

**ENVIRONMENTAL IMPACT ASSESSMENT SCOPING  
REPORT FOR MAKANGA AGRICULTURAL  
DEMONSTRATION SITE**

**PROJECT: DRILLING OF A BOREHOLE FOR IRRIGATION  
PURPOSE**

**Application No: APP-002322**



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## Acronyms

Term	Definition
EIA	Environmental Impact Assessment
EIF	Environmental Investment Fund of Namibia
ECC	Environmental Clearance Certificate
EMA	Environmental Management Act
EMP	Environmental Management Plan
ESA	Environmental Scoping Assessment
ESS	Environmental and Social Safeguards
CASO	Chief Agricultural Scientific Officer
CRAVE	Climate Resilient Agriculture in three of the Vulnerable Extreme northern crop-growing regions
DAPEES	Directorate of Agricultural Production, Engineering and Extension Services
DEA	Directorate of Environmental Affairs
DRWSS	Directorate of Rural Water Supply and Sanitation
GBV	Gender Based Violence
GCF	Green Climate Fund
MAWLR	Ministry of Agriculture, Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism
PMU	Project Management Unit

## EXECUTIVE SUMMARY

The Climate Resilient Agriculture in three of the Vulnerable Extreme northern crop-growing regions (CRAVE) Project is funded by the Green Climate Fund through the Environmental Investment Fund (EIF) and is executed by the Ministry of Agriculture, Water and Land Reform through the Directorate of Agricultural Extension and Engineering Services (DAPEES). The CRAVE Project identified and established demonstration sites in three of its target Regions of Kavango East, Kavango West and Zambezi for Conservation Agricultural Demonstration activities, both horticulture and rain-fed production. One of the established sites is in Makanga area within Sibinda Constituency in Zambezi Region. This site is being used on rain-fed production mainly white maize.

As part of the demonstration site's model, the project includes the horticultural production despite the fact that there is no permanent water source around the area. During consultations with the Directorate of Rural Water Supply and Sanitation within MAWLR, the Makanga area is not situated in a proclaimed subterranean water control area and as such there was no objection for drilling a borehole for irrigation purposes.

In September 2020, the Ministry of Agriculture, Water and Land Reform further wrote a letter to the Office of the Environmental Commissioner requesting for the exemption of the EIA for the aforementioned activity and in terms of Section 27 of the Environmental Management Act (EMA) (Act 7 of 2007), it was advised that the proponent should compile a comprehensive Environmental Scoping Assessment Report (ESA) and Environmental Management Plan (EMP) for review and possible issuance of an Environmental Clearance Certificate (ECC).

As part of the environmental clearance certificate application, an environmental scoping assessment has been undertaken to satisfy the requirements of the Environmental Management Act 7 of 2007. These environmental scoping report and environmental management plan (EMP) will be submitted as part of the application for the environmental clearance certificate.

The Scoping Assessment shows that project activities are likely to cause, albeit on a very small scale, concerns related to social, economic development as well as environmental conservation. It is for this reason that an Environmental Management Plan was developed as a necessity for the project implementation. The purpose of the EMP is to define mitigation measures to be undertaken during project implementation and operation phases. The EMP provides the key Environmental and Social concerns, appropriate mitigation measures and responsibilities during project implementation. Some of the Environmental and Social Impacts

identified for mitigation and management during the project implementation include, noise and dust, pollution of water resources, health and safety risks.

The proposed project will entail various types of activities such as field aerial or remote sensing, geophysical surveys, drilling and installation of a solar water pump and Solar plant (PV). Although the lifespan of the project will be determined by the underground discharge and other environmental, social and economic defects, the drilling and installation activities are envisaged to take place within a month.

# **1. CHAPTER ONE: BACKGROUND**

## **1. 1 Introduction**

The Environmental Investment Fund (EIF) of Namibia is a state owned enterprise comprised of personnel from various areas of expertise and amongst others this includes; environmentalist, agriculture, finance and risk management, climate finance, environment social safeguard and Others. The entity is mandated to mobilise funds for environmental protection projects while promoting the building of the green economy at national and regional level. As part of its activities among others to implement sustainable agricultural projects for the climate change vulnerable in Namibia, the entity is developing an agricultural demonstration project in the Zambezi region, Makanga area under the Mafwe traditional Authority's jurisdiction.

The proposed project triggers listed activities in terms of the Environmental Management Act (EMA) 7 of 2007, therefore, an environmental clearance certificate is required. As part of the environmental clearance certificate application, a desktop study on the envisaged environmental impact and filed work have been conducted as well as consultation with affected and interested parties to satisfy the requirements of the Environmental Management Act 7 of 2007. In addition, a drilling permit from the Ministry of Agriculture, Water and Land Reform has been applied and a consent letter to this effect will be submitted together with this environmental scoping report and environmental management plan (EMP) as part of the application requirement for the environmental clearance certificate.

Due to the fact that the proposed project site is already cleared, within a demarcated area with less than a kilometre from the main road, main activities will be more of aerial or remote sensing, geophysical surveys, shallow drilling and installation of a solar water pump and Solar plant (PV). Although the lifespan of the project will be determined by the underground discharge and other environmental, social and economic defects, the drilling and installation activities are envisaged to take place within a month.

Through the scoping process, the surrounding environmental assessment was completed both by a desktop review and on-ground assessment. Despite noise and air pollution which are normally experienced during drilling and could be a disturbance to immediate neighbours, these will be more minimal and will be at a short duration. Additionally, disturbance of the ground is also being anticipated, that can be fixed after the drilling activities are completed.

Water is a scarce commodity in Namibia and, as such, it must always be treated with caution. The hydrology of the area is limited to ephemeral streams and groundwater and the potential for contamination from the proposed activities is regarded as very minimal. Protection of water quality is addressed in the EMP. The only potential environmental risk that may require further assessment will be related to irrigation activities which is considered to be of moderate significance, however with proposed mitigation measures, the impact can be reduced through the use of sustainable irrigation methods like drip irrigation, and environmentally friendly chemicals as recommended in the CRAVE Project proposal.

To ensure environmental and social risks are controlled during drilling duration, contractors will be requested to adhere to the EMP and where possible, all drilling equipment will be kept within the fenced boundaries. Residents shall be provided with at least two weeks' notice of drilling operations and continual engagement with residents shall be undertaken by the proponent to identify any concerns or issues, and appropriate mitigation and management measures agreed upon.

The assessment was partial but sufficient to identify impacts, and it is concluded that no further assessment may be required. On this basis, it is the opinion of the EIF that an environmental clearance certificate could be issued, on conditions that the management and mitigation measures specified in the EMP are implemented and adhered to effectively.

## **1.2 Main objective**

The main objective of this environmental scoping assessment is to determine and assess the potential environmental impacts that are likely to result from the drilling of a borehole at Makanga demonstration site of the CRAVE project in Zambezi region.

## **1.3 Specific objectives**

- ✓ To establish baseline environmental conditions so that relevant impacts could be projected, and sufficient mitigation measures could be designed.
- ✓ Ensure that the impacts identified are adequately addressed.
- ✓ To facilitate an informed, transparent, and accountable decision-making process by consulting with key, interested, and affected stakeholders so that their concerns are considered in the formulation and implementation of the environment management plan.
- ✓ Comply with Namibia's Environmental Impact Assessment Regulation (2012), Environmental Management Act (No. 7 of 2007) and other relevant laws and regulations.
- ✓ To propose alternative measures where it is noticed that adverse effects may occur.



- ✓ To set up an environmental management plan that will govern all activities of the project for the better protection of the environment.

## **1.4 Impact assessment methodology**

In compliance with the EMA No.7 of 2007 and its Regulations (2012), this report has addressed environmental, social, economic issues and concerns associated with the proposed project. The general steps followed during the assessment were as follows:

### **1.4.1 Field Observations**

The Environmental and Social Safeguards (ESS) team from the Environmental Investment Fund of Namibia (EIF) visited the site on the 30th of April 2021 to collect the required qualitative and quantitative data. During the site visit, an observation of the following attributes was done namely; vegetation, the current state of the site, and surrounding land use. Images were taken and all the observed information was recorded.

### **1.4.2 Desktop Research**

Desktop research was used to establish an environmental information database for the EIA. Materials such as books, articles, maps, internet, photographs, GIS datasets, past EIA reports, and baseline reports of the area were consulted. Documentation on policies, laws, regulations, and guidelines related to environmental management at the national level as well as the international level were also consulted.

### **1.4.3 Public participation**

Different stakeholders and community members were invited to a public meeting to give their views on the proposed project.

## **1.5 Scope of work**

The EIF-Environmental and Social Safeguard team's responsibility was to undertake the scoping assessment process which is inclusive of the associated work of detailed description of the project, investigate legislative requirements for the type of project, identify activities and assess their impacts both positive and negative as well as coming up with mitigation measures. Moreover, the team was further required to undertake a public consultation process and address concern issues. Finally compile reports and submit an application for an ECC for the proposed project to the competent authority i.e. Directorate of Environmental Affairs (DEA) in the Ministry of Environment, Forestry and Tourism (MEFT).

## **1.6 Environmental Impact Assessment**

An Environmental Impact Assessment (EIA) is a tool to manage negative environmental impacts that may arise from the proposed development and guides the project design to be more environmental friendly. The aim of the EIA is to reduce negative impacts (effects) and

maximize positive impacts, through the adoption of best environmental practices and application of the precautionary principle.

## 1.7 Project description

### 1.7.1 Project Location

The proposed development is to be implemented on a 10 hectares at Makanga Demonstration site in Sibinda Constituency, Zambezi region. The site is approximately 70km West of Katima Mulilo (S: 17°80'04 and E: 23°75'65) and just a 100 metres adjacent to the Kongola-Katima main Road. The drilling site is on a 1 ha portion (at 17°48'22 S and 23°45'18 E) reserved for infrastructure development within the demarcated Demonstration Site. Please refer to the map below (Fig 1) giving a locality layout of the demonstration site.



Figure 1 Makanga Demonstration site

### 1.7.2. Project Activities

Through the division of Geo-hydrology within the MAWLR, the CRAVE Project intends to survey the envisaged area to determine if there is sufficient and quality water for irrigation purposes. It is foreseen that the prospecting activity will include field mapping, surveying, literature review, drilling, trenching, sampling and analysis before geological modelling and resource estimation.

The prospecting programme will consist of non-invasive geological mapping, geophysical surveys sampling for water quality while analysing for water quantity. It will be the same information that will be used for feasibility analysis before confirming with the drilling.

### **1.7.3 Project Justification**

The Demonstration Plot is currently underutilized due to lack of water for irrigation purposes but the land is highly suitable for sustainable agriculture production that can transform the livelihood of the rural community in this area. The proposed project would make the demonstration Plot more productive to the beneficiaries and the entire small-scale farming community in Makanga area.

Research has shown that the area where the demonstration site is situated, lies above the porous aquifer with water quality ranging from Group A to D depending on the sites' geo-characteristics. Hence, there is a need to drill a borehole to enable agricultural demonstration activities under the CRAVE Project to run smoothly in order to reduce food insecurity and rural human population's vulnerability to climate risks and threats while increasing the adaptive capacity, well-being and resilience of the vulnerable small-scale farming communities in crop production landscapes that are threatened by climate variability and change.

## **2.CHAPTER TWO: LEGISLATIVE REQUIREMENTS**

### **2.1 Introduction**

An important part of the EIA is identifying and reviewing the administrative, policy and legislative frameworks concerning the proposed activity, to inform the proponent about the requirements to be fulfilled in undertaking the proposed project (Ruppel & Ruppel-Schlichting, 2011). This section looks at the legislative framework within which the proposed development will conform to; the focus is on the compliance with the legislation during the planning, construction and operational phases. All relevant legislations, policies and international statutes applying to the project are highlighted in the table below as specified in the Environmental Management Act, 2007 (Act No.7 of 2007) and the regulations for Environmental Impact Assessment as set out in the Schedule of Government Notice No. 30 (2012).

Table 1 Policies, legal and administrative regulations

Law/Ordinance	Provision	Applicability to the project
<p><b>The constitution of Namibia (1990) First Amendment Act 34 of 1998</b></p>	<p>Article 16(1) guarantees all persons the right to property, to acquire, own and dispose of property, alone or in association with others and to bequeath such property. “The State shall actively promote and maintain the welfare of the people by adopting policies that are aimed at maintaining ecosystems, essential ecological processes and the biological diversity of Namibia. It further promotes the sustainable utilisation of living natural resources basis for the benefit of all Namibians, both present and future.” (Article 95(I)).</p>	<p>Through implementation of the environmental management plan, the proposed project activities will ensure conformity to the constitution in terms of environmental management and sustainability.</p>
<p><b>Environmental Assessment Policy of Namibia 1994</b></p>	<p>The Environmental Assessment Policy of Namibia requires that all projects, policies, Programmes, and plans that have detrimental effect on the environment must be accompanied by an EIA. The policy provides a definition to the term “Environment” broadly interpreted to include biophysical, social, economic, cultural, historical and political components and provides reference to the inclusion of alternatives in all projects, policies, programmes and plans.</p>	<p>-Drilling of borehole requires environmental approval before it is undertaken. -By abiding by the requirements of the Environmental Assessment Policy of Namibia, the EMP will cater for the sustainable management of biophysical environment.</p>
<p><b>Environmental Management Act No. 7 Of 2007</b></p>	<p>Requires that projects with significant environmental impacts are subject to an environmental assessment process (Section 27).</p>	<p>This Act and its regulations will inform and guide this process. The project will ensure that all provisions of</p>

	<p>Requires adequate public participation during the environmental assessment process for interested and affected parties to voice their opinions about a project (Section 2(b-c)). According to Section 5(4) a person may not discard waste as defined in Section 5(1)(b) in any way other than at a disposal site declared by the Minister of Environment and Tourism or in a manner prescribed by the Minister. Details principles which are to guide all EIA</p>	<p>the EMP are implemented and regular environmental compliance auditing is conducted.</p>
<p><b>EIA Regulations GN 2007 (no.30 of 2012)</b></p>	<p>Details requirements for public consultation within a given environmental assessment process (GN No 30 S21). Details the requirements for what should be included in a Scoping Report</p>	<p>This Act and its regulations will inform and guide this process</p>
<p><b>Soil Conservation, 1969 (Act 76 of 1969) and the Soil Conservation Amendment Act (Act 38 of 1971)</b></p>	<p>Makes provision for the prevention and control of soil erosion</p>	<p>The proposed project will monitor and apply the soil conservation mechanisms.</p>
<p><b>Forest Act 12 of 2001 Forest Act Regulations 2015</b></p>	<p>To provide for the protection of the environment and the control and management of forest. Relevant sections: Approval required for the clearance of vegetation on more than 15 hectares (Section 23, subsection 1(b)).</p>	<p>The species on site are not protected thus no permit is acquired</p>

	<p>Tree species and any vegetation within 100m from a watercourse may not be removed without a permit</p> <p>(Section 22, subsection 1 (b))</p>	
<p><b>National Monuments Act of Namibia (No. 28 of 1969) as amended until 1979</b></p>	<p>“No person shall destroy, damage, excavate, alter, remove from its original site or export from Namibia: Meteorites, fossils, petroglyphs, ornamental infrastructure graves, caves, rock shelters, middens, shells that came into existence before the year 1900 AD: or Any other archaeological or paleontological finds.</p>	<p>The proposed site of development is not within any known monument site, both movable and immovable as specified in the Act.</p>
<p><b>The Occupational Safety and Health Act No. 11 of 2007</b></p>	<p>Advocates for employee and public safety, health</p>	<p>The project will ensure compliance with the terms of the Act.</p>
<p><b>National Act, No. 2004. Heritage 27 of 2004</b></p>	<p>The Act provides for the protection and conservation of places and objects with heritage significance</p>	<p>The proposed site of development is not within any known cultural heritage site.</p>
<p><b>Pollution and Waste Management Bill (draft)</b></p>	<p>This bill defines pollution and the different types of pollution. It also points out how the Government intends to regulate the different types of pollution to maintain a clean and safe environment. The bill also describes how waste should be managed to reduce environmental pollution. Failure to comply with the requirements is considered an offense and is punishable.</p>	<p>The proposed project shall be executed in harmony with the requirements of the act to reduce negative impacts on the surrounding environs from waste during exploration activities. A waste management strategy that follows recycling, reuse and reducing will be commissioned throughout the activities.</p>

<p><b>Nature Conservation Ordinance 4 of 1975 with amendments and special regulations</b></p>	<p>This ordinance prohibits "picking of indigenous plants in private nature reserves 24. (1) No person shall without the written approval of the Minister pick any indigenous plant, or any portion of an indigenous plant, in a private nature reserve: Provided that the owner of the land concerned may at any time pick any indigenous plant, other than a protected plant, on such land.</p>	<p>The project will not remove any protected species because the site has already been cleared for agricultural purposes.</p>
<p><b>Water Resources Management Act, 2013.</b></p>	<p>Provide for the management, protection, development, use and conservation of water resources; to provide for the regulation and monitoring of water services and to provide for incidental matters.</p>	<p>This Act and its regulations will inform and guide this process</p>

### **3. CHAPTER THREE: THE RECEIVING ENVIRONMENT**

#### **3.1 Rainfall**

Rainfall averages about 700 mm per year in the wetter north-east, and about 500 mm in the southern Zambezi Region. The climate can be divided into two main seasons – a dry season between April and September, and a wet season which stretches from end of October to early April. Rainfall, as in the rest of Namibia, is highly variable, with standard deviation values from 30–40%. For example, the long-term rainfall recorded from Katima Mulilo since 1945 to present, with a 9-year gap in the 70s-80s) shows annual totals over 1,000 mm in four of the years, and falls less than 400 mm in three years. This variability directly affects the livelihoods of farmers, exposing them to the risk of crop failure and poor grazing in some years, and floods in others. Thus Makanga demonstration site intends to produce through sustainable irrigation to forestall climatic conditions that may be unsuitable for rain-fed production.

#### **3.2 Temperature, Evaporation, Wind and Solar**

Temperatures are moderate during summer months in the Zambezi Region mostly due to cloudy conditions in these months. The highest temperatures are between September to November when there is less cloud cover and average daily maximums of 32-35°C can be reached. In the winter months, the region has a more moderate winter than the rest of Namibia with maximum daily temperature of between 18 -25°C and minimum temperatures of 5 °C. Frost is unusual in the Zambezi region, but may occur in some years in low lying river valleys, especially in the western part of the region. The highest rate of evaporation takes place during September to October when it is hot, dry and clouds are sparse. The potential evaporation of 2,500 mm is over four times the volume of water normally provided by rain (Martínez-Capel, García-López, & Beyer, 2017).

#### **3.3 Soils**

The Zambezi Region is characterized by the Kalahari Basin, which consists of sand dunes type. Soil types in the Zambezi were classified largely on the basis of their textures, with soils consisting of varying amounts of sand and clay having different textures. At the one end of the spectrum are the heaviest soils with a high content of clay in areas which are regularly flooded (Krug, 2017). Water does not penetrate or drain away easily because the clay is so dense and therefore these areas hold water for longer periods. On the other end of the spectrum are the pure sands that do not hold moisture for long. Between these two extremes are a range of intermediate soils – loams, clay-loams, sandy clays and such intermediate soils also offer the best opportunities for cultivating crops as they retain water to some degree and have fairly high levels of nutrients. The proposed project site proposed is therefore characterized by flat



and clay-loam soil which is fertile and highly suitable for cash cropping, fruits and horticulture crops and vegetables.

### **3.4 Vegetation**

The Six land types that form a broad range of vegetation is described by (Strohbach & Sheuyange, 2001) for the Zambezi region. These vegetation types are open water, floodplains, riverine woodlands, mopane woodlands, Kalahari woodlands and Impalila woodlands. The Makanga demonstration site is dominated by *Colophospermum mopane* however the identified site for the borehole drilling is dominated by *Dichrostachys cineria* (Mendelsohn, Jarvis, Roberts, & Robertson, 2002). A physical inspection indicates that the site is not very well wooded but more covered by grasses such as *Pennisetum clandestinum*. The identified trees and grasses on the proposed site are not listed as protected on Appendix 2 of the Forest act of 2001.

### **3.5 Hydrology and Drainage**

The Zambezi Region is topographically featureless and almost completely flat, which is what makes its hydrology so unusual. The region is mostly defined by four perennial rivers; the Zambezi, Kwando, Linyanti and Chobe. All of these connect with each other, and with the Okavango River further west, when water levels are high. At such times, their waters flood over large areas, forming extensive marshes and floodplains, and significantly influencing livelihoods and human activities. The drainage System is supported by the Zambezi river flood water plains, which runs from the North to the South of the area. However, Makanga community is not located near any source of water such as rivers or dams, they only depend on rain-fed agriculture. During dry season the area is often dry and agricultural activities do not take place because there is no water to sustain them.

### **3.6 Socio –Economic**

Sibbida constituency has a population of 10182 according to the Namibia Statistic Agency, 2011. The livelihood strategies of the people at Makanga are largely dependent on agricultural activities and collection of non- wood forest products. Maize, pearl millet (Mahangu), beans and Sorghum as well as Cassava are the main crops grown in the area. Other crops grown in medium to small quantities include groundnuts, finger millet, and sweet potatoes. Though, Livestock being a source of livelihood is only practiced on a small-scale, animals mostly reared include goats, pigs, chickens and ducks. Honey and mushroom collection are another off-farm income generating activities the people depend on for livelihood (Kamwi, Chirwa, Manda, Graz, & Kätsch, 2015)

## 4. CHAPTER FOUR: PUBLIC CONSULTATION PROCESS

### 4.1 Introduction

The EIA Process is incomplete without engagement of the public mainly those affected by the proposed development but also those with keen interest in the proposed development. The public consultation process allows persons or groups that may be affected or merely interested in a project the opportunity to submit or voice their concerns or comments regarding the proposed activity. Section 21 of the Regulations prescribes the steps to meeting the requirements of the public consultation process, these were guides to conducting of this very important step in the EIA process.

### 4.2 Steps taken in the public consultation process

#### 4.2.1 Identified and consulted stakeholders

Table 2 List of stakeholders who were consulted during the scoping assessment

Stakeholders	Purpose
MEFT	Notice of intent to conduct Scoping assessment and submission of an application for the ECC
Zambezi Regional Council	Pivotal to regional planning and development intervention.
DRWSS-MAWLR	Notice of intent to conduct Scoping assessment
DWRM-MAWLR	
Mafwe Traditional Authority	Administration of land rights and public meeting arrangement
Makanga and Surrounding Communities	Affected and Interested Parties/Beneficiaries of the project
CASO –MAWRL, Zambezi	Notice of intent to conduct Scoping assessment
ASO-MAWRL, Zambezi	Notice of intent to conduct Scoping assessment

#### 4.2.2 Engagement with Traditional Authority and local residents

Communication was made with the Traditional Authority (TA) of the area for information about the project and the proposed public meeting to be held. All communications to the traditional authority was made through the CRAVE Liaison Officer in Zambezi region. The meeting was held on the 30<sup>th</sup> of April 2021 at Makanga sub-Khuta office through a Focus Group Discussion

(FGD). During these discussions, the EIF team firstly wanted to know whether the residents were aware of the proposed project and the residents indicated that they were aware of the project and they wholeheartedly welcomed it. Further discussions were based on the question whether the proposed project will cause negative impacts on following:

- ✓ the local residents,
- ✓ natural ecology of the area,
- ✓ scenic beauty of the area,
- ✓ public health and safety,
- ✓ water resources and quality,
- ✓ the soil quality of the area, and
- ✓ drainage of the area.

Through the discussions, it came out strongly that the proposed project will not have any significant impacts on the above. *Hence, the residents pleaded with the EIF through the CRAVE Project to expedite the process of acquiring the Environmental Clearance Certificate from the Ministry of Environment, Forestry and Tourism to allow the drilling of the borehole at the demonstration site to enable the beneficiaries continue with their agricultural activities at the site.* The attendance register and pictures are annexed at the end of this report.

## **5. CHAPTER FIVE: ASSESSMENT OF IMPACTS**

The EIA Policy of Namibia seeks to achieve a balance between negative and positive impacts and between biophysical impacts and social and economic gains to society. Consequently, both negative and positive impacts on the environment will be considered. Moreover, this report will recommend measures to mitigate negative impacts and optimize (or enhance) positive impacts.

### **5.1 Identified potential impacts**

#### **5.1.1 Positive impacts**

- Employment creation
- Generation of revenue through improved yields
- Diversification of livelihoods
- Year round production
- Economic stimulation in rural area

#### **5.1.2 Negative impacts**

- Noise and Air Quality concerns
- Soil erosion

- Occupational health and safety
- Impact on ground water
- Risk of Covid-19

## 5.2 impact analysis and evaluation

The identified impacts were assessed in terms of probability (likelihood of occurring), extent (spatial scale), magnitude (severity) and duration (temporal scale). The following assessment methodology was used to examine each impact identified.

Table 3 Ranking matrix for environmental significance

Score	1	2	3	4	5
Temporal scale	Short term – impact quickly reversible, (less than 1 year)	Short term impact (1-5 years)	Reversible over time; medium-term (5-15 years)	Impact is long-term (15-40 years)	Long term; beyond closure; permanent; irreplaceable or irretrievable commitment of resources( over 40 years)
Spatial scale	<b>Site only:</b> Impact is localized within the site boundary	<b>Local:</b> Impact is beyond the site boundary	<b>Regional:</b> Impact is felt within adjacent biophysical and social environments:	<b>National:</b> Impact widespread far beyond Regional:	<b>International:</b> Impact extend National or over international boundaries
Likelihood	<b>Improbable:</b> low likelihood; seldom. No known risk or vulnerability to natural or induced hazards.	<b>Low probability:</b> Likely to occur from time to time. Low risk or vulnerability to natural or	<b>Medium Probability:</b> Possible, distinct possibility, frequent. Low to medium risk or vulnerability to natural or	<b>Highly probable:</b> Probable if mitigating measures are not implemented. Medium risk of	<b>Definite:</b> Definite (regardless of preventative measures), highly likely, continuous. High risk or vulnerability to

		induced hazards	induced hazards.	vulnerability to natural or induced hazards.	natural or induced hazards.
	<b>2</b>	<b>4</b>	<b>6</b>	<b>8</b>	<b>10</b>
Magnitude	Minor deterioration, nuisance, or irritation, minor change species habitat diversity in / or resource, no or very little quality deterioration.	Low deterioration, slight noticeable alteration in habitat and biodiversity. Little loss in species numbers.	Moderate deterioration, discomfort, partial loss of habitat/biodiversity or resource, moderate alteration.	High deterioration, death, illness or injury, loss of habitat / diversity or resource, severe alteration, or disturbance of important processes.	Extremely high deterioration, high quantity of deaths, injury or illness / total loss of habitat, total alteration of ecological processes, extinction of rare species.

Impact significance is determined through a synthesis of the above impact characteristics. The significance of the impact “without mitigation” is the main determinant of the nature and degree of mitigation required. Significance point = (magnitude + duration + extend) x likelihood. The maximum value per potential impact is 100 significance points (SP). Potential impacts are rated as high, moderate, and low significance, based on the following significance rating scale:

Table 4 Significance rating scale

Type of impact	Significant point	Significant rate
Positive +	>60	H
	30-60	M
	30 <	L
None	0	N
Negative -	>60	H
	30-60	M

	30<	L
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Table 5 Rated negative impacts

Aspect	Type of impact	Scale	Duration	Magnitude	Likelihood	Significance	
						Unmitigated	Mitigated
Noise and Air quality concerns	-ve	1	1	2	2	L	L
Soil erosion	-ve	1	1	2	2	L	L
Impact on ground water	-ve	1	1	4	2	L	L
Safety risks	-ve	2	1	4	2	L	L
Increased risk of Covid-19	-ve	2	1	2	5	L	L

Table 6 Rated positive impacts

Aspect	Type of impact	Scale	Duration	Magnitude	Likelihood	Significant
Employment creation	+ve	3	3	8	5	H
Generation of revenue through improved yields	+ve	3	3	6	5	H
Livelihood diversification	+ve	3	3	6	5	H
Year round production	+ve	3	3	8	5	H

Economic stimulation in rural area	+ve	3	3	6	5	H

## 6. CHAPTER SIX: THE ENVIRONMENTAL MANAGEMENT PLAN (EMP)

### 6.1 Overview of the EMP

The Environmental Management Plans are used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the projects are enhanced. A conscious decision was made based on the recommendations and guidelines by the Directorate of Environmental Affairs-EIA division, to assess both significant and less significant environmental impacts of the proposed development and develop an EMP for the identified impacts. The EMP was developed and it will effectively be implemented by the proponent, to ensure that the adverse impacts identified through the scoping assessment are mitigated and/or minimised

### 6.2 Identified negative impacts and proposed mitigation measures

Table 7 Potential negative impacts and proposed mitigation measures

Potential impacts	Proposed Mitigation Measures
<b>1. Noise and Air Quality concerns</b> (Expected sources of noise pollution include vehicles and machinery. Air pollution is anticipated to arise from exhaust from engines)	-Sprinkling water to dusty areas during site preparation and Drilling operations -Containment of noisy operations, including locating noise operations away from sensitive neighbourhoods -Limit drilling works to day time only -Drilling work to take shortest time possible -Selection of appropriate machinery and regular servicing of machinery and vehicles, -Provision by contractor and Use of ear plugs by construction workers .
<b>2. Soil Erosion</b> (drilling and heavy machinery movement will expose top soil to possible soil erosion).	-Loose soils to be used to fill back excavated/disturbed areas. -Loose soils to be compacted with a mechanical roller so as to avoid erosion by wind or surface runoff.
<b>3. Impact on ground water resources</b> (increased demand for water).	-Put proper measures for collection and disposal of spilled oils and lubricants - Ensure the available underground water quantity can sustain the identified activities.
<b>4. Health and Safety Risks</b> (Risk of accident incidents is anticipated)	-Design and implement safety measures and emergency plans to contain accident risks,

<p>with the drilling activities. Drilling workers will be in direct contact with heavy machinery and equipment Health, safety and security are important aspects throughout the project implementation).</p>	<p>-Regular Training on health and safety to workers shall be conducted,          -Provide workers with protective clothing (nose and mouth masks, ear muffs, overalls, industrial/safety boots and gloves) and helmets,          -Avail first aid kits on site</p>
<p><b>6. Increased risk of Covid-19</b>          (Increased risk of Covid-19 can occur due to handling of the same tools and equipment at the drilling site and social interactions between drilling workers and local people)</p>	<p>-Provide workers with face masks and hand sanitizers to reduce the risk of contracting Covid-19.</p>

The detailed EMP in terms of roles and responsibilities as well as the monitoring timeframes is annexed at the of this report.

## 7. CHAPTER SEVEN: CONCLUSION AND RECOMMENDATIONS

### 7.1 Recommendations

- ✓ The project, overall, will have substantial significant positive social, economic and environmental benefits. It will enhance accessibility to sufficient water for irrigation purposes at the Makanga Demonstration site.
- ✓ The project shall build the resilience of small-scale farmers to climate risks and threats in the area by enabling them to establish market opportunities, diversify livelihoods, and create employment for women and youth.
- ✓ Monitoring has been identified as an important process in the protection of environment of the project site and addressing social concerns since it will reveal changes and trends brought about mainly by the drilling and operational activities.

### 7.2 Conclusion

In conclusion, the economic benefits of the proposed development project outweigh its shortcomings. Although, the project activities are likely to cause, on a small scale, risk of accidents, health, and emission of dust, and increase in noise, these impacts are synonymous with the development project of this nature and will be adequately mitigated through the effective implementation of the EMP prepared. We therefore recommend that the project be cleared for commissioning.



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## Pictures



Figure 3 At the proposed site for the borehole



Figure 4 After the meeting with the community at Makanga Sub-Khuta



Figure 5 EIF team and community members at Makanga demo-site during site visit



Figure 6 During stakeholder consultation