region's residents. There are already existing active mining licenses around the vicinity of the Town. According to the Erongo Regional Council (2015), the mining Sector in the Region has been characterized by the establishment and expansion of several Uranium mines over the past decade due to an increased demand for this energy source. The Erongo Region also accommodates the mining of commodities such as gold, marble, granite, salt, and semi-precious stones.

### 5.7.3 Infrastructure and Services

In terms of services infrastructure, the Erongo Region is well serviced and equipped with necessary services and infrastructure such as roads, railways, schools, health facilities, and other basic services.

From a regional and local perspective, the services that are concentrated towards the town of Karibib, and these includes:

- Accessibility: The project area lies near the B2 road which is known as the Trans-Kalahari Highway which carries large traffic volume between Windhoek and Walvis Bay (passing through Karibib Town) and it is considered to be the regional (Erongo) form of trade route.
- Water Supply: The project area is situated close to the NamWater supply scheme which consists of pump station located near the project area. Bulk water to Karibib is pumped by NamWater from the Swakoppoort reservoir to a treatment plant in Karibib.
- Power Supply: Karibib Town is supplied by a 66kV overhead powerline belonging to ErongoRED connected to a 2.5 MVA substation. The power required for the mining activities will be sourced from the existing power line however renewable grid power will be considered for the project.
- Telecommunication services: The area of Karibib near the ML and the communities within the ML are well connected to the rest of the country and world via local network service providers. The main providers of this service in the area are Telecom Namibia (through both landlines and cellular connection) and MTC Namibia.

The services and infrastructure around the project site is shown in Figure 5-13.



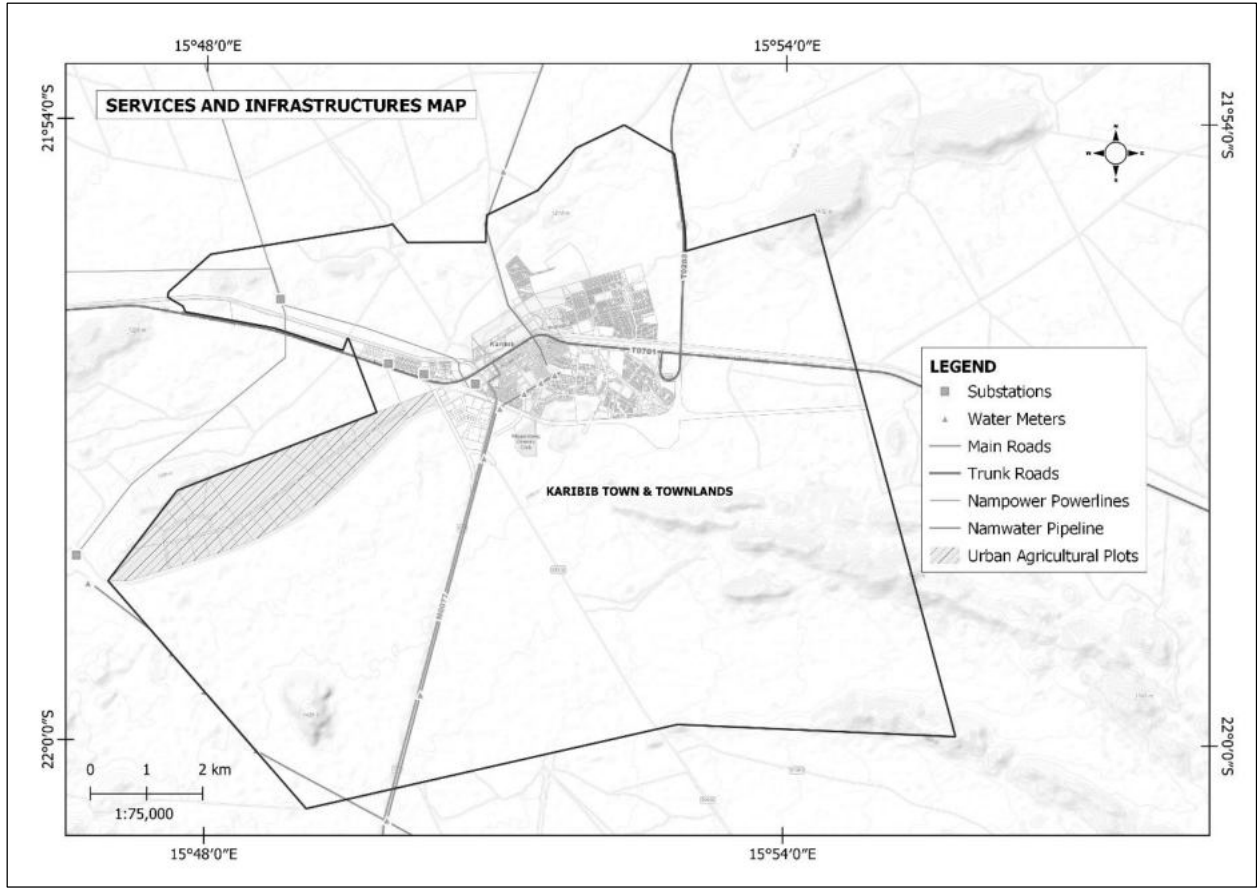


Figure 5-13: The services and infrastructure on and around the site area

The next chapter is a presentation of how the public was notified and consulted for the EIA.

## 6 PUBLIC CONSULTATION PROCESS

The Environmental Impact Assessment (EIA) Regulations GN 28-30 (GG 4878) detail requirements for public consultation within a given environmental assessment process (GN 30 S21). Public consultation forms an important component of an Environmental Assessment (EA) process. It provides potential Interested and Affected Parties (I&APs) with an opportunity to comment on and raise any issues relevant to the project for consideration as part of the assessment process. The public consultation process assists the Environmental Assessment Practitioner (EAP) in identifying all potential impacts and to what extent further investigations are necessary. Public consultation can also aid in the process of identifying possible mitigation measures. Public consultation for this project has been done under the EMA and its EIA Regulations.

### 6.1 Registered Interested and Affected Parties (I&APs)

The Consultant identified relevant and applicable national, regional, and local authorities, local leaders, and other interested members of the public. Pre-identified I&APs were contacted directly, while other parties who contacted the Consultant after project advertisement notices in the newspapers, were registered as I&APs upon their request. Newspaper advertisements of the proposed irrigation activities were placed in two widely read national newspapers in the region (*The Namibian* and *New Era* Newspapers). The project advertisement/announcement ran for two consecutive weeks inviting members of the public to register as I&APs and submit their comments.

### 6.2 Communication with I&APs

Regulation 21 of the EIA Regulations details the steps to be taken during a public consultation process and these have been used in guiding this process. Communication with I&APs with regards to the proposed development was facilitated through the following means and in this order:

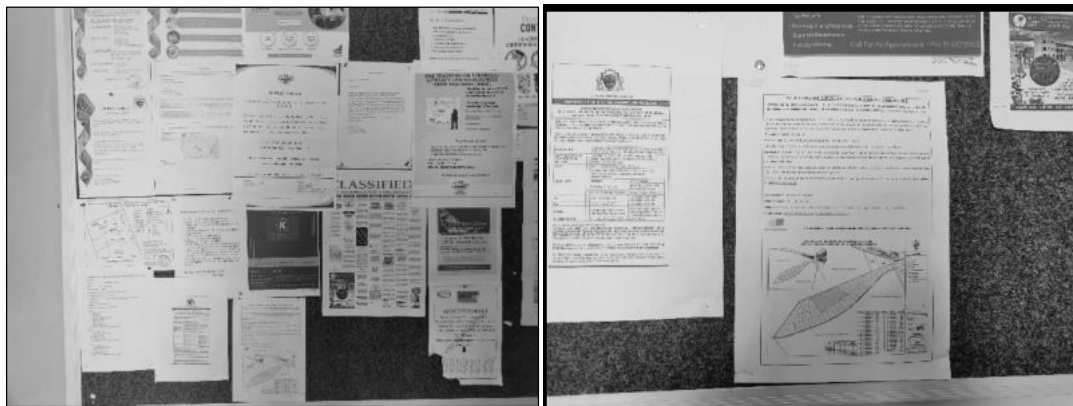
- A Background Information Document (BID) containing brief information about the proposed facility was compiled and circulated to relevant pre-identified authorities (stakeholders), and upon request to all new registered I&APs,
- Project Environmental Assessment notices were published in *The Namibian newspaper* and *New Era* dated 21 and 28 April 2022 - Appendix C, briefly explaining the activity and

its locality, inviting members of the public to register as I&APs and submit their comments/concerns.

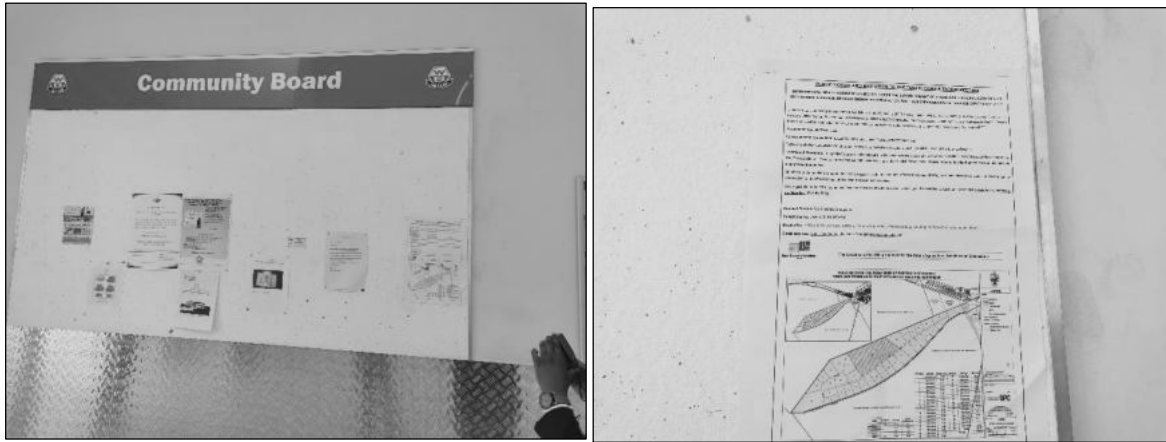
- Site notices (A3) were placed at the Karibib Town Council notice Office, Usab Community Hall, OK Foods and Woermann Brock Community board notice board (Figure 6-1 to Figure 6-3). The notices were informing members of the public of the EIA process and register as I&APs, as well as submit comments.



**Figure 6-1: Public notices placed at Karibib Town Council (Main Office) and Usab Community Hall**



**Figure 6-2: Public notice placed at Karibib Town' OK Foods Supermarket**



**Figure 6-3: Public notice placed at Karibib’ Woermann Brock Supermarket**

- A Consultation meeting was scheduled for Friday, 08 July 2022 at 09h30 at the Usab Hall in Karibib (Figure 6-4). However, none of the community members or residents turned up for the meeting. The only people who turned up at the meeting were three EDS consultants and two representatives from the Town Council.



**Figure 6-4: Venue for the consultation meeting on 08 July 2022**

The following chapter entails the potential impacts that are anticipated to be associated with the irrigation project activities, their description (for the negative/adverse impacts only), assessment and management/mitigation thereof to minimize their significance to the affected environmental features.

## 7 IMPACT IDENTIFICATION, ASSESSMENT AND MITIGATION MEASURES

### 7.1 Identification of Potential Impacts

Irrigation activities are usually associated with potential positive and negative impacts. For an environmental assessment, the focus is mainly placed on the negative impacts. This is done to ensure that these impacts are addressed by providing adequate mitigation measures such that an impact's significance is brought under control, while maximizing the positive impacts of the project. The potential positive and negative impacts that have been identified from the irrigation activities are listed as follow:

#### **Positive impacts:**

- Local socio-economic development through the employment during the crop production leading to income generation.
- The production of the crops and eventual food in the Town will ensure food security in the Town and certain parts of the Erongo Region.
- Increase in agriculture skills and technological development in the agriculture sector,

#### **Negative impacts:**

- Soil and water pollution: improper handling of wastewater or fertilisers may lead to pollution of surrounding soils and eventually water resources systems
- General environmental pollution through mishandling of project related waste.
- Impact on water resources (groundwater) through over-abstraction to supply the agricultural and related activities onsite.
- Loss of biodiversity through the removal of vegetation that may be found within the planned site of the Extension.
- Vehicular traffic: potential increase in local traffic due to site activities.
- Health and safety: improper handling of site materials and equipment may cause health and safety risks.
- Archaeological or cultural heritage impact through uncovering of unknown objects on site (when carrying out earthworks).

## 7.2 Impact Assessment Methodology

The Environmental Assessment is primarily a process used to ensure that potential impacts that may occur from project activity are identified and addressed with environmentally cautious approaches and legal compliance. The impact assessment method used for this project is in accordance with Namibia’s Environmental Management Legislation (Environmental Management Act No. 7 of 2007) and its Regulations of 2012, as well as the International Finance Corporation (IFC) Performance Standards.

### 7.2.1 Impact Assessment Criteria

The identified impacts were assessed in terms of probability (likelihood of occurring), scale/extent (spatial scale), magnitude (severity) and duration (temporal scale) as presented in Table 7-1. To enable a scientific approach to the determination of the environmental significance, a numerical value is linked to each rating scale. This methodology ensures uniformity and that potential impacts can be addressed in a standard manner so that a wide range of impacts are comparable. It is assumed that an assessment of the significance of a potential impact is a good indicator of the risk associated with such an impact. The following process will be applied to each potential impact:

- Provision of a brief explanation of the impact.
- Assessment of the pre-mitigation significance of the impact; and
- Description of recommended mitigation measures.

The recommended mitigation measures prescribed for each of the potential impacts contribute towards the attainment of environmentally sustainable operational conditions of the project for various features of the biophysical and social environment. The following criteria (Table 7-1) were applied in this impact assessment:

**Table 7-1: Impact Assessment Criteria employed to assess the potential negative impacts**

Nature	Description	Rating
<b>Extent (Spatial scale)</b>	An indication of the physical and spatial scale of the impact.	<p><b>Low (1):</b> Impact is localized within the site boundary: Site only.</p> <p><b>Low/Medium (2):</b> Impact is beyond the site boundary: Local.</p> <p><b>Medium (3):</b> Impacts felt within adjacent biophysical and social environments: Regional.</p>

Nature	Description	Rating
		<p><b>Medium/High (4):</b> Impact widespread far beyond site boundary: Regional</p> <p><b>High (5):</b> Impact extend National or over international boundaries.</p>
<b>Duration</b>	<p>The timeframe, over which the impact is expected to occur, measured in relation to the lifetime of the project.</p>	<p><b>Low (1):</b> Immediate mitigating measures, immediate progress</p> <p><b>Low/Medium (2):</b> Impact is quickly reversible, short term impacts (0-5 years)</p> <p><b>Medium (3):</b> Reversible over time; medium term (5-15 years).</p> <p><b>Medium/High (4):</b> Impact is long-term.</p> <p><b>High (5):</b> Long term; beyond closure; permanent; irreplaceable or irretrievable commitment of resources</p>
<b>Intensity, Magnitude / Severity (Qualitative criteria)</b>	<p>The degree or magnitude to which the impact alters the functioning of an element of the environment. The magnitude of alteration can either be positive or negative</p>	<p><b>Medium/low (4):</b> Low deterioration, slight noticeable alteration in habitat and biodiversity. Little loss in species numbers.</p> <p><b>Low (2):</b> Minor deterioration, nuisance or irritation, minor change in species / habitat / diversity or resource, no or very little quality deterioration.</p>
<b>Probability of occurrence</b>	<p>Probability describes the likelihood of the impacts occurring. This determination is based on previous experience with similar projects and/or based on professional judgment</p>	<p><b>Low (1):</b> Improbable; low likelihood; seldom. No known risk or vulnerability to natural or induced hazards.</p> <p><b>Medium/low (2):</b> Likely to occur from time to time. Low risk or vulnerability to natural or induced hazards.</p> <p><b>Medium (3):</b> Possible, distinct possibility, frequent. Low to medium risk or vulnerability to natural or induced hazards.</p> <p><b>Medium/High (4):</b> Probable if mitigating measures are not implemented. Medium risk of vulnerability to natural or induced hazards.</p> <p><b>High (5):</b> Definite (regardless of preventative measures), highly likely, continuous. High risk or vulnerability to natural or induced hazards.</p>

**7.2.2 Impact Significance**

After the impact has been assessed, its significance is then determined. The impact significance is determined through a synthesis of the above impact characteristics (in Table 3 above). The significance of the impact “without mitigation” is the main determinant of the nature and degree of mitigation required. Once the above factors (Table 7-1) have been ranked for each potential impact, the impact significance of each is assessed using the following formula:

$$SP = (magnitude + duration + scale) \times probability$$

The maximum value per potential impact is 100 significance points (SP). Potential impacts were rated as high, moderate, or low significance, based on the following significance rating scale (Table 7-2).

**Table 7-2: Significance rating scale**

<i>Significance</i>	<i>Environmental Significance Points</i>	<i>Colour Code</i>
High (positive)	>60	H
Medium (positive)	30 to 60	M
Low (positive)	<30	L
Neutral	0	N
Low (negative)	>-30	L
Medium (negative)	-30 to -60	M
High (negative)	>-60	H

**Positive (+)** – Beneficial impact

**Negative (-)** – Deleterious/ adverse Impact

**Neutral** – Impacts are neither beneficial nor adverse.

For an impact with a significance rating of high (-ve), mitigation measures are recommended to reduce the impact to a medium (-ve) or low (-ve) significance rating, provided that the impact with a medium significance rating can be sufficiently controlled with the recommended mitigation measures. To maintain a low or medium significance rating, monitoring is recommended for a period to enable the confirmation of the significance of the impact as low or medium and under



control. The potential negative impacts stemming from the proposed activities are described, and assessed below. The management and mitigation measures in a form of management action plans are provided in the Draft EMP.

### 7.3 Assessment of Potential Negative Impacts

The main potential negative impacts associated with the project establishment, operation and maintenance phases are identified and assessed in Table 7-3 below:

**Table 7-3: Assessment of the impacts of agricultural activities on the environment**

<b>Soil disturbance (land degradation): Impact Description</b>					
The excavations and land clearing to enable erection of project structures and installation of services will potentially result in soil disturbance which will leave the site soils exposed and vulnerable to erosion. This impact would be probable at site areas with no to little vegetation cover to hold the soils in place. The movement of heavy vehicles and equipment may lead to compaction of the soils during establishment. The potential impact can be rated as medium if no mitigation measures are implemented. However, with the effective implementation of mitigation measures and monitoring, the impact significance will be reduced to low.					
<b>Impact Assessment</b>					
<b>Mitigation Status</b>	<b>Extent</b>	<b>Duration</b>	<b>Intensity</b>	<b>Probability</b>	<b>Significance</b>
<b>Pre-mitigation</b>	M - 3	M/H - 4	L/M - 4	M/H - 4	M – 44
<b>Post-mitigation</b>	L/M - 2	L/M - 2	L - 2	L/M - 2	L - 12
<b>Loss of biodiversity: Impact Description</b>					
The earthworks done to prepare the site for project structures and services infrastructure could result in land degradation. This would lead to habitat loss for a diversity of flora and fauna ranging from microorganisms, reptiles, and large animals as well as trees. Endemic species are most severely affected since even the slightest disruption in their habitat can result in extinction or put them at high risk of being wiped out. Under the status, the impact can be of a medium significance rating. With the implementation of appropriate mitigation measures, the rating will be reduced to a low significance rating.					
<b>Impact Assessment</b>					
<b>Mitigation Status</b>	<b>Extent</b>	<b>Duration</b>	<b>Intensity</b>	<b>Probability</b>	<b>Significance</b>
<b>Pre-mitigation</b>	M - 3	M - 3	M - 6	M/H - 4	M – 48
<b>Post-mitigation</b>	L/M: -2	L/M: -2	L/M: -4	L/M: 2	L: -16
<b>Water Resources Use: Demand and Availability: Impact Description</b>					
In terms of groundwater, the project area is in low groundwater potential area (based on the groundwater map of Namibia and site map). The area has no permanent surface water source such as rivers therefore it relies on schemes and drilled boreholes for water supply. The impact of the project activities on the resources would be dependent on the water volumes required by the project activities. Commonly irrigation activities use a lot of water, but this would also depend on the scale, crop type and duration of water demand per year.					
This water will be used for irrigating the crops, washing, drinking and domestic purposes, and other water requiring activities on site.					

If not maintained and used efficiently, this water volume may exert pressure on the boreholes supply in the long-term which will not only affect the sustainable supply to the project, but also other users relying on the same source (aquifers), especially when rainy seasons are not good enough to replenish the source.

Without the implementation of any mitigation measures, the impact can be rated as medium to high, but upon effective implementation of the recommended management and measures, the impact significance would be reduced to low.

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
<b>Pre-mitigation</b>	M - 3	M - 3	M - 6	M/H - 4	M - 48
<b>Post-mitigation</b>	L/M: -2	L/M: -2	L/M: -4	L/M: 2	L: -16

**Occupational health and safety risks associated with handling of machinery and equipment: Impact Description**

The project operational activities can be associated with some health and safety risks. This is possible when personnel (workers) involved in the project activities are exposed to health and safety risks such as mishandling of machinery and equipment and accidental fire outbreaks. This could pose a safety risk to the project personnel, equipment, and vehicles. If machinery and equipment are not properly stored and packed, there would be risks of this machinery or equipment falling and injure the project workers or visitors on site at the time. The impact can be rated as medium significant if no mitigation measures are implemented, but upon implementation, the impact will be of low significance.

**Impact Assessment**

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
<b>Pre-mitigation</b>	M - 3	M - 3	M - 6	M/H - 4	M - 48
<b>Post-mitigation</b>	L/M - 2	L/M - 2	L - 2	L/M - 2	L - 12

**Vehicular traffic safety: Impact Description**

The national road B2 are the main transportation routes for all vehicular movement in the area that also provide access to the project site. Therefore, the project associated vehicles will obtain access to the site from the B2. The main roads also connect the site area to the service providers (for water, waste removal, machinery, equipment, as well as during the operational phase when transporting project materials to site and generated waste to waste management facilities). Pre-mitigation, the impact can be rated medium and with the implementation of mitigation measures, the significance will be low.

**Impact Assessment**

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
<b>Pre-mitigation</b>	M - 3	M/H - 4	L/M - 4	M/H - 4	M - 44
<b>Post-mitigation</b>	L/M - 2	L/M - 2	L - 2	L/M - 2	L - 12

**Waste generation from project activities: Impact Description**

Domestic and general (solid) waste is produced on site. If the generated waste is not disposed of in a responsible way, solid waste would be scattered in the area resulting in environmental pollution (land degradation) on or around the site. Improper handling, storage and disposal of hydrocarbon products and hazardous materials associated with the project site may lead to soil and groundwater contamination, in case of spills and leakages. Another impact on the environment is poor handling and storage of wastewater that may not only pollute the ground surface but also the water resources when infiltration and runoff occur.

**Impact Assessment**

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
<b>Pre-mitigation</b>	L/M - 2	L/M - 2	M - 6	M - 3	M - 30
<b>Post-mitigation</b>	L - 1	L - 1	L - 2	L/M - 2	L - 8

**Soil and water pollution: Impact Description**

The proposed establishment and subsequent operational activities are associated with a variety of potential pollution sources (i.e., fuels and wastewater) that may contaminate/pollute soils and eventually groundwater and surface water. The anticipated potential source of pollution to water resources from the project activities would be hydrocarbons (oil) from project vehicles, machinery, and equipment as well as potential wastewater/effluent from project activities. Some of these sources of pollution will be temporary, i.e., they will only last for the duration of establishment works. The spills on the soils (depending on volumes spilled on the soils) from these machinery, vehicles and equipment could infiltrate into the ground and pollute the fractured or faulted aquifers on site, and with time reach further groundwater systems in the area.

However, some potential pollutants will impact the environment on a long-term during the operational phase when there are also additional potential pollutants such as insecticide, pesticides and fertilizers applied on the land for crop protection and growth. Pre-mitigation measure implementation, the impact significance is low to medium for the establishment phase and medium to slightly high for the operational phase. Upon the implementation of management and mitigation measures, the significance will be reduced to medium and then progressively to low.

Impact Assessment					
Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre-mitigation	M - 3	M - 3	M - 6	M/H - 4	M - 48
Post-mitigation	L/M - 2	L/M - 2	L - 2	L/M - 2	L - 12

**Heritage/Archaeological resources: Impact Description**

During establishment and operational activities, historical resources may be impacted through inadvertent destruction or damage. This may include the excavation of subsurface graves or other archaeological objects. There was no information provided about either known heritage or site of significant cultural values within the plots. Therefore, the project activities will not have an impact of great significance on these and potentially other archaeological remains, at least on surface and visible resources if any. It should however be noted that the absence of confirmable and significant archaeological cultural heritage site is not evidence that such sites did not exist in the proposed site area. With that said, the potential impact significance is slightly medium if no mitigation measures, are implemented. However, after the implementation of the measures, this impact significance will be low.

Impact Assessment					
Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre-mitigation	L/M - 2	L/M - 2	M - 6	M - 3	M - 30
Post-mitigation	L - 1	L - 1	L - 2	L/M - 2	L - 8

**Heritage/Archaeological resources: Impact Description**

Noise from excavations and movement of heavy vehicles during establishment may be a nuisance. However, the noise would be localized (limited to the site) because the surrounding communities/neighbours are far, and the site earmarked for agricultural activities. Therefore, the impact of noise to people is minimal to none. Without any mitigation, the impact is rated as of low to medium significance. To change the impact significance from the pre-mitigation significance to low rating, the mitigation measures should be implemented.

Impact Assessment					
Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre-mitigation	L/M - 2	L/M - 2	M - 6	M - 3	M - 30
Post-mitigation	L - 1	L - 1	L - 2	L/M - 2	L - 8

## 8 RECOMMENDATIONS AND CONCLUSIONS

### 8.1 Recommendations

The potential impacts that are anticipated from the proposed project activities were identified, described, and assessed.

The interested and affected parties (stakeholders) were consulted as per the EMA and its 2012 EIA Regulations (Section 21 to 24). This was done via *The Namibian and New Era* newspapers (on 21 and 28 April 2022).

The following impacts have been assessed and the assessment found that the negative impacts have a low, slightly medium and medium ratings. Therefore, the effective and monitoring of the implementation of the recommended management and mitigation measures provided in the EMP can reduce the significance from "slightly medium" to "low", and "medium" to "low", and where possible, bring the significance to negligible over time. The aim will be to reduce to low and maintain this impacts' significance in the long run and bring the impact under control. These management and mitigation measures are provided under chapter 7 of this ESA report, and as management actions in the draft EMP.

The assessment is therefore deemed sufficient and concludes that no further detailed assessments are required to the ECC application.

The assessment of negative impacts provided the following concluding ratings (pre- and post-mitigation):

- Soil and water pollution from improper handling of wastewater or fertilisers - *medium (pre-mitigation) and low (post-mitigation)*.
- General environmental pollution through mishandling of project related waste - *medium (pre-mitigation) and low (post-mitigation)*.
- Impact on water resources (groundwater) through over-abstraction - *slightly high (pre-mitigation) and medium (post-mitigation)*.
- Loss of biodiversity through the removal of vegetation that may be found within the planned site of the Extension - *medium (pre-mitigation) and low (post-mitigation)*.
- Vehicular traffic: *potential increase in local traffic due to site activities* - *medium (pre-mitigation) and low (post-mitigation)*.
- Health and safety - *medium (pre-mitigation) and low (post-mitigation)*.

- Archaeological or cultural heritage - *medium (pre-mitigation) and low (post-mitigation)*.

It is therefore, recommended that the proposed activities be granted an environmental clearance, on the emphasis that:

- All the management and mitigation measures provided herein and in the Draft EMP are effectively and progressively implemented and monitoring with annual auditing.
- The Proponent and all their personnel or contractors comply with the legal requirements governing their project and its associated activities and ensure that project permits and or approvals required to undertake specific site activities are obtained and renewed as stipulated by the issuing authorities.
- Environmental Compliance monitoring reports should include groundwater monitoring, compiled and submitted to the DEAF every 6 months from the date of ECC issuance.

## 8.2 Conclusions

The Proponent and their workers and contractors to effectively implement the recommended management and mitigation measures to protect both the biophysical and social environment throughout the project duration.

Monitoring of the environmental components described in the impact assessment should be conducted by the Proponent and applicable Competent Authority. This is to ensure that all potential impacts identified in this study and other impacts that might arise during implementation are properly identified in time and addressed. Lastly, should the ECC be issued, the Proponent will be expected to be compliant with the ECC conditions as well as legal requirements governing the project and its related activities.

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