APP-006094

IRRIGATION-BASED AGRICULTURAL ACTIVITIES ON PORTIONS 19 AND 20 OF THE FARM OTAVI FONTEIN NO. 794 AND FARM EISENBERG NO. 509, OTJOZONDJUPA REGION

ENVIRONMENTAL ASSESSMENT SCOPING REPORT

Assessed by:

Assessed for:

Ondundu Farming Enterprises CC

April 2025

PROJECT:	**IRRIGATION-BASED AGRICULTURAL ACTIVITIES ON PORTIONS 19 AND 20 OF THE FARM OTAVI FONTEIN NO. 794 AND FARM EISENBERG NO. 509, OTJOZONDJUPA REGION: ENVIRONMENTAL ASSESSMENT SCOPING REPORT**	
	Final March 2025	
Prepared for: **(Proponent)**	Ondundu Farming Enterprises CC P O Box 432 Otavi	
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Report Approval	20250710 Ondundu ECC Application **Quzette Bosman** **Environmental & Social Practitioner**	

I Geo Friedrich Ernst Hirsch acting as representative of (Ondundu Farming Enterprises CC), hereby confirm that the project description contained in this report is a true reflection of the information which the Proponent provided to Geo Pollution Technologies. All material information in the possession of the Proponent that reasonably has or may have the potential of influencing any decision or the objectivity of this assessment is fairly represented in this report and the report is hereby approved.

Signed at Otavi on the 10 day of July 2025.

Ondundu Farming Enterprises CC

CC 2007/2220

Company Registration Number

EXECUTIVE SUMMARY

Geo Pollution Technologies (Pty) Ltd was appointed by Ondundu Farming Enterprises CC (the Proponent) to undertake an environmental assessment for irrigation activities on Portions 19 and 20 of the Farm Otavi Fontein No. 794 and Farm Eisenberg No. 509, in the Otjozondjupa Region. Existing activities on the farms are focussed on irrigated crop cultivation as well as livestock farming. The Proponent currently cultivates an area of approximately 77 ha which is irrigated by means of sprinklers and centre pivot systems utilising abstracted groundwater. At present, the main crop cultivated under irrigation is maize, but alternative crops may be considered in future. Irrigation is from production boreholes by means of centre pivot irrigation systems. The main operational activities include:

The main operational activities related to the Proponent's farms include:

- land preparation,
- planting,
- water abstraction and irrigation,
- fertilizer application and pest control,
- harvesting and transporting activities specific to each crop,
- cattle, sheep and potentially other livestock farming, and
- bush clearing.

All historically cleared areas for crop cultivation and rangeland improvement across the farm, including the existing and potential irrigation areas, amount to approximately 118 ha. For irrigation, water is abstracted from three registered production boreholes on portion 19. The boreholes are registered with the Ministry of Agriculture, Water, Fisheries and Land Reform and the Proponent has applied for a water license as required by the new Water Resources Management Act, to replace the existing water permit which authorises operations. The hydrogeological specialist study concluded that the total area to be irrigated can be increased and additional boreholes are planned to be drilled on Eisenberg farm. The main produce cultivated are vegetables and maize for local and international markets.

The environmental assessment determines all environmental, safety, health and socio-economic impacts associated with the continued and planned agricultural activities on the farms. Relevant environmental data was compiled by making use of primary data, from a reconnaissance site visit and secondary data (hydrogeological specialist study). Potential environmental impacts and associated social impacts were identified and are addressed in this report.

The project area is located amidst other farms and due to the nature and location of the Proponent's agricultural activities, some impacts can be expected on the surrounding environment. Therefore, preventative and/or mitigation measures must be implemented to address prevent or minimize such impacts

Regular environmental performance monitoring is recommended to ensure regulatory compliance and the implementation of corrective measures when necessary, especially with regard to water abstraction. The Proponent's operations play a role in contributing to the Namibian agricultural sector and provide valuable employment opportunities in the region.

The main concerns related to the operations are potential groundwater, surface water and soil contamination, decreased groundwater availability, ecological and social impacts. A safety, health, environmental and quality policy, coupled to an environmental management plan, will contribute to effective management procedures, to prevent and mitigate impacts. All regulations relating to agriculture, labour, health and safety should be adhered to. Groundwater and soil pollution must be prevented at all times. All staff must be made aware of the importance of biodiversity and poaching or illegal harvesting of animal and plant products prohibited. Groundwater abstraction permits must be strictly adhered to. Any waste produced must be burned or removed from site and disposed of at an appropriate facility or re-used or recycled where possible. Hazardous waste must be disposed of at an approved hazardous waste disposal site. By appointing local employees and by implementing monitoring and training programs, the positive socio-economic impacts can be maximised while preventing or mitigating negative impacts.

The environmental management plan included in Section 9 of this document should be used as an on-site reference document during all phases (planning, operations (including maintenance) and decommissioning) of the development. All monitoring and records kept should be included in six monthly reports to ensure compliance with the environmental management plan and the Ministry of Environment, Forestry and Tourism's requirements. Parties responsible for transgression of the environmental management plan should be held responsible for any rehabilitation that may need to be undertaken. A safety, health, environmental and quality policy should be used in conjunction with the environmental management plan. Operators and responsible personnel must be taught the contents of these documents. Local or national regulations and guidelines must be adhered to and monitored regularly as outlined in the environmental management plan.

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LIST OF ABBREVIATIONS & MEASURMENTS

AEZ	Agro-Ecological Zone
CHIRPS-2	Climate Hazards Group Infra-Red Precipitation with Station data
DWA	Department of Water Affairs
EB	Existing Borehole
EIA	Environmental Impact Assessment
EMA	Environmental Management Act No 7 of 2007
EMP	Environmental Management Plan
EMS	Environmental Management System
EPL	Exclusive Prospecting License
IAPs	Interested and Affected Parties
IUCN	International Union for Conservation of Nature
MAFWLR	Ministry of Agriculture, Fisheries, Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism
MERRA-2	Modern-Era Retrospective analysis for Research and Applications v2
MSDS	Material Safety Data Sheet
NDP	National Development Plan
PPE	Personal Protective Equipment
SANS	South African National Standards
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization
°C	Degrees Celsius
cmol/kg	Centimoles per kilogram
g/L	Grams per Litre
ha	Hectare
km	Kilometre
km²	Square kilometres
kV	Kilovolt
kWh	Kilowatt-hour
kWh/m²/day	Kilowatt-hours per square metre per day
L	Litres
m	Metre
m/s	Metre per second
m³	Cubic metres
mamsl	Metres Above Mean Sea Level
mbs	Metres below surface
mg/cm³	Milligrams per cubic centimetre
mm	Millimetres
mm/a	Millimetres per annum
ppm	Parts per million

GLOSSARY OF TERMS

Alternatives - A possible course of action, in place of another, that would meet the same purpose and need but which would avoid or minimize negative impacts or enhance project benefits. These can include alternative locations/sites, routes, layouts, processes, designs, schedules and/or inputs. The "no-go" alternative constitutes the 'without project' option and provides a benchmark against which to evaluate changes; development should result in net benefit to society and should avoid undesirable negative impacts.

Assessment - The process of collecting, organising, analysing, interpreting and communicating information relevant to decision making.

Competent Authority - A body or person empowered under the local authorities act or Environmental Management Act to enforce the rule of law.

Construction - The building, erection or modification of a facility, structure or infrastructure that is necessary for the undertaking of an activity, including the modification, alteration, upgrading or decommissioning of such facility, structure or infrastructure.

Cumulative Impacts - In relation to an activity, means the impact of an activity that in itself 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.

Environment - As defined in the Environmental Assessment Policy and Environmental Management Act - "land, water and air; all organic and inorganic matter and living organisms as well as biological diversity; the interacting natural systems that include components referred to in sub-paragraphs, the human environment insofar as it represents archaeological, aesthetic, cultural, historic, economic, palaeontological or social values".

Environmental Impact Assessment (EIA) - The process of assessment of the effects of a development on the environment.

Environmental Management Plan (EMP) - A working document on environmental and socio-economic mitigation measures, which must be implemented by several responsible parties during all the phases of the proposed project.

Environmental Management System (EMS) - An Environment Management System, or EMS, is a comprehensive approach to managing environmental issues, integrating environment-oriented thinking into every aspect of business management. An EMS ensures environmental considerations are a priority, along with other concerns such as costs, product quality, investments, PR productivity and strategic planning. An EMS generally makes a positive impact on a company's bottom line. It increases efficiency and focuses on customer needs and marketplace conditions, improving both the company's financial and environmental performance. By using an EMS to convert environmental problems into commercial opportunities, companies usually become more competitive.

Evaluation - The process of ascertaining the relative importance or significance of information, the light of people's values, preference and judgements in order to make a decision.

Green Scheme - The Green Scheme is an initiative conducted by the Ministry of Agriculture, Water and Forestry to encourage the development of irrigation based agronomic production in Namibia with the aim of increasing the contribution of agriculture to the country's Gross Domestic Product. Its aim is also to simultaneously achieve the social development and upliftment of communities located within suitable irrigation areas and to also promote the human resources and skills development within the irrigation sub-sector. Such initiative could possibly enhance cross-border investment and facilitate the exchange of relevant and limited resources with neighbouring countries in this regard.

Hazard - Anything that has the potential to cause damage to life, property and/or the environment. The hazard of a particular material or installation is constant; that is, it would present the same hazard wherever it was present.

Interested and Affected Party (IAP) - Any person, group of persons or organisation interested in, or affected by an activity; and any organ of state that may have jurisdiction over any aspect of the activity.

Mitigate - The implementation of practical measures to reduce adverse impacts.

Proponent (Applicant) - Any person who has submitted or intends to submit an application for an authorisation, as legislated by the Environmental Management Act no. 7 of 2007, to undertake an activity or activities identified as a listed activity or listed activities; or in any other notice published by the Minister or Ministry of Environment & Tourism.

Public - Citizens who have diverse cultural, educational, political and socio-economic characteristics. The public is not a homogeneous and unified group of people with a set of agreed common interests and aims. There is no single public. There are a number of publics, some of whom may emerge at any time during the process depending on their particular concerns and the issues involved.

Scoping Process - The process of identifying: issues that will be relevant for consideration of the application; the potential environmental impacts of the proposed activity; and alternatives to the proposed activity that are feasible and reasonable.

Significant Effect/Impact - 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.

Stakeholder Engagement - The process of engagement between stakeholders (the Proponent, authorities and IAPs) during the planning, assessment, implementation and/or management of proposals or activities. The level of stakeholder engagement varies depending on the nature of the proposal or activity as well as the level of commitment by stakeholders to the process. Stakeholder engagement can therefore be described by a spectrum or continuum of increasing levels of engagement in the decision-making process. The term is considered to be more appropriate than the term "public participation".

Stakeholders - A sub-group of the public whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. The term therefore includes the Proponent, authorities (both the lead authority and other authorities) and all interested and affected parties (IAPs). The principle that environmental consultants and stakeholder engagement practitioners should be independent and unbiased excludes these groups from being considered stakeholders.

Sustainable Development - "Development that meets the needs of the current generation without compromising the ability of future generations to meet their own needs and aspirations" – the definition of the World Commission on Environment and Development (1987). "Improving the quality of human life while living within the carrying capacity of supporting ecosystems" – the definition given in a publication called "Caring for the Earth: A Strategy for Sustainable Living" by the International Union for Conservation of Nature (IUCN), the United Nations Environment Programme and the World Wide Fund for Nature (1991).

1 BACKGROUND AND INTRODUCTION

Geo Pollution Technologies (Pty) Ltd was appointed by Ondundu Farming Enterprises CC (the Proponent) to undertake an environmental assessment for the existing agricultural activities on portions 19 and 20 of the farm Otavi Fontein No. 794 and Farm Eisenberg No. 509 in the Otjozondjupa Region (Figure 1-1). The two portions are integrated in operations and managed as one farming unit. Farm Eisenberg was however only recently incorporated into the framing unit. The main commercial activities of the Proponent on the farming unit include crop cultivation and livestock farming. Crop cultivation is on approximately 77 ha which is irrigated with groundwater. The hydrogeological specialist study accompanying this report (Appendix A) indicates that the volume of groundwater abstracted for irrigation can be increased without affecting sustainability. The total land area that can be irrigated may thus be increased. Existing irrigation is from three production boreholes by means of centre pivot and sprinkler irrigation systems. The main operational activities include:

- land preparation,
- planting
- water abstraction and irrigation,
- fertilizer application and pest control,
- harvesting,
- packaging and transporting activities specific to each crop,
- cattle, sheep and potentially other livestock farming, and
- rangeland maintenance.

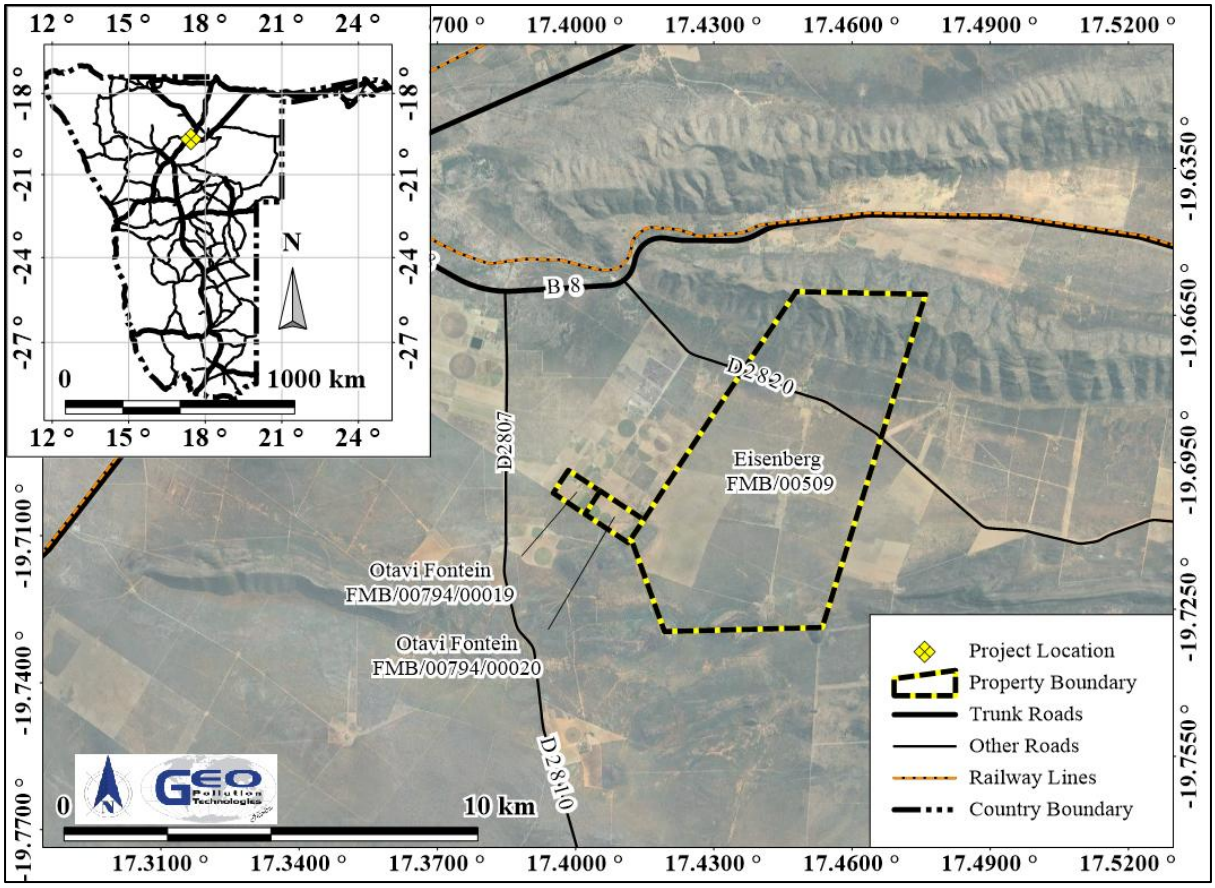

Figure 1-1 Project location

A detailed project description is provided in Section 4. The potential impacts of the project on the environment, resulting from various operational, maintenance and construction, and possible decommissioning activities, were determined through the risk assessment as presented in this report.

The environment being defined in the Environmental Management Act as "land, water and air; all organic and inorganic matter and living organisms as well as biological diversity; the interacting natural systems that include components referred to in sub-paragraphs, the human environment insofar as it represents archaeological, aesthetic, cultural, historic, economic, paleontological or social values". The environmental assessment was conducted to apply for an environmental clearance certificate in compliance with Namibia's Environmental Management Act (Act No 7 of 2007) (EMA).

Project Justification – Traditionally farms in the region were used for cattle ranching with limited dryland crop cultivation. However, in the area, including on the Proponent's farm, agriculture was diversified to include irrigation-based crop cultivation. The Proponent has a well-established irrigation and agriculture development, which sees an optimisation of crop production by means of irrigation, augmented by rainwater. It is now the Proponent's intention to increase his water licence quota, this addition is proposed in an effort to increase resilience in food production for Namibia. Namibia aims at increasing sustainable food production and ensuring food security in the country. In addition, agriculture is an important employment sector for Namibia, adding to roughly a third of the workforce. Existing and planned agricultural activities require employment, which is required to be maintained for continued operations. Pivot irrigation systems also require significant investment costs and therefore the development of the irrigation areas, has ensured a sizeable investment into the area and the Grootfontein-Otavi district.

Benefits of the agricultural activities conducted by the Proponent include.

- Food production and enhanced food security.
- Employment and supporting of livelihoods of both unskilled and skilled labourers.
- Technological development and investment in agricultural practices.
- Generation of income that contributes to the national treasury and a positive trade balance through the export of produce to international markets.
- Support for economic resilience in the area through diversified business activities and opportunities.

2 SCOPE

The scope of this report is to, in compliance with the requirements of EMA:

1. Present a detailed project and environmental description related to the Proponent's activities.
2. Determine the potential environmental impacts emanating from the Proponent's activities and potential future decommissioning of such activities.
3. Identify a range of management actions to mitigate the potential adverse impacts to acceptable levels.
4. Provide sufficient information to the relevant competent authority and the Ministry of Environment, Forestry and Tourism (MEFT) and related authorities to make an informed decision regarding the project and the issuing of an environmental clearance certificate.

3 METHODOLOGY

Methods employed to investigate and report on potential impacts of the Proponent's activities on the social and natural environment include:

1. Detailed infrastructure and operational procedures received from the client are presented in this report.
2. Baseline information about the site and its surroundings were obtained from primary information, a reconnaissance site visit and existing secondary information from (hydrogeological study).
3. As part of the scoping process to determine potential environmental impacts, interested and affected parties (IAPs) were consulted about their views, comments and opinions, all of which are presented in this report.
4. As per the findings of this environmental assessment, a scoping report with an environmental management plan (EMP) were prepared and this will be submitted to the MEFT.

4 OPERATIONS AND RELATED ACTIVITIES

The Proponent has been cultivating grains for nearly 16 years. However, the farms have been used for crop cultivation for more than 40 years, with the earliest documentation of cultivated areas visible on the topographic sheets, which were generated in the 1970's. Irrigation-based crop cultivation is a more recent development to augment the traditional dryland cropping and cattle ranching. The Proponent also gradually started implementing precision agriculture over the past few years to ultimately include pivot-based irrigation systems. Currently, commercial produce is cultivated on a rotational basis on irrigation-based fields. In addition, the Proponent plans to increase the cultivated areas with cultivation of maize planned on Farm Eisenberg No. 509 which was traditionally only used for cattle ranching. Livestock farming involves mainly cattle, while there is also some game on the farm. However, game farming and related fencing is not an active pursuit of the Proponent. Existing and planned operations are reliant on support infrastructure and resources, all of which are described below.

4.1 LAND CLEARING

The farming unit is a known agricultural unit for more than 40 years. Initial land clearing was conducted to accommodate dryland cropping on Portion 19 and Portion 20 of the Farm Otavi Fontein FMB/00794 while Farm Eisenberg FMB/00509 are subject to continued rangeland improvement efforts. Land clearing for crop cultivation includes removal of boulders and vegetation. Future expansion of operations include the proposed clearing of 42 ha of land on Farm Eisenberg FMB/00509 to accommodate additional crop cultivation. Bush clearing is also conducted around crop fields to allow for implements to manoeuvre and to reduce competition for groundwater.

In addition to the clearing of land for crops, the majority of the faming unit, apart from isolated outcrops, has historically undergone rangeland improvement. This was, and still is, necessary due to serious bush encroachment problems in central to north-central Namibia (Photo 4-1). Rangeland improvement thus mainly involved bush-thinning activities targeting invasive species (Photo 4-2). More recently, renewed rangeland management efforts have focussed on the eastern portions of the farming unit, i.e. Farm Eisenberg FMB/00509. These rangeland measures include implementation of an aftercare program. Vegetation was also cleared, and is maintained so, next to all fences to accommodate firefighting efforts (firebreaks).

Photo 4-1 Bush encroached areas Farm Eisenberg FMB/00509

Photo 4-2 Rangeland management area Farm Eisenberg FMB/00509

Photo 4-3 Rock pile from historically cleared fields on the Farm Otavi Fontein FMB/00019

Photo 4-4 Firebreak along the fence of the Farm Eisenberg FMB/00509

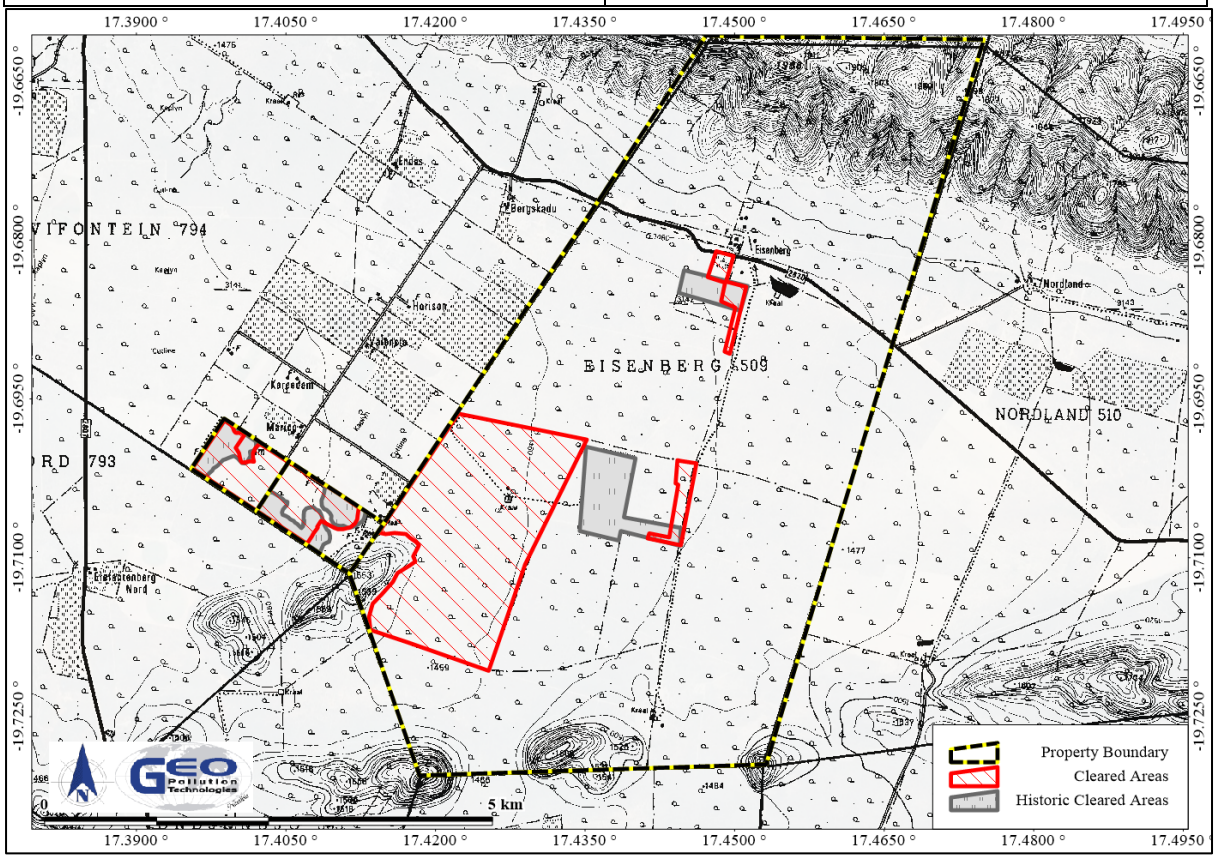

Figure 4-1 Cleared areas in relation to the 1975 topographical map

4.1 ARABLE FARMING

A variety of crops are planted on a rotational basis across the farming unit. Apart from the maize, wheat and vegetables, which are the main commercial crops cultivated, lablab beans and sorghum, or varieties thereof, are used to improve soil health and provide additional feed for cattle. Figure 4-2 depicts the cultivated fields in relation to cleared areas.

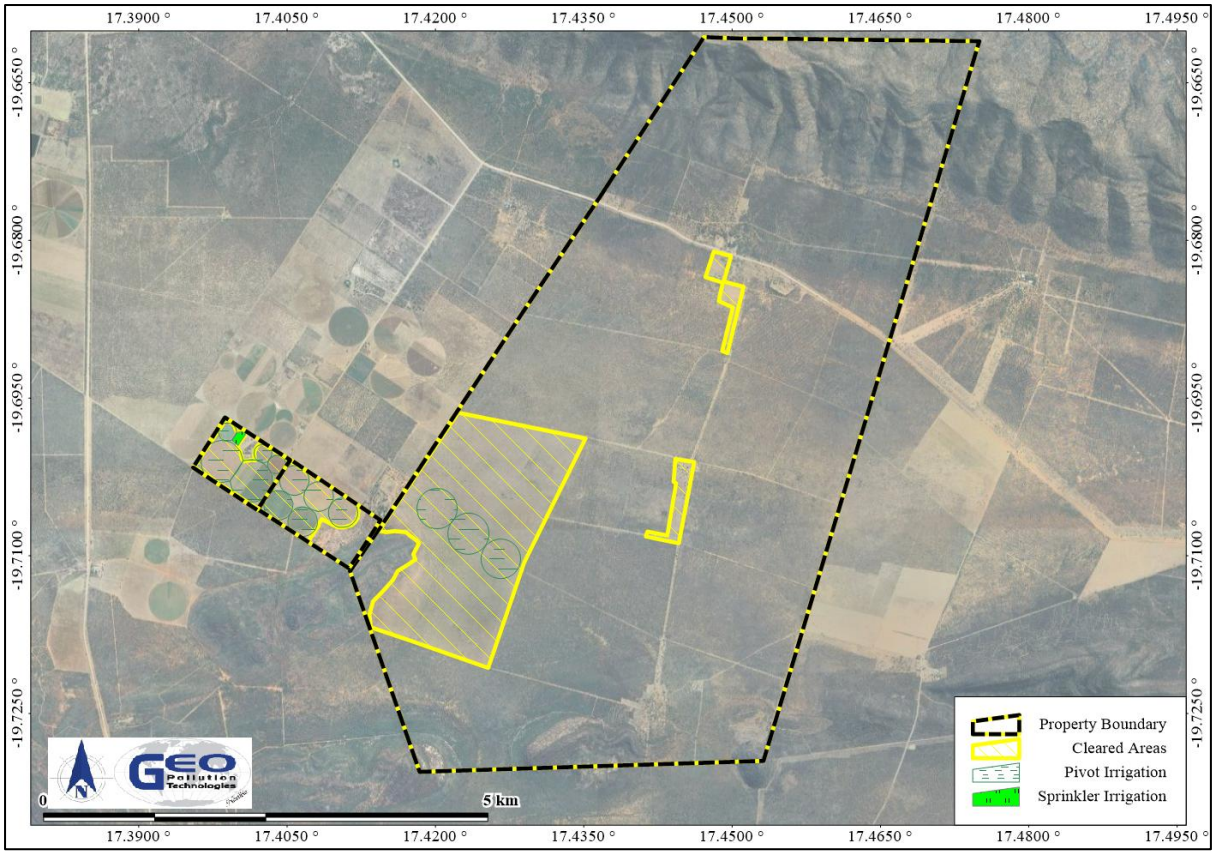

Figure 4-2 Cultivated and cleared areas

Each crop has a different planting and cultivation regime. However, for all crops, the compaction caused by the pivot systems, necessitates tilling of all fields prior to planting. Once tilled, fields are irrigated to achieve optimal soil moisture for seed germination. Aligning this phase with the onset of good rains ultimately increases the success rate and decrease the amount of water needed to start the processes. The majority of produce are annual crops, which require one or two seasons to complete their life cycle.

Photo 4-5 Pivot track within carrot field

Photo 4-6 Carrot cultivation

Vegetable production is varied and informed by soil condition. For example, it is advisable that potatoes only be cultivated on the same portion of land every 4 to 5 years. Crop rotation is therefore vital to the greater success of the agricultural unit. Each crop also requires a different pesticide and fertiliser regime. However, some weeds like the lamb quarters / fat-hen (*Chenopodium albunm*) (Photo 4-7 and Photo 4-8 below) is best controlled through physical removal (PlantNet, 2024). Employees thus clear the weeds manually from the fields. All such weeds are then bagged to prevent further seed distribution, before being burnt.

Photo 4-7 Lamb quarters / fat-hen (*Chenopodium albunm)*

Photo 4-8 Lamb quarters / Fat-hen (*Chenopodium album)* after weeding

Once a crop reaches maturity, it is harvested. Harvesting techniques used depend on the type of crop. Most of the vegetables are harvested by hand. Harvested crops are collected in crates and transported to the packing station. Here they are washed, sorted, packed and stored until they are shipped to customers.

Photo 4-9 Plastic harvest crates

Photo 4-10 Harvested potatoes

Photo 4-11 Potato sorting station

Photo 4-12 Potato bagging station

Photo 4-13 Packed potatoes

Photo 4-14 Unwashed potatoes

After planting and before complete germination of maize, all of the planted sections need to be treated with herbicides to prevent weeds from overwhelming the future seedlings. Once the maize plants have broken the soil surface, herbicides such as round-up can no longer be used. Combinations of chemicals and herbicides are then employed to try and stem weed growth (Photo 4-7 and Photo 4-8) among the maize. Apart from weed control, pesticides area also employed to protect the crop field from insects such as the fall-army worm (*Spodoptera frugiperda*) and the arachnid, red spider mite (*Tetranychus urticae*). Pesticides are administered as per the specified application procedures for the corresponding pest by means of the specialised pivot system. To ensure correct and safe application of pesticides, a pesticide plan is implemented and regularly updated.

Mammals, such as warthog, porcupine and antelope, can cause considerable damage to vegetables and maize fields. Cultivated areas are therefore surrounded by game fencing including additional rocks at ground level to restrict wildlife entrance and movement.

Fertilizers are applied as required and according to the specifications for application. For irrigated fields, fertilisers are mixed with water in a large mixing tank (Photo 4-15). Once the desired mixing ratio is achieved, the fertiliser is fed into the irrigation system for administration onto the crops. The Proponent utilises a low-soluble-nutrient fertilizer which may be readily absorbed by crops and requires less water. Maize, one of the commercial produces is harvested by conventional means such as a combine harvester. Maize is store in a maize dam while the corn stover is processed by a baler for animal feed (Photo 4-16). Cattle are allowed to graze on left-over stover on harvested fields.

Photo 4-15 Fertiliser mixing tank

Photo 4-16 Baler

Photo 4-17 Fertilizer sprayer

Photo 4-18 Disc harrow

4.2 LIVESTOCK

Cattle are herded and managed as part of the integrated business unit. A dedicated workforce manages all operations related to the cattle, which includes predator protection, watering equipment, calving support, herd vaccinations, hoof care, pasture management and meat marketing. A feedlot is employed at times to provide for additional support during droughts. Cattle are used to fertilise crop fields after harvesting, when they are allowed to graze on the maize stover or on resting / fallow crop fields.

Photo 4-19 Cattle in feedlot / holding pen

Photo 4-20 Cattle being moved along a local movement corridor

4.3 SUPPORT INFRASTRUCTURE

Operations as outlined above, require support infrastructure or resources. The most crucial of these relate to water required for irrigation and potable use. Water and related irrigation systems are discussed in Section 4.4 while labour and related aspects are detailed in Section 4.5.

The majority of operations on the farm are provided with **electricity** from a 75 kV CENORED line. The power line has a 9 m wide servitude which is kept clean by the Proponent for the portions of the power line over their farm. A 120 kVA photovoltaic solar system, made up by three installation sites augments the power supply of the farming unit. An additional 100 kVA photovoltaic solar system is planned for future expansion. Employee houses are serviced with electricity. In addition to the solar installations and the CENORED grid connection, the Proponent also has his own generators. These are used to augment the power consumption of the irrigation systems when the solar system cannot deliver enough output to run the pivot systems. **Fuel** is stored in an above ground tank of 2,500 *l*, for the use by mainly tractors and farming related operations. The fuel storage tank is secured in a bund area and under roof to prevent exposure from harsh weather / environmental conditions.

Photo 4-21 Photovoltaic solar installation

Photo 4-22 Generator

Photo 4-23 Fuel storage tank

Photo 4-24 Fuel storage room

Water is pumped from eight boreholes for irrigation, stock watering and domestic use. Storage of water is determined by its use. While irrigation boreholes have no storage structures, stock watering rely on reservoirs and domestic water supply employ raised water tanks. All offices and employees' houses are provided with septic tank and french drain systems to accommodate wastewater. In addition to the french drains, the Proponent also provides in-field chemical toilets for employees. **Waste** generated on the farm is **disposed** of at the municipal landfill site. Due to a lack of any recyclers in the area, recycling of certain wastes is not possible. However, where possible, certain waste items are not discarded, but rather re-used for alternative purposes. This includes the re-use of old oil when not collected by the Proponent's service partner (John Deer). All spoiled produce are made available as animal feed. Any hazardous waste is stored in suitable bunded areas while empty pesticides containers are handed in to the local Ministry of Agriculture, Water, Fisheries, and Land Reform's (MAFWLR) offices in Otavi, or where capacity exist to accept them.

Photo 4-25 Raised domestic water reservoir

Photo 4-26 Employee water reservoir

Photo 4 21 French drain

Photo 4 21 Chemical toilet

A **storage and maintenance area** is located on the farm and comprise of a shed and storerooms where implements and other maintenance material are stored under roof and on impermeable surfaces. Any maintenance and or minor repairs are conducted on site and within these areas. Unused equipment and related materials are stored in an access controlled area. Offices and employee houses are all located on the farm. All pesticides, herbicides and fertilizers are stored in a dedicated, access controlled **chemical store**. All discarded chemical containers are locked away until disposal. Fertilisers are stored, separate from all other chemicals or materials, on an impermeable layer. Operational areas have firefighting equipment and safety signs where required.

The Proponent is a large producer of various vegetables that are being grown, sorted, packaged and stored. Inside of the **storage and packaging space** there are specialised equipment that is used to sort, wash and package the various produce that are cultivated. A summary of the support infrastructure components is presented in Figure 4-3.

Photo 4-27 Tractor and implement storage shed

Photo 4-28 Fertilizer storage room entrance

Photo 4-29 Fertiliser storage

Photo 4-30 Chemical store entrance

Table 4-1 Summary of infrastructure components related to agricultural operations

Project Component	Current Provision	Future Provision
Electricity Provision	Estimated 75 kVA mainly sourced from CENORED	No significant increase expected
Photovoltaic Solar System	120 kVA	100 kVA planned for future
Telecommunication Tower	None	None
Water Provision	Groundwater abstraction from eight boreholes	An increase in water allocation may be applied for
Water Storage	Various stock watering reservoirs and water tanks	No storage reservoirs planned for irrigation related activities
Equipment and General Storage	One existing storage complex	No additional storage proposed
Sanitation	Current septic tank and french drain systems catering for existing staff compliment	Additional septic tank and french drains may be required for planned expansions
Landfill	None	No additional sites planed
Fuel Storage	One diesel tank with a capacity of 2,500 *l* located in a bund wall within a building	No additional tanks will be erected for the foreseeable future

Project Component	Current Provision	Future Provision
Chemical Storage Area	One chemical storage unit	No additional chemical storage unit planned
Fertilizer storage area	One fertilizer storage unit	No additional fertilizer storage unit planned
Storage and packaging space	One storage and processing complex	No additional storage units are planned

Photo 4-31 Chemical storage

Photo 4-32 Discarded chemical containers

Photo 4-33 Fire extinguisher post

Photo 4-34 Health and safety signs

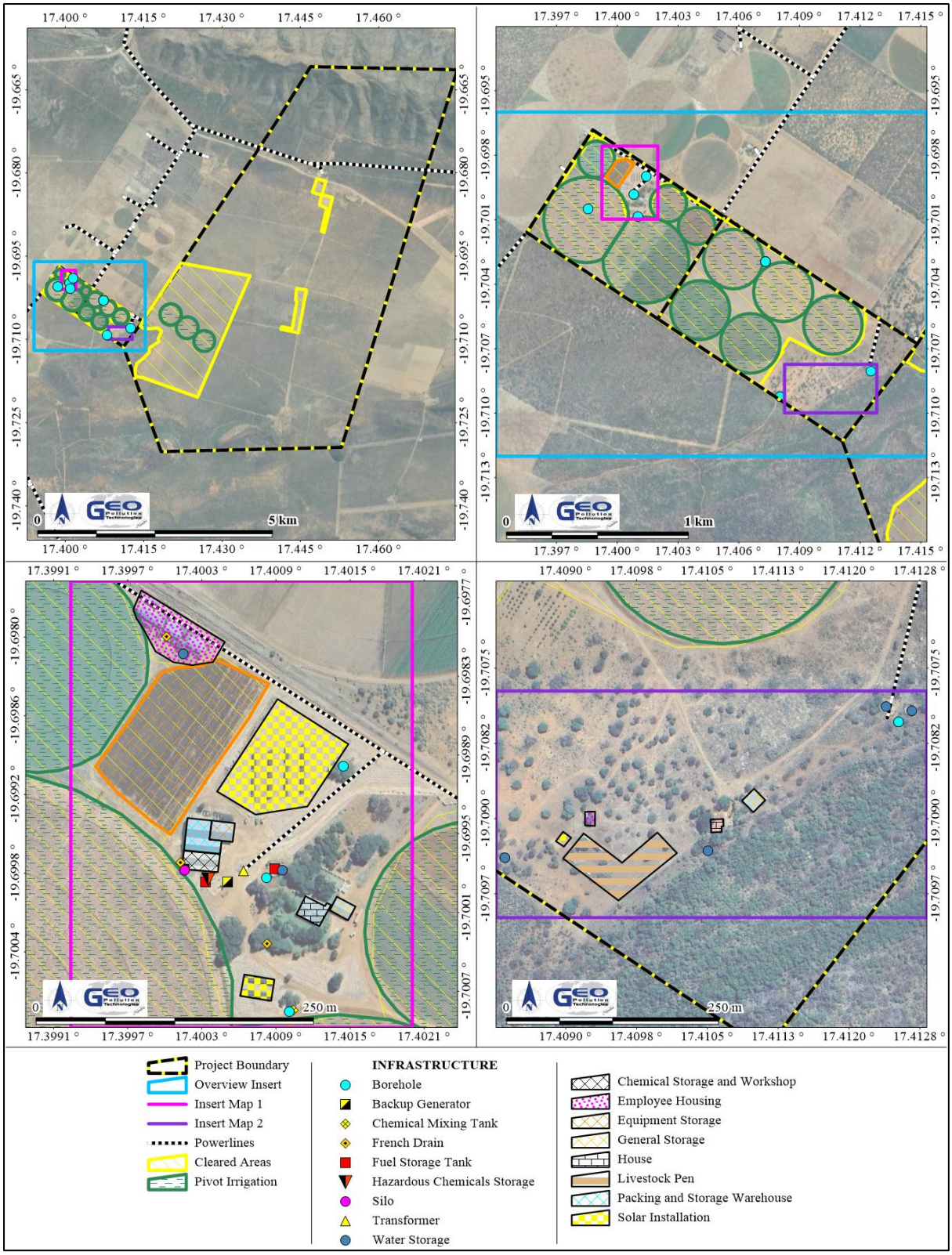

Figure 4-3 Map with infrastructure components

4.4 IRRIGATION AND WATER SUPPLY

All water requirements of the Proponent are met through groundwater abstraction. Existing and proposed irrigation of crops, make up the bulk of the water use, and is the determining factor in terms of water use and related permitting. The irrigation system employed on the farm is centre pivots and a very small portion of fixed sprinkler lines. The Proponent employs fixed centre

pivots which are installed on each of the irrigation fields. The larger pivot has a span length of 60 m with an overhang of 24 m.

Phocaides (2007) provides a description of the centre pivot, being a low to medium pressure, fully mechanised, automated irrigation of permanent assemble. It basically comprises a sprinkler pipeline (usually of high tensile galvanized light steel or aluminium pipes) supported above ground by mobile A-frame towers, long spans, steel trusses and/or cables (Photo 4-35). The pipeline is connected to a central tower with the "pivot mechanism" and main control panel. Moveable systems are mounted on wheels which allows it to be dragged from one field and fixed water supply point, to the next. The entire active irrigation system remains self-propelled to slowly rotate around the central tower while dispensing water through sprinklers (emitters) connected to the pipeline (Photo 4-36 to Photo 4-37). An automatic alignment systems ensures the irrigation pipeline remains straight while a drive system enables the system movement. Small variations to the emitter sequence may be done when moving between different crops which may have different irrigation requirements. The Proponent has approximately 76ha of pivot related irrigation fields on the farm and would like to further develop another 42 ha. An schematic diagram of a basic pivot system is presented in Figure 4-4.

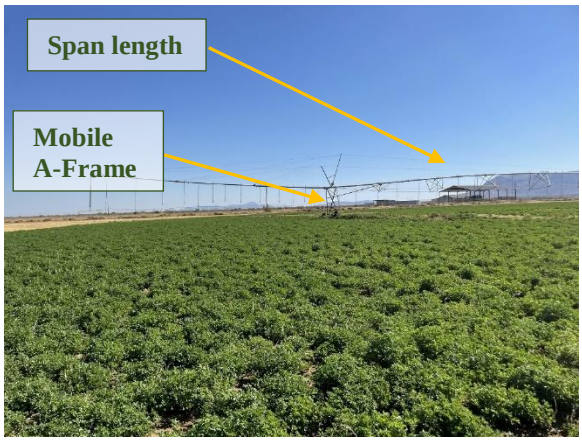

Photo 4-35 Centre pivot system

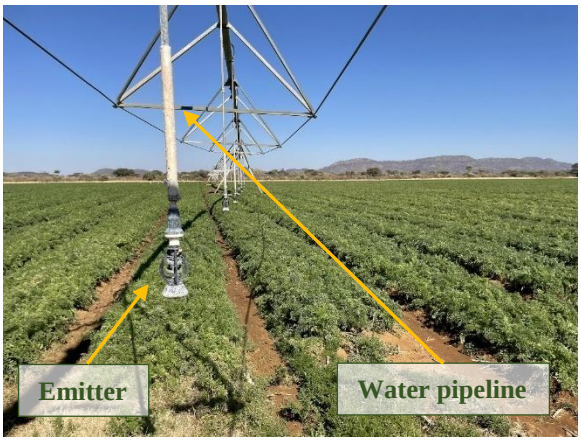

Photo 4-36 Centre pivot system close up

Photo 4-37 Emitters linked to the pivot

Photo 4-38 Centre pivot base

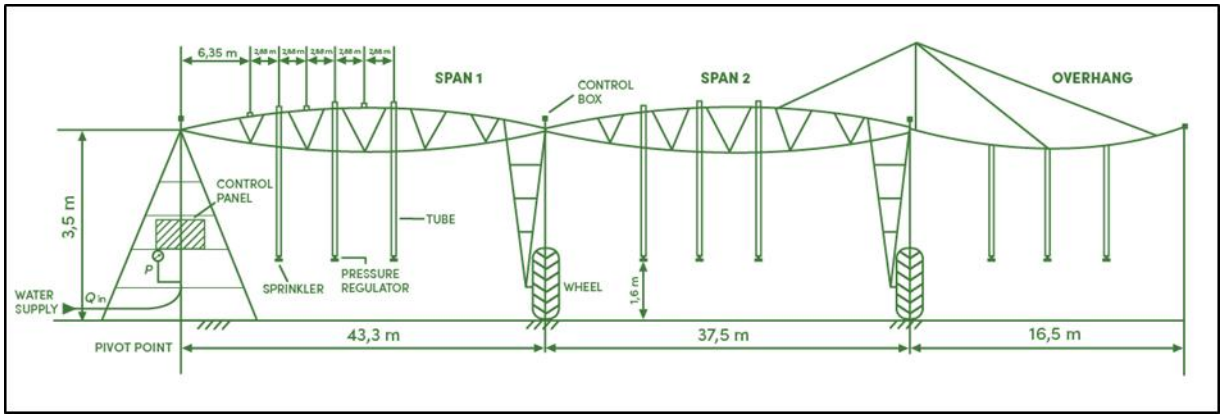

Figure 4-4 Diagram of a typical centre pivot irrigation system (AGRIVI, 2022)

During the recognisance site visit, al known boreholes on the farm were documented. Eleven boreholes were visited and data gathered about their status, use and physical description. Coordinates of all boreholes were recorded and mapped, as presented in Figure 4-5. Of the boreholes surveyed, three are used for irrigation purposes.

The Proponent has a total combined water abstraction permit for 300,000 m³ per year and has, as required by the new Water Act, applied to the have the permit replaced by a water license.

Table 4-2 Summary of borehole information obtained from the Proponent

Map Ref	Borehole Name	Farm Portion	Use	Borehole Depth (m)	Yield (m^3/h)	Water Level (mbs)
EB01	Huis gat	Otavi Fontein FMB/00794/00019	Domestic	150	60	
EB02	WW204677	Otavi Fontein FMB/00794/00019	Irrigation			
EB03	WW35647	Otavi Fontein FMB/00794/00019	Domestic	150	25	43.6
EB04	WW35703	Otavi Fontein FMB/00794/00019	Irrigation	150	120	
EB05		Otavi Fontein FMB/00794/00020	Stock		12	
EB06		Otavi Fontein FMB/00794/00020	Not in use	Collapsed		Dry
EB07		Otavi Fontein FMB/00794/00020	Not in use			Dry
EB08	WW207503	Eisenberg FMB/00509	Planned Irrigation	114	63	43.21
EB09	WW6217	Eisenberg FMB/00509	Not in use	76.2	6.4	
EB10		Eisenberg FMB/00509	Domestic			
EB11		Eisenberg FMB/00509	Stock			

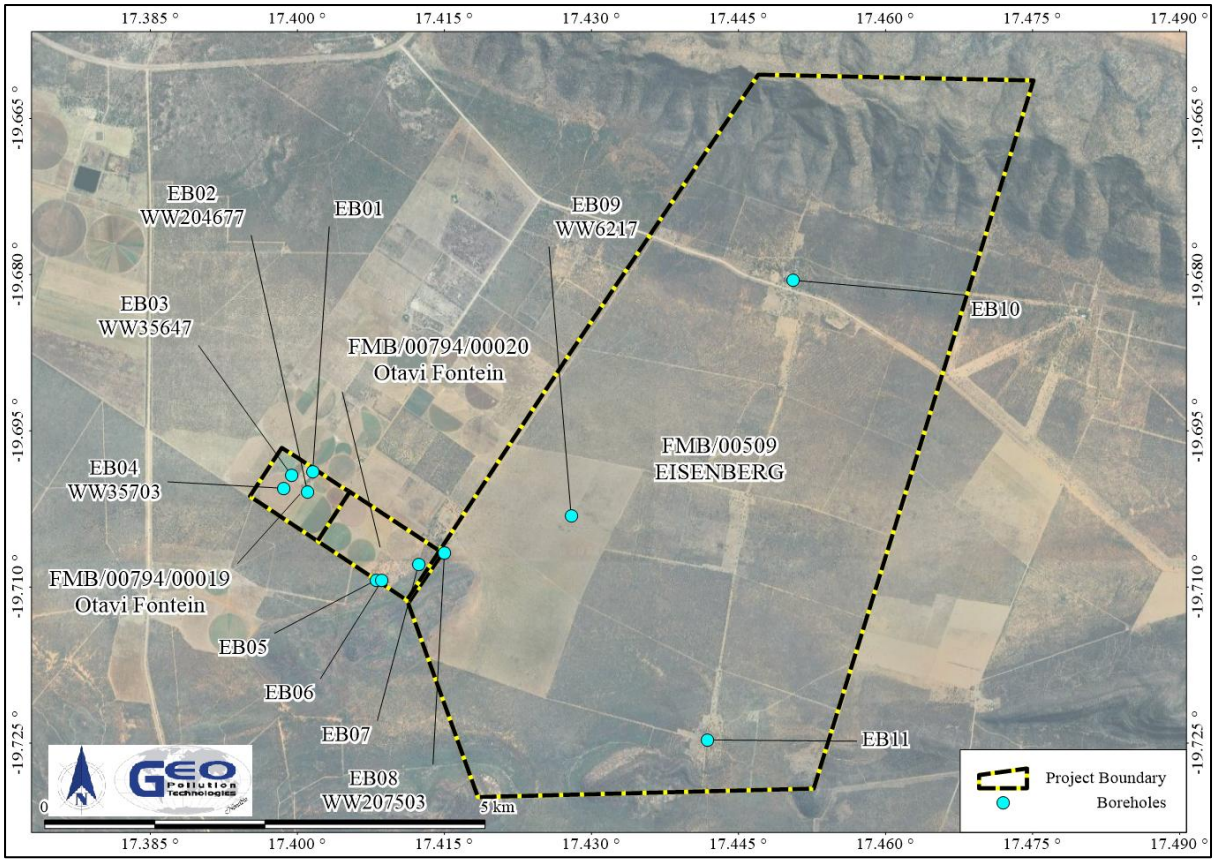

Figure 4-5 Locations of boreholes

Photo 4-39 EB1 Domestic-use borehole

Photo 4-40 EB2 / WW204677 Irrigation-use borehole

Photo 4-41 EB3 / WW35647 Domestic-use borehole

Photo 4-42 EB4 / WW35703 Irrigation-use boreholes

Photo 4-43 Flow meter on EB4

Photo 4-44 EB5 Stock-use borehole

Photo 4-45 EB 6 Not used/collapsed borehole

Photo 4-46 **EB7 Not used/dry boreholes**

4.5 EMPLOYMENT

All operations on the farm are reliant on labour. Operations currently require 9 permanent employees and approximately 20 to 70 seasonal employees. All permanent employees are provided with housing, running warm water, electricity and flush toilets. There are dedicated permanent housing units. All employees are further provided with personal protective equipment (PPE) when appropriate, while support is provided in terms of education, etc. Limited contractors are used as the Proponent's focus is to provide employment as well as to build and equip their own workforce with knowledge and skills related to the various components of operations.

Photo 4-47 Employee housing

Photo 4-48 Septic tank at worker housing

Photo 4-49 Employee ablution

Photo 4-50 Employee housing

5 ALTERNATIVES

The Proponent has incorporated various possible revenue generating activities on the property to ensure a robust and sustainable operational unit. A combination of agriculture and related activities are implemented, thereby significantly reducing possible feasible alternatives. Alternatives considered and described below, relate mostly to the implementation of the various project components, but also include:

- Location alternatives;
- Project implementation and design alternatives;
- No-go alternative.

5.1 LOCATION ALTERNATIVES

The location of the irrigation areas are well suited for crop production due to the availability of water and suitability of soils. Boreholes are already in place and land clearing and field establishment have already been completed for existing operations. Cultivation areas have been informed by soil sampling and analysis to ensure the most suited placement of recent developed fields and proposed expansion areas. No location alternatives are therefore considered feasible, as the Proponent owns the property on which operations are conducted and proposed.

5.2 PROJECT IMPLEMENTATION AND DESIGN ALTERNATIVES

Various alternatives are continually considered to optimise crop production and irrigation. Boreholes are already in place and no surface water is available. Therefore, there are no alternative water sources for the irrigation operations. However, there are a number of alternatives with regards to the application of the water used. The most pertinent relates to crop irrigation methods. Furthermore, the type and variation of crops cultivated are also considered as alternatives.

5.2.1 Irrigation Methods

When considering alternative irrigations systems, the most viable irrigation option is not only based on the irrigation system's design efficiency, but should include environmental constrains and operating costs. Some systems are simply not viable due to climatic and topographical features as well as cost implications. For example, flood irrigation is not viable on steeper gradients and are more expensive due to water pumping costs.

The type of produce cultivated also plays a determining role. It will not be feasible to install highly efficient yet expensive irrigation systems (such as drip irrigation) for crops with lower economic yields. In turn, some crops will not produce such high yields when cultivated under less efficient systems. Table 5-1 depicts different types of irrigation systems as per the South African Irrigation Institute's suggested efficiencies (IWRM Plan Joint Venture Namibia, 2010). The estimated average costs are based on 35 ha units and although outdated estimates are still useful for comparisons purposes. Although flood systems are not viable irrigation methods, these have been included for comparison with regards to capital cost and design efficiency.

Table 5-1 Irrigation system efficiency (IWRM Plan Joint Venture Namibia, 2010)

Irrigation System	Design Efficiency	Capital Costs (R /ha)
Flood: Furrow	65%	13,000
Flood: Border	60%	17,600
Flood: Basin	75%	18,800
Sprinkler: Dragline	75%	24,800
Sprinkler: Quick-coupling	75%	22,500
Sprinkler: Permanent	85%	34,500
Sprinkler: Travelling boom	80%	23,200
Sprinkler: Centre pivot	85%	43,300
Sprinkler: Linear	85%	69,400
Sprinkler: Micro sprinkler	85%	36,300
Micro: Spray	90%	53,200
Micro: Drip	95%	46,300

In the Otavi Constituency, climatic and soil conditions necessitate an irrigation system with a high rate of water deposition (due to evaporation). For purposes of irrigation, centre pivot and sprinkler systems are suitable. All irrigation is adjusted and implemented according to rainfall. During higher rainfall periods, less water is irrigated. The Proponent further employees an emitter which can allow for larger droplets of water to be delivered, reducing evaporative losses.. Apart from the emitter's ability to deliver larger water droplets, the devise has further been designed to allow for the administering of both fertilisers and pesticides (chemigation) which can be regulated in terms of its mixing ratio. In other words, the amount of water to be added to the pesticide or fertiliser, can be adjusted.

5.2.2 Soil Preparation

Traditionally, soil is prepared for planting by tilling and ploughing. These processes break the top layer of soil at varying depths and mix residual plant material into the soil. It also uproots weeds and provide for loose soil. There is nowadays however a shift in the approach to soil preparation that has some advantages over traditional tilling. Conservation tillage practises aim at less disturbance of the soil and have advantages of less erosion, less evaporation and save on time and costs of traditional tilling. Conservation tillage can either be partial tillage, as is the case with strip-tilling, or no tilling at all. With strip-tillage, only narrow strips are tilled in the area where planting will take place. The areas, between planted rows are left untilled, and with residual plant material from the previous harvest. With no-tillage, seeds are

planted on the field with no soil preparation at all. The Proponent already employs standard ploughing-and-tilling practises. Because of the soil compaction that is caused by the centre pivot systems, there were no other alternatives considered.

5.2.3 Crop Selection (Maize)

The main challenges faced by the Proponent in maize cultivation, relates to the removal of weeds and extermination of pests such as lamb quarters / fat-hen (*Chenopodium albunm*), Red Spider Mite (*Tetranychus urticae*) and the fall armyworm (*Spodoptera frugiperda*). The use of pesticides to control weeds and insect pests have its limitations. Herbicides can be broad spectrum, i.e. effective against all plants, or selective, i.e. targeting only selected plants based on morphological, physiological, or biochemical characteristics. A common form of selectivity is between herbicides targeting broad-leaved flowering plants (dicotyledons) and those targeting grasses and grass-like flowering plants (monocotyledons). Thus, maize can for example be sprayed post-emergent with a broad-leaved herbicide. This will however not target and kill grasses.. Ideally, one would like to spray a broad spectrum herbicide, like a glyphosate, that kills both broad-leaved and grass-like plants.

Insect control with insecticides also has its limitations and disadvantages. Insecticides are mostly non-selective and will kill both beneficial and pest species. Insecticides can also not be sprayed on food crops that are near harvesting as the insecticide may remain in the produce and thus pose human health risks. Furthermore, insecticides applied by spraying, does not always reach and kill the insects that burrows into the fruit, or as is the case with maize, the maize ear.

5.3 NO GO ALTERNATIVE

Agriculture has been a core activity in the region for decades. Maize is supplied to Namibian mills and the stover used for fodder. Currently, within the restriction of pesticides available in Namibia and the significant infestation of invader grass species (lamb quarters / fat-hen (*Chenopodium albunm*)), the production of maize is almost not feasible. If maize is for example harvested along with the grass seeds, the entire harvest is downgraded, becoming not economically feasible when considering input costs. This could be disastrous to Namibia who already is a nett importer of maize.

Should the project not receive an environmental clearance certificate, there would be a loss in capital investment and a loss in employment. This will lead to a decrease in the spending power of the local community. Finally, less revenue will be generated for Namibia and more money will be required for importing of feed and food. However, the most important aspect of the no go alternatives will be the lack of staple food production for the local market.

6 ADMINISTRATIVE, LEGAL AND POLICY REQUIREMENTS

All projects, plans, programmes and policies with potential adverse impacts on the environment require an environmental assessment, as per the Namibian legislation. This promotes protection of the environment as well as sustainable development. The legislation and standards provided in Table 6-1 to Table 6-3 govern the environmental assessment process in Namibia, and are relevant to the assessed development.

Table 6-1 Namibian law applicable to the development

Law	Key Aspects
The Namibian Constitution	♦ Promotes the welfare of people ♦ Incorporates a high level of environmental protection ♦ Incorporates international agreements as part of Namibian law
Environmental Management Act Act No. 7 of 2007, Government Notice No. 232 of 2007	♦ Defines the environment ♦ Promotes sustainable management of the environment and the use of natural resources ♦ Provides a process of assessment and control of activities with possible significant effects on the environment
Environmental Management Act Regulations Government Notice No. 28-30 of 2012	♦ Commencement of the Environmental Management Act ♦ Lists activities that requires an environmental clearance certificate ♦ Provides Environmental Impact Assessment Regulations
Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act Act No. 36 of 1947; Government Notice No. 1239 of 1947	♦ Governs the registration, importation, sale and use of fertilizers, farm feeds, agricultural remedies and stock remedies ♦ Various amendments and regulations
Seed and Seed Varieties Act 23 of 2018 Act No. 23 of 2018, Government Notice No. 368 of 2018	♦ Provides for restrictions on the importation of seed ♦ Not in force yet
Water Resources Management Act Act No. 11 of 2013, Government Notice No. 268 of 2023	♦ Provides for management, protection, development, use and conservation of water resources ♦ Prevention of water pollution and assignment of liability ♦ Permits and licencing for borehole drilling and water abstraction
Forest Act Act 12 of 2001, Government Notice No. 248 of 2001	♦ Makes provision for the protection of the environment and the control and management of forest fires ♦ Provides for the licencing and permit conditions for the removal of woody and other vegetation as well as the disturbance and removal of soil from forested areas
Forest Regulations: Forest Act, 2001 Government Notice No. 170 of 2015	♦ Declares protected trees or plants ♦ Issuing of permits to remove protected tree and plant species ♦ Issuing of permits for harvesting of trees for wood and charcoal production and transport
Soil Conservation Act Act No. 76 of 1969, Government Notice No. 494 of 1970	♦ Laws relating to the combating and prevention of soil erosion, the conservation, improvement and manner of use of the soil and vegetation and the protection of the water sources in Namibia

Law	Key Aspects
Petroleum Products and Energy Act Act No. 13 of 1990, Government Notice No. 45 of 1990	♦ Regulates petroleum industry ♦ Makes provision for impact assessment ♦ Petroleum Products Regulations (Government Notice No. 155 of 2000) ♦ Prescribes South African National Standards (SANS) or equivalents for construction, operation and decommissioning of petroleum facilities (refer to Government Notice No. 21 of 2002)
Local Authorities Act Act No. 23 of 1992, Government Notice No. 116 of 1992	♦ Defines the powers, duties and functions of local authority councils
Public and Environmental Health Act Act No. 1 of 2015, Government Notice No. 86 of 2015	♦ Provides a framework for a structured more uniform public and environmental health system, and for incidental matters ♦ Deals with Integrated Waste Management including waste collection disposal and recycling, waste generation and storage, and sanitation
Labour Act Act No 11 of 2007, Government Notice No. 236 of 2007	♦ Provides for Labour Law and the protection and safety of employees ♦ Labour Act, 1992: Regulations relating to the health and safety of employees at work (Government Notice No. 156 of 1997)
Hazardous Substances Ordinance Ordinance No. 14 of 1974	♦ Applies to the manufacture, sale, use, disposal and dumping of hazardous substances as well as their import and export ♦ Aims to prevent hazardous substances from causing injury, ill-health or the death of human beings
Pollution Control and Waste Management Bill (draft document)	♦ Not in force yet ♦ Provides for prevention and control of pollution and waste ♦ Provides for procedures to be followed for licence applications

Table 6-2 Guiding documents, directives and standards

Standard or Code	Key Aspects
South African National Standards (SANS)	♦ The Petroleum Products and Energy Act prescribes SANS standards for the construction, operations and demolition of petroleum facilities ♦ SANS 10089-3:2010 is specifically aimed at storage and distribution of petroleum products at fuel retail facilities and consumer installations ♦ SANS 10131 (2004) is aimed at above-ground storage tanks for petroleum products ♦ Provide requirements for spill control infrastructure
Department of Water Affairs and Forestry Code of Practice: Volume 1 Septic Tank Guidelines (General Guidelines July 2008)	♦ It defines french drains and septic tanks ♦ Gives location consideration and tank design guidance ♦ Septic tanks are- not allowed between two and five meters from a building and or a boundary ♦ It specifically states that in rocky areas secondary treatment must be provided for soak-aways

Table 6-3 Relevant multilateral environmental agreements

Agreement	Key Aspects
Stockholm Declaration on the Human Environment, Stockholm 1972	♦ Recognizes the need for a common outlook and common principles to inspire and guide the people of the world in the preservation and enhancement of the human environment
United Nations Framework Convention on Climate Change (UNFCCC)	♦ The Convention recognises that developing countries should be accorded appropriate assistance to enable them to fulfil the terms of the Convention
Convention on Biological Diversity, Rio de Janeiro, 1992	♦ Under article 14 of The Convention, EIAs must be conducted for projects that may negatively affect biological diversity
International Treaty on Plant Genetic Resources for Food and Agriculture, 2001	♦ Promotes conservation, exploration, collection, characterization, evaluation and documentation of plant genetic resources for food and agriculture ♦ Promote the sustainable use of plant genetic resources for food and agriculture

Listed activities, which require an ECC application (Government Regulation No 29 of 2012) related to this project, include the following:

Section 1 of Government Notice No. 29 of 2012: Energy, Transmission and Storage Activities

- 1(a) The construction of facilities the generation of electricity. The Proponent uses a photovoltaic solar system for some aspects of the operations.

Section 2 of Government Notice No. 29 of 2012: Waste Management, Treatment, Handling and Disposal Activities

- 2.1 The construction of facilities for waste sites, treatment of waste and disposal of waste. The Proponent has septic tank and soak away systems to collect and dispose of sewage and wastewater from employee housing.

Section 4: Forestry Activities

- 4 The clearance of forest areas, deforestation, afforestation, timber harvesting or any other related activity that requires authorisation in terms of the Forest Act, 2001 (Act No 12 of 2001) or any other law. Various portions of the farm have previously been cleared (spanning a timeframe of 50 years). The Proponent manage cleared areas for crop production, fire brakes and conducts an aftercare program for invader bush control (as part of rangeland management).

Section 7: Agriculture and Aquaculture Activities

- 7.5 Pest control: The Proponent uses conventional pest control products as approved by the Namibian government. These may include herbicides and pesticides and will vary according to season and pests encountered during a year.

Section 8 of Government Notice No. 29 of 2012: Water Resource Developments

- 8.1. The abstraction of ground or surface water for industrial or commercial purposes: Groundwater is abstracted for current and proposed commercial operations.
- 8.7 Irrigation schemes for agriculture excluding domestic irrigation: No *irrigation scheme* was developed, however, *irrigation systems* are used on the farm. Irrigation on the farm does not contribute to, or is part of any irrigation scheme, as proclaimed by the Namibian Government.

Section 9 of Government Notice No. 29 of 2012: Hazardous Substance Treatment, Handling and Storage

- 9.1 The manufacturing, storage, handling or processing of a hazardous substance defined in the Hazardous Substances Ordinance, 1974." Fuel is stored on site for daily operations.

- 9.2 Any process or activity which requires a permit, licence or other form of authorisation, or the modification of or changes to existing facilities for any process or activity which requires an amendment of an existing permit, licence or authorisation or which requires a new permit, licence or authorisation in terms of a law governing the generation or release of emissions, pollution, effluent or waste. The Proponent has the infrastructure to store 2,500 *l* in aboveground storage tanks.
- 9.5 Construction of filling stations or any other facility for the underground and aboveground storage of dangerous goods, including petrol, diesel, liquid petroleum gas or paraffin. Fuel is stored on site, in aboveground storage tanks for daily operations.

Additional national planning legislation considered include:

- National Development Plans (NDPs).
- Ministry of Agriculture, Water & Forestry Strategic Plan 2017/18-2021/22.
- Namibia's Climate Change Adaptation.

The rationale behind the NDPs is to introduce an element of flexibility within the Ministry planning system by fast tracking development in areas where progress is insufficient. It also incorporates new development opportunities and aims to address challenges that have emerged after the formulation of various NDPs. In the latest Development Plan, the amount of hectares developed for irrigation, is a key performance indicator for the plan's Economic Progression's strategic objectives, which are aimed:

"*to increase productivity during the strategic period through the implementation of appropriate technologies e.g. Comprehensive Conservation Agriculture (CCA) and mechanization in order to ensure food security at both household and national level."*

Additional strategies included for the Agriculture Sector and Food Security include:

- Increase agricultural production for cereals, horticulture and livestock
- Promote the planting of drought resistance varieties

The above ties in with NDPs which purposes to set out a roadmap for achieving envisioned rapid industrialization while adhering to the four integrated pillars of sustainable development as identified in the plan. Irrigation activities contribute primary to the "Economic Progression" pillar by increasing the volumes of locally produced goods. One of the focus areas of the economic progression pillar of NDPs is agriculture and food security. The NDPs aims to decrease the amount of food insecure individuals, increase food production and increase the share of value addition in crop and livestock farming. Development and operations of irrigation activities on the farm are in line with all of these strategies as identified in the NDPs. The operation contributes to the amount of productive, irrigated land in Namibia, provides employment, and most crucially, produces crops for local markets.

Namibia's Climate Change Adaptation Communication to the United Nations Framework Convention on Climate Change, identifies adaptation actions (amongst others) for the agriculture and water sectors. The Proponent has specifically considered the following actions:

- Develop improved crop varieties that adapt to climate change (Climate-Resilient Agriculture);
- Promote the diversification of crops to hedge against erratic rainfall and shorter seasons (Climate-Smart Agriculture); and
- Improve water demand management, particularly at the local level and in the agricultural sectors.

7 ENVIRONMENTAL CHARACTERISTICS

This section lists pertinent environmental characteristics of the study area and provides a statement on the potential environmental impacts on each.

7.1 LOCALITY AND SURROUNDING LAND USE

The project is located in the Otavi Constituency, approximately 11 km southeast of Otavi and 32 km west of Kombat. A historic landmark, the Khorab-Denkmal memorial (19.60573 °S, 17.384187 °E) is located about 11 km north-northwest of the project area. Portion 19 of the farm Otavi Fontein is about 1.2 km east of the D2807 district road. Presently, there is one exclusive prospecting license (EPL), EPL 5232, active across the farming unit. The EPL is registered for base and rare metals, precious metals.

Surrounding properties are all similar in nature and used for crop cultivation and livestock rearing (commercial farming). No national or proclaimed conservation areas, protected areas or communal conservancies are located close to the project. The adjacent properties are listed in the table below and their locations are depicted in Figure 7-1.

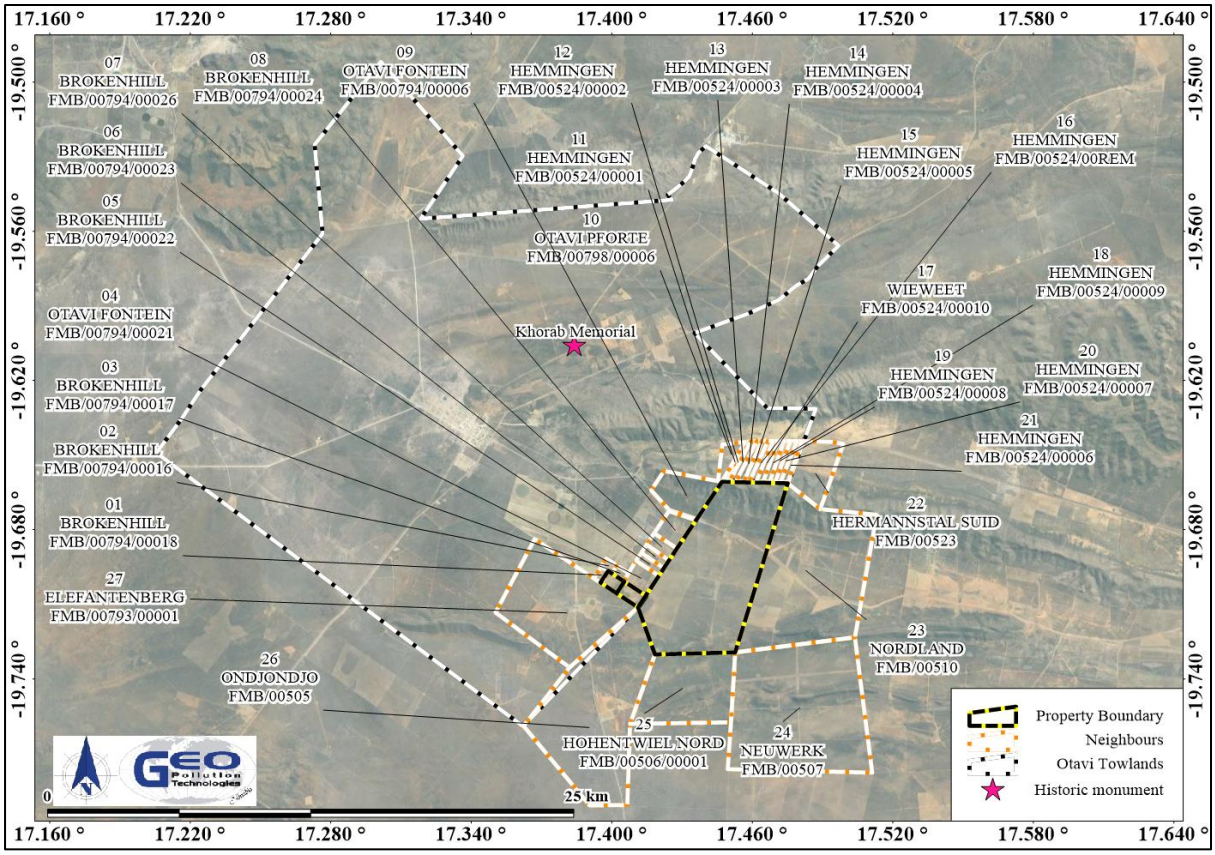

Figure 7-1 Properties adjacent to the farming unit

Implications and Impacts

The location is well suited for the agricultural activities. It is already zoned for agricultural use and is located in an area suitable for irrigation. Consideration should be provided toward prospecting activities proposed across plantations which are not allowed as per the section 1 of the Minerals (Prospecting and Mining) Act 33 of 1992 as amended by the Minerals (Prospecting and Mining) Amendment Act 8 of 2008.

7.2 CLIMATE

There is a general lack of weather stations and data in Namibia especially in the rural areas. To overcome this problem, there are a few solutions available. One is to make use of satellite precipitation observation data like CHIRPS 2 or to obtain in-situ observation data/measurements from farmers/individuals in the project area this type of data can provide a more precise depiction of the local climatic conditions of the area. For this project, in-situ observations are available.

Firstly, long term precipitation data from CHIRPS-2 will be discussed along with the climatic conditions as described by the Atlas of Namibia 2022. Afterwards the in-situ rainfall observations will be analysed and compared to the long-term precipitation data. Lastly the temperature and prevailing wind conditions will be discussed is short.

According to the Köppen-Geiger Climate Classification system the project is located in a hot semi-arid climate (BSh) (http://koeppen-geiger.vu-wien.ac.at/present.htm) (Kottek et al., 2006). This means that the area receives precipitation below potential evapotranspiration, but not as low as a desert climate and has a mean annual temperature of at least 18°C.

Long-term precipitation data was obtained for the project area from the CHIRPS-2 (Climate Hazards Group Infra-Red Precipitation with Station data version 2) database (Funk et al., 2015). The CHIRPS-2 dataset (Climate Hazards Group Infra-Red Precipitation with Station data version 2) consist of long-term precipitation data (1981 to near-present) obtained from satellite imagery and in-situ station data and therefore represents more recent data. Data is averaged over an area of roughly 5 km by 5 km. This averaging effect should be kept in mind during data analyses as high precipitation from single thunderstorm cells would be averaged out, thereby providing a reduced daily maximum precipitation value.

Photo 7-1 Rain gauge

Photo 7-2 Small weather station installation

The Atlas of Namibia average rainfall for the area is 450 to 500 mm/a with a variation of 30 to 40%. Based on the CHIRPS-2 dataset the rainfall is well within rage with 468.34 mm/a, but also with a smaller coefficient of variance of 26.98%. Both datasets indicate monthly rainfall peaking in January to February. CHIRPS-2 also indicates heavier precipitation (single day events) occurring between December to April, with a single day 25 km² maximum of 62.24 mm in February being the highest. Maximum precipitation received over a 3-day period is 88.48 mm indicating that heavy rainfall over long periods is not a common occurrence. Chirps-2 daily and seasonal precipitation data is presented in Table 7-1 and in Figure 7-2 (Funk et al., 2015). Seasonal (July to June) total precipitation, centred on the average line for the last 43 years, is presented, with the daily total precipitation and the seasonal cumulative precipitation. From the figure it is clear that the rainfall for 6 out of the last 10 seasons were all below average. The potential evapotranspiration is 2,300 to 2,400 mm/a. By dividing the mean annual potential evapotranspiration into the mean annual precipitation, an aridity index value for the area was computed as 0.2, which indicates the area to be arid.

Table 7-1 Rainfall statistics (modelled) (Funk et al., 2015)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum (mm/m)	20.24	27.10	27.91	0.00	0.00	0.00	0.00	0.00	0.00	5.33	9.80	15.82
Maximum (mm/m)	293.44	209.96	172.54	98.10	6.10	0.51	0.03	0.00	8.95	57.83	118.88	175.56
Average (mm/m)	121.34	110.21	77.06	27.47	0.98	0.03	0.00	0.00	1.06	17.59	37.99	70.90
Variability (%)	55.14	48.69	40.78	83.30	196.48	359.27	458.13	0.00	205.84	71.40	54.05	52.05
Daily Maximum (mm)	45.19	62.24	61.68	51.41	6.10	0.23	0.01	0.00	8.29	20.70	33.40	44.87
Average Rain Days	12.93	11.16	7.93	2.93	0.33	0.26	0.16	0.00	0.60	3.70	7.53	10.47
Season July - June average 468.34				Season coefficient of variation: 26.98				3 Day return period: 88.48				
Date range: 1981-Jan-01 to 2024-Jun-30							Lat: -19.725°S			Long: 17.425°E		

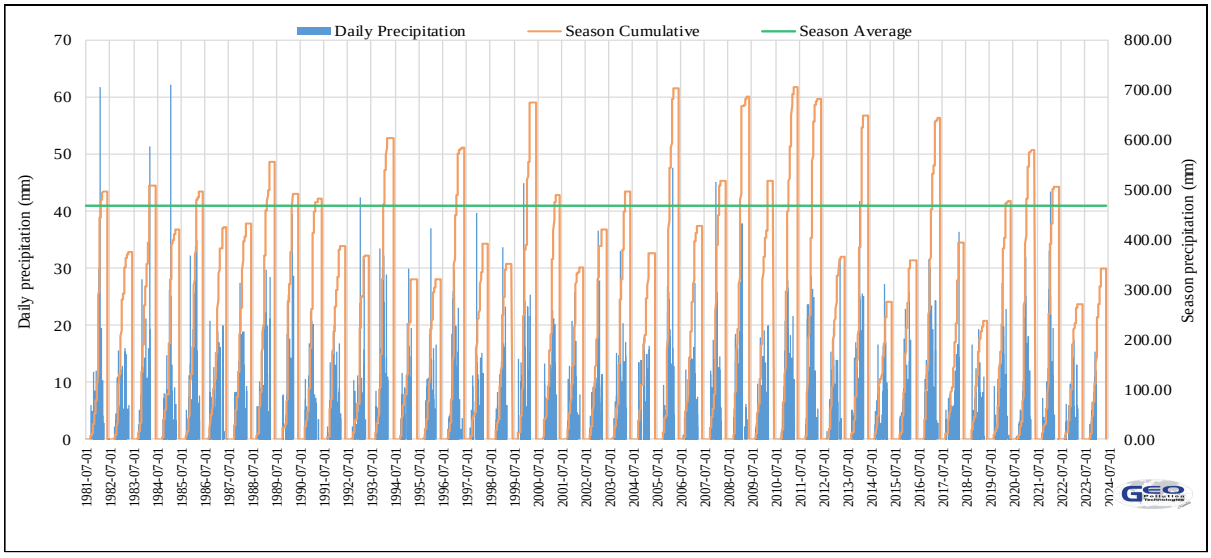

Figure 7-2 Daily and seasonal rainfall (modelld) (Funk et al., 2015)

The Proponent has provided locally observed (in-situ) rainfall measurements for this environmental scoping report. The rainfall measurements have been recorded over the last 57 years (1968 to Near present) across several locations in the area. The data was processed and summarised in Figure 7-3 In-situ observed rainfall recorded on site

Table 7-2 Rainfall statistics recorded on site

Total 57 Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Rainfall (mm/a)		
Average Rainfall (mm)	155.1	156.2	109.3	46.5	3.6	0.1	0.0	0.0	3.1	19.7	53.7	92.3	Min	Avg	Max
Maximum Rainfall (mm)	487.2	425.0	232.0	181.7	74.0	5.0	0.0	0.0	45.0	109.0	178.0	264.5	383.0	639.8	1115.4
Year of maximum rainfall	2021	1978	1977	2011	1994	1975	1968	1968	1976	2010	2009	2014	Years above average: 23		

. Based on the supplied data for the last 57 years, the area has received an average rainfall of 639.8 mm/a (Figure 7-3 In-situ observed rainfall recorded on site

Table 7-2 Rainfall statistics recorded on site

Total 57 Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Rainfall (mm/a)		
Average Rainfall (mm)	155.1	156.2	109.3	46.5	3.6	0.1	0.0	0.0	3.1	19.7	53.7	92.3	Min	Avg	Max
Maximum Rainfall (mm)	487.2	425.0	232.0	181.7	74.0	5.0	0.0	0.0	45.0	109.0	178.0	264.5	383.0	639.8	1115.4
Year of maximum rainfall	2021	1978	1977	2011	1994	1975	1968	1968	1976	2010	2009	2014	Years above average: 23		

). In the last 10 years, 5 of the seasons had an above average rainfall. The area had a recorded seasonal minimal rainfall of 383 mm during the 1981-1982 season and a maximum rainfall of 1,115.43 mm during the 2010-2011 season. The supplied data produced statistical values significantly higher than other data derived from formal measurement locations in the area.

Similar to precipitation data, temperature data is also lacking for the project area, with the Atlas of Namibia presenting only crude, large scale averages. To have an idea of temperatures in the area, monthly temperature data was retrieved from the Modern-Era Retrospective analysis for Research and Applications version 2 (MERRA-2) data set for a height of 2 m above surface (Ronald Gelaro, et al., 2017). This data set is a NASA atmospheric reanalysis, incorporating satellite data integration and aims at historical climate analyses at 0.5° x 0.625° spatial resolution. This translates to roughly 3,640 km², which still is a large area, but is somewhat less crude than the Atlas data.

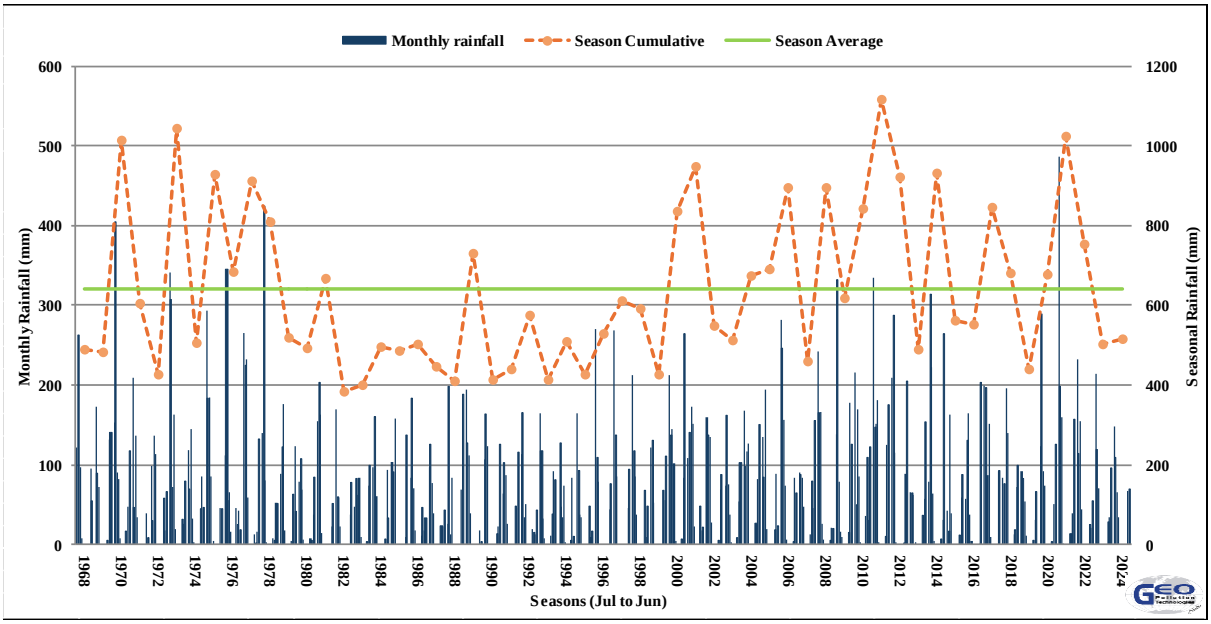

Figure 7-3 In-situ observed rainfall recorded on site

Table 7-2 Rainfall statistics recorded on site

Total 57 Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Rainfall (mm/a)		
Average Rainfall (mm)	155.1	156.2	109.3	46.5	3.6	0.1	0.0	0.0	3.1	19.7	53.7	92.3	Min	Avg	Max
Maximum Rainfall (mm)	487.2	425.0	232.0	181.7	74.0	5.0	0.0	0.0	45.0	109.0	178.0	264.5	383.0	639.8	1115.4
Year of maximum rainfall	2021	1978	1977	2011	1994	1975	1968	1968	1976	2010	2009	2014	Years above average: 23		

Table 7-3 presents statistics of daily data abstracted from the MERRA-2 data set for the last 41 years. The lowest temperature of -1.86°C was recorded in June. The average annual minimum temperature is 5.1°C. A maximum temperature of 40.6°C was measured in January, while the average annual maximum temperature is 36.8°C. The average annual temperature range is 22°C while the average diurnal temperature (difference between daily minimum and maximum temperature) for this area is around 23°C. Direct normal solar irradiance for the area is 6.908 kWh/m²/day. Figure 7-4 indicates wind data that has been generated via satellite data and has not been generated on site. Localised conditions may see wind patterns being slightly altered by localised topography. Wind is generally blowing from East-Southeast (ESE) and from the East (E).

Table 7-3 Temperature statistics based on Merra-2 data

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum (°C)	8.73	8.22	8.49	6.95	2.98	-1.86	-0.45	2.84	5.51	5.13	5.42	9.43
Maximum (°C)	40.63	38.87	38.97	36.14	33.84	30.27	30.50	33.75	37.68	40.26	40.53	40.26
Average (°C)	25.49	24.20	23.39	21.32	19.12	16.24	16.12	19.05	22.62	25.16	25.94	25.64
Diurnal (°C)	21.22	19.40	19.86	20.82	22.43	23.47	24.01	25.55	26.06	24.61	24.16	22.31
Season July - June				Seasonal average Temperature: 22.02								
Date range:		1980-Jan-01	to	2021-Sep-30		Lat: -19.500°S				Long: 17.500°E		

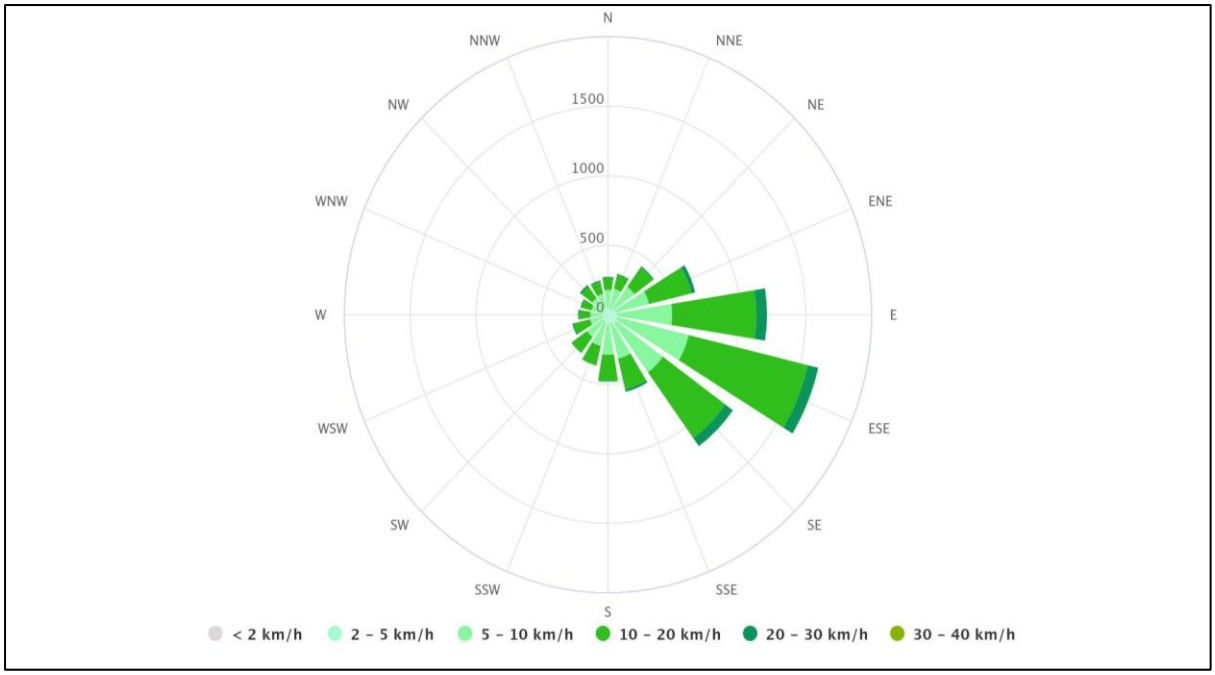

Figure 7-4 Average wind speed and direction (https://www.meteoblue.com)

Implications and Impacts

Rainfall events are often thunderstorms with heavy rainfall that can occur in short periods of time ("cloud bursts"). Rainfall in the area is above the Namibian average, but varies significantly year on year. Heavy rainfall can lead to soil erosion when improper agricultural practises are employed, while dry seasons will necessitate greater reliance on groundwater resources. Recurring drought conditions may impact on groundwater availability due to reduced aquifer recharge.

Hot dry winds increase the risk of crop damages as well as fire risks and related severity. General winds may carry chemicals and pollen of crops in mainly a west-northwest direction. Solar radiation values are high enough to reliably support future construction of photovoltaic solar panels. Occasional frost necessitate frost management measures. Climate change contributors will be largely related to the mechanised systems and synthetic fertilisers used as part of operations. Effects of climate change to consider during the proposed operations over the next 30 years include increased frequency of droughts (changing rainfall patterns) and higher temperatures (World Bank, 2021).

7.3 TOPOGRAPHY AND DRAINAGE

The farming unit is located within the Otavi Mountain Land, one of Namibia's mineral-rich geological belts. The Otavi Mountain Land forms part of the Karstveld landscape and is characterised by carbonate-rich formations. It is dominated by dolomite and limestone hills, rising some 500 m above surrounding valleys and depressions. Another prominent characteristic of the Otavi Mountain Land is the sinkholes, dolines and caves of the Karstveld landscape.

Ground surface elevation ranges between 1,930 mamsl at the most northern boundary of Farm Eisenberg, where a west-east mountain range, the Otavi Valley syncline (Photo 7-3 and Figure 7-5), is present, to 1,470 mamsl at the most southern boundary of the project area (Figure 7-5). The southern boundary is characterised by a few isolated outcrops (Photo 7-4 and Photo 7-5) while the rest of the farming unit is flat with very slight elevations changes (Photo 7-6). Therefore, surface drainage is poorly developed, despite the relative mountainous terrain in the north and south. Most of the local rainfall infiltrates into the subsurface. The project area falls within the Etosha Pan catchment.

Photo 7-3 Otavi valley syncline north of the farming unit

Photo 7-4 Hills on southern boundary

Photo 7-5 Hills on southern boundary

Photo 7-6 Flat topography at Portion 19

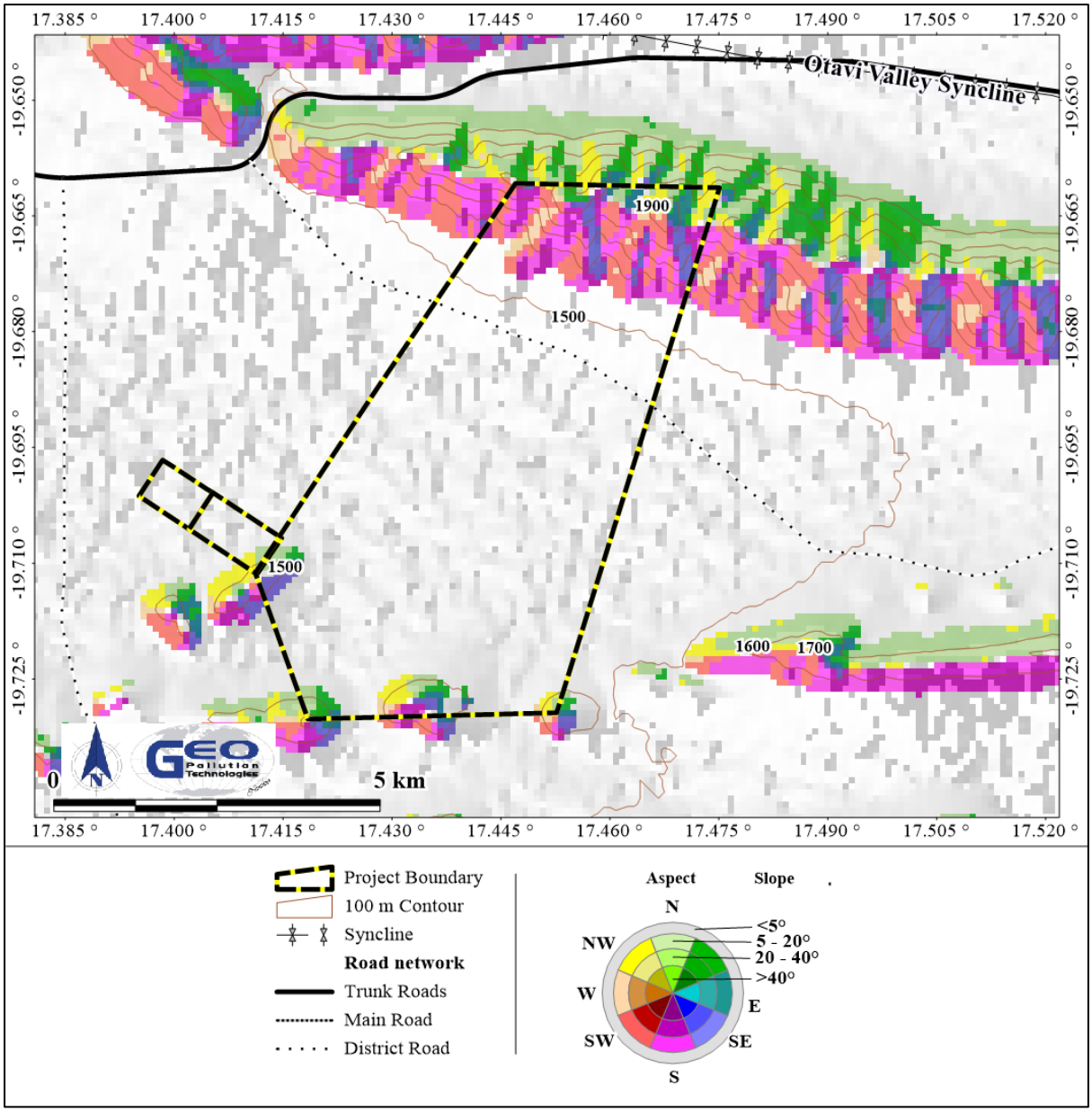

Figure 7-5 Aspect slope

Implications and Impacts

The project area is generally flat and well suited for pivot-based irrigation. The lack of major surface runoff and drainage may lead to pooling in localised areas during heavy rainfall events. The area north of the project area has a much greater slope which will have a greater effect on drainage. The higher gradient will increase run-off velocity, which in turn can lead to erosion, especially along cleared areas situated on the foothills of any of the hills/mountains located on the farming portions. This can negatively impact soil quality and crop production..

7.4 GEOLOGY AND HYDROGEOLOGY

The geology underlaying the project area was formed during the Namibian to Quaternary Ages. Kalahari Group sediments, consisting of sand, calcrete and gravel cover most of the project area (Figure 7-6 and Figure 7-7). The Kalahari Group sediments originate mainly from fluvial deposition with some reworking through aeolian processes. Kalahari sediments at the project area form only a surface cover. The Kalahari Group sediments here commonly overlie pre-Kalahari rocks of the Damara Sequence (Namibian Age).

The project area falls within the Northern Margin Zone of the Damara Sequence. A tectonostratigraphic zone that is part of a narrow transition zone between the highly deformed Damara Sequence to the south and the platform equivalents to the north. The underlaying Damara Sequence consists of dolostones, limestone and phyllites of the Otavi Group associated with the Chuos (NChd) -, Berg Aukas (NBal) and Maieberg (NMap) formations. These outcrops are predominantly found near the southern border of the project area. The Chuos – and Berg Aukas formations form part of the Abenab Subgroup. The Maieberg Formation of the Tsumeb Subgroup lies disconformed on the Abenab Supergroup.

Outcrops of dolostones near the northern border of the project area are associated with the Maieberg (NMa) and Elandshoek (NEl) formations of the Tsumeb Subgroup. Limited outcrops of phyllites from the Kombat Formation (NKt) of the Mulden Group are also present.

Moderate folding of the strata occurred during the Pan African Orogeny (680-450 Ma) and resulted in the formation of synclines and anticlines, generally trending east-west. The development of joints and fractures in the rocks are associated with the folding, which have an impact on the hydrogeological characterization of the area. The Otavi Valley Syncline is present approximately 8 km to the north of the project location, with fault lines trending in an east-west direction, parallel to the syncline near the northern border of the project area.

Several known karst features (mineralised karst chimneys, cave and sinkhole lakes) are present in the broader region. The Gross Otavi and the Kombat mines are located 23 and 33 km respectively to the east of the project area. Springs form between the contact of the formations of the Damara Sequence and the less permeable underlaying Metamorphic Complex. The nearest of these contact zone springs is present approximately 4.5 km to the northwest of the project area (Figure 7-6). No caves or lakes are known of near (<10 km radius) the project area.

The project area is situated in the Kunene South Groundwater Basin. Localised groundwater flow may take place along preferred flow paths in different directions, but the larger scale groundwater flow from the project location is expected to be in a north-westerly direction. Local flow patterns may vary due to groundwater abstraction.

Groundwater flow is expected to take place throughout two types of aquifers. The first type is associated with the Kalahari sediments (primary aquifer). While the second aquifer type is associated with the karstic/dolomitic hard rock formations (fractured aquifer) where groundwater flow is expected to flow along the fractures, faults (secondary porosity) and other geological structures present within the underlying formations (hard rock or consolidated formations).

The karst aquifer within the Otavi Mountain Land is recognized as the primary groundwater resource in the region, characterized by water of generally high quality. Recharge to these aquifers occurs primarily through local rainfall infiltration, facilitated by several factors such as comparatively high rainfall, minimal soil cover in mountainous areas, and the storage capacity within karst field dolomite synclines. These conditions enable rapid infiltration during precipitation events and the storage of significant volumes of water within the aquifers.

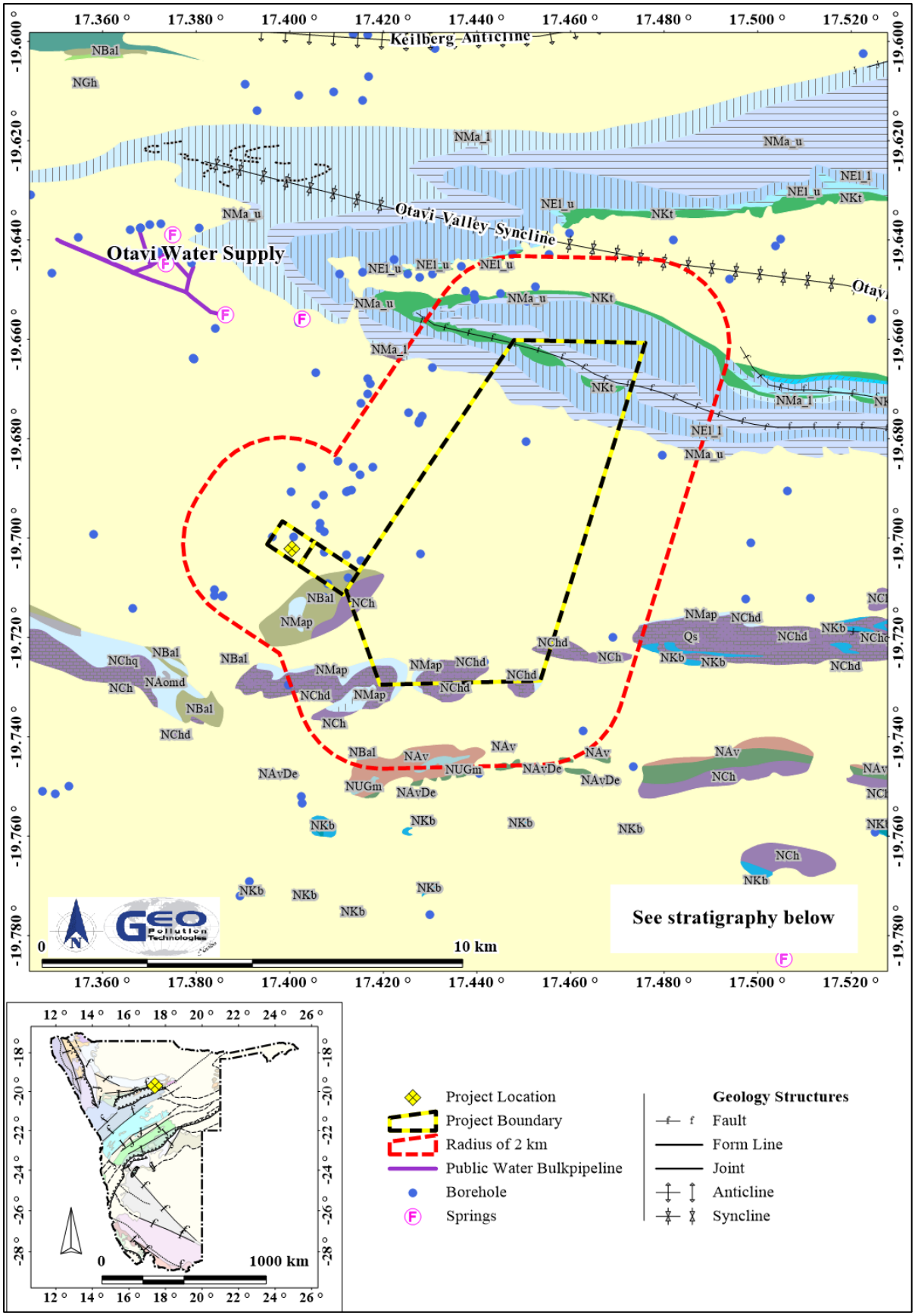

Figure 7-6 A 1:250 000 Geological map (1916)

Age	Lithcode	Supergroup	Group	Subgroup	Formation	Member	Main_Litho	Other_Rock
Quaternary	Qs						sand; gravel; calcrete	
Namibian	NKt	Damara	Mulden		Kombat		phyllite	
	NHt_m		Otavi	Tsumeb	Huttenberg		dolostone (bedded)	phyllite
	NEl_u				Elandshoek		dolostone (bedded)	
	NEl_l						dolostone (massive)	
	NMa_u				Maieberg		dolostone (bedded)	
	NMa_l						limestone/marl (bedded)	
	NMap						phyllite	
	NGh				Ghaub		diamictite	
	NAomd			Abenab	Auros		dolostone (massive)	
	NGa				Gauss		dolostone (massive)	
	NBa				Berg Aukas		dolostone (laminated; light/dark)	
	NBal						limestone	
	NCh		Swakop/Otavi	Usakos/Abenab	Chuos		diamictite; pebbly schist	quartzite; conglomerate; dolostone; shale
	NChq						quartzite	
	NChd			Usakos/Abenab			dolostone (massive)	
	NSWm		Swakop				marble	
	NKb			Navachab	Karibib		marble; dolostone; limestone	calc-silicate rock; mica schist
	NUGm			Ugab			marble	
	NAv		Nosib		Askevold		epidosite; agglomerate	chlorite schist
	NAvDe					Devon	dolostone	

Figure 7-7 Stratigraphy

Table 7-4 presents groundwater statistics for 44 boreholes in a 5 km radius around the project. The groundwater information was obtained from Department of Water Affairs (DWA) borehole database. This database is generally outdated and more boreholes might be present. The average depth of 26 of the 44 boreholes is 69 m below surface and the yield of 26 of the 44 boreholes ranges between 0.1 and 60 m³/h. The average groundwater level of 23 of the 44 known boreholes is 41 m below surface, ranging between 15 and 58 m below surface. Water quality is mainly of good quality, although the water hardness would likely be high.

Table 7-4 Groundwater statistics

	Depth (m)	Yield m3/h)	Water level (m)	Water Strike (m)	TDS (ppm)	SO4 (ppm)	NO3 (ppm)	F (ppm)
Data Points	26	26	23	8	14	14	9	14
Minimum	37	0.1	15	27.3	377	4	0.7	0.2
Average	69.3	10.7	40.9	48.3	682	74	3	0
Maximum	105	60	57.5	61.5	1005	220	9.1	0.6
Group A	*0-50*	*>10*	*0-10*	*0-10*	*0-1000*	*0-200*	*0-10*	*0-1.5*
%	8%	27%	0%	0%	93%	93%	100%	100%
Group B	*50-100*	*5-10*	*10-50*	*10-50*	*1000-1500*	*200-600*	*10-20*	*1.5-2.0*
%	88%	31%	83%	38%	7%	7%	0%	0%
Group C	*100-200*	*0.5-5*	*50-100*	*50-100*	*1500-2000*	*600-1200*	*20-40*	*2.0-3.0*
%	4%	38%	17%	63%	0%	0%	0%	0%
Group D	*>200*	*0-0.5*	*>100*	*>100*	*>2000*	*>1200*	*>40*	*>3*
%	0%	4%	0%	0%	0%	0%	0%	0%
42 boreholes in a 5 km radius from				**-19.702123**		**17.400486**		

Statistical grouping of parameters is for ease of interpretation, except for the grouping used for sulphate, nitrate and fluoride, which follow the Namibian guidelines for the evaluation of drinking-water quality for human consumption, with regard to chemical, physical and bacteriological quality. In this case the groupings has the following meaning:

Group A: Water with an excellent quality

Group B: Water with acceptable quality

Group C: Water with low health risk

Group D: Water with a high health risk, or water unsuitable for human consumption.

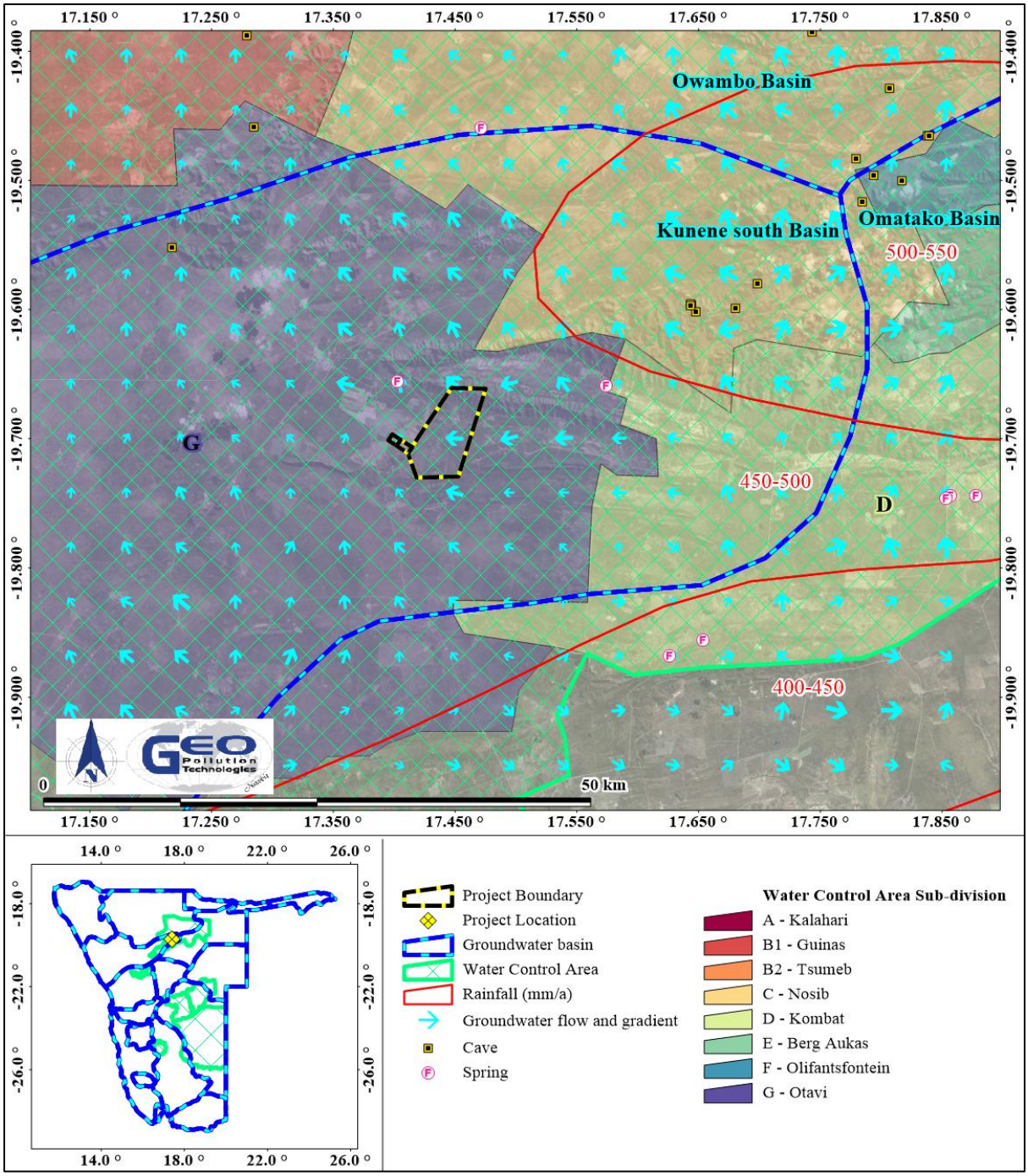

Figure 7-8 Groundwater catchments and water control areas

Implications and Impacts

A risk to groundwater pollution is expected due to the geological sensitivity of the area. Groundwater is utilized in the area and such users would be at risk if groundwater contamination occurs. Irresponsible irrigation methods like over-irrigation may result in higher demands for fertiliser and pesticide which in turn will increase nitrates and pesticide concentration in the groundwater. Over application of the herbicide RoundUpTM on is specifically a common expressed concern when planting RoundUpTM ready maize.

Over abstraction may also impact on other users of the aquifer. The hydrogeological specialist study however indicates that water levels, under current groundwater abstraction rates, are stable.

7.5 SOIL AND AGRO-ECOLOGICAL ZONES

The dominant soil type that covers the majority of the farming unit is Petric Calcisol, which refers to the soil type commonly found in arid or semi-arid regions with dry seasons. They form in calcium and magnesium rich alluvial, colluvial and aeolion deposits and are alternately dampened by rain and dried through evaporation which results in soft masses or hard layers of calcrete. In addition to this, the calcisol of this particular area is known for having been strongly cemented or indurated within 100 cm from the soil surface. The composition of soil in this particular area is roughly 55 to 60% sand, 15 to 20% silt and 25 to 30% clay, which gives it the characteristics and texture of silt-loam soil. Soils in this area typically reach depths of >190 cm, have a pH of 4.6 to 5.5 and a cation exchange capacity of 10-13 cmol/kg. Furthermore, this region has a water capacity of 60 to 80 mm at root depth (De Pauw, et al, 1998).

The northern and southern boundaries of the farming unit overlays a Skeletic Lithic Leptosol which refers to a soil type with a stony characteristic or very shallow depth over a continuous rock surface. These soils are typically found in hills where erosion takes place at a higher rate than soil formation or sediment deposition. Due to this, and the fact that these soils form a thin layer with high drainage, leptosols are poor candidates for crop production. In addition, the leptosol of this particular area is known for having, within 10 cm from the soil surface, continuous hard rock, having to a depth of 100 cm from the soil surface, between 40 and 90% (by weight) gravel or other coarse fragments. The composition of soil in this particular area is roughly 65 to 70% sand, 10 to 15% silt and 25 to 30% clay, which gives it the characteristics and texture of sandy clay loam soil. Bulk density is 1,450 to 1,500 mg/cm^3 which means that the soil will affect the root growth of various plants, but not necessarily restrict it. Soils in this area typically reach depths of 100 cm, have a pH of 5.5 to 6 and a cation exchange capacity of 7 to 10 cmol/kg. Furthermore, this region has a water capacity of 40-60 mm at root depth (De Pauw, et al, 1998).

Photo 7-7 Light brown sandy soil

Photo 7-8 Darker loamier soil used for cultivation on pivot fields

The farm is situated within the CPL16-2 Agro-Ecological Zone (AEZ) with an average growing period of 91 to 120 days. The CPL16-2 AEZ is ranked 2nd in Namibia in terms of agricultural potential and is deemed most suitable for short-maturing crops and large stock grazing. The CPL16-2 is mainly characterised as sandy and loamy soils, often shallow; usually underlain by calcrete. Dependable growing period can be adequate for crop growing, provided soils are deep and have a good moisture retention capacity The areas under irrigation around Otavi are located in patches where sufficiently deep, quality soil is present for irrigation of crops.

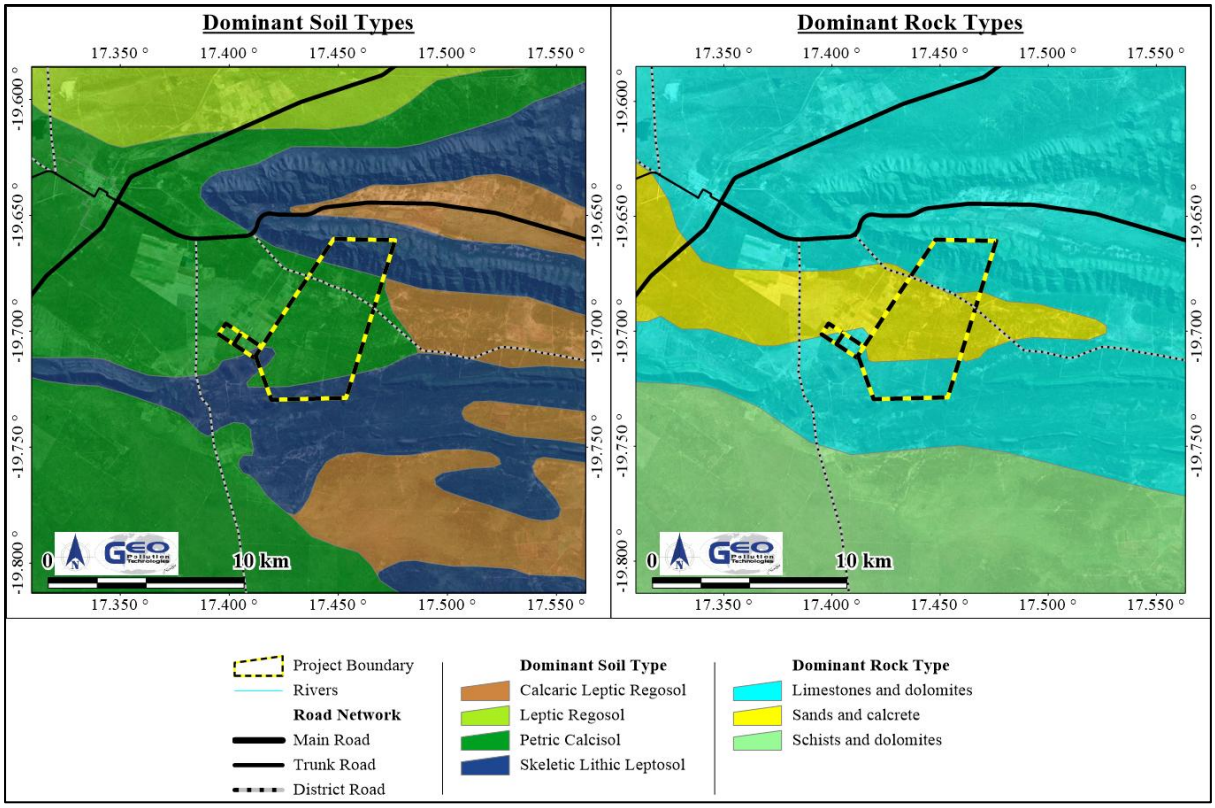

Figure 7-9 Rock type and Agro Ecological Zone (Atlas of Namibia Project, 2002)

Implications and Impacts

Soil contamination by hazardous chemicals and/or the excessive use of fertilizers and pesticides may negatively impact soil and the local ecology. Conservation agricultural techniques aid at maintaining and even increasing soil organic content and thereby improving soil. Conservation agriculture should be conducted where possible. Different types of soil loose heat at different rates. Loose sandy soils may cool more quickly than heavy, dense clayey soils. Sandy soils therefore have a higher risk of radiation frost.

7.6 PUBLIC WATER SUPPLY

The Proponent and surrounding farming communities are completely reliant on groundwater as a source of potable water supply. The boreholes tap into the Kunene south basin and are located within the Tsumeb-Otavi-Grootfontein Subterranean Water Control Area, subdivision G – Otavi (Figure 7-8). The NamWater Otavi Water Supply Scheme is located 7.5 km north of the site.

Implications and Impacts

Groundwater is a valuable resource in the farming area and is controlled by a water abstraction permit system as regulated by the Ministry of Agriculture, Water and Land Reform (MAWLR). Groundwater contamination may negatively impact surrounding boreholes. No alternative water supply options exist if extensive contamination or deterioration of groundwater occur. The project may affect water abstraction schemes which is located downstream of the project.

7.7 ECOLOGY

This region is located in the Acacia sub-biome of the tree and shrubs savana biome. This biome is known for being dominated by Acacias that grow in its arid environment along with short shrubs and grasses that grow in the shallow soils of the area's hills. It can further be classified under the Karstveld vegetation type and forms part of the Zambesian domain and Highlands (1,500 m) domain floristic groups. The area hosts up to 403 species of flora with 25 to 30% of

the area being covered by woody plants. Up to 20 plant species are considered endemic to the area, with 1 species considered to be locally endemic. Tree height range is 6.5-7.0 m.

Based on data obtained from the Atlas of Namibia, the area is dominated by trees such as *Colophospermum mopane*, *Terminalia prunioides*, *Combretum apiculatum*, *Acacia reficiens*, *Dichrostachys cinerea* and various *Commiphora* species. According to Curtis & Manheimer (2005), 87 different tree species occur in quarter degree square 1917CB in which the farming unit is located. A summary of trees protected by legislation in Namibia, is presented in Table 7-5, while a complete list of trees, which may occur in the area, is attached in Appendix B.

Table 7-5 Trees with conservation concerns in quarter degree squares 1917CB (Curtis & Mannheimer, 2005)

Name	Common Name	Notes
Acacia erioloba	Camel-thorn	Protected by forestry legislation
Adansonia digitata	Baobab	Generally protected by local communities for its medicinal uses and place in folklore. It is indirectly threatened by fires and elephants, in areas where elephant occur. The apparent lack of young plants to replace the old ones may be a concern, but young trees may have been overlooked. Protected by forestry legislation.
Albizia anthelmintica	Worm-cure Albizia; Aru	The low numbers of young trees recorded are a concern, as is the number of dead trees in some areas. It is Protected by forestry legislation.
Aloe littoralis	Windhoek Aloe	Potentially threatened by pachycaul trade. Protected by the Nature Conservation Ordinance and listed in CITES Appendix II.
Berchemia discolor	Bird Plum	Protected by forestry legislation, as well as by traditional Owambo cultures for its fruit and shade. The population does not appear to be in any real danger at the moment, but communities could be encouraged to plant this species.
Boscia albitrunca	Shepherd's Tree	Although widespread and hardy, it is heavily utilised by people and animals. The difficulty that young plants have in becoming established is a concern, but fortunately there appears to be a healthy and widespread population of young plants. Protected by forestry legislation.
Burkea africana	Burkea	Excessive fire may be compromising recruitment by destroying seeds. Overharvesting for timber may also be of concern in future. Protected by forestry legislation.
Colophospermum mopane	Mopane	Protected by forestry legislation. Rate of harvesting and overgrazing may exceed regeneration.
Combretum imberbe	Leadwood	Although heavily utilized by people, regrowth is good and growth of young trees is vigorous. Because of its religious importance and many uses, it is protected locally. Old specimens warrant protection as monuments. Protected by forestry legislation.
Cyphostemma juttae	Blue Kobas, Namibian grape, Wild grape	Endemic with very small population and threatened with pachycaul trade. Least concern according to IUCN criteria. Protected by Nature Conservation Ordinance. Protected by forestry legislation.
Euphorbia guerichiana	Paper-bark Euphorbia	CITES Appendix II
Ficus cordata subsp *cordata*	Namaqua Rock-fig	Protected by forestry legislation
Lannea discolor	Live-long	Protected by forestry legislation
Maerua schinzii	Ringwood Tree	Increasingly impacted by humans and giraffes. Protected by forestry legislation.
Pachypodium lealii	Bottle Tree	Vulnerable to pachycaul trade. Lack of young trees is a concern. Protected by nature conservation ordinance. Listed on CITES Appendix II. Near-endemic extending

Name	Common Name	Notes
		into extreme southern areas of Angola. Protected by forestry legislation.
Searsia lancea	Willow Rhus	May be affected by a disease. Protected by forestry legislation. Previously Rhus lancea.
Schinziophyton rautanenii	Manketti; Mongongo nut; False balsa	Increased use for carving might be a concern. Great food value. Greatly damaged by veld fires. Protected by forestry legislation.
Sclerocarya birrea	Marula	Protected locally by communities that use them. Protected by forestry legislation.
Spirostachys africana	Tamboti	Protected by forestry legislation
Ziziphus mucronata	Buffalo-thorn	Protected by forestry legislation

Photo 7-9 General vegetation on the "koppie" of portion 20

Photo 7-10 General vegetation on the farm Eisenberg

There are 217 species of mammals in Namibia, 76 to 90 species occur in the area. Between 3 to 4 species of mammals are considered to be endemic to the area. Around 7 to 8 species of large herbivores are expected to occur naturally in the area. Namibia has 32 carnivore species and between 18 to 20 carnivore species are expected to occur naturally in the area. A total of 676 bird species has been recorded in Namibia, with 201 - 230 bird species expected to occur in the area.

The Otavi Mountainlands present suitable habitats for a number of bat species which have been documented to range across the project area. These bats include the following species: Dent's Horseshoe Bat (*Rhinolophus denti*), Striped Leaf-nosed Bat (*Macronycteris vittatus*) and the Greater Long-fingered Bat (*Miniopterus inflatus)*. The farming unit further falls within the habitat for a number of other species of concern which may occur within the area. Some of the IUCN Red List of threatened species, which are more likely to occur on or in the vicinity of the site, are listed in Table 7-6.

Table 7-6 IUNC Red listed species which may occur in the area

Species Name	Common Name	IUCN Red List Status
Falco vespertinus	Red-footed Falcon	Vulnerable
Neophron percnopterus	Egyptian Vulture	Endangered (Breeding area)
Torgos tracheliotos	Lappet-faced Vulture	Endangered
Ardeotis kori	Kori Bustard	Near Threatened
Aquila nipalensis	Steppe Eagle	Endangered
Parahyaena brunnea	Brown Hyaena	Near Threatened
Numenius arquata	Eurasian Curlew	Near Threatened
Acinonyx jubatus	Cheetah	Vulnerable
Gyps africanus	White-backed Vulture	Critically Endangered
Macronycteris vittatus	Striped Leaf-nosed Bat	Near Threatened
Madoqua kirkii	Kirk's dik dik	Lease concern
Sagittarius serpentarius	Secretarybird	Endangered
Necrosyrtes monachus	Hooded Vulture	Endangered

The probability of some of the species in Table 7-6 occurring on site is very likely, mainly due to wildlife roaming freely and undisturbed on areas of the farm which may present preferred habitation areas. This is mainly true for farm Eisenberg as Portion 19 and 20 has no undisturbed areas. Various antelope species, predators and large game are known to be present on the farm. Since the property borders farming operations who also have their own less disturbed areas, an ecological corridor exists between them and the Proponent which see some species crossing to and from. These include antelope species such as kudu and eland, but also include predator species.

Crop damage or loss as a result of animals occur throughout the year. The most prominent and challenging being as a result of migratory Red-billed Queleas (*Quelea quelea*) during the winter months. Snakes which have been observed on the farm in the past include the zebra snake, black mamba, puff adder, boomslang and Anchieta's cobra.

Implications and Impacts

Pollution of the soil and groundwater by hazardous chemicals and/or the excessive use of fertilizers and pesticides may negatively impact the local ecology. Irresponsible use of pesticides to kill vermin such as jackal may further impact on already threatened vulture populations as well as other scavengers. Pesticides may also magnify (biomagnification) in higher trophic levels, especially top predators. This may lead to reproductive and other physiological defects and ultimately declining populations. Over-abstraction of groundwater may lead to ecosystem changes as groundwater levels decrease, which may have direct impacts on especially cave habitats downstream (towards Etosha).

7.8 LOCAL ECONOMY

The Otjozondjupa Region's economy is a diverse representation of various sectors and industries within the region. These include (but are not limited to) mining, tourism and agriculture; all of which have shown potential to be developed. Portions of the constituency which are closer to the urban areas, has more economic diversity. However, the agricultural sector, specifically the irrigation farms around the town of Otavi, are large economic contributors, if not the largest in the constituency. Not only does it create jobs, but it has also been one of the driving forces of infrastructure development and related capital expenditure, which are on-going in planning considerations. Continued employment increases individuals' economic resilience and provides for increased social security benefits.

In evaluating water use in primary economic activities such as agriculture, it is useful to consider the entire value-chain, i.e. the upstream and downstream activities. Intensive irrigated production schemes are strong economic drivers, as witnessed by the influx of workers to such areas.

Water quality will have an effect on the productivity of operations, therefore the economic benefits of ensuring that the water quality and quantity of the groundwater reserve remains at its best, is an essential component of the agricultural process. If water treatment is required, then the cost of production will increase, resulting in a decrease in revenue and feasibility. The same can be said for the quality of the soil, as lowered quality soil will be less economically productive and contaminated soil, such as found in some areas within the constituency, not usable at all. Water and soil are paramount for the continued functioning of the agricultural project and therefore provide a vital ecosystem service to the Proponent.

Regionally, skilled agriculture and fisheries provide the most employment. The data presented in Table 7-7 was obtained from the Namibia Statistics Agency as per the census in 2011. Updated data related to the different industries' employment statistics, has not yet been released as part of 2023 census data. It should be noted that although fisheries falls within the agriculture sector, it does not contribute to employment in the Otjozondjupa Region. The economy of the area relies largely on commercial livestock farming supplemented with crop production and charcoal manufacturing. Livelihoods in the constituency are varied, engaging sectors such as mining, construction, wholesale and retail, administrative (public and defence) and manufacturing.

Table 7-7 Main industry of employed population aged 15 years and above for the Otavi Constituency and Otjozondjupa Region (Namibia Statistics Agency, 2011)

Main industry	Otavi Constituency	Otjozondjupa Region
Total	4,109	40,477
Agriculture Forestry and Fishing	1,719	12,526
Mining And Quarrying	370	1,879
Manufacturing	451	2,547
Electricity Gas Steam and Air conditioning supply	3	92
Water Supply Sewerage Waste Management and Remediation activities	23	208
Construction	217	2,147
Wholesale and Retail trade; Repair of motor vehicles and motorcycles	95	2,872
Transportation and Storage	116	1,398
Accommodation and Food Service activities	77	1,114
Information and Communication	12	221
Financial Insurance Activities	21	695
Real estate Activities	0	8
Professional Scientific and Technical activities	15	366
Administrative and Support service activities	227	3,339
Public Administration and Defence; compulsory social security	369	4,927
Education	85	1,800
Human Health and Social work activities	26	974
Arts Entertainment and Recreation	5	156
Other Services activities	60	835
Activities of Private Households	191	2,206
Activities of extraterritorial organisation and bodies	0	12
Don't Know	27	155

Implications and Impacts

Future operations on the farm will sustain valuable full time as well as seasonal employment opportunities in a constituency which relies on the agricultural sector. The project will contribute to the local and national agricultural sector and specifically in terms of the planned growth in the irrigation sector as envisioned by the local government. Employment and remuneration of such a large workforce within the area stimulates additional economic growth.

7.9 DEMOGRAPHIC PROFILE

The project area is located in the Otavi magisterial district in the Otavi Constituency of the Otjozondjupa Region. General goods and services are mainly sourced from Otavi, while more specialist goods and services are sourced from bigger centres like Grootfontein and Otjiwarongo or Windhoek. For demographic information of the 2023 population and housing census, refer to Table 7-8 (Namibia Statistics Agency, 2023) which includes the details for the Otavi Constituency in relation to the National and regional averages, compared to the census data of 2023.

Unemployment in the Otavi Constituency is lower, at 31%, compared to the national and regional averages. Livelihoods in the constituency are varied engaging various sectors such as construction, wholesale and retail, administrative (public and defence) and manufacturing.

Table 7-8 Demographic characteristics of the Grootfontein Constituency, the Otjozondjupa Region (Namibia Statistics Agency, 2011; 2023)

	2011		2023	
	Otavi Constituency	**Otjozondjupa Region**	**Otavi Constituency**	**Otjozondjupa Region**
Population (Males)	12,748	73,902	9,937	113,280
Population (Females)	12,130	70,001	8,342	107,531
Population (Total)	24,878	143,903	18,279	220,811
Population density (people/km^2)	2.2	1.4	1.3	2.1
Unemployment (15+ years)	30,8%*	37%*	Tbd	Tbd
Literacy (15+ years)	80.5%	83%	Tbd	Tbd

* Calculated as per the economically active segment of the population

Tbd - To be determined

Implications and Impacts

The project contributes mainly to demographic processes indirectly in requiring seasonal employment. Temporary migration in the area will changes the demographic profile of the project as well as the surrounding area. Employment in a rural area works against urbanisation of the surrounding sectors. Skills development, training and exposure to best practises in terms of livestock management and irrigation, benefit employees during the operational phase over and above having access to economic resources and food. Increased access to such resources may increase the fertility rate of the local population. The concentration of the workforce requires planning of governmental services (such as education clinics and public services) to ensure adequate resources.

7.10 Cultural, Heritage and Archaeological Aspects

There are no cultural or heritage aspects known to be present on the farming unit. However, there is a memorial site, Khorab Memorial (19.60573 °S, 17.384187 °E) just north of Otavi, near Schumannsthal. The proximity of the farm to Otavi, allows for easy integration to cultural and related services for employees. The greater area has been cited to contain a number of caves and dolomite cavities which have been studied for, not only the unique habitats they present, but also the geological evidence related climate.

Implications and Impacts

Existing and proposed areas of operations are not close to any caves or related features. However should any archaeological resources be found, such resources should be reported for investigation. Over abstraction of groundwater should be avoided to ensure no water bearing caves downstream of operations are impacted by dewatering.

8 PUBLIC CONSULTATION

Consultation with the public forms an integral component of an environmental assessment investigation and enables interested and affected parties (IAPs) e.g. neighbouring landowners, local authorities, environmental groups, civic associations and communities, to comment on the potential environmental impacts associated with projects and to identify additional issues that they feel should be addressed in the environmental assessment.

Public participation notices were advertised, twice in two weeks, in the national papers the Republikein and the Namibian Sun on 01 and 08 July 2024. A site notice was placed on site and notification letters were hand-delivered or e-mailed to neighbours as well as the relevant ministries and parastatals. See Appendix C for proof of the public participation processes and registered IAPs.

9 ASSESSMENT AND MANAGEMENT OF IMPACTS

The purpose of this section is to assess and identify the most pertinent environmental impacts that are expected from the operational, construction, care and maintenance, and potential decommissioning activities of the farming unit. An EMP based on these identified impacts is presented in this section.

For each impact, an environmental classification was determined based on an adapted version of the Rapid Impact Assessment Method (Pastakia, 1998). Assessment of impacts is based on the following categories: importance of condition (A1); magnitude of change (A2); permanence (B1); reversibility (B2); and cumulative nature (B3) (Table 9-1).

The environmental classification is calculated as follows:

Environmental classification = A1 x A2 x (B1 + B2 + B3).

The environmental classifications of impacts and the respective classes are provided in Table 9-2.

The probability ranking refers to the probability that a specific impact will happen following a risk event. These can be improbable (low likelihood); probable (distinct possibility); highly probable (most likely); and definite (impact will occur regardless of prevention measures).

Table 9-1 Assessment criteria

Criteria	Score
Importance of condition (A1) – assessed against the spatial boundaries of human interest it will affect	
Importance to national/international interest	4
Important to regional/national interest	3
Important to areas immediately outside the local condition	2
Important only to the local condition	1
No importance	0
Magnitude of change/effect (A2) – measure of scale in terms of benefit/disbenefit of an impact or condition	
Major positive benefit	3
Significant improvement in status quo	2
Improvement in status quo	1
No change in status quo	0
Negative change in status quo	-1
Significant negative disbenefit or change	-2
Major disbenefit or change	-3
Permanence (B1) – defines whether the condition is permanent or temporary	
No change/Not applicable	1
Temporary	2
Permanent	3
Reversibility (B2) – defines whether the condition can be changed and is a measure of the control over the condition	
No change/Not applicable	1
Reversible	2
Irreversible	3
Cumulative (B3) – reflects whether the effect will be a single direct impact or will include cumulative impacts over time, or synergistic effect with other conditions. It is a means of judging the sustainability of the condition – not to be confused with the permanence criterion.	
Light or No Cumulative Character/Not applicable	1
Moderate Cumulative Character	2

Strong Cumulative Character	3

Table 9-2 Environmental classification (Pastakia 1998)

Environmental Classification	Class Value	Description of Class
72 to 108	5	Extremely positive impact
36 to 71	4	Significantly positive impact
19 to 35	3	Moderately positive impact
10 to 18	2	Less positive impact
1 to 9	1	Reduced positive impact
0	-0	No alteration
-1 to -9	-1	Reduced negative impact
-10 to -18	-2	Less negative impact
-19 to -35	-3	Moderately negative impact
-36 to -71	-4	Significantly negative impact
-72 to -108	-5	Extremely Negative Impact

9.1 RISK ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PLAN

The EMP provides management options to ensure impacts of the agricultural and related activities on the farm are minimised. An EMP is a tool used to take pro-active action by addressing potential problems before they occur. This should limit corrective measures needed, although additional mitigation measures might be included if necessary. The environmental management measures are provided in the tables and descriptions below. These management measures should be adhered to during the execution of various activities on the farm. This section of the report is also presented as a stand-alone document for easy reference. All personnel taking part in the operations of the farm should be made aware of the contents of this section, so as to plan the operations accordingly and in an environmentally sound manner.

The objectives of the EMP are:

- to include all components related to operational and possible construction activities of the farm;
- to prescribe the best practicable control methods to lessen the environmental impacts associated with the farm;
- to monitor and audit the performance of operational personnel in applying such controls; and
- to ensure that appropriate environmental training is provided to responsible operational personnel.

Various potential and definite impacts will emanate from the operations, maintenance/construction and decommissioning phases. The majority of these impacts can be mitigated or prevented. The impacts, risk rating of impacts, as well as prevention and mitigation measures are listed below.

As depicted in the tables below, impacts related to the operational phase are expected to mostly be of medium to low significance and can typically be mitigated to have a low significance. The extent of impacts are largely site specific to local and are not of a permanent nature. Due to the nature of the surrounding areas, cumulative impacts are possible and the most important of these are potential groundwater and biodiversity/ecological impacts.

9.1.1 Planning

During the phases of planning for the operations, maintenance/construction and decommissioning of the farm, it is the responsibility of the Proponent to ensure they are and remain compliant with all legal requirements. The Proponent must also ensure that all required management measures are in place prior to, and during all phases, to ensure potential impacts and risks are minimised. The following actions are recommended for the planning phase and should continue during all other phases of the project:

- Ensure that all the necessary permits from the various ministries, local authorities and any other bodies that governs the operations, maintenance/construction and decommissioning activities on the farm remain valid. These include the water abstraction license and consumer installation certificate.
- Ensure all appointed contractors and employees enter into an agreement, which includes the EMP. Ensure that contractors, sub-contractors, employees and all personnel present on site understand the contents of the EMP.
- Make provisions to have a Health, Safety and Environmental (HSE) Coordinator to implement the EMP and oversee occupational health and safety as well as general environmental related compliance.
- Make provision for a community liaison officer to deal with complaints.
- Have the following emergency plans, equipment and personnel on site, where reasonable, to deal with all potential emergencies:
  - EMP, risk management plan, emergency response plan and HSE manuals;
  - Adequate protection and indemnity insurance cover for incidents;
  - Procedures, equipment and materials required for emergencies (e.g. firefighting, first aid, etc.).
- Establish and maintain a fund for future ecological restoration, specifically for instances of environmental damage caused during operations including pollution remediation where required. Should project activities cease completely, and future land-use will not involve agriculture, the funds should be utilised to remove all redundant infrastructure and waste.
- Establish and/or maintain a reporting system to report on aspects of operations, maintenance/construction, and decommissioning as outlined in the EMP. Keep monitoring reports on file for bi-annual submission to MEFT in support of environmental clearance certificate renewal applications. This is a requirement by MEFT.
- Appoint a specialist environmental consultant to update the environmental assessment and EMP and apply for renewal of the environmental clearance certificate prior to expiry.

9.1.2 Revenue Generation in the Professional Sector

Consulting and professional services are engaged with for assistance in applications for new permits and renewal of existing permits such as the water licensees, fuel storage and environmental clearance certificates. In addition, specialist irrigation systems, pumps and implements used by the agricultural project, require specialist and professional services. Such services may further be extended to pest control for operations, and accounting and legal services for administrative processes. All of these services are paid for and therefore the agricultural project contributes to revenue generation in the local and national sectors. In addition, during many of these processes, such as per the renewal of water licenses, information is generated which informs and facilitates planning of the Proponent as well as affected parties and governmental agencies.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Planning	Employment and contribution to local and national economy	3	2	3	3	2	48	4	Definite
Daily Operations	Contracted services and contribution to local and national economy	2	1	3	3	1	14	2	Definite
Indirect Impacts	Increased economic resilience in the professional sector	3	1	3	1	1	15	2	Highly Probable

Desired Outcome: Contribution to national treasury and increased economic resilience in the local and national professional sector.

Actions

Enhancement:

- Contract local Namibians where possible.
- Adhering to permit and license conditions on reporting.
- Deviations from this practice must be justified.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Service providers' contracts or agreements or records be kept.
- All reporting, monitoring and information sharing records kept on file.

9.1.3 National Development Goals: Water, Agriculture and Land Use Planning

The agricultural project pins down key development goals and challenges which were identified as part of the Namibian development goals. It may be considered as an agricultural / irrigation project which aims at generating income from foreign sectors by providing the most value per resource (water, soil and labour). In addition, the project is located in line with the regional planning initiatives which identified the location as an area for agricultural development. The project further contributes to the national climate change combatting initiatives through crop diversification and proposed resilient crop cultivation. Developing of the agricultural sector was identified as one of the core plans within the NDPs for Namibia. The agricultural project therefore is considered to be a positive contributor to achieving national development goals.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Planning	Project implementation in line with the NDP and regional land use planning	4	1	2	1	1	16	2	Highly Probable
Daily Operations	Expansion of the agricultural sector in the Region. Project implementation in line with the regional land use planning	3	2	2	2	2	36	4	Highly Probable
Indirect Impacts	Contributing to achieving the goals set out in Vision 2030 for Namibia	3	1	3	3	3	27	3	Highly Probable

Desired Outcome: Continued contribution to the development of the region as well as implementation of project activities in line with NDPs and Vision 2030.

Actions

Enhancement:

- Liaison with local and national governmental agencies through appropriate financial and social responsibility reporting.
- Increase recycling initiatives and incorporate additional greenhouse gas reduction activities such as conservation tillage and climate smart agriculture.
- Infrastructure maintenance and development such as, road servitude, water- and sanitation system developments (provision to employees) and node development. Where possible, public and private partnership regarding projects should be considered.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- All project contributions towards regional development, inclusive of communications held with relevant authorities, to be kept on file.
- Monitoring of borehole water levels and water abstraction (monthly) and submit to the relevant custodian on a quarterly basis.

9.1.4 Skills and Development

Training is essential to all aspects of the operations. Relative to responsibility, every employee requires the skillset to conduct tasks which form part of the operation. General skills in cattle handling, for example, may be acquired through on the job training and guidance from skilled workers. Progressive training in terms of, for example, safe pesticide application or specialised equipment handling (such as tractor operator) may require additional resources to aid in the training such as demonstrations, manuals and explanations. The skills and training of employees allow them to conduct certain tasks safely and or according to the required standard for continued operations.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Employment and transfer of skills, technological advancements	2	1	2	3	1	12	2	Definite
Daily Operations	Employment and transfer of skills	2	1	2	3	2	14	2	Definite
Indirect Impacts	Employment and transfer of skills in Namibia's agricultural sector	2	1	2	3	3	16	2	Definite

Desired Outcome: To see an increase in skills of local Namibians, as well as development and technological advancements in the agricultural industry.

Actions

Enhancement:

- Sourcing of employees and contractors must first be at local level and if not locally available, regional or national options should be considered. Deviations from this practice must be justified.
- Inform employees about parameters and requirements for references upon employment.
- Provide managerial references for unofficial training or skills transfer when conducted.
- Relative to their responsibilities, provide on-farm training for all staff involved in irrigation management, including but not limited to:
  - Correct agricultural techniques
  - Emergency procedures
  - System monitoring for problem identification
  - System maintenance
- Relative to their responsibilities, provide on-farm training for all staff involved in pesticide application / agrochemical , including but not limited to:
  - The safe transport, handling and storage of pesticides
  - Warning and advice pictograms commonly used on pesticide labels
  - Disposal of leftover pesticide and or pesticide containers
- Ensure first-aid and fire-fighting training for a portion of the workforce.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Keep records of all training provided to employees.
- Ensure that all training is certified or managerial references provided (proof provided to the employees) inclusive of training attendance, completion and implementation.
- Include all information in a bi-annual report.

9.1.5 Revenue Generation and Employment

Skilled and unskilled labour are required for the operations and maintenance/construction activities associated with the farm. Importantly, employment provided is permanent and long term and in some instances, generational. Livelihoods are thus sustained and the spending power of the local community increased. Through continued long term employment, economic resilience is enhanced of individual employees.

Through employment, the Proponent also contributes to the Social Security while significant contributions are also made to the Namibian Revenue Services. Revenue is generated through the sale of products on national and international markets.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Employment and contribution to local and national economy	2	1	2	2	2	12	2	Definite
Daily Operations	Employment contribution to local and national economy	2	1	3	3	1	14	2	Definite
Indirect Impacts	Decrease in unemployment, contribution to local economy	3	1	3	3	3	27	3	Definite

Desired Outcome: Contribution to national treasury and provision of employment to local Namibians.

Actions

Enhancement:

- The Proponent must employ local Namibians where possible.
- If the skills exist locally, employees must first be sourced from the area, then the region and then nationally.
- Deviations from this practice must be justified.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Bi-annual summary report based on employee records.

9.1.6 Agricultural Produce

The project is in line with the objectives of Namibia's NDPs and contributes to the economy of, and food security in, Namibia. Locally produced crops decrease the amount of crops that needs importing.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction and Daily Operations	Contribution to economy, contribution to food security in Namibia	1	2	3	3	2	16	2	Definite
Indirect Impacts	Reduced import needs, contribution towards a positive trade balance, spread of knowledge and skills, increased crop productivity	1	2	3	3	3	18	2	Definite

Desired Outcome: Maximum contribution to the food security and economy of Namibia. Provide a positive contribution to the trade balance of Namibia by reducing the amount of imported produce and exporting higher value products.

Actions:

Enhancement:

- Teach employees on sustainable farming practices to enable the spread of knowledge and skills and thereby increase the productivity of small-scale farming as well.
- Diversification and continuous improvement to maximise sustainability of the farm.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Bi-annual reporting on educational programmes and training conducted.

9.1.7 Health, Safety and Security

Daily operational and intermittent maintenance and construction activities on the farm are reliant on human labour. Such activities have varying degrees of health and safety risks. Examples include the operation of vehicles and machinery with moving parts, such as harvesters, and the handling of hazardous chemicals with inherent health hazards, such as pesticides and fuel, when ingested, inhaled or physical contact occur. Encounters with wild animals, and especially venomous species like snakes, may pose risks to employees. The provision of personal protective equipment, and the intended use thereof, is paramount. Security risks relates to unauthorized entry on the farm, theft and sabotage.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Physical injuries, exposure to chemicals and criminal activities	1	-2	3	3	1	-14	-2	Probable
Daily Operations	Physical injuries, exposure to chemicals and criminal activities	1	-2	3	3	2	-16	-2	Probable

Desired Outcome: To prevent injury, health impacts and theft.

Actions

Prevention:

- Implement and maintain an integrated health and safety management system, to act as a monitoring and mitigating tool.
- Comply with all health and safety standards as specified in the Labour Act and related legislation.
- Clearly label dangerous and restricted areas as well as dangerous equipment and products such as agrochemicals.
- Lock away or store all equipment and goods on site in a manner suitable to discourage criminal activities (e.g. theft).
- Provide all employees with required and adequate personal protective equipment where required.
- Ensure that all personnel receive adequate training on the operational procedures of equipment and machinery and the handling of hazardous substances.
- Train selected personnel in first aid and ensure first aid kits are available on site.
- The contact details of all emergency services must be readily available.
- Implement a maintenance register for all equipment whose malfunction can lead to injury or exposure to hazardous substances.
- Apply and adhere to all industry specific health and safety procedures and regulations applicable to the handling of food produce for markets.

Mitigation:

- Treat all minor work-related injuries immediately and obtain professional medical treatment if required.
- Assess any safety problems and implement corrective action to prevent future occurrences.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Record any incidents with the actions taken to prevent future occurrences.

- Compile a bi-annual report of all incidents reported. The report should contain dates when training was conducted and when safety equipment and structures were inspected and maintained.

9.1.8 Fire

Construction activities, failing electrical infrastructure, mechanical operations and fires outside of designated areas, may increase the risk of the occurrence of unplanned and / or uncontrolled fires, which may spread into the nearby fields and surrounding farms. Lightning may cause natural fires during the dry season. Farming operations do not present the same fire risk as operations which include charcoal production in the greater area. Uncontrolled fires which have generated in other areas will present a risk to existing and prosed operations.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Fire risk	1	-2	2	2	1	-10	-2	Probable
Daily Operations	Fire risk	1	-2	2	2	1	-10	-2	Probable

Desired Outcome: To prevent property damage, veld fires, possible injury and impacts caused by uncontrolled fires.

Actions

Prevention:

- Maintenance of firebreaks, especially along fences and the power line servitude.
- Prepare a holistic fire protection and prevention plan. This plan must include evacuation plans and signage, an emergency response plan and a firefighting plan.
- Ensure fire-fighting equipment are maintained in good working order at all times. Ensure such equipment is readily available / unobstructed access.
- Personnel training (safe operational procedures, firefighting, fire prevention and responsible housekeeping practices).
- Ensure all flammable chemicals are stored according to material safety data sheet (MSDS) and SANS instructions and all spills or leaks are cleaned immediately.
- Maintain regular site, mechanical and electrical inspections and maintenance.
- Maintain firefighting equipment and promote good housekeeping.
- Notify the farmers' association as well as all surrounding farmers if planned burns (e.g. to create firebreaks) are planned.
- Allow fires used for purposes such as cooking (by staff) in designated areas only.

Mitigation:

- Implement the fire protection and firefighting plan in the event of a fire.
- Quick response time by trained staff will limit the spread and impact of fire.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Maintain a register of all incidents on a daily basis. Include measures taken to ensure that such incidents do not repeat themselves.
- Compile a bi-annual incidents report. The report should also contain dates when fire drills were conducted and when firefighting equipment were tested and training given.

9.1.9 Noise

Noise is generated by various operational and possible construction activities. Machinery like generators, machinery, vehicles and harvesters cause elevated noise levels that may result in hearing impairment after long term exposure. Activities are generally remote from receptors other than the Proponent, his employees and their families residing on the farm. The nature of the noise is related mainly to the ongoing operations and mechanical maintenance, typically on a farm.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Excessive noise generated from construction activities – nuisance and hearing loss	1	-1	2	2	1	-10	-1	Probable
Daily Operations	Noise generated from the operational activities – nuisance and hearing loss	1	-1	2	2	1	-10	-1	Definite

Desired Outcome: To prevent any nuisance and hearing loss due to noise generated.

Actions

Prevention:

- Follow Health and Safety Regulations of the Labour Act and/or World Health Organization (WHO) guidelines on maximum noise levels (Guidelines for Community Noise, 1999) to prevent hearing impairment.
- Regularly service all machinery to ensure minimal noise production.

Mitigation:

- Hearing protectors as standard PPE for workers in situations with elevated noise levels.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Health and Safety Regulations of the Labour Act and WHO Guidelines.
- Maintain a complaints register.
- Bi-annual report on complaints and actions taken to address complaints and prevent future occurrences.

9.1.10 Waste Production

Various waste streams result from the operational and possible construction and maintenance activities. Waste may include hazardous waste associated with hydrocarbon products and chemicals, as well as soil and water contaminated with such products. Construction waste may include building rubble and discarded equipment. Domestic waste will be generated by the residents and employees on the farm. Most of the farming related waste can be re-used and or recycled, however certain waste, such as empty pesticide containers are hazardous and should be disposed of according to hazardous waste requirements.

Waste presents a contamination risk and when not removed regularly may become a health and/or fire hazard and attract wild animals and scavengers. Sewage is a form of liquid biological waste that needs disposal.

Since no official waste disposal facilities, especially for hazardous waste, are available, all waste that cannot be re-used are burned at dedicated waste sites.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Excessive waste production, littering, illegal dumping, contaminated materials	1	-2	2	2	2	-12	-2	Definite
Daily Operations	Excessive waste production, littering, contaminated materials	1	-2	2	2	2	-12	-2	Definite

Desired Outcome: To reduce the amount of waste produced and prevent pollution and littering.

Actions

Prevention:

- Implement waste reduction measures. All waste that can be re-used/recycled must be kept separate.
- All old oil and related re-using application should be conducted in a manner which will not constitute in hydrocarbon pollution of soil.
- Ensure adequate temporary storage facilities for disposed waste are available.
- Prevent windblown waste from entering the environment.
- Prevent scavenging (human and non-human) of waste at the storage facilities.
- Educate employees on the importance of proper waste handling and disposal.

Mitigation:

- Waste should be disposed of regularly and at appropriately classified disposal facilities, this includes hazardous material (empty chemical containers and contaminated materials, soil and water).
- Discarded waste should be disposed of and burned regularly at a dedicated site to reduce health and pollution risks.
- Empty chemical containers that may present a contamination/health risk must be treated as hazardous waste. Workers should not be allowed to collect such containers for purposes of storing water or food. This can be achieved by puncturing or crushing such containers prior to disposal.
- Liaise with the applicable authorities regarding waste and handling of hazardous waste.
- Ensure all ablution facilities are connected to properly constructed septic tank systems to prevent groundwater contamination.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Maintain a register of disposal of hazardous waste. This should include type of waste, volume as well as disposal method/facility.
- Record any complaints received regarding waste with notes on actions taken.
- All information to be included in a bi-annual report.

9.1.11 Ecosystem and Biodiversity Impact

Agriculture and related activities are ongoing on the farm. Possible expansion is planned on existing cleared areas and no further impacts on vegetation are thus expected from additional land clearing. Rangeland improvement is an ongoing endeavour as part of the aftercare program, while cattle numbers are continually evaluated to avoid the risk of overgrazing.

Irresponsible pesticide use, for example as method of vermin control, may impact on scavengers such as vultures and in the long run on top predators through biomagnification in higher trophic levels. Similarly, the use of insecticide on crop fields may also affect non-target species. Less insecticide can be applied to reduce the risk of harm to non-target species. Over-abstraction of groundwater may potentially have devastating effects on plant and animal populations reliant on it. It not only include the drying up of springs, dying of trees and migration or dying of animals, but also the lowering of cave water levels.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Impact on fauna and flora. Loss of biodiversity	2	-1	3	2	2	-14	-2	Probable
Daily Operations	Impact on fauna and flora. Loss of biodiversity – poaching, poisoning, etc.	2	-1	2	2	2	-12	-2	Probable

Desired Outcome: To avoid pollution of, and impacts on, the ecological environment.

Actions

Prevention:

- Strictly adhere to pesticide application instructions and use pesticides only for the purposes for which it is registered and marketed. Importantly, pesticides should not be used to kill vermin unless specifically registered for that purpose, and even then alternative, environmentally friendly methods should be investigated and used.
- Restrict access to pesticides, insecticides and any other material which can be used by poachers.
- Prevent spray drift by applying pesticides during calm weather conditions.
- Ensure the employees applying pesticides are trained and / or skilled in the application thereof.
- Educate all contracted and permanent employees on the value of biodiversity and strict conditions prohibiting harvesting and poaching of fauna and flora must be part of employment contracts. Include prohibitions or regulations on the collection of firewood.
- Regular inspection of fences, game footpaths and other sites for snares, traps or any other illegal activities.
- Ensure all fuel, oil, hydraulic fluid and waste oil handling (e.g. servicing of vehicles or refuelling) is conducted on impermeable or bunded areas or make use of drip trays where such structures are not present.
- Adhere to all management measures as listed in the attached specialist assessment.

Mitigation:

- For construction activities, if any, contain construction material to a designated laydown area and prevent unnecessary movement out of areas earmarked for clearing and construction.
- Report any extraordinary animal sightings to the MEFT.
- Prevent scavenging of waste by fauna.

- Take disciplinary action against any employees failing to comply with contractual conditions related to poaching and the environment.

Responsible Body:

- Contractor
- Proponent

Data Sources and Monitoring:

- Report on all extraordinary animal or plant sightings or instances of poaching.
- Keep frequent records of borehole water levels and abstracted water volumes to identify any trends or consistent reduction in water levels.
- Compile a bi-annual report on all monitoring results.

9.1.12 Soil Disturbance and Contamination

Without good and suitable soil, existing and proposed farming operations will not be possible. All farming operations have an impact on the soil, some by a lesser degree and others more extensively. Cattle require drinking posts. At these sites there is usually an accumulation of manure which undergoes frequent trampling. Similarly, septic tank-french drain systems may affect the soil, especially if not properly constructed and maintained. In these areas the soil structure and composition may be affected. Overgrazing may lead to soil degradation and erosion. However, crop cultivation has a much more significant impact on not only soil structure, but also composition. Land preparation techniques involve tillage of all areas while infrastructure establishment may necessitate earthworks. Once the dryland crop field have been established, the Proponent further employs no-till (conservation tillage) practises, limiting further soil disturbance. Irrigated fields, however, have higher occurrences of soil compaction which require conventional tillage. Soil is compacted by mechanical activities such as planting, crop spraying and harvesting as well as livestock being allowed on the field after harvesting.

Once crop fields have been established, the addition of agrochemicals may change the soil composition. Fertiliser is added for certain elements lacking in the existing soil while pesticides may remain in the soil until broken down. In some instances, the irrigation itself, which is often more than the natural rainfall, may further alter the soil composition as the water dissolves of reacts with elements of the soil.

Apart from the crop and cattle related activities, hydrocarbon spills and leaks from machinery, equipment or failing fuel storage infrastructure may also affect the soil composition. All of the processes have the potential to contaminate the soil rendering it less feasible for crop cultivation.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2)Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Daily Operations	Hazardous material, spillages, hydrocarbon leakages from vehicles and machinery.	2	-1	2	2	1	-10	-2	Improbable
Daily Operations	Over application of fertilizer, pesticides, herbicides, etc. Sewerage system malfunction.	2	-1	2	2	1	-10	-2	Improbable

Desired Outcome: To prevent the contamination, compaction, erosion, or structure disturbance of soil.

Actions

Prevention:

- Appoint reputable contractors.
- Vehicles may only be serviced on a suitable spill control structure.
- Regular inspections and maintenance of all vehicles to ensure no leaks are present.
- Ensure all waste oil handling is conducted on impermeable or bunded areas.
- Follow prescribed dosage of fertilizers and pesticides / herbicides and to avoid over application. Where possible application decision should be based on soil testing and plant analysis. Fertiliser application should consider soil temperature and moisture content and not be applied to severely compacted soils.
- Maintain sewerage systems and conduct regular monitoring.
- All hazardous waste must be removed from the site and disposed of timeously at a recognised hazardous waste disposal facility, including any polluted soil or water.

- All hazardous chemicals and fuel should be stored in a sufficiently bunded area, as per MSDS requirements.
- Where possible, soil compaction from stock grazing and/or heavy machinery movement should be minimised.
- Restrict heavy machinery to designated areas.
- Retain appropriate indigenous vegetation buffers along soil berm and cut-off trenches.
- Increased crop residue left in the soil where possible.

Mitigation:
- All spills must be cleaned up immediately.
- Consult relevant MSDS information and a suitably qualified specialist where needed.

Responsible Body:
- Proponent
- Contractors

Data Sources and Monitoring:
- Maintain MSDS for hazardous chemicals.
- Continued visual monitoring for soil compaction.
- Soil should be sampled and analysed annually to ensure the correct amounts of fertilizer is applied and soil and groundwater quality is maintained.
- Registers be kept by the Proponent on the type, quantities and frequency of application of fertiliser, pesticides and any other chemicals utilised in crop production.
- A register of all incidents must be maintained on a daily basis. This should include measures taken to ensure that such incidents do not repeat themselves.
- All spills or leaks must be reported on and cleaned up immediately.

9.1.13 Groundwater and Surface Water Contamination

Leakages and spillages of hazardous substances from vehicles, waste oil handling and accidental fuel, oil or hydraulic fluid spills during the operational phase may contaminate the environment. Increase of nutrient levels (from over application of fertilizers or pesticides) in the soil that can leach to the groundwater. Runoff from over-irrigation and or rainfall events may carry chemical components, such as fertilisers and or pesticides from the site. Pollution due to sewerage system overflow or leakage may further put the groundwater at risk.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2)Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Daily Operations	Hazardous material, spillages, hydrocarbon leakages from vehicles and machinery.	2	-1	2	2	1	-10	-2	Improbable
Daily Operations	Over application of fertilizer, pesticides, herbicides, etc. Sewerage system malfunction.	2	-1	2	2	1	-10	-2	Improbable

Desired Outcome: To prevent the contamination of groundwater, surface water and soil.

Actions

Prevention:

- Appoint reputable contractors.
- Vehicles may only be serviced on a suitable spill control structure.
- Regular inspections and maintenance of all vehicles to ensure no leaks are present.
- All hazardous chemicals and fuel should be stored in a sufficiently bunded area, as per MSDS requirements.
- Ensure all waste oil handling is conducted on impermeable or bunded areas.
- Follow prescribed dosage of fertilizers and pesticides / herbicides and to avoid over application.
- Maintain sewerage systems and conduct regular monitoring.
- All hazardous waste must be removed from the site and disposed of timeously at a recognised hazardous waste disposal facility, including any polluted soil or water.
- Train and or guide persons involved with the sewerage systems, or any related effluent system, in terms of maintenance and operation to ensure the system is operated effectively.

Mitigation:

- All spills must be cleaned up immediately.
- Consult relevant MSDS information and a suitably qualified specialist where needed.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Maintain MSDS for hazardous chemicals.
- Soil should be sampled and analysed annually to ensure the correct amounts of fertilizer is applied and soil and groundwater quality is maintained.
- Groundwater should be sampled and analysed to test for nitrate concentrations from the fertilizers and for traces of chemicals used in pesticides and herbicides.
- Registers be kept by the Proponent on the type, quantities and frequency of application of fertiliser, pesticides and any other chemicals utilised in crop production.

- A register of all incidents must be maintained on a daily basis. This should include measures taken to ensure that such incidents do not repeat themselves.
- All spills or leaks must be reported on and cleaned up immediately.

9.1.14 Groundwater Abstraction

Groundwater abstraction is a very sensitive topic in a dry country where the value of land is drastically reduced if no or unusable groundwater is present on the land. Abstraction of groundwater must be done in a sensible way not to impact on other groundwater users that depend on such groundwater. This includes water abstracted for human and animal use, irrigation, and also ecosystems that depend on groundwater.

In a typical groundwater environment, a water balance would consist of inflow and outflow of the groundwater system. Over time, an equilibrium (or steady state) is normally reached with rising water tables following good recharge events and declining water tables when recharge is below average. Inflow into the system would typically be from infiltration following rainfall in the area and in upstream areas. Outflow would be comprised of water leaving the system through springs and as outflow over the lower boundary of the groundwater system as well as evapotranspiration losses. Groundwater abstraction through boreholes is important as this is normally necessary to sustain human and animal demands where such users became essentially dependant on the abstracted groundwater as a reliable and sustainable source.

Typical consequences of over abstraction will include a lowering in the water table. This may further lead to the drying up of boreholes, springs, and shallow wells. Vegetation will also be impacted where such vegetation has access to groundwater.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2)Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Daily Operations	Over-abstraction of the local aquifer, decrease in the local hydraulic head.	2	-2	2	2	2	-24	-3	Probable

Desired Outcome: To utilise the groundwater sustainably.

Actions

Prevention:

- Spread the water abstraction points over a larger area to diffuse the impact.
- Monthly water level monitoring as well as rainfall measured and recorded.
- Maintain safe abstraction rates prescribed by test pump evaluations (an abstraction permit with prescribed rates from the MAFWLR is a requirement for this project).
- All irrigation infrastructure meets water license requirements related to flow meters, and limits on flow rate, volume and area irrigated.
- Regular maintenance of the irrigation system and related infrastructure be conducted. Where flow meters need to be replaced, the MAFWLR should be informed accordingly.
- Continual monitoring for blocked nozzles or emitters, leaking hydrants or hoses, irrigator alignment etc.
- Soil moisture assessment conducted along with daily visual checks for excessive runoff or ponding.

Mitigation:

- Reduce abstraction when the water levels nears 5 m below the average rest water level of each borehole.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Monthly boreholes rest water level monitoring.

- Rainfall records
- Baseline values should be reviewed every three years based on all historic water level data.
- A summary report on all monitoring results must be prepared.
- The Proponent supply monitoring returns to the MAFWLR, as required by the permit.

9.1.15 Visual Impact

Agricultural activities are, and will continued to be, conducted across farmland that have already been used for this purpose over the last 50 years, or longer. Cultivated areas are demarcated on old topographic maps, indicating that the area has long since been recognised as an agricultural area. Satellite imagery of 1985 confirm these agricultural areas on the property which is surrounded by similar operations. Expansion areas will therefore add to the existing landscape character. No further requirements related to its operations were received.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Aesthetic appearance and integrity of the site	1	-1	2	2	2	6	-1	Probable
Daily Operations	Change in landscape character and aviation navigational interest	1	-1	2	2	2	6	-1	Probable

Desired Outcome: To minimise aesthetic impacts associated with the farm.

Actions

Mitigation:

- Regular waste disposal, good housekeeping and routine maintenance on infrastructure will ensure that the longevity of structures are maximised and maintain a low visual impact.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Compile a bi-annual report of all complaints received and actions taken.

9.1.16 Cumulative Impact

Possible negative cumulative impacts (i.e. the build-up of minor impacts to become more significant) associated with the operational phase and any maintenance/construction activities are mainly linked to traffic, reduction in soil and groundwater quality and groundwater availability. The cumulative increase in employees in the area may put more pressure on biodiversity as a result of poaching or harvesting of plant and animal products. The cumulative positive impacts from farming in the Otjozondjupa Region relates to increased and sustained employment, revenue generation and overall improved living conditions and livelihoods as a result of increased spending power.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Daily Construction and Operations (Negative)	Waste production, pollution, social ills, traffic, etc.	2	-1	2	2	1	-10	-2	Probable
Daily Construction and Operations (Positive)	Employment, skills development, revenue generation	2	1	2	2	1	10	2	Definite

Desired Outcome: To minimise cumulative all impacts associated with the farm.

Actions

Mitigation:

- Addressing each of the individual impacts as discussed and recommended in the EMP would reduce the cumulative impact.
- Reviewing biannual reports for any new or re-occurring impacts or problems would aid in identifying cumulative impacts. Planning and improvement of the existing mitigation measures can then be implemented.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Reviewing monitoring results based on all other impacts will give an overall assessment of the impacts of the operational phase.

9.2 DECOMMISSIONING AND REHABILITATION

Closure and decommissioning of agricultural and related activities on the farm as a whole is not foreseen during the validity of the environmental clearance certificate or in the near future. However, it is more likely that certain components may be decommissioned. Decommissioning is therefore included for this purpose as well as the fact that construction activities may also include modification and decommissioning of infrastructure. Future land use after decommissioning should be assessed prior to decommissioning and rehabilitation initiated if the land would not be used for future purposes. Should decommissioning occur at any stage, rehabilitation of the area may be required. Decommissioning will entail the complete removal of all infrastructure including buildings and irrigation infrastructure. Any pollution present on the site must be remediated. The impacts associated with this phase include noise and waste production as structures are dismantled. Noise must be kept within the Health and Safety Regulations of the Labour Act and WHO standards. Waste should be contained and disposed of at a dedicated waste disposal site and not dumped in the surrounding areas. The EMP for the farm will have to be reviewed at the time of full decommissioning to cater for changes made to the site and to implement guidelines and mitigation measures.

9.3 ENVIRONMENTAL MANAGEMENT SYSTEM

The Proponent could implement an environmental management system (EMS) for their operations. An EMS is an internationally recognized and certified management system that will ensure ongoing incorporation of environmental constraints. At the heart of an EMS is the concept of continual improvement of environmental performance with resulting increases in operational efficiency, financial savings and reduction in environmental, health and safety risks. An effective EMS would need to include the following elements:

- A stated environmental policy which sets the desired level of environmental performance;
- An environmental legal register;
- An institutional structure which sets out the responsibility, authority, lines of communication and resources needed to implement the EMS;
- Identification of environmental, safety and health training needs;
- An environmental program(s) stipulating environmental objectives and targets to be met, and work instructions and controls to be applied in order to achieve compliance with the environmental policy;
- Periodic (internal and external) audits and reviews of environmental performance and the effectiveness of the EMS; and
- The EMP.

10 CONCLUSION

Agricultural and related activities as performed on farming unit, by the Proponent, contributes positively to the economy of Namibia. Food is produced for national markets and the sale of livestock for meat production to both local and international markets. A number of employment opportunities are sustained and skills development within the local workforce occur. Revenue is generated that contributes to the Namibian economy.

Negative impacts associated with operational and intermittent maintenance and construction activities on the farming unit, as summarised in section 9, can successfully be mitigated. Implementing a HSE policy will contribute to effective management procedures to prevent and mitigate impacts. All regulations relating to the agricultural and related activities of the Proponent, including health and safety legislation, should be adhered to and implemented where applicable. Groundwater and soil pollution must be prevented at all times and over abstraction of groundwater prevented. Fire prevention should be key, fire response plans must be in place, and regular firefighting training provided to key employees. All staff must be made aware of the importance of biodiversity and the poaching or illegal harvesting of animal and plant products prohibited. This includes the proper handling and correct application of pesticides. Any waste produced must be properly disposed, re-used, or recycled where possible.

The EMP (Section 9) should be used as an on-site reference document for the operations of the farm. Parties responsible for transgression of the EMP should be held responsible for any rehabilitation that may need to be undertaken. The Proponent could use an in-house Health, Safety, Security and Environmental Management System in conjunction with the EMP. All operational personnel must be taught the contents of these documents.

Should the Directorate of Environmental Affairs agree with the impacts and related mitigation measures, they may issue an environmental clearance certificate to the Proponent. The environmental clearance certificate will render this document legally binding on the Proponent. The assessment process's aim is not to stop the farming activities, or any of its components, but to rather determine its impact and guide sustainable and responsible development as per the spirit of the EMA.

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Appendix A : Hydrogeological Specialist Study

FARM PORTIONS 19 & 20 (PART OF PORTION 5 BROKEN HILL) ON FARM OTAVI FONTEIN NO 794 AND FARM EISENBERG NO 509, OTJOZONDJUPA REGION

HYDROGEOLOGICAL SPECIALIST STUDY

Assessed by:

Assessed for:

Ondundu Farming Enterprises CC

March 2025

Project:	**FARM PORTIONS 19 & 20 (PART OF PORTION 5 – BROKEN HILL) ON FARM OTAVI FONTEIN NO 794 AND FARM EISENBERG NO. 509, OTJOZONDJUPA REGION - HYDROGEOLOGICAL SPECIALIST STUDY**	
Report Version/Date	V1 April 2025	
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Report Approval	 Pierre Botha Managing Director	

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CHIRPS-2	Climate Hazards Group Infra-Red Precipitation with Station data version 2
DWA	Department of Water Affairs
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMS	Environmental Management System
MAR	Mean Annual Rainfall
MAWLR	Ministry of Agriculture, Water and Land Reform
MERRA-2	Modern-Era Retrospective analysis for Research and Applications version 2
NASA	National Aeronautics and Space Administration
OML	Otavi Mountain Land
µm	Micrometres
cmol/kg	Centimole per kilogram
ha	Hectare
km	Kilometre
kWh/m²/day	Kilo watt hours per metre squared per day
m	Metre
m³/h	Metre cubed per hour
Ma	Million years
mamsl	Metres Above Mean Sea Level
mbs	Metres below surface
mg/cm³	Milligrams per cubic centimetre
mg/kg	Milligram per kilogram
mg/l	Milligrams per litter
mm	Millimetres
mm/a	Millimetres per annum
mS/m	MilliSiemens per metre
g/cm³	Grams per cubic centimetre

1 INTRODUCTION

Geo Pollution Technologies (Pty) Ltd was appointed by Ondundu Farming Enterprises CC (the Proponent) to undertake a hydrogeological specialist study for the farming portions 19 and 20 of Otavi Fontein FMB/00794 and for farm Eisenberg FMB/00509 (Figure 3-1), located in the Otjozondjupa Region. These farming portions will be reference as the project area in this specialist study. The D2807 district road is located to the west of farm Otavi Fontein. The main commercial activities of the Proponent includes crop cultivation and livestock farming. For purposes of crop cultivation, the Proponent utilizes approximately 76 ha of centre pivot irrigation. Pending the outcome of this specialist study, the total hectares of land to be irrigated simultaneously, may be increased. Irrigation is from boreholes by means of centre pivot irrigation systems.

2 SCOPE OF WORK

The aims of the study were to:

1. Conduct a hydrogeological assessment based on data obtained from an in-field hydro-census survey.
2. Gather historic information and compile a hydrogeological assessment based on the information.
3. Prepare a specialist report of the investigation.

3 METHODOLOGY

Obtain and review all available geological and hydrogeological information/reports for the investigation area. Review and delineation of hydrogeological catchment and sub-catchments within the investigation area. This will be based on historic groundwater level data contained in the Department of Water Affairs (DWA) database and from hydro-census data gathered on behalf of the proponent. Prepare a specialist report of the investigation.

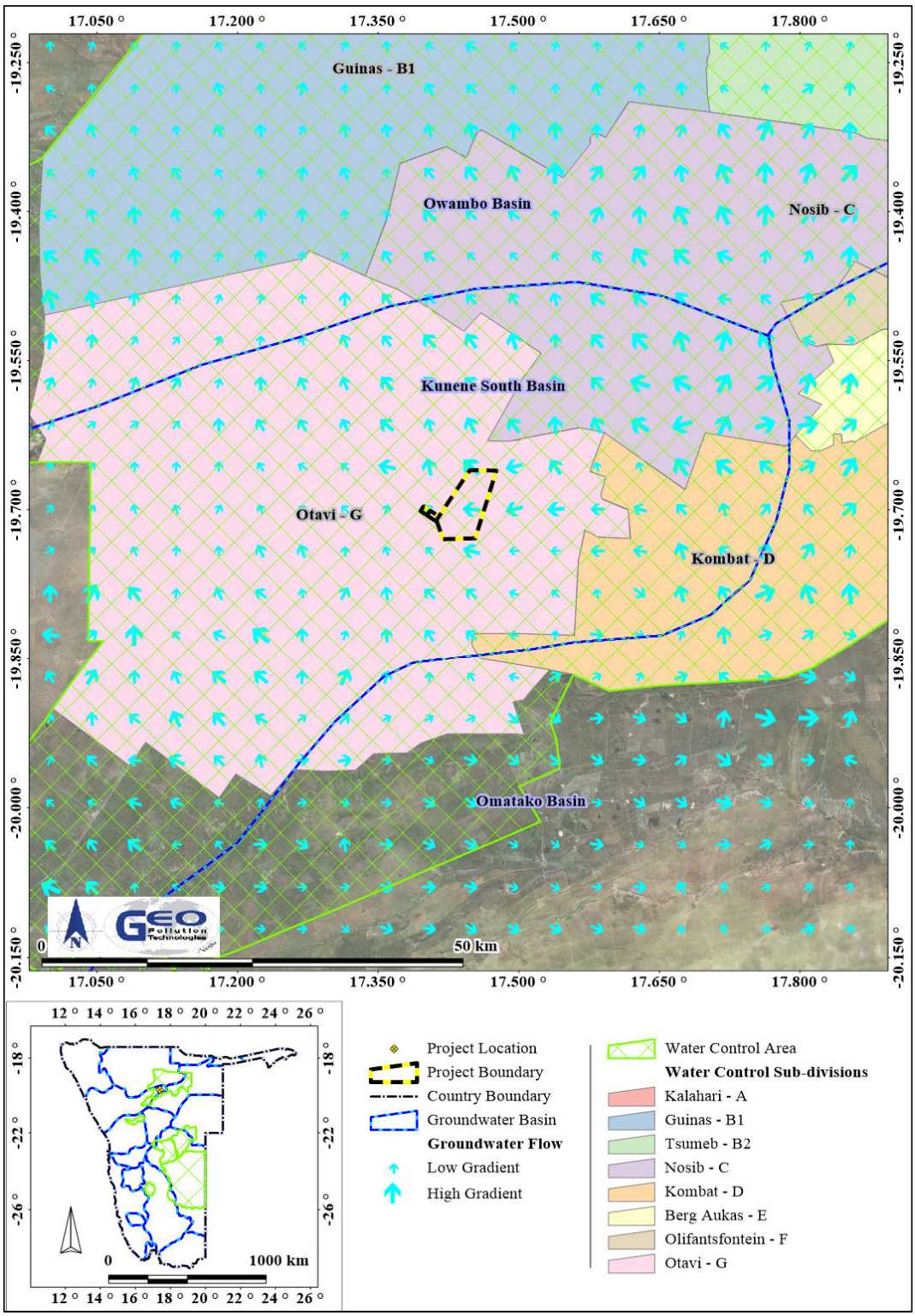


Figure 3-1 Project location and hydrogeological characterisation

4 ADMINISTRATIVE, LEGAL AND POLICY REQUIREMENTS

To protect the environment and achieve sustainable development, all projects, plans, programmes and policies deemed to have adverse impacts on the environment require an environmental impact assessment (EIA), as per the Namibian legislation. The key legislation provided in Table 4-1 govern the environmental assessment process in Namibia and/or are relevant to the project.

Table 4-1 Namibian Law applicable to the project

Law	Key Aspects
The Namibian Constitution	♦ Incorporate a high level of environmental protection. ♦ Land, water and natural resources below and above the surface of the land and in the continental shelf and within the territorial waters and the exclusive economic zone of Namibia shall belong to the State if they are not otherwise lawfully owned.
Environmental Management Act Act No. 7 of 2007, Government Notice No. 232 of 2007	♦ Defines the environment. ♦ Promote sustainable management of the environment and the use of natural resources.
Water Resources Management Act Act No. 11 of 2013 Government Notice No. 268 of 2023	♦ Provide for management, protection, development, use and conservation of water resources. ♦ Prevention of water pollution and assignment of liability.
Soil Conservation Act Act No. 76 of 1969	♦ Law relating to the combating and prevention of soil erosion, the conservation, improvement and manner of use of the soil and vegetation and the protection of the water sources Namibia.

Relevant water resource development and related activities listed as activities requiring an environmental clearance certificate are (Government Notice No. 29 of 2012):

Section 8: Water resource developments:

- 8.1 The abstraction of ground or surface water for industrial or commercial purposes: the Proponent is making use of the groundwater for irrigation based farming.
- 8.2 The abstraction of groundwater at a volume exceeding the threshold authorised in terms of a law relating to water resources.
- 8.6 Construction of industrial and domestic wastewater treatment plants and related pipeline systems.
- 8.7 Irrigation schemes for agriculture excluding domestic irrigation.
- 8.8 Construction and other activities in water courses within flood lines.
- 8.9 Construction and other activities within a catchment area.

The relevance of 8.2 is not clear as to under which act such a threshold is defined, if any. The Water Resources Management Act (Act No. 11 of 2013) do not define such a threshold and existing water control areas in which abstraction permits would be required, was not repealed. The repealed Water Act (Act No. 54 of 1956) only requires abstraction permits within water control areas, see Figure 3-1. According to the new Water Resource Management Act (Act No. 11 of 2013) an abstraction licence is now required regardless whether the project is located within a water control area or not. Abstraction licenses are currently issued by the Ministry of Agriculture Water and Land Reform (MAWLR). The project falls inside a control area, thus an abstraction permit is a requirement.

Within the Water Resources Management Act (Act No. 11 of 2013) it is clearly stipulated that the purification and disposal of industrial water and effluents as well as the disposal of effluents by local

authorities is subjected to the requirements of the Act. Agricultural activities is not subjected to the requirements of the Act, making the implementation of 8.6 questionable. The return period for flood lines is not provided for, nor a definition of flood lines to make 8.8 applicable. It is however in the Proponent's best interest to ensure that the project area is outside a flood risk area. All land in Namibia is in some form of catchment area, making the practical implementation of 8.9 questionable. It however remains important to consider all activities that would/may impact on the groundwater.

5 DESCRIPTION OF NATURAL ENVIRONMENT

5.1 LOCATION

The project area (portions 19 and 20 of Otavi Fontein FMB/00794 and Farm Eisenberg FMB/00509) (-19.702123°S, 17.400486°E) is located in the Kunene South Groundwater Basin (Figure 3-1). The project area falls in a subdivision (Otavi - G) of the Grootfontein-Otavi-Tsumeb Water Control Area. This is set forth in the Government Notice 1969 of 13 November 1970 and Proclamation 278 of 31 December 1976 (Extension).

Implications and Impacts

Groundwater Basin committees will likely be formed under the Water Resources Management Act, Act No. 11 of 2013. This will likely give more powers to groundwater users in a basin to ensure sustainability of groundwater usage, but also encourage the optimal usage of groundwater. The project area falls inside a declared water control area and permits are required for drilling and rehabilitation of boreholes as well as for groundwater abstraction.

5.2 CLIMATE

According to the Köppen-Geiger Climate Classification system the project is located in a hot semi-arid climate (BSh) (http://koeppen-geiger.vu-wien.ac.at/present.htm) (Kottek et al., 2006). This means that the area receives precipitation below potential evapotranspiration, but not as low as a desert climate and has a mean annual temperature of at least 18 °C.

There is a general lack of weather stations and data in Namibia especially in the rural areas. To overcome this problem, there are a few solutions available. One is to make use of satellite precipitation observation data like CHIRPS 2 or to obtain in-situ observation data/measurements from farmers/individuals in the project area. The second option is not always possible, but when the data is available, it can provide a more precise depiction of the local climatic conditions of the area.

Additionally, long-term precipitation data was obtained for the project area from the CHIRPS-2 database (Funk et al., 2015). The CHIRPS-2 dataset (Climate Hazards Group Infra-Red Precipitation with Station data version 2) consist of long-term precipitation data (1981 to near-present) obtained from satellite imagery and in-situ station data and therefore represents more recent data. Data is averaged over an area of roughly 5 km by 5 km. This averaging effect should be kept in mind during data analyses as high precipitation from single thunderstorm cells would be averaged out, thereby providing a reduced daily maximum precipitation value.

The Atlas of Namibia average rainfall for the area is 450 to 500 mm/a, with a variation of 30 to 40%. Based on the CHIRPS-2 dataset the rainfall is well within rage with a seasonal average of 468.34 mm/a, but also with a slightly smaller coefficient of variance of 26.98%. Both datasets indicate monthly rainfall peaking in January to February. CHIRPS-2 also indicates heavier precipitation (single day events) occurring between December to April, with a single day maximum of 62.24 mm in February being the highest. CHIRPS-2 daily and seasonal precipitation data is presented in Table 5-1 and in Figure 5-1 (Funk et al., 2015). Seasonal total precipitation, centered on the average line for the last 43 years, is presented, with the daily total precipitation and the seasonal cumulative precipitation. From the figure it is clear that the rainfall for 6 out of the last 10 seasons were below average. The potential evapotranspiration is 2,300 to 2,400 mm/a. By dividing the mean annual potential evapotranspiration into the mean annual precipitation, an aridity index value for the area was computed as 0.2, which indicates the area to be arid.

Table 5-1 Rainfall statistics based on CHIRPS-2 data (Funk *et al.*, 2015)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum (mm/m)	20.24	27.10	27.91	0.00	0.00	0.00	0.00	0.00	0.00	5.33	9.80	15.82
Maximum (mm/m)	293.44	209.96	172.54	98.10	6.10	0.51	0.03	0.00	8.95	57.83	118.88	175.56
Average (mm/m)	121.34	110.21	77.06	27.47	0.98	0.03	0.00	0.00	1.06	17.59	37.99	70.90
Variability (%)	55.14	48.69	40.78	83.30	196.48	359.27	458.13	0.00	205.84	71.40	54.05	52.05
Daily Maximum (mm)	45.19	62.24	61.68	51.41	6.10	0.23	0.01	0.00	8.29	20.70	33.40	44.87
Average Rain Days	12.93	11.16	7.93	2.93	0.33	0.26	0.16	0.00	0.60	3.70	7.53	10.47
Season July - June average 468.34				Season coefficient of variation: 26.98				3 Day return period: 88.48				
Date range:		1981-Jan-01	to	2024-Jun-30		Lat: 19.702°S			Long: 17.400°E			

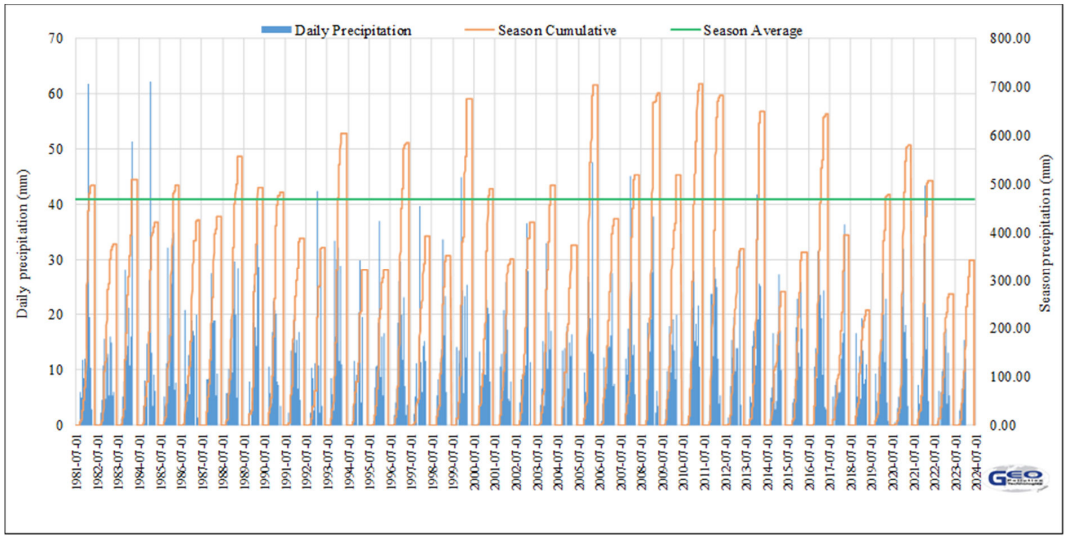
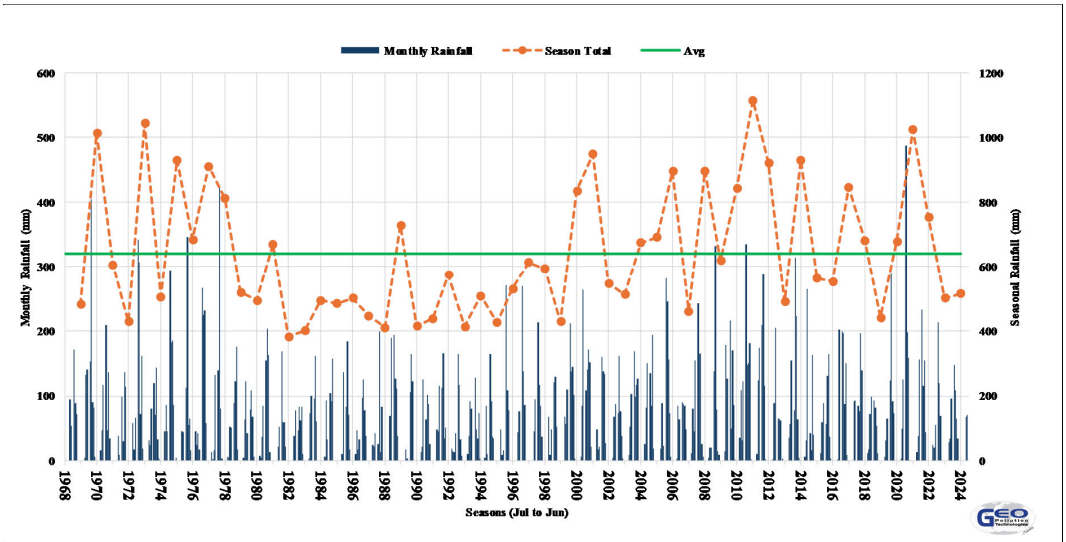


Figure 5-1 Daily and seasonal rainfall from CHIRPS-2 data (Funk *et al.*, 2015)

The Proponent has provided locally observed rainfall measurements for this specialist study. The rainfall measurements have been recorded over the last 57 years (1968-present) across several locations in the area.

Based on the supplied data for the last 57 years, the area has received an average rainfall of 639.56 mm/a (Figure 5-2). In the last 10 years, 5 of the seasons had an above average rainfall. The area had a recorded seasonal minimal rainfall of 383 mm during the 1981-1982 season and a maximum rainfall of 1,115.43 mm/a during the 2010-2011 season. The supplied data produced statistical values significantly higher than other data derived from formal measurement locations in the area.



Total 57 Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Rainfall (mm/a)		
Average Rainfall (mm)	155.09	156.19	109.27	46.46	3.58	0.14	0.00	0.00	3.12	19.71	53.69	92.30	Min	Avg	Max
Maximum Rainfall	487.2	425	232	182	74	5	0	0	45	109	178	265	383	640	1115.43
Year of maximum rainfall	2021	1978	1977	2011	1994	1975	1968	1968	1976	2010	2009	2014	Years above average: 23		

Figure 5-2 Local rainfall data from Ondundu Farming CC

Similar to precipitation data, temperature data is also lacking for the project area, with the Atlas of Namibia presenting only crude, large scale averages. To have an idea of temperatures in the area, monthly temperature data was retrieved from the Modern-Era Retrospective analysis for Research and Applications version 2 (MERRA-2) data set for a height of 2 m above surface (Ronald Gelaro, et al., 2017). This data set is a NASA atmospheric reanalysis, incorporating satellite data integration and aims at historical climate analyses at 0.5° x 0.625° spatial resolution. This translates to roughly 3,640 km², which still is a large area, but is somewhat less crude than the Atlas data.

Table 5-2 presents statistics of daily data abstracted from the MERRA-2 data set for the last 41 years. The lowest temperature of -1.86°C was recorded in June. The average annual minimum temperature is 5.1°C. A maximum temperature of 40.6°C was measured in January, while the average annual maximum temperature is 36.8°C. The average annual temperature range is 22°C while the average diurnal temperature (difference between daily minimum and maximum temperature) for this area is around 23°C. Direct normal solar irradiance for the area is 6.908 kWh/m²/day.

Table 5-2 Temperature statistics based on Merra-2 data

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum (°C)	8.73	8.22	8.49	6.95	2.98	-1.86	-0.45	2.84	5.51	5.13	5.42	9.43
Maximum (°C)	40.63	38.87	38.97	36.14	33.84	30.27	30.50	33.75	37.68	40.26	40.53	40.26
Average (°C)	25.55	24.23	23.41	21.34	19.12	16.23	16.12	19.04	22.60	25.16	25.94	25.64
Diurnal (°C)	21.30	19.52	19.87	20.85	22.46	23.52	24.00	25.53	26.10	24.61	24.16	22.31
Season July - June				Seasonal average Temperature: 22.03								
Date range:	1980-Jan-01	to	2021-Sep-30		Lat: -19.725°S					Long: 17.425°E		

Implications and Impacts

Rainfall events are often thunderstorms with heavy rainfall that can occur in short periods of time ("cloud bursts"). Rainfall in the area is above the Namibian average but varies significantly year on year. Heavy rainfall can lead to soil erosion when improper agricultural practises are employed, while dry seasons will necessitate greater reliance on groundwater resources.

Recurring drought conditions may impact on groundwater availability. Pollutants that enter the groundwater can pollute this valuable resource. Rainfall is important for groundwater recharge.

5.3 TOPOGRAPHY & DRAINAGE

The project area falls within the Karstveld landscape, an area dominated by limestone with little or no surface run-off. The topography ranges from rugged mountains to relative flat valleys. Ground surface elevation ranges between 1,700 mamsl at the most northern boundary to 1,470 mamsl at the most southern boundary of the project area; the project area falls within the Etosha Pan catchment. Surface drainage is poorly developed, despite the relative mountainous terrain. Most of the local rainfall infiltrates into the subsurface.

The development of sinkholes, dolines and caves are common in the areas around the project location, especially northeast of the area.

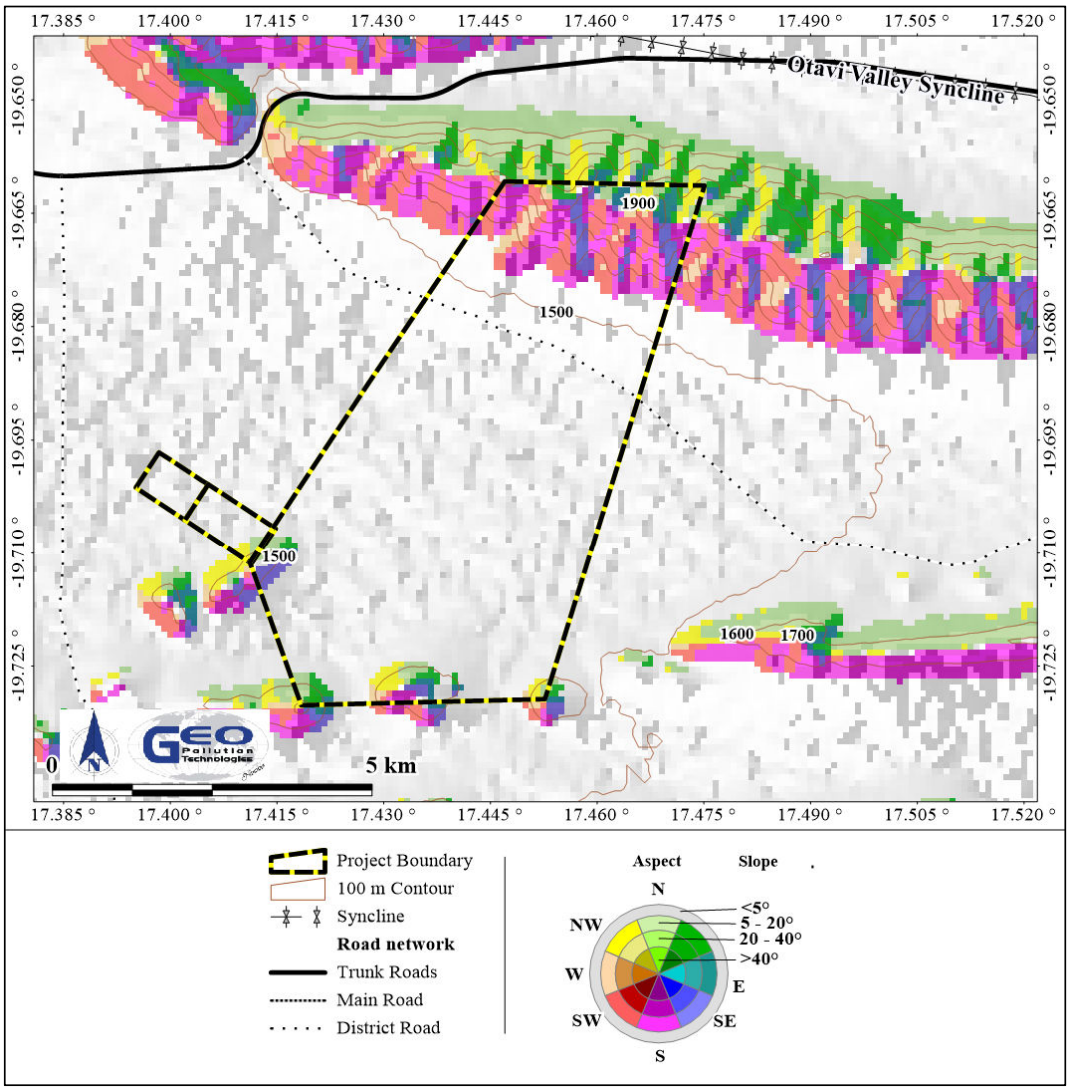


Figure 5-3 Aspect slope

Implications and Impacts

The area is generally flat and suitable for agricultural activities. The lack of major surface runoff and drainage may lead to pooling and even flooding of plains during heavy rainfall events. This may negatively impact soil quality and cause localised flooding of infrastructure, if located in flood prone areas, or if such areas are not considered in designs. The risk of erosion is relatively low, except for areas near the mountains. The local geology might prevent localised flooding, as the top layer is mainly characterised as Kalahari sediments with a relative high permeability.

5.4 GEOLOGY

The dominant soil type that covers the majority of the project area, is Petric Calcisol which refers to the soil type commonly found in arid or semi-arid regions having dry seasons (Figure 5-4). They form in calcium and magnesium rich alluvial, colluvial and aeolian deposits and are alternately dampened by rain and dried through evaporation which results in soft masses or hard layers of calcrete. In addition to this, the calcisol of this particular area is known for having been strongly cemented or indurated within 100 cm from the soil surface. The composition of soil in this particular area is roughly 55-60 % sand, 15-20 % silt and 25-30 % clay which gives it the characteristics and texture of Silt Loam soil. Bulk density was computed to be 1,450-1,500 mg/cm³ which means that the soil will affect the root growth of various plants, but not necessarily restrict it. Soils in this area typically reach depths of >190 cm, have a pH of 4.6-5.5 and a cation exchange capacity of 10-13 cmol/kg. Furthermore, this region has a water capacity of 60-80 mm at root depth.

The northern and southern boundaries of the project area overlay Skeletic Lithic Leptosol soil which refers to a soil type with a stony characteristic or very shallow depth over a continuous rock surface (Figure 5-4). These soils are typically found in hills where erosion takes place at a higher rate than soil formation or sediment deposition. Due to this and the fact that these soils form a thin layer with high drainage, leptosols are poor candidates for crop production. In addition to this, the leptosol of this particular area is known for: having, within 10 cm from the soil surface, continuous hard rock; having, to a depth of 100 cm from the soil surface, between 40 and 90 percent (by weight) gravel or other coarse fragments. The composition of soil in this particular area is roughly 65-70 % sand, 10-15 % silt and 25-30 % clay which gives it the characteristics and texture of Sandy Clay Loam soil. Bulk density was computed to be 1,450-1,500 mg/cm³ which means that the soil will affect the root growth of various plants, but not necessarily restrict it. Soils in this area typically reach depths of 100 cm, have a pH of 5.5-6 and a cation exchange capacity of 7-10 cmol/kg. Furthermore, this region has a water capacity of 40-60 mm at root depth.

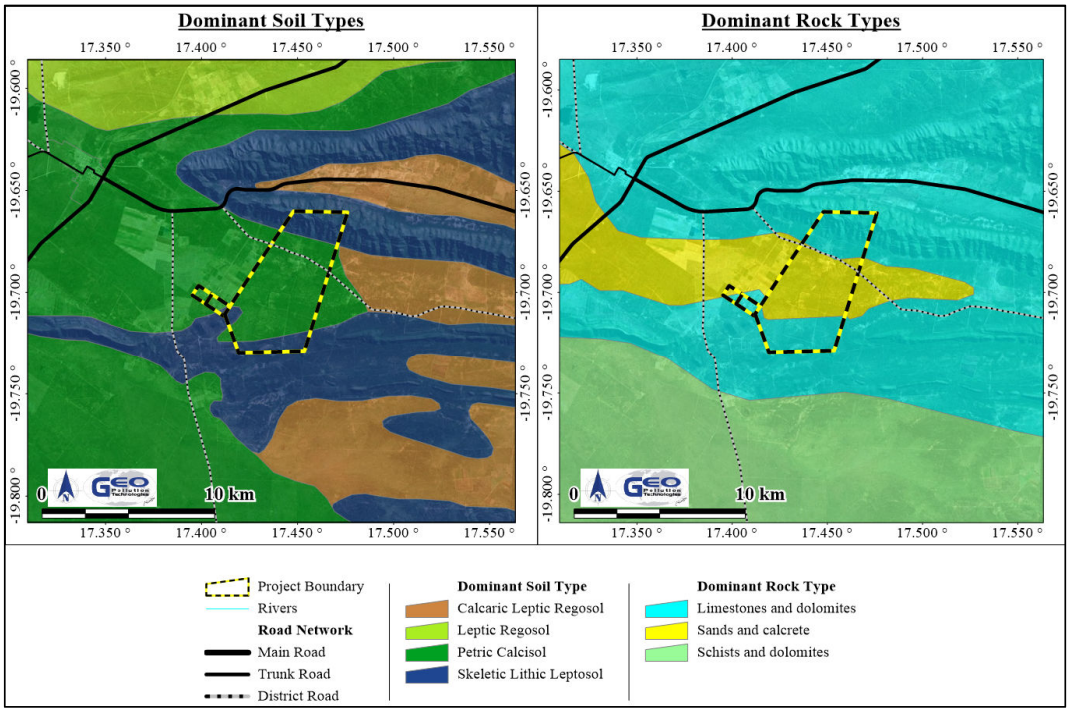


Figure 5-4 Dominant soil and Rock types

The geology underlaying the project area was formed during the Namibian to Quaternary Ages. Kalahari Group sediments, consisting of sand, calcrete and gravel cover most of the project area (Figure 5-5 and Figure 5-6). The Kalahari Group sediments originate mainly from fluvial deposition with some reworking through aeolian processes. Kalahari sediments at the project area form only a surface cover. The Kalahari Group sediments here commonly overlie pre-Kalahari rocks of the Damara Sequence (Namibian Age).

The project area falls within the Northern Margin Zone of the Damara Sequence. A tectonostratigraphic zone that is part of a narrow transition zone between the highly deformed Damara Sequence to the south and the platform equivalents to the north. Underlaying Damara Sequence consists of dolostones, limestone and phyllites of the Otavi Group associated with the Chuos (NChd) -, Berg Aukas (NBal) and Maieberg (NMap) formations. These outcrops are predominantly found near the southern border of the project area. The Chuos – and Berg Aukas formations form part of the Abenab Subgroup. The Maieberg Formation of the Tsumeb Subgroup lies disconformed on the Abenab Supergroup.

Outcrops of dolostones near the northern border of the project area are associated with the Maieberg (NMa) and Elandshoek (NEl) formations of the Tsumeb Subgroup. Limited outcrops of phyllites from the Kombat Formation (NKt) of the Mulden Group are also present.

Moderate folding of the strata occurred during the Pan African Orogeny (680-450 Ma) and resulted in the formation of synclines and anticlines, generally trending east-west. The development of joints and fractures in the rocks are associated with the folding, which have an impact on the hydrogeological characterization of the area. The Otavi Valley Syncline is present approximately 8 km to the north of the project location, with fault lines trending in an east-west direction, parallel to the syncline near the northern border of the project area.

Several known karst features (mineralised karst chimneys, cave and sinkhole lakes) are present in the broader region. The Gross Otavi and the Kombat mines are located 23 and 33 km respectively to the east of the project area.

Springs form between the contact of the formations of the Damara Sequence and the less permeable underlaying Metamorphic Complex. The nearest of these contact zone springs is present approximately 4.5 km to the northwest of the project area (Figure 5-5). No caves or lakes are known of near (<10 km radius) the project area.

5.5 HYDROGEOLOGY

The project area is situated in the Kunene South Groundwater Basin. Localised groundwater flow may take place along preferred flow paths in different directions, but the larger scale groundwater flow from the project location is expected to be in a northwesterly direction. Local flow patterns may vary due to groundwater abstraction.

Groundwater flow is expected to take place throughout two types of aquifers. The first type is associated with the Kalahari sediments (primary aquifer). While the second aquifer type is associated with the karstic/dolomitic hard rock formations (fractured aquifer) where groundwater flow is expected to flow along the fractures, faults (secondary porosity) and other geological structures present within the underlying formations (hard rock or consolidated formations).

The karst aquifer within the Otavi Mountain Land (OML) is recognized as the primary groundwater resource in the region, characterized by water of generally high quality. Recharge to these aquifers occurs primarily through local rainfall infiltration, facilitated by several factors such as comparatively high rainfall, minimal soil cover in mountainous areas, and the storage capacity within karst field dolomite synclines. These conditions enable rapid infiltration during precipitation events and the storage of significant volumes of water within the aquifers.

Groundwater quality data is presented in Figure 5-7 as Maucha plots. From the figure it is clear that the groundwater of the project location is mostly of a calcium-magnesium-bicarbonate type water, which suggest the water is recently recharged. Groundwater quality from the project area reflect an aquifer that is typical of a dolomitic hard rock formation host where rapid groundwater recharge takes place.

Table 5-3 presents groundwater statistics for 44 boreholes in an area covered by the project area and a 2 km buffer around the project. The groundwater information was obtained from Department of Water Affairs (DWA) borehole database. This database is generally outdated and more boreholes might be present. The average depth of 22 of the boreholes is 69.45 m below surface and the yield of 24 of the boreholes ranges between 0.10 and 60.00 m³/h, with an avergae yield of 9.56 m³/h. The average groundwater level of 22 of the boreholes is 39.86 m below surface, ranging between 15.00 m and 57.50 m below surface. Water quality is mainly of good quality, although the water hardness would likely be high.

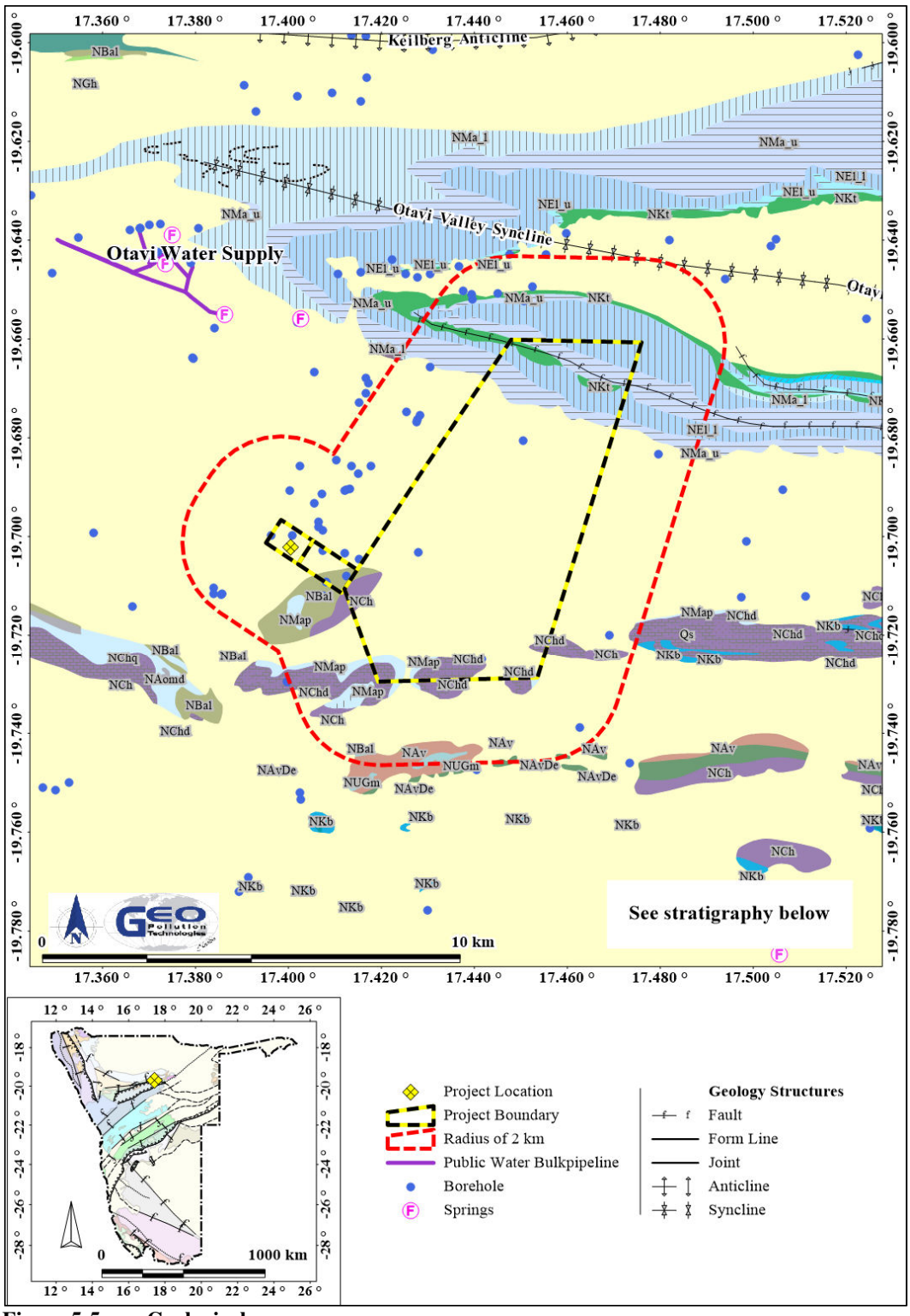


Figure 5-5 Geological map

Age	Lithcode	Supergroup	Group	Subgroup	Formation	Member	Main_Litho	Other_Rock
Quaternary	Qs						sand; gravel; calcrete	
Namibian	NKt	Damara	Mulden		Kombat		phyllite	
	NHt_m		Otavi	Tsumeb	Huttenberg		dolostone (bedded)	phyllite
	NEl_u				Elandshoek		dolostone (bedded)	
	NEl_l						dolostone (massive)	
	NMa_u				Maieberg		dolostone (bedded)	
	NMa_l						limestone/marl (bedded)	
	NMap						phyllite	
	NGh				Ghaub		diamictite	
	NAomd			Abenab	Auros		dolostone (massive)	
	NGa				Gauss		dolostone (massive)	
	NBa				Berg Aukas		dolostone (laminated; light/dark)	
	NBal						limestone	
	NCh		Swakop/Otavi	Usakos/Abenab	Chuos		diamictite; pebbly schist	quartzite; conglomerate; dolostone; shale
	NChq						quartzite	
	NChd			Usakos/Abenab			dolostone (massive)	
	NSWm		Swakop				marble	
	NKb			Navachab	Karibib		marble; dolostone; limestone	calc-silicate rock; mica schist
	NUGm			Ugab			marble	
	NAv		Nosib		Askevold		epidosite; agglomerate	chlorite schist
	NAvDe					Devon	dolostone	

Figure 5-6 Stratigraphy

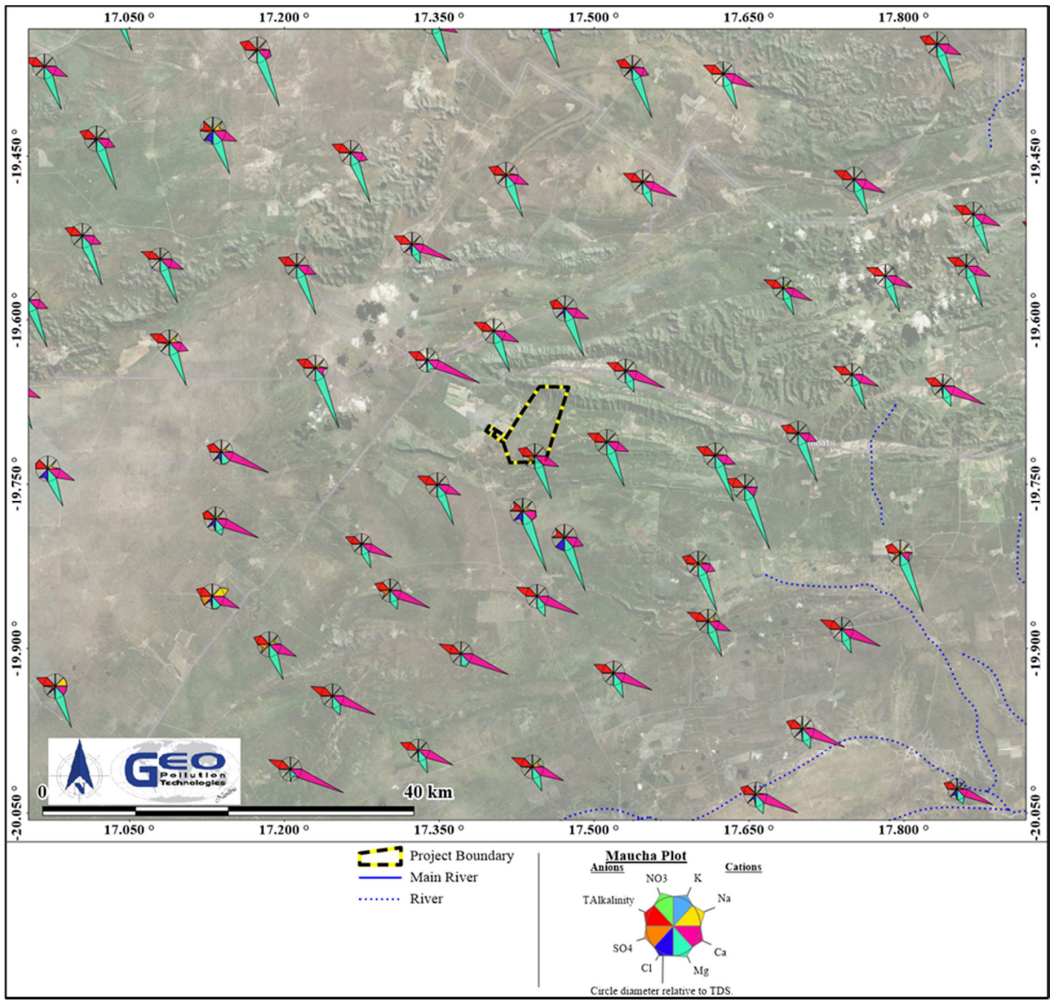


Figure 5-7 Groundwater quality

Table 5-3 Groundwater statistics

	DEPTH (mbs)	YIELD (m^3/h)	WATER LEVEL (mbs)	TDS (ppm)	SULPHATE (ppm)	NITRATE (ppm)	FLUORIDE (ppm)
Data points	22	24	22	14	14	9	14
Minimum	46.50	0.10	15.00	504.00	4.00	0.60	0.20
Average	69.45	9.56	39.86	686.14	72.93	3.39	0.31
Maximum	105.00	60.00	57.50	1,005.00	220.00	9.10	0.60
Group A	4.55%	25.00%	0.00%	92.86%	92.86%	100.00%	100.00%
Limit	50	>10	10	1000	200	10	1.5
Group B	90.91%	29.17%	72.73%	7.14%	7.14%	0.00%	0.00%
Limit	100	>5	50	1500	600	20	2.0
Group C	4.55%	41.67%	27.27%	0.00%	0.00%	0.00%	0.00%
Limit	200	>0.5	100	2000	1200	40	3.0
Group D	0.00%	4.17%	0.00%	0.00%	0.00%	0.00%	0.00%
Limit	>200	<0.5	>100	>2000	>1200	>40	>3

44 known boreholes within the project area and a 2 km buffer around the area

Statistical grouping of parameters is for ease of interpretation, except for the grouping used for sulphate, nitrate and fluoride, which follow the Namibian guidelines for the evaluation of drinking-water quality for human consumption, with regard to chemical, physical and bacteriological quality. In this case the groupings has the following meaning:

Group A: Water with an excellent quality
Group B: Water with acceptable quality
Group C: Water with low health risk
Group D: Water with a high health risk, or water unsuitable for human consumption

Implications and Impacts

The area is known to have a high ground water recharge rate with rapid infiltration. This makes abstraction of groundwater more sustainable, but also at the same time more vulnerable to pollution. Agricultural activities on the Kalahari sediments will offer some protection against contamination.

5.6 LONG TERM GROUNDWATER LEVELS

Data from 3 nearby groundwater monitoring points were received. The long term trends of the data is presented in Figure 5-8, while their locations are presented in Figure 5-9. Bothe boreholes WW78901 and WW28403 is near the project area, while borehole WW25369 is near the town's public water supply scheme. Both boreholes WW78901 and WW28403 shows an increase in wate levels, with borehole WW25369 having a stable water levels. Unfortunately recent groundwater monitoring data is not available.

Implications and Impacts

Based on the available groundwater monitoring data it seems as if groundwater levels near the project area is increasing. This is a good indication and the aquifer utilisation may be increased.

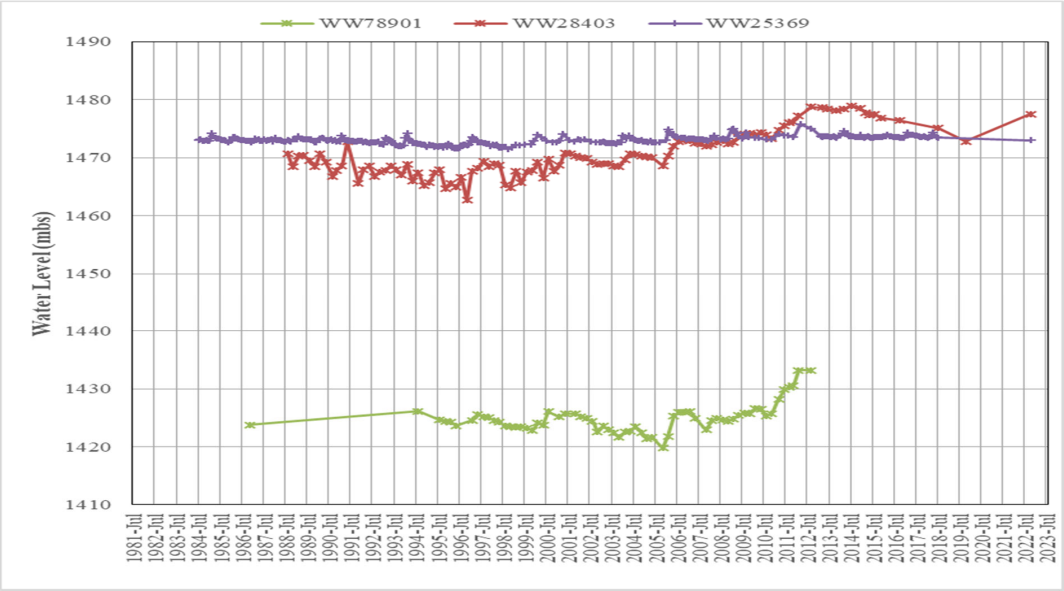


Figure 5-8 Groundwater level trends

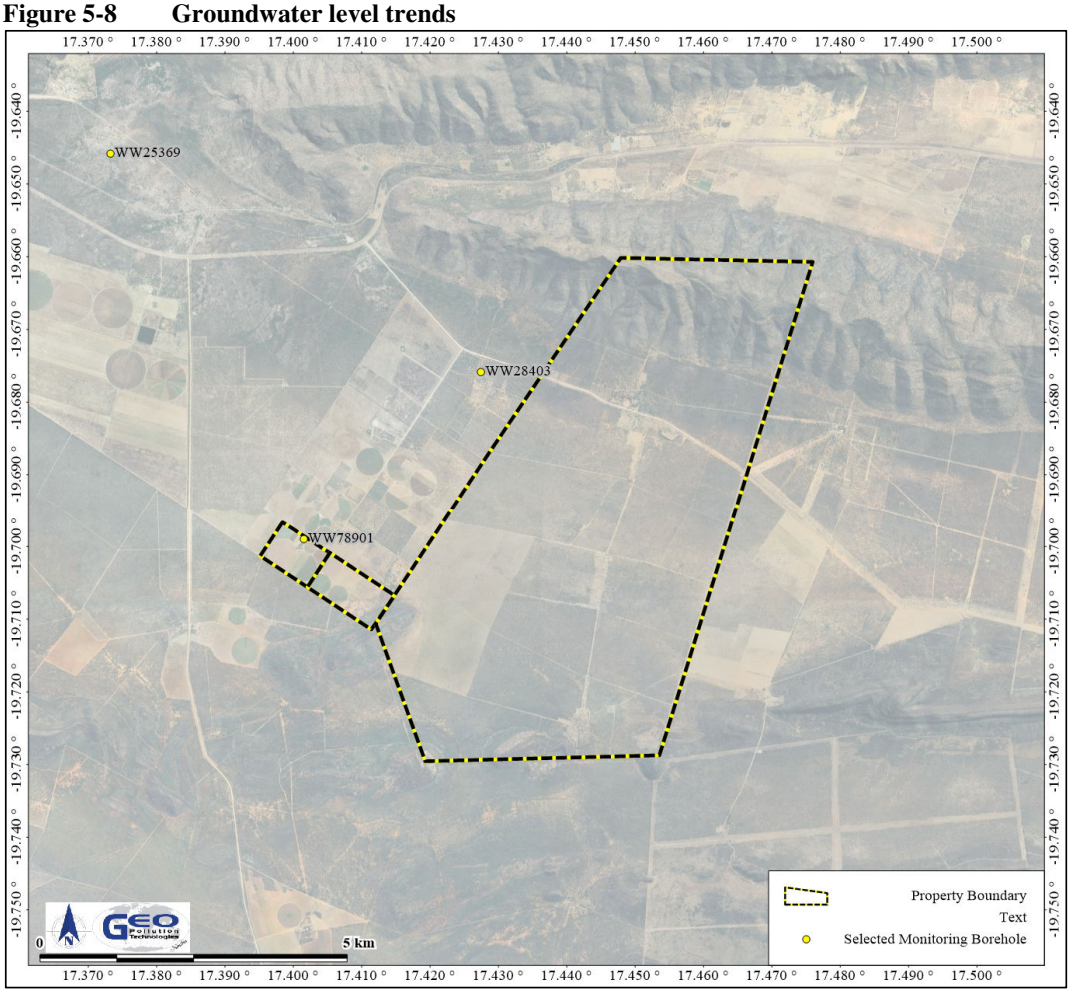


Figure 5-9 Groundwater monitoring points

5.7 PUBLIC WATER SUPPLY

Public water supply to the town Otavi is sourced from a groundwater well field situated approximately 5 km northwest of the project area. The scheme is operated by Namwater and consists of five boreholes (WW34587, WW9052, WW9053, WW9093 and WW9094) and a fountain near Otavi (Figure 5-5). Water to neighbouring properties is sourced from own groundwater abstraction points.

Implications and Impacts

The Public water supply scheme for Otavi is unlikely to be impacted by planned activities investigated in this study.

6 PROJECT WATER SUPPLY

6.1 GROUNDWATER USAGE

The only available source of water at the project area is the local aquifer. The proponent has drilled several boreholes on different parts of the project area in order to utilise the groundwater for irrigation, stock watering and domestic usage.

During a hydrocensus at the project area, four boreholes were recorded on portion 19 and three on portion 20. Additionally, four boreholes exist on the farm Eisenberg, with three documented and one drilled after the site visit in early 2025 (Figure 6-1). Three more boreholes are planned for Eisenberg. Out of eleven boreholes, eight are operational - three for irrigation, three for domestic use, and two for stock watering. All working boreholes have submersible pumps, flowmeters. The remaining boreholes are either dry, damaged, or kept as backup. All borehole details are summarized in Table 6-1.

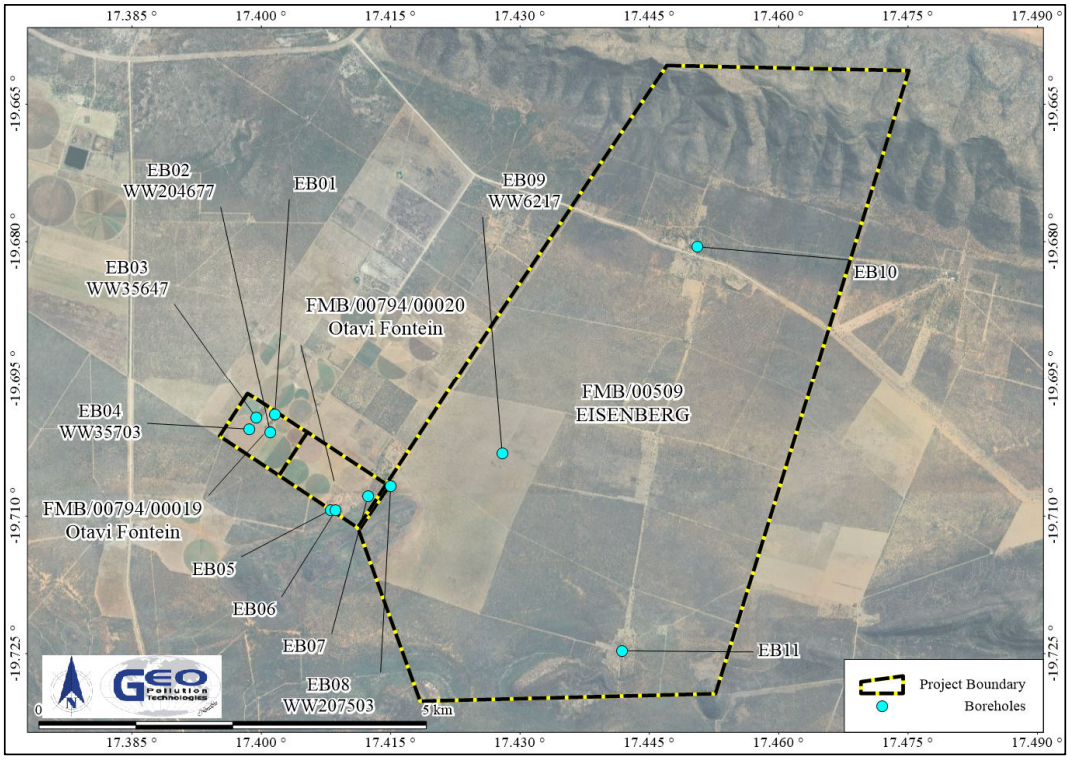


Figure 6-1 Borehole locality map

Accurate rest water level measurements could not be obtained from any of the boreholes due to obstructions from installed infrastructure and when the borehole was dry/collapsed. All water levels are subject to the influenced of nearby abstraction and irrigation activities.

Table 6-1 Summary of groundwater information obtained from hydrocensus on 17 June 2024

Map Ref	Borehole Name	Farm portion	Use	Borehole Depth (m)	Yield (m^3/h)	Water Level (mbs)
EB01	Huis gat	Otavi Fontein FMB/00794/00019	Domestic	150	60	
EB02	WW204677	Otavi Fontein FMB/00794/00019	Irrigation			
EB03	WW35647	Otavi Fontein FMB/00794/00019	Domestic	150	25	43.6
EB04	WW35703	Otavi Fontein FMB/00794/00019	Irrigation	150	120	
EB05		Otavi Fontein FMB/00794/00020	Stock		12	
EB06		Otavi Fontein FMB/00794/00020	Not in use	Collapsed		Dry
EB07		Otavi Fontein FMB/00794/00020	Not in use			Dry
EB08	WW207508	Eisenberg FMB/00509	Irrigation	114	63	43.21
EB09	WW6217	Eisenberg FMB/00509	Not in use	76.2	6.4	
EB10		Eisenberg FMB/00509	Domestic			
EB11		Eisenberg FMB/00509	Stock			

Photo 6-1 EB1 - Domestic

Photo 6-2 EB2/WW204677 - Irrigation

Photo 6-3 EB3/WW35647 - Domestic

Photo 6-4 EB4/WW35703 - Irrigation

Photo 6-5 EB5 - Stock

Photo 6-6 EB6 - Not in use/ collapsed

Photo 6-7 EB7 Not in use/dry

Photo 6-8 EB9 Not in use/dry

6.2 WATER QUALITY

The proponent provide one water quality analyses (Sample No I17039811) as conducted in March 2020 by Analytical Laboratory Services. Note that the location where the water sample was taken is unknown. The analysis is however incorporated in this study as it provides some insights into the water chemistry of the project area. The analysis results are presented in Table 6-2. The results were screened against the Water Quality Standards and Guidelines of the Water Resource Management Act of 2013, (Act No. 11 of 2013, Government notice No. 268 of 2023). Elevated Iron, Zinc and Boron concentrations were reported. The groundwater is of excellent quality and suitable for human consumption and/or irrigation purposes.

Table 6-2 Summary of the water analysis

Chemical parameter	Units	Water quality guidelines and standards (Act No. 11 of 2013, Government Notice No. 268 of 2023)		Sample
		Ideal Guidelines	Acceptable Standards	I170398/1
pH		6.0 to 8.5	6.0 to 9.0	7
Electrical conductivity	mS/m	80	300	106
Turbilinity	NTU	0.5	2	0.1
Total Disolved Soids	mg/l	1000	2000	710
Total alkalinity $CaCO_3$	mg/l	No Value	No Value	510
Total hardness $CaCO_3$	mg/l	400	1000	539
Ca- Hardness as CaCO3	mg/l	No Value	No Value	255
Mg Hardness as CaCO3	mg/l	No Value	No Value	284
Chloride Cl^-	mg/l	100	300	21
Fluoride F^-	mg/l	0.7	1.5	0.6
Sulphite SO_4^{2-}	mg/l	100	300	31
Nitrate N	mg/l	6	11	7.3
Sodium Na	mg/l	100	300	21
Potassium K	mg/l	25	100	0.6
Magnesium Mg	mg/l	30	70	31
Calcium Ca	mg/l	80	150	7.3
Iron Fe	mg/l	0.2	0.3	21
Copper Cu	mg/l	0.5	2	0.6
Zinc Zn	mg/l	1	5	31
Boron B	mg/l	0.3	0.5	7.3
Selenium	mg/l	0.01	0.05	0.01

Note:
Ideal Guidelines
Acceptable Standards
Exceeding Acceptable guidelines
Exceeding Acceptable guidelines *100

Implications and Impacts

Groundwater is a valuable resource at the project area as the proponent utilises the groundwater for a variety of purposes. These include irrigation, stock watering and domestic use. The amount of water the proponent may use is controlled by a water abstraction licensing system as regulated by the Ministry of Agriculture, Water and Land Reform. Groundwater contamination may negatively impact surrounding boreholes and groundwater users in the wider area. Groundwater is widely utilised as the only source of potable water.

7 AQUIFER TESTING

The Proponent has drilled a new production borehole (WW207503) on Farm Eisenberg FMB/00509 during January 2025 (Figure 7-1). The purpose is to increase the irrigation capacity and increase the amount of land that can be irrigated simultaneously. Aquifer tests were conducted on borehole WW207503 during January 2025. The test report was compiled by Geo Pollution Technologies (PTY) LTD and is attached in Appendix A.

A step test consisting of five 1-hour steps, a 24-hour constant discharge test and a 24-hour recovery test were conducted and evaluated. The results of the evaluation indicated that WW207503 had a sustainable yield of 1,522 m^3/d with a maximum long-term pumping level of 49.2 m below surface. The rest water level before the pumping commenced was 43.21 m below surface. The transmissivity of the borehole

was computed to be approximately 793.15 m^2/d. WW207503 was deemed a successful borehole to be utilised for irrigation.

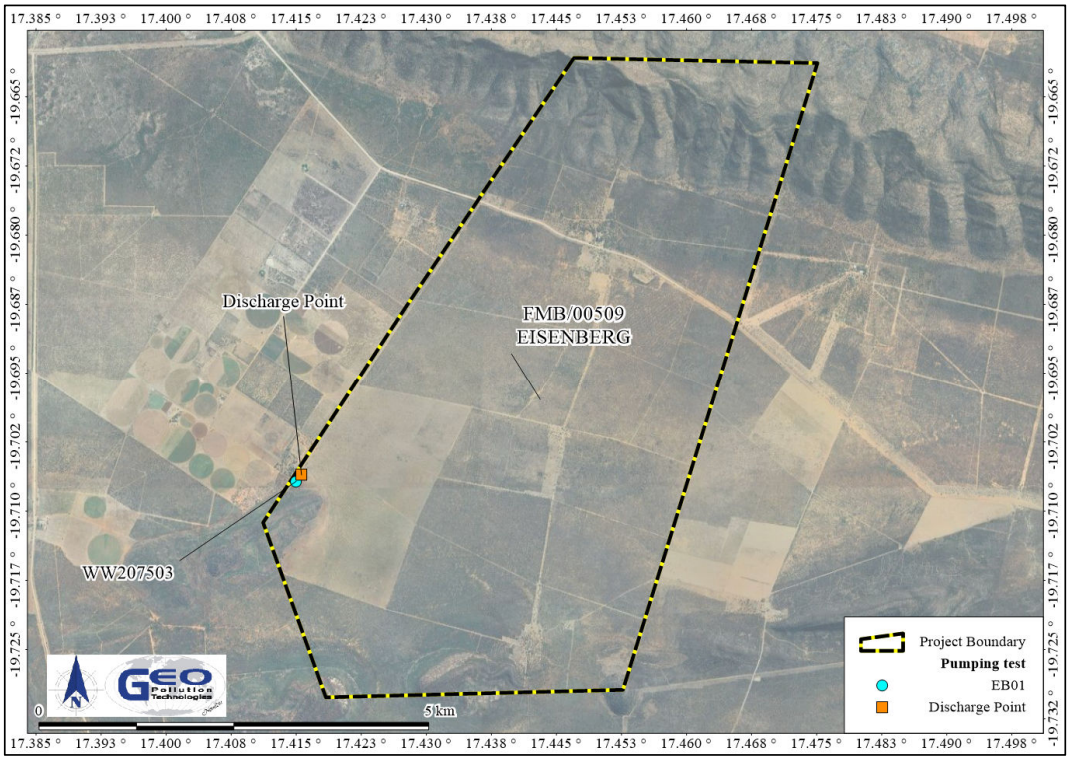


Figure 7-1 Locality map of the aquifer test

Implications and Impacts

This recommendation should be reviewed bi-annually and updated as more data becomes available. Data to be collected on a weekly basis during the first six months of operation includes: rest water levels (where possible), pumped water levels, monthly abstraction volumes and rainfall. Weekly rest water levels should also be monitored in any observation boreholes available and all data should be collected from other abstraction boreholes within a 500 m radius. After the initial six-month observation period, data can be collected on a monthly basis (or more frequently if so deemed by any other custodian of groundwater in Namibia or permit conditions).

8 SOIL ANALYSIS

Analysis of 25 soil samples were collected and analysed during August 2022. The samples were collected from multiple unknown locations. Although the locations of the soils samples are unknown, it still provides a general chemical signature of the area. For future referencing and comparison it is recommended that sample locations be included in any sampling project conducted in the future.

The soils have been analysed for several different parameters (Table 8-1). The pH ranges between 7.0 and 8.3, making the soils very slightly alkaline to medium alkaline as indicated by the red box (Figure 8-1). Figure 8-1 indicates the solubility of different nutrients present in the soil at different pH levels. Where green indicated optimal solubility levels and range from green to yellow to red at very high or low pH values.

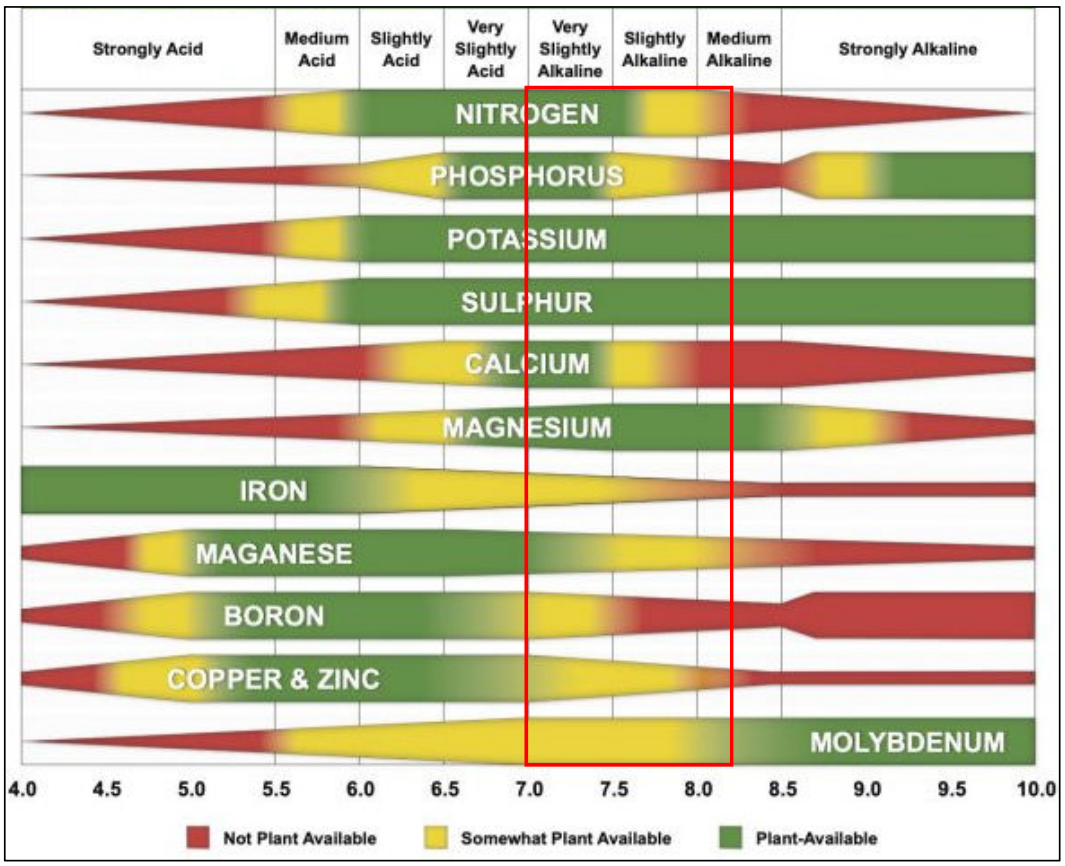


Figure 8-1 Soil pH effects on availability of elements (after University of California, 2019)

A summary of the soil sample results is provided in Table 8-1. All elements highlighted in blue have low concentrations of the element as required by plants. All elements highlighted in orange have high concentrations of the elements that can be harmful to plants. All the elements highlighted in white are in the most efficient range as required by plants.

The soil pH exceeds the recommended guideline for all of the samples taken, although according to Figure 8-1 the pH values are still in the range for effective nutrient absorption. The majority of the samples shows a higher than recommended concentration of Phosphorus, Potassium, Magnesium and Calcium. With 2 samples having a shortage in these macronutrients. The Calcium and Magnesium content of the soil samples are elevated above the recommended guidelines. The remaining soil parameters are all within acceptable concentration levels that promotes efficient growth and nutrient exchange. Overall, the soil quality of the irrigation fields are of an acceptable quality for crop production.

Implications and Impacts

The soil seems to be suitable for crop production. Careful monitoring on overuse of herbicides, pesticides and fertilizers should take place to protect the soil and groundwater against pollution.

Table 8-1 Summary of the soil analysis results

	Parameters	pH	Conductivity	Cation Exchange Capacity	Carbonate	Organic Carbon	Organic Matter	Phosphorus (Mehlich)	Phosphorus (Bray1)	Sodium Na	Potassium K	Magnesium Mg	Calcium Ca	Iron Fe	Manganese Mn	Copper Cu	Zinc Zn	Boron B		Dencity
	Unit		(mS/m)		(%$CaCO^3$)	(%m/mC)	(%m/m OM)	(mg P/kg)	(mg P/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		g/cm3
	Acceptable guideline	5.5 to 6.7						10 to 20	10 to 20		150 to 250	60 to 180	1000 to 2000							
Chemical Analysis	Sample N276401	8.0	37	19.35	1.8	0.9	1.6	146	76	114	285	698	2479	41.7	137	2.51	6.73	67.3	Particle size	1.106
	N276402	8.1	35	24.11	3	0.7	1.2	196	102	120	396	763	3263	45.2	120.8	2.77	8.15	55		1.129
	N276403	8.0	40	21.12	2.3	0.8	1.4	176	91	112	357	712	2777	58	113.5	2.73	7.76	62		1.074
	N276404	8.1		22.09				195	102	197	438	759	2778	51	123.2	2.35	7.22	96.8		1.153
	N276405	7.7		32.07				55	28	196	425	885	4574	41.6	36.4	2.16	3.08	55.7		1.098
	N276407	7.7		25.56				86	44	150	392	871	3354	46.7	128.2	2.89	5.84	72.9		1.037
	N276408	7.7		20.12				72	37	113	273	710	2623	46.6	100.1	2.13	4.96	60.1		1.136
	N276410	7.8		22.71				109	57	106	413	794	2938	47.1	110.3	2.87	5.97	60.9		1.093
	N276411	8.0		21.59				129	67	121	270	727	2883	46.4	153.8	3.18	11.58	42.1		1.14
	N276412	8.1		19.92				98	52	129	241	691	2615	43.2	138.6	2.41	7.86	47.2		1.107
	N276413	8.1		19.81				104	55	121	280	728	2521	40.6	150.5	2.73	8.99	46.2		1.067
	N276414	8.2		19.96				97	51	144	328	746	2476	42.5	136.2	3.05	7.55	51.6		1.096
	N276415	8.1		18.67				116	60	136	316	696	2312	47.2	138.8	2.69	8.52	78.4		1.13
	N276417	8.1		19.79				122	63	133	289	742	2478	46.6	180.2	2.75	10.62	79.1		1.042
	N276418	8.2		21.7				158	83	104	326	783	2800	46	181.9	2.98	12.64	40.1		1.045
	N276420	8.3		20.33				174	90	184	283	729	2568	49.3	168.2	2.63	12.29	66.7		1.097
	N276421	8.2		15.69				57	30	92	275	603	1928	38.2	141.3	1.58	6.75	36.8		1.257
	N276422	7.0		7.57				8	7	66	226	339	785	45.2	155	1.44	1.4	30.8		1.116
	N276423	7.4		8.8				11	9	92	309	340	965	39	149.1	2.15	2.22	30.1		1.166
	N276424	7.6		9.35				17	14	116	278	379	1007	39.3	153.6	2.24	2.29	39.6		1.134
	N276426	7.9		10.45				11	10	80	268	472	1111	35.4	108.7	1.54	1.14	17.7		1.112
	N276427	8.2		16.96				70	37	96	407	680	1986	40.1	110.9	2.06	4.24	37.9		1.148
	Pivot A	7.6		12.2				n/a	40	95	221	356	1734	n/a	n/a	n/a	n/a	n/a		n/a
	Pivot B	7.8		11.5				n/a	45	104	263	369	1548	n/a	n/a	n/a	n/a	n/a		n/a
	Pivot C&D	8.1		8.8				n/a	39	98	250	319	1098	n/a	n/a	n/a	n/a	n/a		n/a

Note:
High
Optimal
Low

9 ASSESSMENT OF IMPACTS

The purpose of this section is to assess and identify the most pertinent environmental impacts and provides possible mitigation measures that are expected from the project. The Rapid Impact Assessment Method (Pastakia, 1998) will be used during the assessment. Impacts are assessed according to the following categories: Importance of condition (A1); Magnitude of Change (A2); Permanence (B1); Reversibility (B2); and Cumulative Nature (B3) (see Table 9-1).

The Environmental Classification = A1 x A2 x (B1 + B2 + B3), see Table 9-2.

The probability ranking refers to the probability that a specific impact will happen following a risk event. These can be improbable (low likelihood); probable (distinct possibility); highly probable (most likely); and definite (impact will occur regardless of prevention measures).

Table 9-1 Assessment criteria

Criteria	Score
Importance of condition (A1) – assessed against the spatial boundaries of human interest it will affect	
Importance to national/international interest	4
Important to regional/national interest	3
Important to areas immediately outside the local condition	2
Important only to the local condition	1
No importance	0
Magnitude of change/effect (A2) – measure of scale in terms of benefit / detriment of an impact or condition	
Major positive benefit	3
Significant improvement in status quo	2
Improvement in status quo	1
No change in status quo	0
Negative change in status quo	-1
Significant negative detriment or change	-2
Major detriment or change	-3
Permanence (B1) – defines whether the condition is permanent or temporary	
No change/Not applicable	1
Temporary	2
Permanent	3
Reversibility (B2) – defines whether the condition can be changed and is a measure of the control over the condition	
No change/Not applicable	1
Reversible	2
Irreversible	3
Cumulative (B3) – reflects whether the effect will be a single direct impact or will include cumulative impacts over time, or synergistic effect with other conditions. It is a means of judging the sustainability of the condition – not to be confused with the permanence criterion.	
Light or No Cumulative Character/Not applicable	1
Moderate Cumulative Character	2
Strong Cumulative Character	3

Table 9-2 Environmental classification of impacts (Pastakia 1998).

Environmental Classification (ES)	Class Value	Description of Class
72 to 108	5	Extremely positive impact
36 to 71	4	Significantly positive impact
19 to 35	3	Moderately positive impact
10 to 18	2	Less positive impact
1 to 9	1	Reduced positive impact
0	-0	No alteration
-1 to -9	-1	Reduced negative impact
-10 to -18	-2	Less negative impact
-19 to -35	-3	Moderately negative impact
-36 to -71	-4	Significantly negative impact
-72 to -108	-5	Extremely Negative Impact

9.1 GROUNDWATER ABSTRACTION

Groundwater abstraction is a very sensitive topic in a dry country where the value of land is drastically reduced if no or poor-quality groundwater is present on the land. Abstraction of groundwater must be done in a sensible way not to impact on other groundwater users that depend on such groundwater. This includes water abstracted for human and animal use, irrigation, and also ecosystems that depend on groundwater. A typical groundwater balance was compiled to illustrate the potential consequences of over abstraction of groundwater, see Figure 9-1. Recharge to the area is considered to be high. It is considered that recharge can vary from 0 % to 4 % of

rainfall with an average of 2 % of the rainfall. In periods of drought there may be no recharge while in above average rainfall recharge could be above 4 % (Hoad, 1992).

In a typical groundwater environment, a water balance would consist of inflow and outflow of the groundwater system. Over time an equilibrium (or steady state) is normally reached with rising water tables following good recharge events and declining water tables when recharge is below average.

Inflow into the system would typically be from infiltration following rainfall in the area and in upstream areas. The inflow component will further be enhanced by the high secondary porosity nature of the karst aquifer.

Outflow would be comprised of water leaving the system through springs and as outflow over the lower boundary of the groundwater system as well as evapotranspiration losses. Groundwater abstraction from boreholes is important as this is normally necessary to sustain human and animal demands where such users became essentially dependant on the abstracted groundwater as a reliable and sustainable source.

Typical consequences of over abstraction will include a lowering in the water table. This may lead to the collapse of underground cave roofs where the hydrostatic pressure, that used to support the roof of a cave, decrease. The increased flow of water may enhance the dissolution of dolomitic rock, leading to an increase in karst structures. Lowering of water tables may further lead to the drying up of boreholes, springs, underground caves and the subsequent loss of organisms that lives in the subsurface and surface water. Vegetation will also be impacted where such vegetation has access to groundwater.

Based on current water level fluctuations in the area, a short term threshold of 5 m below the long term average water level is set from where abstraction rates should be reduced. Note that this level refers to rest water levels and not pump water levels.

All boreholes should be equipped with a dipper pipe to enable safe water level measurements.

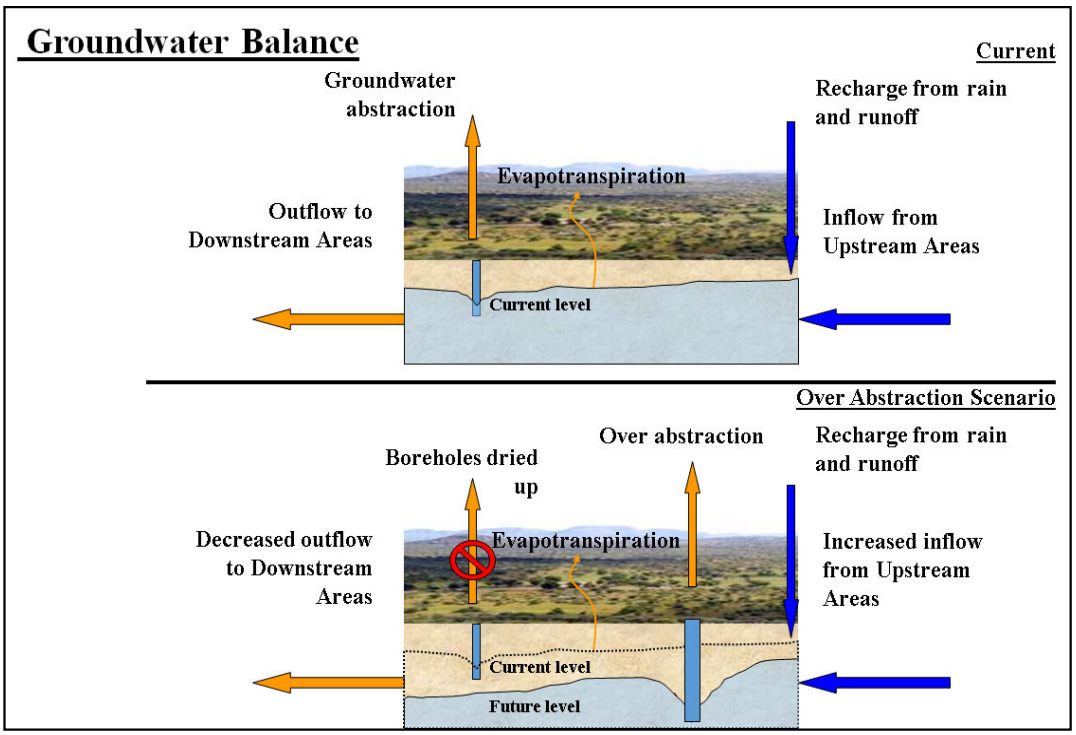


Figure 9-1 Conceptual groundwater balance with over abstraction scenario

Table 9-3 Assessment – Groundwater abstraction

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Daily Operations	Over-abstraction of the local aquifer, decrease in the local hydraulic head.	2	-2	2	2	2	-24	-3	Probable

Desired Outcome: To utilise the groundwater sustainably.

Actions

Prevention:

- Spread the water abstraction points over a larger area to diffuse the impact.
- Monthly water level monitoring.
- Maintain safe abstraction rates prescribed by test pump evaluations (an abstraction permit with prescribed rates from the MAWLR is a requirement for this project).

Mitigation:

- Reduce abstraction when the water levels nears 5 m below the average rest water level of each borehole.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Monthly boreholes rest water level monitoring.
- Baseline values should be reviewed every three years based on all historic water level data.
- A summary report on all monitoring results must be prepared.

The Proponent supply monitoring returns to the MAWLR, as required by the permit.

9.2 GROUNDWATER, SURFACE WATER AND SOIL CONTAMINATION

Leakages and spillages of hazardous substances from vehicles, waste oil handling and accidental fuel, oil or hydraulic fluid spills during the operational phase may contaminate the environment. Increase of nutrient levels (from over application of fertilizers or pesticides) in the soil that can leach to the groundwater. Pollution due to sewerage system overflow or leakage may further put the groundwater at risk.

Table 9-4 Assessment – Groundwater, surface water and soil contamination

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Daily Operations	Hazardous material, spillages, hydrocarbon leakages from vehicles and machinery.	2	-1	2	2	1	-10	-2	Improbable
Daily Operations	Over application of fertilizer, pesticides, herbicides, etc. Sewerage system malfunction.	2	-1	2	2	1	-10	-2	Improbable

Desired Outcome: To prevent the contamination of groundwater, surface water and soil.

Actions

Prevention:

- Appoint reputable contractors.
- Vehicles may only be serviced on a suitable spill control structure.
- Regular inspections and maintenance of all vehicles to ensure no leaks are present.
- All hazardous chemicals and fuel should be stored in a sufficiently bunded area, as per MSDS requirements.
- Ensure all waste oil handling is conducted on impermeable or bunded areas.
- Follow prescribed dosage of fertilizers and pesticides / herbicides and to avoid over application.
- Maintain sewerage systems and conduct regular monitoring.
- All hazardous waste must be removed from the site and disposed of timeously at a recognised hazardous waste disposal facility, including any polluted soil or water.

Mitigation:

- All spills must be cleaned up immediately.
- Consult relevant Material Safety Data Sheet (MSDS) information and a suitably qualified specialist where needed.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Maintain Material Safety Data Sheets for hazardous chemicals.
- Soil should be sampled and analysed annually to ensure the correct amounts of fertilizer is applied and soil and groundwater quality is maintained.
- Groundwater should be sampled and analysed to test for nitrate concentrations from the fertilizer and for traces of chemicals used in pesticides and herbicides.
- Registers be kept by the Proponent on the type, quantities and frequency of application of fertiliser, pesticides and any other chemicals utilised in crop production.
- A register of all incidents must be maintained on a daily basis. This should include measures taken to ensure that such incidents do not repeat themselves.
- All spills or leaks must be reported on and cleaned up immediately.

10 CONCLUSION

Groundwater at the project area is high yielding and of acceptable quality for human consumption. Most boreholes are utilisation for irrigation and stock watering purposes.

Based on current water level fluctuations in the area, as presented in Figure 5-8, a short-term threshold of 5 m below the long term average water level is set from where abstraction rates should be reduced. This threshold may require adjustment during drought periods as abstraction from neighbouring farms may also influence the regional water levels. Careful cooperation between neighbouring farms and beyond is required to optimally utilize the groundwater resource without depleting it as depletion will be detrimental to all. This should include self-monitoring and assessment of water levels in the area as data obtained from DWA indicates a lack of sufficient monitoring in the recent years. Proper monitoring data will provide the required information to make informed decisions and will assist to obtain increased abstraction volume permits when needed and if justified.

Groundwater vulnerability to contamination would be the highest around boreholes, around geological structures as well as where shallow groundwater is present. Contaminated surface runoff can create a pathway to the groundwater, putting the groundwater at risk. Potential sources of groundwater pollution include normal runoff from roofs, properties and surfaced areas, e.g. roads and then also herbicides, pesticides and fertilizers applied to agricultural land. These impacts are normally of a low magnitude and can be managed through proper housekeeping. Care must be taken that the application of herbicides,

pesticides and fertilizers is minimised where possible and a proper soil and groundwater sampling plan be implemented to monitor for potential pollutants.

Based on the current water level and abstraction volumes, continuous monitoring is recommended to determine if higher abstraction volumes may be considered.

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Appendix A - Aquifer Test Report

FARM EISENBERG FMB00509, OTJOZONDJUPA REGION

AQUIFER TESTS ANALYSIS

Assessed by:

Assessed for:

Ondundu Framing Enterprise CC

February 2025

Project:	**FARM EISENBERG FMB00509, OTJOZONDJUPA REGION – AQUIFER TEST ANALYSIS**	
Report Version/Date	V1 10 February 2025	
Prepared for:	Ondundu Farming Enterprises CC PO Box 432 Otavi Namibia	
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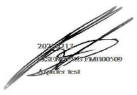
Report Approval	 Pierre Botha Managing Director	

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VSD	Variable Speed Drive

1 INTRODUCTION

Geo Pollution Technologies (Pty) Ltd was appointed by Ondundu Farming Enterprises CC (the Proponent) to undertake a hydrogeological evaluation of borehole WW207503 (EB01) on Farm Eisenberg FMB509 in the Otjozondjupa Region (Figure 1-1), hereafter referred to as the project area. The aquifer investigation included a calibration -, step -, constant discharge - and related recovery tests.

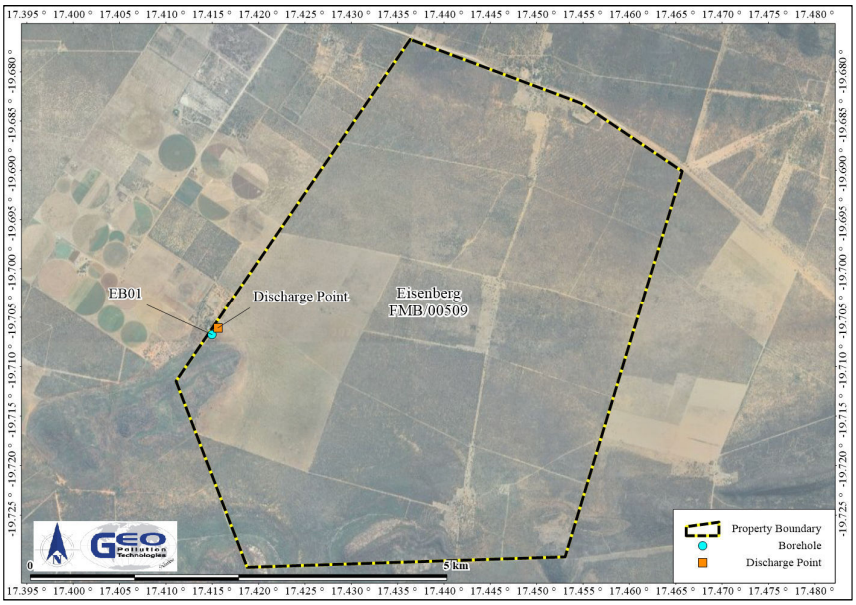


Figure 1-1 Locality map

2 CONCEPTUAL AQUIFER SETUP

No information was provided on borehole construction, i.e. casing, gravel pack and other related construction information that may play a role in test interpretation. It is therefore interpreted that the borehole has a short length of casing that terminates above the water level and that the borehole is consider to be an uncased borehole.

No information on water strike depths were provided and no geological logs were provided to help with test interpretation. It is known from geological maps that the area has a surface cover of Quaternary and Tertiary Age, comprising of Kalahari Group deposits which consists of sand, calcrete and gravel. It is unclear what underlie this but it is most likely dolostones, limestone, diamicitite, phyllites, quartzites, and / or shales of the Tsumeb, Abenab, and Usakos Subgroups of the Damara Sequence. The depth of the contact between the Kalahari Group sediments and the underlying hardrock is unknown.

For interpretation purposes it is conceptualise that the aquifer is a fracture aquifer that is most likely confined with the water potentially rising through the borehole into the unsaturated Kalahari sediments and / or into previously dry fractures closer to surface within the dolomite. This can thus give the impression of an unconfined aquifer, especially during early times of testing.

The depth of the borehole was given as 114 m deep and the rest water level was measured as 43.21 m below datum. It is assumed that no nearby boreholes influenced the test data. For the purpose of this evaluation all water levels will be reported as metres below surface as measured from the top of the casing or dipper tube.

3 TEST PUMPING RESULTS

3.1 BOREHOLE WW207503

Information regarding WW207503 (-19.706773°S; 17.414996°E) was captured during the field work. A borehole completion sheet was unavailable. Test pumping data is attached in Appendix A.

Borehole WW207503 was evaluated during the aquifer analysis tests conducted in January 2025. The water from the aquifer test was discharged at a point (19.706088°S; 17.415608°E) approximately 106 m to the northeast from EB01 (Figure 1-1). No other boreholes were observed during the different testing phases.

The step test consisted of five 1-hour steps with an increasing pump rate after each hour. The step test was followed by a recovery period of 16 hours. Consecutive abstraction rates of 30.80 m^3/h, 53.33 m^3/h, 80.75 m^3/h, 107.20 m^3/h and 121.6 m^3/h were used. A fifth step was conducted on request of the proponent. The abstraction rate was controlled by adjusting the frequency of the variable speed drive (VSD) of the pump.

Analysis of the step test data is depict in Figure 3-1. The gradient of the drawdown increases when the abstraction rate exceeds 53.33 m^3/h. An abstraction rate of 75 m^3/h was advised for the constant discharge test.

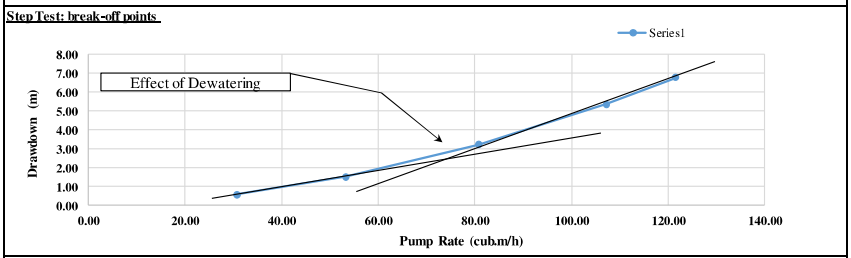
A linear well-loss coefficient (B) of 0.00701 h/m^2 was calculated while a non-linear well-loss coefficient (C) of 0.0004 h^2/m^5 was calculated. This indicated that severe deterioration or clogging of the borehole took place. This is confirmed by the relative low well efficiency computed (Figure 3-1).

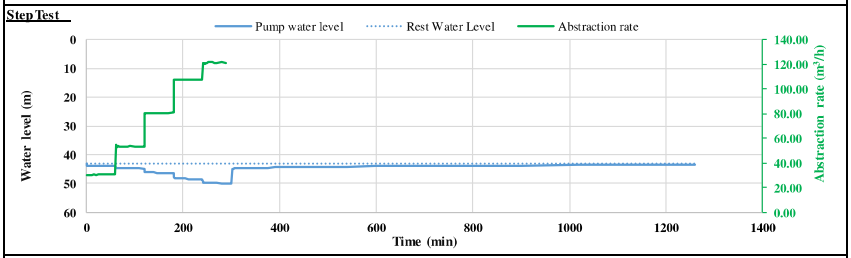
Step Test Analysis Borehole #: **WW207503**

Step Number	Duration (min)	Pump Rate Q (m^3/h)	Water Level s (m)	Drawdown Sw(n)	Sw(n)/Q(n)	Well Efficiency	
0			43.21				
1	60	30.80	43.80	0.59	0.02	36%	
2	60	53.33	44.75	1.54	0.03	25%	
3	60	80.75	46.42	3.21	0.04	18%	
4	60	107.20	48.58	5.37	0.05	14%	
5	60	121.60	49.98	6.77	0.06	12%	

Results

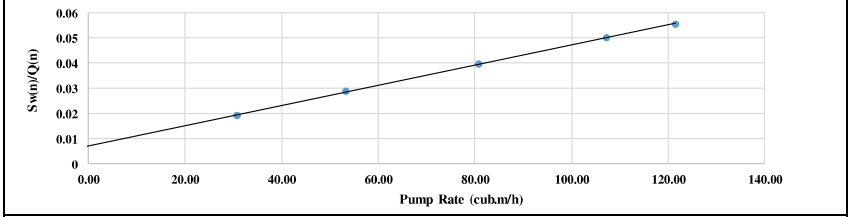
Linear well-loss coefficient (B) =	**0.00701**	h/m^2
Non-linear well-loss coefficient (C) =	**0.00040**	h^2/m^5
Prescribed main test pump rate (Q) =	***75.00***	m^3/h





Step Test Analysis Borehole #: **WW207503**

Step Test - Hantush-Bierschenk Method



Well Efficiency

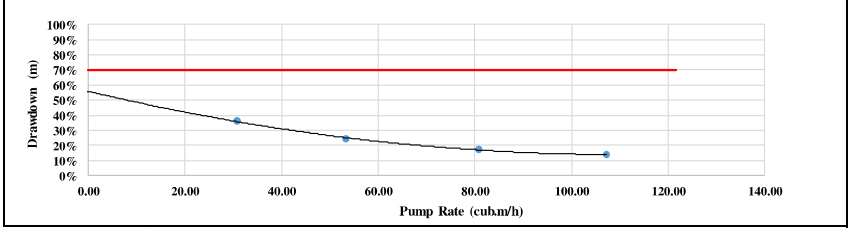


Figure 3-1 Step test analysis of WW207503

The step test was followed by a 24-hour constant discharge test and lastly a 24-hour recovery test. Fluctuation in the discharge rate during the test was insignificant and an average discharge rate of 75.45 m^3/h was achieved. The rest water level at the start of the constant discharge test was 43.21 metres below surface and the maximum water level at the end of the test was 49.20 metres below surface. The water level in the borehole recovered to 44.20 metres below surface within the 25-hour recovery period.

Analysis of the flow characteristics of the constant discharge test is presented in Figure 3-2. Considering the drawdown curve then it is evident that three distinct stages of dewatering are observed, typical of an unconfined aquifer. The first stage is characterised by the initial steep section of the drawdown data, which lasts for the first 2 minutes of pumping. Water is released essentially instantaneously from aquifer storage by the aquifer compaction and by water expansion. Almost all water supplied to the well comes from the aquifer storage in the saturated zone. Gravity water above the hydraulic head within the cone of depression still has not reached the saturated zone.

The second stage (between 2 minutes and 600 minutes) is characterised by a gradual flattening in the time-drawdown slope caused by gravity-drainage replenishment from the pore spaces above the cone of depression, which were saturated before pumping. It indicates that the gravity water is reaching the saturated zone, but is not yet in equilibrium with the saturated flow. The almost flat (straight-line) portion of the time-drawdown curve indicates that the rate of gravity drainage is equal to the rate of pumping from the aquifer.

The third or late stage after 600 minutes is characterised by a steepening of the drawdown curve. This represents equilibrium between the gravity drainage and the saturated flow when the delayed gravity response ceases. Such an equilibrium condition is achieved when the rate of gravity drainage match the rate of decline in the water table.

Characteristics of a double porosity system is evident in the first derivate (s') graph (Figure 3-2). The first derivative (s') indicates well storage losses during the first 2 minutes of the test, followed by changes in storativity and transmissivity contributed to a double porosity medium.

Figure 3-2 Derivative Graph of WW207503

A transmissivity of the aquifer was calculated/modelled using the Theis method (Figure 3-3). An average transmissivity of 793.15 m^2/d and storativity of 0.001 was determined for the aquifer system.

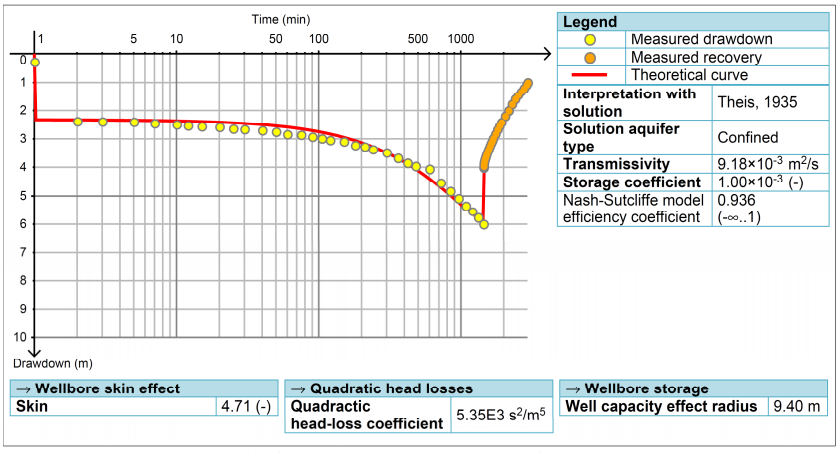


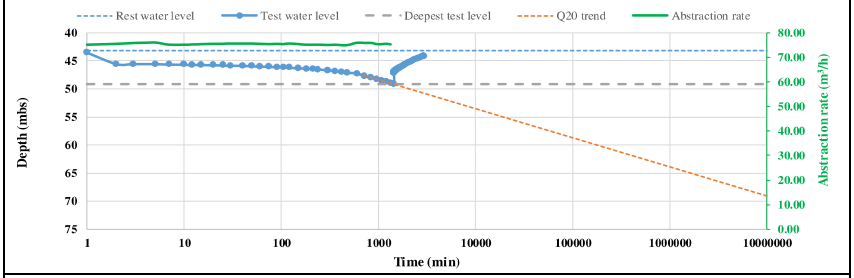
Figure 3-3 Theis analysis of the constant discharge test of WW207503

The recovery data of the pump borehole indicates that the borehole recovered to 84% of the initial rest water level within 26 hours.

Applying the Theis extrapolation method it is recommended that the borehole be abstracted at a rate not exceeding 1,522 m^3/d. The poor recovery during testing is a concern and the lack of geological data puts a constrain on the accuracy of the interpretation. It is further recommended that the water levels and abstraction volumes in all of the boreholes at the project area be monitored on a monthly basis. Long-term monitoring and evaluation of this borehole is advised to enable a better understanding of the sustainability of the formation and the influences of recharge from rainfall, recovery after abstraction and the simultaneous operation of other nearby boreholes as all of these will have an influence on the sustainability of the wellfield.

Region:	**Otjozondjupa**			Depth of borehole:	**114**
Place:	**OTAVI - EISENBERG**			Depth of pump inlet:	**85**
Borehole #:	**WW207503**			BH radius ID (m):	**0.125**
Lat:	**-19.706773°S**			Casing radius ID (m):	**0.125**
Long:	**17.414996°E**			Test pump operator:	**FRANS STROH**
Elevation (mamsl):				Average test yield (m^3/hr):	**75.45**
Date started:	**2025/Jan/10 09:00:00**			Rest water level (m):	**43.21**
Date stopped:	**2025/Jan/11 09:00:00**			Max test water level (m):	**49.20**
Dist to pump BH (m):	**100**			Main water strike (m):	
Transmissivity (m^2/d):		**793.15**	Late transmissivity - Theis		
Storativity:		**0.00100**	Assumed due to lack of observation hole data		
t/t" zero intercept at:		**1.28**	Total time from start of pumping / recovery time to full recovery.		
Maximum test water level (m):		**49.20**	Deepest drawdown achieved during test		
Max long term pump level (m):		**49.20**	Due to lack of data provided maximum test water level was used		
Safety Factor:		**70%**			
Safe yield based on recovery data					
Pump Q (m^3/d)	**396.13**	*66.02*	*m^3/h*	hourly pump rate for 6 hours per day	
Hours recovery/d	**18.75**				
Twenty year safe yield Q20					
Theis extrapolation Q (m^3/d)	**1,522.62**	*63.44*	*m^3/h*	Pump water level extrapolated to 49.2 m below surface	
Farfolden method Q (m^3/d)	**2,261.47**	*94.23*	*m^3/h*	Pump water level extrapolated to 49.2 m below surface	
van der Kamp and Maathuis method Q (m^3/d)	**1,267.60**	*52.82*	*m^3/h*	Pump water level extrapolated to 69 m below surface	

Constant discharge test



Recovery test

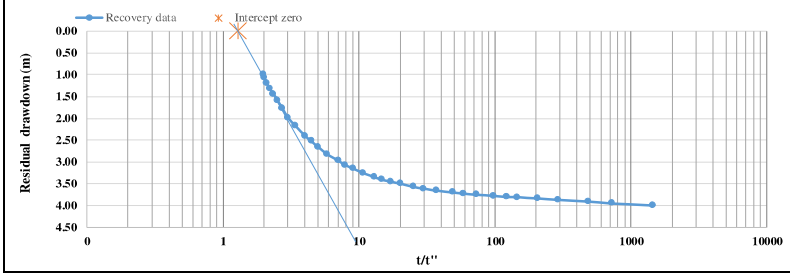


Figure 3-4 Constant discharge test of WW207503

4 CONCLUSION

Groundwater at the project area is high yielding, but caution should be exercised in any karst environment. Based on the evaluation of the 2025 pumping tests and the various characteristics of WW207503 as demonstrated during the testing, it seems most likely that this borehole is a product of a karst aquifer overlain by a primary aquifer, likely recharged through the borehole.

Due to the nature of the aquifer, it is advised that this borehole be installed and operated as recommended. This will serve the purpose of a long-term pumping test and will enable the calculation of a more sustainable yield and abstraction scenario for the future.

Table 4-1 Summary of recommended abstraction scenario

Place	Borehole #	Rest water level (m)	Recommended abstraction rate (m^3/d)
Otavi - Eisenberg	WW207503	43.21	1,522

This recommendation should be reviewed bi-annually and updated as more data becomes available. Data to be collected on a weekly basis during the first six months of operation includes: rest water levels (where possible), pumped water levels, monthly abstraction volumes and rainfall. Weekly rest water levels should also be monitored in any observation boreholes available and all data should be collected from other abstraction boreholes within a 500 m radius. After the initial six-month observation period, data can be collected on a monthly basis (or more frequently if so deemed by any other custodian of groundwater in Namibia or permit conditions).

Careful cooperation between neighbouring farms and beyond is required to optimally utilize the groundwater resource without depleting it as depletion will be detrimental to all. This should include self-monitoring and assessment of water levels in the area as data obtained from DWA indicates a lack of sufficient monitoring in the recent years. Proper monitoring data will provide the required information to make informed decisions and will assist to obtain increased abstraction volume permits when needed and if justified.

5 REFERENCE

Kruseman, G.P. and de Ridder, N.A. (1994) Analysis and Evaluation of Pumping Test Data. 2nd Edition, lLRI, Publication 47, 377 p.

APPENDIX A: Test pumping data

Information Sheet	
Region:	Otjozondjupa
Property Name & #:	ONDUNDU FARMING ENTERPRISES CC
Place:	OTAVI - EISENBERG
Borehole #:	WW207503
Latitude °S	-19.706773
Longitude °E	17.414996
Datum Point During Testing:	TOP OF CASING
Stickup (m):	0.2
Borehole Diameter ID (m):	0.25
Casing Diameter ID (m):	0.25
Depth of Borehole (m):	114
Estimated Yield after Drilling (m^3/h):	180
Rest Water Level (m):	43.21
Dipper tube for measurements used:	YES, 25MM WHITE PVC
Water level logger Make; Model; Serial Number:	VALOO 150M TYPE 010
Water Level Logger Installation Depth (m):	84
Test Pump Company:	AGRITURF
Test Pump Operator:	FRANS STROH
Hydrogeologist:	PIERRE BOTHA
Depth of Pump Inlet (m):	85
Diameter of Rising Main (m):	0.09
Make And Model Motor Kw of Pump: P1	VSP SS 08160-3 , CRI 45KW MOTOR
Method Used to Estimate Abstraction Rate:	FLOW METER
Method Used to Control Pump Rate:	VARIBLE DRIVE
Flowmeter Diameter (m):	150
Distance Between Upstream Fitting and Flowmeter (m):	1.8
Distance Between Downstream Fitting and Flowmeter (m):	1.8
Water Discharge Distance from Pump Borehole (m):	100
Discharge Point Latitude °S:	-19.706088
Discharge Point Longitude °E:	17.415608

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Step Test

Region:	Otjozondjupa	Depth of Borehole:	114
Place:	OTAVI - EISENBERG	Depth of Pump inlet:	85
Borehole #:	WW207503	Type of Pump:	VSP SS 08160-3 , CRI 45KW MOTOR
Lat:	-19.706773°S	Datum point (m)	TOP OF CASING
Long:	17.414996°E	Rest Water Level:	43.21
Date Started:	7-Jan-2025 11:00:00	Test Pump Operator:	FRANS STROH
Date Stopped:	8-Jan-2025 08:00:00	Hydrogeologist:	PIERRE BOTHA
Dist. To pump BH (m):	100	Pump Rate Step 1 (m^3/h):	30.80
Borehole Diameter ID (m):	0.25	Pump Rate Step 2 (m^3/h):	53.33
		Pump Rate Step 3 (m^3/h):	80.75
		Pump Rate Step 4 (m^3/h):	107.20
		Pump Rate Step 5 (m^3/h):	121.60

Step Test					Recovery		
Time (Date)	Time (hh:mm)	Wl (m)	Time (hh:mm)	Yield (m^3)	Time (Date)	Time (hh:mm)	Wl m
2025-Jan-07 11:00:00	11:00:00	43.27	11:00:00	0.00	2025-Jan-07 16:01:00	16:01:00	45.06
7-Jan-2025	11:01:00	43.67	11:01:00	30.00	7-Jan-2025	16:02:00	44.9
7-Jan-2025	11:02:00	43.69	11:02:00	29.92	7-Jan-2025	16:03:00	44.83
7-Jan-2025	11:03:00	43.7	11:03:00	30.11	7-Jan-2025	16:05:00	44.75
7-Jan-2025	11:05:00	43.7	11:05:00	30.32	7-Jan-2025	16:07:00	44.7
7-Jan-2025	11:07:00	43.71	11:07:00	29.95	7-Jan-2025	16:10:00	44.64
7-Jan-2025	11:10:00	43.72	11:10:00	30.22	7-Jan-2025	16:12:00	44.61
7-Jan-2025	11:12:00	43.72	11:12:00	29.92	7-Jan-2025	16:15:00	44.58
7-Jan-2025	11:15:00	43.74	11:15:00	30.66	7-Jan-2025	16:20:00	44.55
7-Jan-2025	11:20:00	43.75	11:20:00	30.19	7-Jan-2025	16:25:00	44.52
7-Jan-2025	11:25:00	43.77	11:25:00	30.82	7-Jan-2025	16:30:00	44.51
7-Jan-2025	11:30:00	43.78	11:30:00	30.79	7-Jan-2025	16:40:00	44.48
7-Jan-2025	11:40:00	43.8	11:40:00	30.82	7-Jan-2025	16:50:00	44.44
7-Jan-2025	11:50:00	43.83	11:50:00	30.97	7-Jan-2025	17:00:00	44.42
7-Jan-2025	**12:00:00**	**43.8**	**12:00:00**	**30.8**	7-Jan-2025	17:15:00	44.38
7-Jan-2025	12:01:00	44.51	12:01:00	54.76	7-Jan-2025	17:30:00	44.34
7-Jan-2025	12:02:00	44.51	12:02:00	52.13	7-Jan-2025	17:45:00	44.36
7-Jan-2025	12:03:00	44.52	12:03:00	53.1	7-Jan-2025	18:00:00	44.28
7-Jan-2025	12:05:00	44.54	12:05:00	53.67	7-Jan-2025	18:30:00	44.21
7-Jan-2025	12:07:00	44.54	12:07:00	53.1	7-Jan-2025	19:00:00	44.10
7-Jan-2025	12:10:00	44.56	12:10:00	53.35	7-Jan-2025	19:30:00	44.12
7-Jan-2025	12:12:00	44.58	12:12:00	53.12	7-Jan-2025	20:00:00	44.06
7-Jan-2025	12:13:00	44.59	12:13:00	53.14	7-Jan-2025	21:00:00	43.98
7-Jan-2025	12:20:00	44.63	12:20:00	53	7-Jan-2025	22:00:00	43.91
7-Jan-2025	12:25:00	44.64	12:25:00	53.35	7-Jan-2025	23:00:00	43.85
7-Jan-2025	12:30:00	44.66	12:30:00	53.72	8-Jan-2025	0:00:00	43.79
7-Jan-2025	12:40:00	44.69	12:40:00	53.43	8-Jan-2025	2:00:00	43.67
7-Jan-2025	12:50:00	44.72	12:50:00	53.04	8-Jan-2025	4:00:00	43.62
7-Jan-2025	**13:00:00**	**44.75**	**13:00:00**	**53.33**	8-Jan-2025	6:00:00	43.52
7-Jan-2025	13:01:00	46	13:01:00	80.17	8-Jan-2025	8:00:00	43.49
7-Jan-2025	13:02:00	46.01	13:02:00	80.19			
7-Jan-2025	13:03:00	46.02	13:03:00	80.4			
7-Jan-2025	13:05:00	46.07	13:05:00	80.45			
7-Jan-2025	13:07:00	46.09	13:07:00	80.42			
7-Jan-2025	13:10:00	46.12	13:10:00	80.48			
7-Jan-2025	13:12:00	46.14	13:12:00	80.41			
7-Jan-2025	13:15:00	46.16	13:15:00	80.49			
7-Jan-2025	13:20:00	46.17	13:20:00	80.52			
7-Jan-2025	13:25:00	46.22	13:25:00	80.49			
7-Jan-2025	13:30:00	46.27	13:30:00	80.54			
7-Jan-2025	13:40:00	46.32	13:40:00	80.2			
7-Jan-2025	13:50:00	46.38	13:50:00	80.5			
7-Jan-2025	**14:00:00**	**46.42**	**14:00:00**	**80.75**			
7-Jan-2025	14:01:00	48	14:01:00	107.7			
7-Jan-2025	14:02:00	48.07	14:02:00	107.7			
7-Jan-2025	14:03:00	48.1	14:03:00	107.3			
7-Jan-2025	14:05:00	48.14	14:05:00	107.3			
7-Jan-2025	14:07:00	48.17	14:07:00	107.2			
7-Jan-2025	14:10:00	48.2	14:10:00	107.4			
7-Jan-2025	14:12:00	48.23	14:12:00	107			
7-Jan-2025	14:15:00	48.27	14:15:00	107.3			
7-Jan-2025	14:20:00	48.31	14:20:00	107.4			
7-Jan-2025	14:25:00	48.35	14:25:00	107.2			
7-Jan-2025	14:30:00	48.4	14:30:00	107.6			
7-Jan-2025	14:40:00	48.45	14:40:00	107.5			
7-Jan-2025	14:50:00	48.51	14:50:00	107.2			
7-Jan-2025	**15:00:00**	**48.58**	**15:00:00**	**107.2**			
7-Jan-2025	15:01:00	49.43	15:01:00	120.8			
7-Jan-2025	15:02:00	49.49	15:02:00	120.2			
7-Jan-2025	15:03:00	49.53	15:03:00	120.7			
7-Jan-2025	15:05:00	49.58	15:05:00	120.2			
7-Jan-2025	15:07:00	49.61	15:07:00	121.1			
7-Jan-2025	15:10:00	49.63	15:10:00	121.2			
7-Jan-2025	15:12:00	49.66	15:12:00	121.4			
7-Jan-2025	15:15:00	49.69	15:15:00	121.6			
7-Jan-2025	15:20:00	49.72	15:20:00	121.7			
7-Jan-2025	15:25:00	49.74	15:25:00	121.1			
7-Jan-2025	15:30:00	49.79	15:30:00	121			
7-Jan-2025	15:40:00	49.89	15:40:00	121.6			
7-Jan-2025	15:50:00	49.94	15:50:00	121.2			
7-Jan-2025	**16:00:00**	**49.98**	**16:00:00**	**121.6**			

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Constant Rate Test - pump borehole

Region:	**Otjozondjupa**			Depth of Borehole:	**114**
Place:	**OTAVI - EISENBERG**			Depth of Pump inlet:	**85**
Borehole #:	**EISENBERG NO 1**			Type of Pump:	**VSP SS 08160-3 , CRI 45KW MOTOR**
Lat:	**-19.706773°S**			Stickup (m)	**0.2**
Long:	**17.414996°E**			Rest Water Level (m):	**43.21**
Date Started:	**10-Jan-2025 09:00:00**			Elevation (mamsl):	
Date Stopped:	**11-Jan-2025 09:00:00**			Test Pump Operator:	**FRANS STROH**
Dist to pump BH (m):	**-19.706088°S**	**17.415608°E**	**100 m**	Hydrogeologist:	**PIERRE BOTHA**
BH radius ID (m):	**0.125**			Average Yield (m^3/hr):	**75.00**
Casing Radius ID (m):	**0.125**			Datalogger Depth (m):	**84**

Date (YY/MM/DD)	Time (WL) (hh:mm:ss)	Waterlevel (m)	Time (FM) (hh:mm:ss)	Flowmeter 1	Yield (m^3/hr)	Remarks
2025-Jan-10 09:00:00	09:00:00	43.49	09:00:00	0	0.0	
10-Jan-2025	09:01:00	43.49	09:01:00	75.2	75.00	
10-Jan-2025	09:02:00	45.58	09:02:00	75.52	75.00	
10-Jan-2025	09:03:00	45.59	09:03:00	75.8	75.00	
10-Jan-2025	09:05:00	45.60	09:05:00	75.97	75.00	
10-Jan-2025	09:07:00	45.65	09:07:00	75.24	75.00	
10-Jan-2025	09:10:00	45.69	09:10:00	75.2	75.00	
10-Jan-2025	09:12:00	45.73	09:12:00	75.3	75.00	
10-Jan-2025	09:15:00	45.76	09:15:00	75.4	75.00	
10-Jan-2025	09:20:00	45.78	09:20:00	75.49	75.00	
10-Jan-2025	09:25:00	45.84	09:25:00	75.54	75.00	
10-Jan-2025	09:30:00	45.86	09:30:00	75.6	75.00	
10-Jan-2025	09:40:00	45.90	09:40:00	75.67	75.00	
10-Jan-2025	09:50:00	45.95	09:50:00	75.59	75.00	
10-Jan-2025	10:00:00	46.04	10:00:00	75.52	75.00	
10-Jan-2025	10:15:00	46.06	10:15:00	75.46	75.00	
10-Jan-2025	10:30:00	46.13	10:30:00	75.5	75.00	
10-Jan-2025	10:45:00	46.19	10:45:00	75.46	75.00	
10-Jan-2025	11:00:00	46.25	11:00:00	75.67	75.00	
10-Jan-2025	11:30:00	46.30	11:30:00	75.45	75.00	
10-Jan-2025	12:00:00	46.43	12:00:00	75.21	75.00	
10-Jan-2025	12:30:00	46.48	12:30:00	75.26	75.00	
10-Jan-2025	13:00:00	46.58	13:00:00	75.21	75.00	
10-Jan-2025	14:00:00	46.69	14:00:00	75.1	75.00	
10-Jan-2025	15:00:00	46.88	15:00:00	75.21	75.00	
10-Jan-2025	16:00:00	47.05	16:00:00	75.01	75.00	
10-Jan-2025	17:00:00	47.16	17:00:00	75.06	75.00	
10-Jan-2025	19:00:00	47.26	19:00:00	75.95	75.00	
10-Jan-2025	21:00:00	47.74	21:00:00	75.81	75.00	
10-Jan-2025	23:00:00	48.03	23:00:00	75.88	75.00	
11-Jan-2025	01:00:00	48.28	01:00:00	75.39	75.00	
11-Jan-2025	03:00:00	48.54	03:00:00	75.45	75.00	
11-Jan-2025	05:00:00	48.74	05:00:00	75.49	75.00	
11-Jan-2025	07:00:00	48.97	07:00:00	75.37	75.00	
11-Jan-2025	09:00:00	49.20	09:00:00	75.41	75.00	

Consulting Earth Scientists
Tel: (++264-61) 257411; Cell: (++264-81)1220082
PO Box 11073; Windhoek; Namibia
www.thenamib.com

Recovery Test - pump borehole

Region:	**Otjozondjupa**	Depth of Borehole:	**114**
Place:	**OTAVI - EISENBERG**	Depth of Pump inlet:	**85**
Borehole #:	**EISENBERG NO 1**	Type of Pump:	**VSP SS 08160-3 , CRI 45KW MOTOR**
Lat:	**-19.706773°S**	Stickup (m):	**0.2**
Long:	**17.414996°E**	Rest Water Level (m):	**43.21**
Date Started:	**11-Jan-2025 09:01:00**	Test Pump Operator:	**FRANS STROH**
Date Stopped:	**12-Jan-2025 10:00:00**	Hydrogeologist:	**PIERRE BOTHA**
Dist to pump BH (m):	**100**	Average Yield (m^3/hr):	**75.00**
Discharge point Lat	**-19.706088°S**	BH radius (m):	**0.25**
Discharge point Long	**17.415608°E**	Datalogger Depth (m):	**84**

Date (YY/MM/DD)	Time (WL) (hh:mm:ss)	Waterlevel (m)	Remarks
2025-Jan-11 09:01:00	09:01:00	47.21	
11-Jan-2025	09:02:00	47.16	
11-Jan-2025	09:03:00	47.12	
11-Jan-2025	09:05:00	47.08	
11-Jan-2025	09:07:00	47.05	
11-Jan-2025	09:10:00	47.02	
11-Jan-2025	09:12:00	47.01	
11-Jan-2025	09:15:00	46.99	
11-Jan-2025	09:20:00	46.96	
11-Jan-2025	09:25:00	46.94	
11-Jan-2025	09:30:00	46.91	
11-Jan-2025	09:40:00	46.87	
11-Jan-2025	09:50:00	46.82	
11-Jan-2025	10:00:00	46.78	
11-Jan-2025	10:15:00	46.71	
11-Jan-2025	10:30:00	46.66	
11-Jan-2025	10:45:00	46.62	
11-Jan-2025	11:00:00	46.56	
11-Jan-2025	11:30:00	46.46	
11-Jan-2025	12:00:00	46.36	
11-Jan-2025	12:30:00	46.28	
11-Jan-2025	13:00:00	46.18	
11-Jan-2025	14:00:00	46.03	
11-Jan-2025	15:00:00	45.87	
11-Jan-2025	16:00:00	45.73	
11-Jan-2025	17:00:00	45.61	
11-Jan-2025	19:00:00	45.39	
11-Jan-2025	21:00:00	45.20	
11-Jan-2025	23:00:00	44.98	
12-Jan-2025	01:00:00	44.80	
12-Jan-2025	03:00:00	44.65	
12-Jan-2025	05:00:00	44.53	
12-Jan-2025	07:00:00	44.41	
12-Jan-2025	09:00:00	44.28	
12-Jan-2025	10:00:00	44.20	

Appendix B: Tree Information

Trees recorded in quarter degree squares 1917CB (Curtis & Mannheimer, 2005)

Name	Common_Name	Notes
Acacia ataxacantha	Flame-thorn	None
Acacia erioloba	Camel-thorn	Protected by forestry legislation
Acacia fleckii	Sand-veld Acacia	None
Acacia hebeclada subsp hebeclada	Candle-pod Acacia	None
Acacia hereroensis	Mountain-thorn	None
Acacia karroo	Sweet-thorn	None
Acacia luederitzii var luederitzii	Kalahari Acacia	None
Acacia mellifera subsp detinens	Blue-thorn Acacia	Aggressive invasive
Acacia nilotica subsp kraussiana	Scented-pod Acacia	None
Acacia reficiens subsp reficiens	Red-thorn	Very aggressive invader
Acacia tortilis	Umbrella Thorn	None
Adansonia digitata	Baobab	Generally protected by local communities for its medicinal uses and place in folklore. It is indirectly threatened by fires and elephants, in areas where elephant occur. The apparent lack of young plants to replace the old ones may be a concern, but young trees may have been overlooked. Protected by forestry legislation.
Albizia anthelmintica	Worm-cure Albizia; Aru	The low numbers of young trees recorded are a concern, as is the number of dead trees in some areas. It is Protected by forestry legislation.
Aloe littoralis	Windhoek Aloe	Potentially threatened by pachycaul trade. Protected by the Nature Conservation Ordinance and listed in CITES Appendix II.
Bauhinia petersiana subsp macrantha	White Bauhinia	None
Berchemia discolor	Bird Plum	Protected by forestry legislation, as well as by traditional Owambo cultures for its fruit and shade. The population does not appear to be in any real danger at the moment, but communities could be encouraged to plant this species.
Boscia albitrunca	Shepherd's Tree	Although widespread and hardy, it is heavily utilised by people and animals. The difficulty that young plants have in becoming established is a concern, but fortunately there appears to be a healthy and widespread

		population of young plants. Protected by forestry legislation.
Boscia foetida subsp foetida	Smelly Shepherd's-bush	None
Burkea africana	Burkea	Excessive fire may be compromising recruitment by destroying seeds. Overharvesting for timber may also be of concern in future. Protected by forestry legislation.
Carissa edulis	Simple-spined Carissa; Climbing Num-num	None
Catophractes alexandri	Trumpet-thorn; Rattlepod	Invasive in some areas
Colophospermum mopane	Mopane	Protected by forestry legislation. Rate of harvesting and overgrazing may exceed regeneration.
Combretum apiculatum subsp apiculatum	Kudu-bush	None
Combretum apiculatum subsp leutweinii	None	None
Combretum hereroense subsp hereroense	Mouse-eared Combretum	None
Combretum imberbe	Leadwood	Although heavily utilized by people, regrowth is good and growth of young trees is vigorous. Because of its religious importance and many uses, it is protected locally. Old specimens warrant protection as monuments. Protected by forestry legislation.
Commiphora angolensis	Sand Corkwood	None
Commiphora glandulosa	Tall Common Corkwood; Tall firethorn Corkwood	None
Commiphora glaucescens	Blue-leaved Corkwood	None
Commiphora mollis	Velvet Corkwood	None
Commiphora pyracanthoides	Fire Thorn Corkwood; Small Common Corkwood	None
Commiphora tenuipetiolata	Satin-bark Corkwood	None
Croton gratissimus	Lavender Croton; Lavender fever berry	None

Croton menyhartii	Rough-leaved Croton	None
Cyphostemma juttae	Blue Kobas, Namibian grape, Wild grape	Endemic with very small population and threatened with pachycaul trade. Least concern according to IUCN criteria. Protected by Nature Conservation Ordinance. Protected by forestry legislation.
Dichrostachys cinerea subsp africana	Kalahari Christmas Tree; Sickle-bush	Of concern because of its effects on other species (invasive)
Dombeya rotundifolia	Wild Pear	Two varieties rotundifolia and velutina. Velutina is endemic and classified as least concern.
Ehretia namibiensis s namibensis	Namibian Puzzle-bush	None
Elaeodendron transvaalense	Transvaal Saffron; Bushveld Saffron	None
Euclea undulata var myrtina	Common Guarri; Mountain Ebony	None
Euphorbia guerichiana	Paper-bark Euphorbia	CITES Appendix II
Ficus cordata subsp cordata	Namaqua Rock-fig	Protected by forestry legislation
Ficus sycomorus	Sycamore Fig	Affected in areas with excessive underground water abstraction causing springs to dry up. Lack of young trees. Local communities protect the trees for their fruit and shade. Protected by forestry legislation.
Ficus thonningii	Common wild Fig; Stranglerfig	None
Flueggea virosa subsp virosa	White-berry Bush	None
Gomphocarpus fruticosus	Milkweed; Wild Cotton	None
Grewia bicolor var bicolor	Two-coloured Raisin-bush	None
Grewia flava	Velvet Raisin	None
Grewia flavescens	Sandpaper Raisin	None
Grewia retinervis	Kalahari Raisin	None
Grewia villosa var villosa	Mallow Raisin	None
Gymnosporia buxifolia	Common Spikethorn	None

Gymnosporia senegalensis	Confetti Spikethorn	None
Gyrocarpus americanus	Propeller Tree	None
Kirkia acuminata	Common Kirkia	None
Lannea discolor	Live-long	Protected by forestry legislation
Maerua schinzii	Ringwood Tree	Increasingly impacted by humans and giraffes. Protected by forestry legislation.
Montinia caryophyllacea	Wild Clove-bush	None
Mundulea sericea	Silverbush	None
Obetia carruthersiana	Angola Nettle	None
Ochna pulchra	Peeling-bark Ochna	None
Olea europaea subsp cuspidata	Wild Olive	None
Ozoroa insignis	Africa Resin-tree	None
Ozoroa paniculosa	Common Resin-bush	None
Pachypodium lealii	Bottle Tree	Vulnerable to pachycaul trade. Lack of young trees is a concern. Protected by nature conservation ordinance. Listed on CITES Appendix II. Near-endemic extending into extreme southern areas of Angola. Protected by forestry legislation.
Peltophorum africanum	Muparara	None
Phaeoptilum spinosum	Brittle-thorn	None
Philenoptera nelsii subsp nelsii	Kalahari Omupanda; Kalahari Apple-leaf	None
Prosopis spp	Mesquite	None
Rhigozum brevispinosum	Simple-leaved Rhigozum	None
Searsia ciliata	Sour Karee	None
Searsia lancea	Willow Rhus	May be affected by a disease. Protected by forestry legislation. Previously Rhus lancea.
Searsia marlothii	Bitter Karee	None

Searsia tenuinervis var tenuinervis	Kalahari Currant	None
Schinziophyton rautanenii	Manketti; Mongongo nut; False balsa	Increased use for carving might be a concern. Great food value. Greatly damaged by veld fires. Protected by forestry legislation.
Sclerocarya birrea	Marula	Protected locally by communities that use them. Protected by forestry legislation.
Securidaca longepedunculata	Violet-tree	None
Spirostachys africana	Tamboti	Protected by forestry legislation
Steganotaenia araliacea var araliacea	Carrot-tree	None
Tarchonanthus camphoratus	Camphor Bush	None
Terminalia prunioides	Purple-pod Terminalia	None
Terminalia sericea	Silver Cluster-leave	None
Tinnea rhodesiana	Maroon Bells	May be overlooked.
Triaspis hypericoides subsp nelsonii	None	None
Ximenia americana var microphylla	Blue Sourplum	None
Ximenia caffra var caffra	Large Sourplum	None
Ziziphus mucronata	Buffalo-thorn	Protected by forestry legislation

Appendix C: Proof of Public Consultation

Notified IAPs

Name	Organisation
Agatha Mweti	Otjozondjupa Regional Council
Memory Garonga	Otjozondjupa Regional Council
Jolanda Murangi	Namwater
George Garab	Otavi Constituency Office
Eandro Lottering	Brokenhill FMB/00794/000016 and Brokenhill FMB/00794/000018
Hannes Kruger	Eisenberg FMB/00509
Wolfgang Falk	Ondjondo FMB/00505
Hartmut Freyer	Elephantenberg FMB/00793/00001
Danie Potgieter	Otavi Pforte FMB/00798/00006
Paul Potgieter	Hemmingen FMB/00524/00001 & Hemmingen FMB/00524/00002
Vico Blume	Hemmingen FMB/00524/00003 & Hemmingen FMB/00524/00004
Neels De Jager	Hermannstal Suid FMB/00523
Jaco De Jager	Nordland FMB/00510
Charlie Reiff	Neuwerk FMB/00507
Rene de Schmidt	Brokenhill FMB/00794/00018
Eandro Lottering	Brokenhill FMB/00794/00016 & Brokenhill FMB/00794/00017
Peter Gottert	Brokenhill FMB/00794/00022 & Brokenhill FMB/00794/00023 & Brokenhill FMB/00794/00026
Shorshi Kries	Brokenhill FMB/00794/00024

Notification Letter

(Received by Otjozondjupa Regional Council)

GEO Pollution Technologies

TEL.: (+264-61) 257411 ♦ FAX.: (+264) 88626368
CELL.: (+264-81) 1220082
PO BOX 11073 ♦ WINDHOEK ♦ NAMIBIA
E-MAIL: gpt@thenamib.com

To: **Chief Regional Officer** 17 June 2024
Otjozondjupa Regional Council
Otjiwarongo
Namibia

Re: **Environmental Scoping Assessment and Environmental Management Plan for Irrigation-Based Agricultural Activities and the Environmental Release of Genetically Modified Maize on Portions 19 and 20 (Portions of Portion 5) (Broken Hill) of the Farm Otavi Fontein No 794, Otjozondjupa Region**

Dear Sir/Madam

Geo Pollution Technologies (Pty) Ltd was appointed by Ondundu Farming Enterprises to undertake an environmental assessment for irrigation-based agricultural activities and the environmental release of genetically modified (GM) maize on Portions 19 and 20 (Portions of Portion 5) (Broken Hill) of the Farm Otavi Fontein No 794, Otjozondjupa Region (see location map on page 2). The assessment will be conducted according to the Environmental Management Act of 2007 and its regulations as published in 2012.

Project: Environmental Scoping Assessment and Environmental Management Plan for Irrigation-Based Agricultural Activities and the Environmental Release of Genetically Modified Maize on Portions 19 and 20 (Portions of Portion 5) (Broken Hill) of the Farm Otavi Fontein No 794, Otjozondjupa Region

Proponent: Ondundu Farming Enterprises CC

Environmental Assessment Practitioner: Geo Pollution Technologies (Pty) Ltd

The Proponent has a combined area of 70 ha under irrigation on both farms. Irrigation is from registered boreholes. The main crops cultivated are maize, wheat, and vegetables such as potatoes and carrots. In order to improve productivity of maize cultivation, the Proponent wishes to replace the traditional maize cultivars, as employed in Namibia, with insect and/or roundup resistant GM strains.

The environmental scoping assessment will include all activities pertaining to the transport, storage and planting of GM maize seeds, the management of the crops during the growing period, the application of pesticides to the crops, harvesting of the crops, and the handling and transport of the harvested maize to the markets. Groundwater is abstracted from production boreholes for irrigation purposes via centre pivot irrigation systems. Fuel for farm vehicles is stored in aboveground diesel tanks. General operations also include activities such as electricity supply, waste handling and sewage disposal.

The Regional Council is invited to register with the environmental consultant to receive further documentation and communication regarding the project. By registering, a communication channel will be established between the Regional Council and the environmental practitioner. The Regional Council will further be provided with .an opportunity to provide input that will be considered in the drafting of the environmental assessment report and management plan. Please register either by:

Fax: 088-62-6368 or **E-Mail:** ondundu@thenamib.com

Should you require any additional information please contact Geo Pollution Technologies at telephone 061-257411.

Sincerely,
Quzette Bosman

Social and Environmental Assessment Practitioner

(Received by Otavi Constituancy)

TEL.: (+264-61) 257411 ♦ FAX.: (+264) 88626368
CELL.: (+264-81) 1220082
PO BOX 11073 ♦ WINDHOEK ♦ NAMIBIA
E-MAIL: gpt@thenamib.com

To: **Otavi Constituency Office**
Otavi
Namibia

17 June 2024

Re: **Environmental Scoping Assessment and Environmental Management Plan for Agricultural Activities and the Environmental Release of Genetically Modified Maize on Portion 10 and 20 (Portions of Portion 5)(Broken Hill) of the Farm Otavi Fontein No 794, Otjozondjupa Region**

Dear Sir/Madam

Geo Pollution Technologies (Pty) Ltd was appointed by Ondundu Farming to undertake an environmental assessment for agricultural activities and the environmental release of genetically modified (GM) maize maize on Portions 19 and 20 (Portions of Portion 5) (Broken Hill) of the Farm Otavi Fontein No 794, Otjozondjupa Region (see location map on page 2). The assessment will be conducted according to the Environmental Management Act of 2007 and its regulations as published in 2012.

Project: Environmental Scoping Assessment and Environmental Management Plan for Environmental Scoping Assessment and Environmental Management Plan for Irrigation-Based Agricultural Activities and the Environmental Release of Genetically Modified Maize on Portions 19 and 20 (Portions of Portion 5) (Broken Hill) of the Farm Otavi Fontein No 794, Otjozondjupa Region

Proponent: Ondundu Farming

Environmental Assessment Practitioner: Geo Pollution Technologies (Pty) Ltd

The Proponent has a combined area of 70 ha under irrigation irrigated from boreholes with centre pivot systems. The main crops cultivated are maize, potatoes, onions, carrots, wheat, sorghum and cover crops. In order to improve productivity, the Proponent wishes to replace the traditional maize cultivars, as employed in Namibia, with insect and/or roundup resistant GM strains.

The environmental scoping assessment will include all activities pertaining to the transport, storage and planting of GM maize seeds, the management of the crops during the growing period, the application of pesticides to the crops, harvesting of the crops, and the handling and transport of the harvested maize to the markets. Groundwater is abstracted from production boreholes for irrigation purposes via centre pivot irrigation systems. Fuel for farm vehicles is stored in aboveground diesel tanks. General operations also include activities such as electricity supply, waste handling and sewage disposal.

The Constituency Office is invited to register with the environmental consultant to receive further documentation and communication regarding the project. By registering, a communication channel will be established between the Constituency Office and the environmental practitioner. The Constituency Office will further be provided with .an opportunity to provide input that will be considered in the drafting of the environmental assessment report and management plan. Please register either by:

Fax: 088-62-6368 or **E-Mail:** ondundu@thenamib.com

Should you require any additional information please contact Geo Pollution Technologies at telephone 061-257411.

Sincerely,
Quzette Bosman
Social and Environmental Assessment Practitioner

Received
@ Omburende
Otavi Constituency

(Received by Otavi Town Council)

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E-MAIL: gpt@thenamib.com

To: **Interested and / or Affected Party** **20 June 2024**

Re: **Environmental Scoping Assessment and Environmental Management Plan for Irrigation-Based Agricultural Activities and the Environmental Release of Genetically Modified Maize on Portions 19 and 20 (Portions of Portion 5) (Broken Hill) of the Farm Otavi Fontein No 794, Otjozondjupa Region**

Dear Sir/Madam

Geo Pollution Technologies (Pty) Ltd was appointed by Ondundu Farming Enterprises to undertake an environmental assessment for irrigation-based agricultural activities and the environmental release of genetically modified (GM) maize on Portions 19 and 20 (Portions of Portion 5) (Broken Hill) of the Farm Otavi Fontein No 794, Otjozondjupa Region (see location map on page 2). The assessment will be conducted according to the Environmental Management Act of 2007 and its regulations as published in 2012.

Project: Environmental Scoping Assessment and Environmental Management Plan for Irrigation-Based Agricultural Activities and the Environmental Release of Genetically Modified Maize on Portions 19 and 20 (Portions of Portion 5) (Broken Hill) of the Farm Otavi Fontein No 794, Otjozondjupa Region

Proponent: Ondundu Farming Enterprises CC

Environmental Assessment Practitioner: Geo Pollution Technologies (Pty) Ltd

The Proponent has a combined area of 70 ha under irrigation on both farms. Irrigation is from registered boreholes. The main crops cultivated are maize, wheat, and vegetables such as potatoes and carrots. In order to improve productivity of maize cultivation, the Proponent wishes to replace the traditional maize cultivars, as employed in Namibia, with insect and/or roundup resistant GM strains.

The environmental scoping assessment will include all activities pertaining to the transport, storage and planting of GM maize seeds, the management of the crops during the growing period, the application of pesticides to the crops, harvesting of the crops, and the handling and transport of the harvested maize to the markets. Groundwater is abstracted from production boreholes for irrigation purposes via centre pivot irrigation systems. Fuel for farm vehicles is stored in aboveground diesel tanks. General operations also include activities such as electricity supply, waste handling and sewage disposal.

Interested and affected parties or neighbours are invited to register with the environmental consultant, to receive further documentation and communication regarding the project, or to provide comments related to the project, for inclusion in the assessment. Please register or submit comments at:

Fax: 088-62-6368 or **E-Mail:** ondundu@thenamib.com

Should you require any additional information please contact Geo Pollution Technologies at telephone 061-257411.

Sincerely,
Geo Pollution Technologies

Quzette Bosman
Social and Environmental Assessment Practitioner

Received Otavi Town Council

Background Information Document

ENVIRONMENTAL SCOPING ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PLAN FOR IRRIGATION BASED AGRICULTURE ACTIVITIES ON PORTION 19 AND 20 OF FARM OTAVI FONTEIN, OTJOZONDJUPA REGION

BACKGROUND INFORMATION DOCUMENT

Prepared by:

Prepared for:

Ondundu Farming Enterprises CC

April 2024

1 INTRODUCTION

Geo Pollution Technologies (Pty) Ltd (GPT) was appointed by Ondundu Farming Enterprises CC (the Proponent) to undertake an environmental assessment for irrigation and related activities on Portion 19 and Portion 20 of the farm Otavi Fontein FMB/00794 in the Otjozondjupa Region (Figure 1-1). Currently the Proponent irrigates a combined area of approximately 70 ha (35 ha on portion 20 and 35 ha on portion 19) from three production boreholes. The combined permitted abstraction volume is 550,000 m³ per annum. Crop cultivation focus on maize, potatoes, onions, carrots, wheat, sorghum and cover crops which are mainly irrigated by means of centre pivot irrigation systems.

An environmental clearance certificate (ECC) for the operations is required as per the Environmental Management Act No. 7 of 2007 (EMA). A scoping environmental assessment report (SR) and an environmental management plan (EMP) are proposed to be submitted to the Ministry of Environment, Forestry and Tourism's Department of Environmental Affairs (DEA) in support of an application for an ECC. The environmental assessment will include all operational activities associated with the agricultural activities of the Proponent.

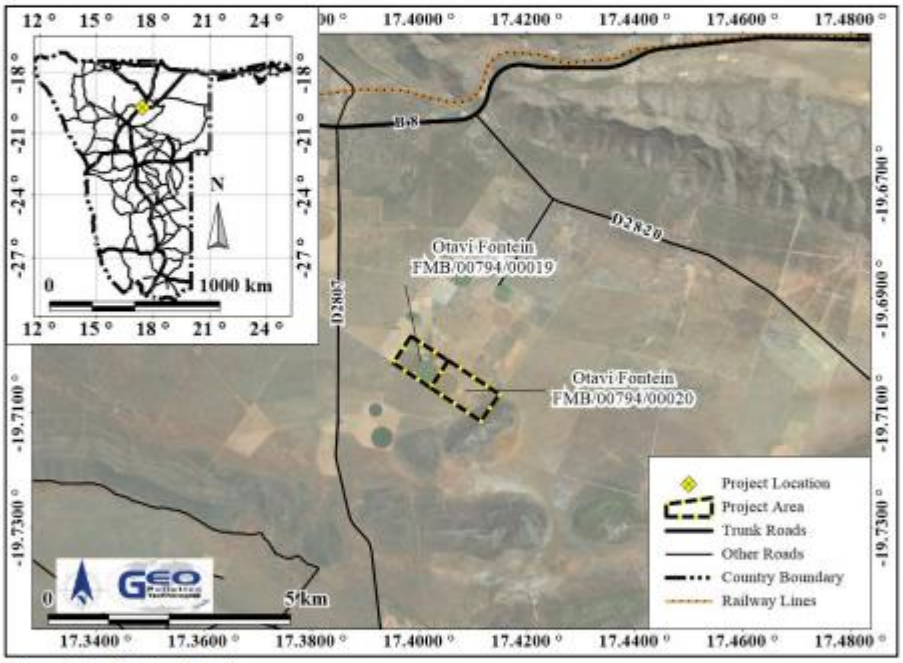


Figure 1-1 Project location

2 PURPOSE OF THE BID

With this background information document (BID), GPT aims to provide interested and affected parties (IAPs) with information about the project and interact with them regarding it. All IAPs are therefore invited to register with GPT for the project in order to:

- Provide GPT with additional information which should be taken into account in the assessment of impacts;
- Share any comments, issues or concerns related to the project; and
- Review and comment on the reports (SR and EMP).

3 PROJECT DESCRIPTION

Activities associated with the project have been divided into the following phases: planning, maintenance/construction, operational and the decommissioning phase. A brief outline of expected activities for each phase is detailed below.

3.1 PLANNING PHASE

While planning for operations, construction / maintenance activities and decommissioning of the farm, it is the responsibility of the Proponent to ensure they are and remain compliant with all legal requirements. The Proponent must also ensure that all required management measures are in place prior to and during all phases, to ensure potential impacts and risks are minimised. Typical planning activities include:

- Obtain permits and approvals from local and national authorities including Ministry of Agriculture, Water and Land Reform.
- Make provisions to have a health, safety and environmental coordinator to implement the EMP.
- Ensure provisions for a fund to cater for environmental incidents (e.g. pollution) and ecological restoration are made.
- Ensure all appointed contractors and employees enter into agreements which include the EMP.
- Establish and/or maintain a reporting system to report on aspects of construction activities, operations and decommissioning as outlined in the EMP.

3.2 CONSTRUCTION AND MAINTENANCE PHASE

Some construction activities will form part of the continuous development of the farm. Maintenance and upgrades continues on a daily basis and may also include some construction activities. Maintenance include minor repairs to infrastructure, general upkeep of buildings, servicing of vehicles, etc.

3.3 OPERATIONAL PHASE

The main operational activities pertains to land preparation, planting, water abstraction and irrigation, pest control and harvesting. High value crops are produced in the form of maize, potatoes, onions, carrots, wheat, sorghum and cover crops. Current areas being irrigated, by means of centre pivot systems, amount to approximately 70 ha. Water for irrigation is abstracted from three production boreholes located on the farms. A limited amount of livestock are also raised on the farms. Operations also include activities typical of farming, inclusive of management of support services such as electricity supply, waste handling, fuel storage and domestic effluent disposal.

3.4 DECOMMISSIONING PHASE

Decommissioning is not foreseen during the validity of the ECC. Decommissioning will however be assessed. Should decommissioning occur at any stage, rehabilitation of the area may be required. Decommissioning will entail the complete removal of all infrastructure including buildings and underground infrastructure. Pollution present on the site, if any, must then be remediated.

3.5 PRELIMINARY IDENTIFIED IMPACTS

During the environmental assessment all components of the environment will be considered, however only those components which are being impacted on significantly, or are deemed to be sensitive, will be assessed. These include the following:

- Health and safety risks
- Soil and groundwater pollution
- Over abstraction of groundwater
- Fire risks
- Waste and effluent generation and disposal
- Traffic
- Noise
- Visual impact

- Ecosystem and biodiversity impacts
- Socio-economic contributions

4 PUBLIC CONSULTATION

GPT invites all IAPs to provide in writing, any issues and suggestions regarding the development. This correspondence must include:

- Name and surname,
- Organization represented or private interest,
- Position in the organization,
- Contact details, and
- Any direct business, financial, personal or other interest which you may have in the approval or refusal of the application.

All contributions become public knowledge and will be circulated along with the reports as per the EMA requirements. The comments, inputs and suggestions will also be submitted to the DEA along with how any issues have been addressed in the SR. The public participation process will remain ongoing during the environmental assessment. The project team may be contacted on the contact details below

Geo Pollution Technologies (Pty) Ltd.
Telephone: (+264-61) 257411
Fax: (+264) 88626368
E-mail: ondundo@thenamib.com

Your Rights as an IAP according to the Environmental Management Act, No7 of 2007, Government Notice No 30 (Environmental Impact Assessment Regulations)

Section 23. (1) A registered interested or affected party is entitled to comment in writing, on all written submissions made to the Environmental Commissioner by the applicant responsible for the application, and to bring to the attention of the Environmental Commissioner any issues which that party, believes may be of significance to the consideration of the application, as long as -

(a) comments are submitted within 7 days of notification of an application or receiving access to a scoping report or an assessment report;
(b) the interested and affected party discloses any direct business, financial, personal or other interest which that party may have in the approval or refusal of the application.

(2) Before the applicant submits a report compiled in terms of these regulations to the Environmental Commissioner, the applicant must give registered interested and affected parties access to, and an opportunity to comment in writing on the report.

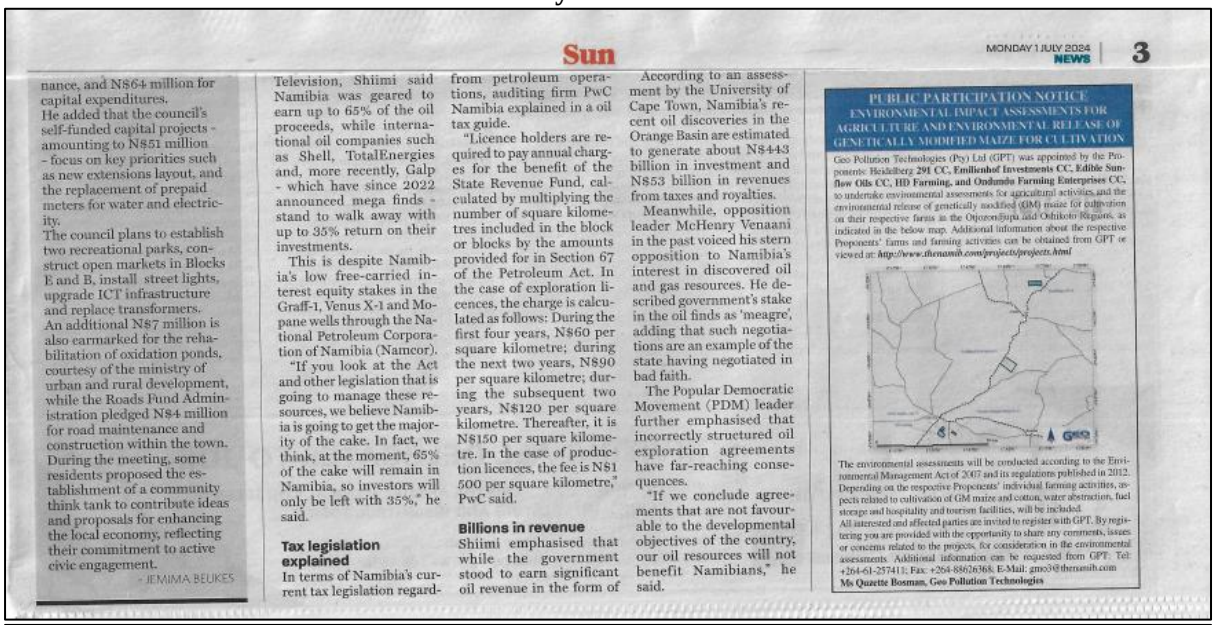
(3) Reports referred to in sub regulation (2) include (a) scoping reports; (b) scoping reports amended and resubmitted; (c) assessment reports; and (d) assessment reports amended and resubmitted.

(4) Any written comments received by the applicant from a registered interested or affected party must accompany the report when the report is submitted to the Environmental Commissioner.

(5) A registered interested or affected party may comment on any final report that is submitted by a specialist reviewer for the purposes of these regulations where the report contains substantive information which has not previously been made available to a registered interested or affected party.

Section 24: The applicant responsible for an application must ensure that the comments of interested and affected parties are recorded in reports submitted to the Environmental Commissioner in terms of these regulations, and comments by interested and affected parties on a report which is to be submitted to the Environmental Commissioner may be attached to the report without recording those comments in the report itself.

Press Notice: The Namibian Sun 1 and 8 July 2024



Sun

MONDAY 1 JULY 2024 | NEWS | 3

nance, and N$64 million for capital expenditures.
He added that the council's self-funded capital projects - amounting to N$51 million - focus on key priorities such as new extensions layout, and the replacement of prepaid meters for water and electricity.
The council plans to establish two recreational parks, construct open markets in Blocks E and B, install street lights, upgrade ICT infrastructure and replace transformers.
An additional N$7 million is also earmarked for the rehabilitation of oxidation ponds, courtesy of the ministry of urban and rural development, while the Roads Fund Administration pledged N$4 million for road maintenance and construction within the town.
During the meeting, some residents proposed the establishment of a community think tank to contribute ideas and proposals for enhancing the local economy, reflecting their commitment to active civic engagement.

- JEMIMA BEUKES

Television, Shiimi said Namibia was geared to earn up to 65% of the oil proceeds, while international oil companies such as Shell, TotalEnergies and, more recently, Galp - which have since 2022 announced mega finds - stand to walk away with up to 35% return on their investments.

This is despite Namibia's low free-carried interest equity stakes in the Graff-1, Venus X-1 and Mopane wells through the National Petroleum Corporation of Namibia (Namcor).

"If you look at the Act and other legislation that is going to manage these resources, we believe Namibia is going to get the majority of the cake. In fact, we think, at the moment, 65% of the cake will remain in Namibia, so investors will only be left with 35%," he said.

Tax legislation explained

In terms of Namibia's current tax legislation regarding from petroleum operations, auditing firm PwC Namibia explained in a oil tax guide.

"Licence holders are required to pay annual charges for the benefit of the State Revenue Fund, calculated by multiplying the number of square kilometres included in the block or blocks by the amounts provided for in Section 67 of the Petroleum Act. In the case of exploration licences, the charge is calculated as follows: During the first four years, N$60 per square kilometre; during the next two years, N$90 per square kilometre; during the subsequent two years, N$120 per square kilometre. Thereafter, it is N$150 per square kilometre. In the case of production licences, the fee is N$1 500 per square kilometre," PwC said.

Billions in revenue

Shiimi emphasised that while the government stood to earn significant oil revenue in the form of

According to an assessment by the University of Cape Town, Namibia's recent oil discoveries in the Orange Basin are estimated to generate about N$443 billion in investment and N$53 billion in revenues from taxes and royalties.

Meanwhile, opposition leader McHenry Venaani in the past voiced his stern opposition to Namibia's interest in discovered oil and gas resources. He described government's stake in the oil finds as 'meagre', adding that such negotiations are an example of the state having negotiated in bad faith.

The Popular Democratic Movement (PDM) leader further emphasised that incorrectly structured oil exploration agreements have far-reaching consequences.

"If we conclude agreements that are not favourable to the developmental objectives of the country, our oil resources will not benefit Namibians," he said.

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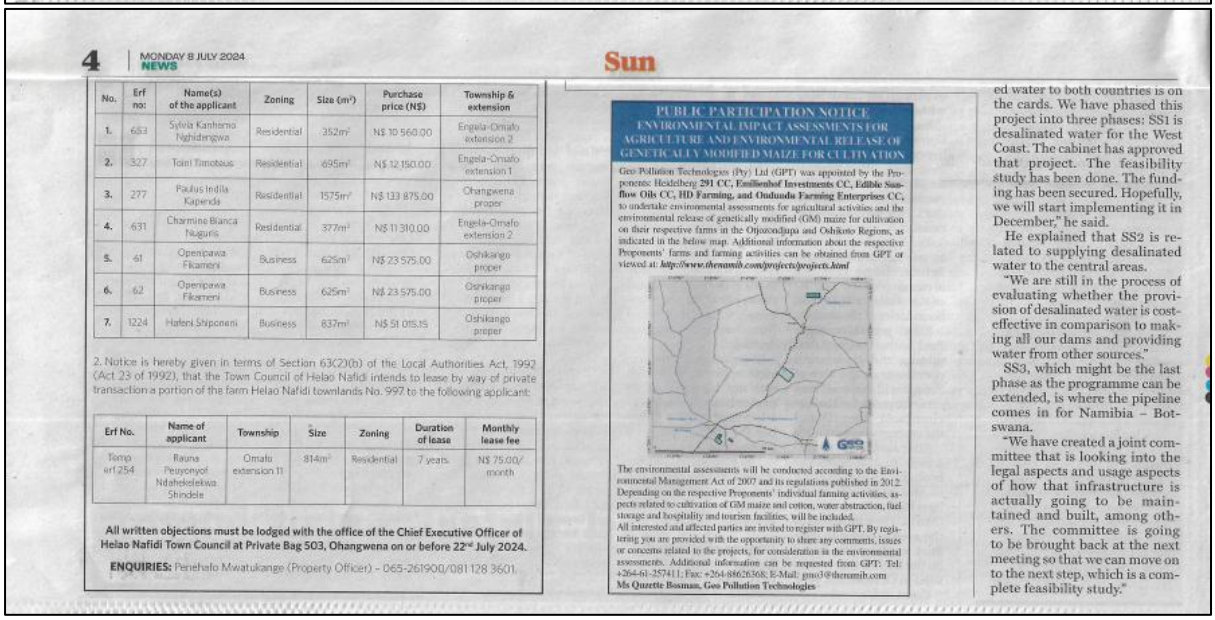
The environmental assessments will be conducted according to the Environmental Management Act of 2007 and its regulations published in 2012. Depending on the respective Proponents' individual farming activities, aspects related to cultivation of GM maize and cotton, water abstraction, fuel storage and hospitality and tourism facilities, will be included.
All interested and affected parties are invited to register with GPT. By registering you are provided with the opportunity to share any comments, issues or concerns related to the projects, for consideration in the environmental assessments. Additional information can be requested from GPT: Tel: +264-61-257411; Fax: +264-88626368; E-Mail: gmo3@thenamib.com
Ms Quzette Bosman, Geo Pollution Technologies



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Sun

No.	Erf no:	Name(s) of the applicant	Zoning	Size (m²)	Purchase price (N$)	Township & extension
1.	653	Sylvia Kanhemo Nghidengwa	Residential	352m²	N$ 10 560.00	Engela-Omafo extension 2
2.	327	Toini Timotaus	Residential	695m²	N$ 12 150.00	Engela-Omafo extension 1
3.	277	Paulus Indila Kapenda	Residential	1575m²	N$ 133 875.00	Ohangwena proper
4.	631	Charmine Bianca Nuguris	Residential	377m²	N$ 11 310.00	Engela-Omafo extension 2
5.	61	Operipawa Fikameni	Business	625m²	N$ 23 575.00	Oshikango proper
6.	62	Operipawa Fikameni	Business	625m²	N$ 23 575.00	Oshikango proper
7.	1224	Hafeni Shiponeni	Business	837m²	N$ 31 015.15	Oshikango proper

2. Notice is hereby given in terms of Section 63(2)(b) of the Local Authorities Act, 1992 (Act 23 of 1992), that the Town Council of Helao Nafidi intends to lease by way of private transaction a portion of the farm Helao Nafidi townlands No. 997 to the following applicant:

Erf No.	Name of applicant	Township	Size	Zoning	Duration of lease	Monthly lease fee
Temp erf 1254	Rauna Peuyonyol Ndahekelekwa Shindele	Omafo extension 11	814m²	Residential	7 years	N$ 75.00/ month

All written objections must be lodged with the office of the Chief Executive Officer of Helao Nafidi Town Council at Private Bag 503, Ohangwena on or before 22nd July 2024.

ENQUIRIES: Penehafo Mwatukange (Property Officer) - 065-261900/081 128 3601.

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Ms Quzette Bosman, Geo Pollution Technologies

ed water to both countries is on the cards. We have phased this project into three phases: SS1 is desalinated water for the West Coast. The cabinet has approved that project. The feasibility study has been done. The funding has been secured. Hopefully, we will start implementing it in December," he said.

He explained that SS2 is related to supplying desalinated water to the central areas.

"We are still in the process of evaluating whether the provision of desalinated water is cost-effective in comparison to making all our dams and providing water from other sources."

SS3, which might be the last phase as the programme can be extended, is where the pipeline comes in for Namibia – Botswana.

"We have created a joint committee that is looking into the legal aspects and usage aspects of how that infrastructure is actually going to be maintained and built, among others. The committee is going to be brought back at the next meeting so that we can move on to the next step, which is a complete feasibility study."

Press Notice: Die Republikein 1 and 8 July 2024

2 NUUS Republikein Maandag 1 Julie 2024

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Ms Quzette Bosman, Geo Pollution Technologies

Namibië sal glo meerderheid van olie-inkomste geniet

VAN BL. 1

BELASTINGWETGEWING VERDUIDELIK

Ingevolge Namibië se huidige belastingwetgewing met betrekking tot petroleumbronne, word tantième bereken as 5% van die bruto inkomste.

Tantième is gewoonlik kwartaalliks betaalbaar en word bereken deur die markwaarde van die ruolie te gebruik.

Daarbenewens word petroleuminkomstebelasting gehef teen 35% van belasbare inkomste en 'n bykomende winsbelasting wat gehef word op die netto kontantvloei uit petroleumbedrywighede ná belasting, het die ouditeursfirma PWC Namibia in 'n olie- en belastinggids verduidelik.

"Daar word van lisensiehouers verwag om jaarlikse heffings ten bate van die fonds vir staatsinkomste te betaal.

"Dit word bereken deur die aantal vierkante kilometer wat in die blok of blokke ingesluit is, te vermenigvuldig met die bedrae waarvoor in Artikel 67 van die Petroleumwet voorsiening gemaak word.

"In die geval van eksplorasielisensies word die heffing soos volg bereken: gedurende die eerste vier jaar, N$60 per vierkante kilometer; gedurende die volgende twee jaar, N$90 per vierkante kilometer; gedurende die daaropvolgende twee jaar, N$120 per vierkante kilometer; daarna, N$150 per vierkante kilometer. In die geval van die produksielisensies is die heffing N$1500 per vierkante kilometer," het PWC gesê.

'NAMIBIËRS DEEL OOK IN OPBRENGS'

Shiimi het beklemtoon hoewel die regering aansienlike olie-inkomste in die vorm van belasting en tantième sal verdien, kan gewone Namibiërs ook direk in die opbrengs deel.

"Dit hang ook af van hoe ons die vaardighede gaan opbou, want om as Namibiërs deel te kan neem moet ons meer Namibiërs op die olieplatforms sien. Die inkomste gaan dus ook direk na individuele Namibiërs," het hy gesê.

Die internasionale energiekonsultantfirma, Wood Mackenzie, raam dat Namibië se onlangse olie-ontdekkings in die Oranjekom ongeveer US$3,5 miljard se beleggings verteenwoordig, sowat N$527,8 miljard teen die heersende wisselkoers, en US$3,5 miljard (N$63,7 miljard) se inkomste uit belasting en tantième jaarliks vir die regering sal genereer.

Wood Mackenzie het vroeër vanjaar egter gemaan dat die ontginning van olie en gas in die Oranjekom waarskynlik met uitdagings gepaard sal gaan omdat die bronne so diep is.

Nie een van die internasionale olierеuse wat betrokke is by aflandige eksplorasie aan die kus van Namibië het reeds besluit dat hul ontdekkings kommersieel ontginbaar is nie.

PDM LEWER KRITIEK

Die leier van die Popular Democratic Movement (PDM), McHenry Venaani, het in die verlede sy streng teenkanting teen Namibië se belangstelling in ontdekte olie- en gasbronne uitgespreek.

"Dit is as sodanig 'n groot kommer dat 'n eksplorasieblok wat in die buiteland van Namibië gelеë is, in blok 2913B waarin TotalEnergies se Venus-1X-boorgat 'n 40%-werkbelang, saam met QatarEnergy (30%), Impact Oil and Gas (20%) geniet, die regering met 'n skamele 10%-belang laat," het Venaani betreur.

Hy meen sulke onderhandelinge is 'n voorbeeld van die regering "wat in swak geloof onderhandel het".

Venaani het verder beklemtoon dat verkeerd gestruktureerde olie-eksplorasie-ooreenkomste verreikende gevolge het, en bygevoeg dat sulke onetiese praktyke selfs groter geword het in die mate dat dit dreig om ontwikkeling en groei binne die land en die vasteland te belemmer.

"Korrupsie heers in Namibië en as ons ooreenkomste sluit wat nie gunstig is vir die ontwikkelingsdoelwitte van die land nie, sal ons oliebronne nie Namibiërs bevoordeel nie," het Venaani gesê.

– republikein@republikein.com.na

Maandag 8 Julie 2024 Republikein NUUS 3

Dveral koud vir die pasiënte van die Katutura-staatshospitaal wat tans tydelik in 'n veldhospitaal gehuisves word wat voorheen vir Covid-

vloer vuil is en vuil linne in 'n bondel op die vloer lê. Mediese afval word glo ook enkele meters van die veldhospitaal se ingang gehou.

taal nie.

"Pasiënte in die veldhospitaal is stabiel. Ek is tans in Swakopmund en moet die superintendent betrek. Alles

was dalk nie 'n oorsaaklike verband nie. Ons moes iewers mense huisves, want die hospitaal word opgeknap. As jy in my skoene was, wat

binnekom. Daarbenewens het pasiënte by die Katutura-staatshospitaal aangevoer dat sommige toiletgeriewe onbruikbaar is weens 'n watertekort.

Die staatshospitaal ondergaan tans uitgebreide opknappings- en herstelwerk op verskeie verdiepings, wat beteken pasiënte moet tydelik uit die betrokke sale verskuif word. Die gesondheidsminister, dr. Kalumbi Shangula, het in die Nasionale Vergadering verseker dat slegs stabiele pasiënte tydelik na die veldhospitaal oorgeplaas is wat tydens die Covid-19-pandemie naby die staatshospitaal opgerig is.

ANDER GERIEWE STAAN LEEG

Langs die tydelike veldhospitaal waarin staatspasiënte nou gehuisves word, is 'n moderne Covid-19-hospitaal wat leeg staan. Die hekke is gesluit en twee sekuriteitswagte is aan diens. Volgens

Die Covid-19-hospitaal is nou gereserveer vir isolasiegevalle van aansteeklike siektes. FOTO HENDELINA NGHITWA

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Ms Quzette Bosman, Geo Pollution Technologies

IAP Comments

Comment: from Deborah L. Walliser. Received: 3 July 2025 via Email	**Response**
Prelim reports mentions additional water extraction permits for new pivots and fields will be applied for. In doing so, the importance of utilizing water sustainably as indicated on page 70 should be highlighted as significant to surrounding farms.	Recognition of the comment. MAFWLR authorises water abstraction and needs to conduct a reserve determination of the entire aquifer which services all groundwater users in the area. Licensees are also required to record monthly water use and submit such figures to MAFWLR, record of such compliance is kept.
In regards to section 9 as far as pesticide use, herbicide use, we will have an open pond that collects rainwater from the greenhouse rooftops in an open pond. We will use this for our vegetable irrigation needs. This pond will be near the adjoining applicant property and we want to make sure precautions are taken to prevent pesticide and herbicide runoff from the applicant property.	A discussion regarding a possible diversion berm was held and it was agreed that operations by the commenter will be best protected by a berm erected themselves since protection will also be required from surround and other farming operations, from which also generate runoff. Runoff from the site is generally towards the west with topographical features (mountains and hills) influencing run-off on the southern and northern portions.

Site Notice

Appendix D: Consultants' Curriculum Vitae

ENVIRONMENTAL ASSESSMENT PRACTITIONER **Quzette Bosman**

Quzette Bosman has 18 years' experience in the Impact Assessment Industry, working as an Environmental Assessment Practitioner and Social Assessment practitioner mainly as per the National Environmental Legislation sets for South Africa and Namibia. Larger projects have been completed in terms of World Bank and IFC requirements. She studied Environmental Management at the Rand Afrikaans University (RAU) and University of Johannesburg (UJ), including various Energy Technology Courses. This has fuelled a passion towards the Energy and Mining Industry with various projects being undertaken for these industries. Courses in Sociology has further enabled her to specialize in Social Impact Assessments and Public Participation. Social Assessments are conducted according to international best practise and guidelines. Work has been conducted in South Africa, Swaziland and Namibia.

CURRICULUM VITAE QUZETTE BOSMAN

Name of Firm	:	Geo Pollution Technologies (Pty) Ltd.
Name of Staff	:	QUZETTE BOSMAN
Profession	:	Social Impact Assessor / Environmental Assessment Practitioner
Years' Experience	:	18
Nationality	:	South African
Position	:	Senior Environmental Consultant
Specialisation	:	ESIA & ESMP; SIA
Languages	:	Afrikaans – speaking, reading, writing – excellent English – speaking, reading, writing – excellent German –speaking, reading - fair
First Aid Class A		EMTSS, 2017
First Aid LSM		OSH-Med International 2022
Basic Fire Fighting		EMTSS, 2017
Basic Industrial Fire Fighting		OSH-Med International 2022

EDUCATION AND PROFESSIONAL STATUS:

BA	Geography & Sociology	:	Rand Afrikaans University, 2003
BA	(Hons.) Environmental Management	:	University of Johannesburg, 2004

PROFESSIONAL SOCIETY AFFILIATION:

Namibian Environment and Wildlife Society
International Association of Impact Assessors South Africa (IAIA SA)
Member 2007 - 2012
Mpumalanga Branch Treasurer 2008/2009

OTHER AFFILIATIONS
Mkhondo Catchment Management Forum (DWAF): Chairperson 2008-2010
Mkhondo Water Management Task Team (DWAF): Member 2009

AREAS OF EXPERTISE:

Knowledge and expertise in:

- environmental impact assessments
- project management
- social impact assessment and social management planning
- community liaison and social monitoring
- public participation / consultation, social risk management
- water use licensing
- environmental auditing and compliance
- environmental monitoring
- strategic environmental planning

EMPLOYMENT:

2015 - Present	:	Geo Pollution Technologies – Senior Environmental Practitioner
2014-2015	:	Enviro Dynamics – Senior Environmental Manager
2010 - 2012	:	GCS – Environmental Manager (Mpumalanga Office Manager)
2007 - 2009	:	KSE-uKhozi - Technical Manager: Environmental
2006 -2007	:	SEF – Environmental Manager
2004 - 2005	:	Ecosat – Environmental Manager

PUBLICATIONS:

Contract reports	: +220
Publications	: 1

ENVIRONMENTAL ASSESSMENT PRACTITIONER Johann Strauss

Johann Strauss holds an B.A degree in Geography with Psychology and Environmental Management from the Northwest University (NWU) South Africa. He is currently in the process of pursuing his honours degree in environmental management from the University of South Africa (UNISA). He entered the environmental assessment profession at the end of 2022 and since then has worked on various Environmental Impact Assessments including assessments of the petroleum industry, irrigation schemes, tourism and transport industry.

CURRICULUM VITAE JOHANN STRAUSS

Name of Firm	:	Geo Pollution Technologies (Pty) Ltd.
Name of Staff	:	Johann Strauss
Profession	:	Environmental Assessment Practitioner
Years' Experience	:	2
Nationality	:	Namibian
Position	:	Environmental Consultant
Specialisation	:	Environmental Impact Assessments
Languages	:	Afrikaans – speaking, reading, writing – excellent
		English – speaking, reading, writing – excellent

EDUCATION AND PROFESSIONAL STATUS:

B.A Geography with Psychology and Environmental Management : North West University, 2021

AREAS OF EXPERTISE:

Knowledge and expertise in:

- Environmental impact assessments
- Environmental management plans
- Environmental monitoring
- Environmental auditing and compliance
- Manifold (GIS)

EMPLOYMENT:

2022-Date : Geo Pollution Technologies – Environmental Consultant

PUBLICATIONS:

Contract reports : 20