

**APP-001938**  
**IRRIGATION ACTIVITIES ON THE FARMS OKASONDANA**  
**NO. 264, EVARE NO. 265 AND OKATJUKURI NO. 263,**  
**OMAHEKE REGION**

**ENVIRONMENTAL ASSESSMENT SCOPING REPORT**



**Assessed by:**



**Assessed for:**

**Hinze Investments cc**

February 2021



<b>Project:</b>	<b>IRRIGATION ACTIVITIES ON THE FARMS OKASONDANA NO. 264, EVARE NO. 265 AND OKATJUKURI NO. 263, OMAHEKE REGION: ENVIRONMENTAL ASSESSMENT SCOPING REPORT</b>		
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<b>Report Approval</b>	<b>André Faul</b> <b>Conservation Ecologist</b>		

I L. HINZE, the Proponent, hereby confirm that the project description contained in this report is a true reflection of the information which the Proponent has 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.

Signed at EVARE on the 11 day of FEB 2021.

L. Hinze  
Hinze Investments CC

CC/2007/0495  
ID/Company Registration Number



## **EXECUTIVE SUMMARY**

Hinze Investments requested Geo Pollution Technologies (Pty) Ltd to undertake an environmental assessment for their existing agricultural activities on the Farms Okasondana No. 264, Evare No. 265 and Okatjukuri No. 269 in the Omaheke Region. Hinze Investments has cleared 600 ha, of which 82 ha is under irrigation and the remainder dryland cropping. In compliance with best agricultural practices, the fields are cultivated or left fallow on a rotational basis. For instance, only 36 ha of the 82 ha irrigated land is planted per season, while the remaining 46 ha remains fallow. Planned future diversification of agricultural activities will consider clearing an additional 152 ha of which 56 ha will be for irrigation purposes and remainder dryland cropping. These areas will also be planted or left fallow on a rotational basis. Irrigation is from production boreholes, by means of centre pivot irrigation systems. The main produce are wheat, maize and oats. Additional activities performed on the farms include livestock farming. The main operational activities include:

- ◆ land preparation,
- ◆ planting,
- ◆ water abstraction and irrigation,
- ◆ fertilizer application and pest control, and
- ◆ harvesting, processing and transporting activities specific to each crop.

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

The project location is amidst various other agricultural farms and developments. Due to the nature and location of Hinze Investment's agricultural activities, some impacts can be expected on the surrounding environment. These are summarised in the impacts table below. Regular environmental performance monitoring is thus recommended to ensure regulatory compliance and the implementation of corrective measures when necessary, especially with regards to water abstraction. Hinze Investments' operations play a role in contributing to the Namibian agricultural sector as well as employment for 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, environment and quality (SHEQ) policy will contribute to effective management procedures, to prevent and mitigate impacts. All regulations relating to agriculture, labour and health and safety legislation 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 disposed of in a safe manner or re-used or recycled where possible. Hazardous waste must be stored in a safe location and periodically 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 mitigating any negative impacts.

The environmental management plan included in Section 10 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. The SHEQ 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.

### Impact Summary Class Values

Impact Category	Impact Type	Construction		Operations	
<i>Positive Rating Scale: Maximum Value</i>		5		5	
<i>Negative Rating Scale: Maximum Value</i>			-5		-5
EO	Skills and Development	2		2	
EO	Revenue Generation and Employment	2		2	
SC	Demographic Profile and Community Health		-1		-2
EO	Agricultural Produce and Economic Diversification		3	3	
SC	Health, Safety and Security		-2		-2
PC	Fire		-3		-3
PC	Noise		-1		-1
PC	Waste Production		-2		-2
BE	Ecosystem and Biodiversity Impact		-2		-2
PC	Groundwater, Surface Water and Soil Contamination		-2		-2
BE/EO	Groundwater Abstraction				-3
SC	Visual Impact		1		1
	Cumulative Impact		-2		-2

BE = Biological/Ecological    EO = Economical/Operational    PC = Physical/Chemical    SC = Sociological/Cultural

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## **LIST OF ABBREVIATIONS**

<b>AEZ</b>	Agro-Ecological Zone
<b>AIDS</b>	Acquired Immune Deficiency Syndrome
<b>BE</b>	Biological/Ecological
<b>CHIRPS 2</b>	Climate Hazards Group Infra-Red Precipitation with Station data
<b>DWA</b>	Department of Water Affairs
<b>EA</b>	Environmental Assessment
<b>EIA</b>	Environmental Impact Assessment
<b>EMA</b>	Environmental Management Act No 7 of 2007
<b>EMP</b>	Environmental Management Plan
<b>EMS</b>	Environmental Management System
<b>EO</b>	Economic/Operational
<b>ES</b>	Environmental Classification
<b>GPT</b>	Geo Pollution Technologies
<b>HIV</b>	Human Immunodeficiency Virus
<b>IAPs</b>	Interested and Affected Parties
<b>IUCN</b>	International Union for Conservation of Nature
<b>LNAPL</b>	Light Non-Aqueous Phase Liquids
<b>mamsl</b>	Meters Above Mean Sea Level
<b>m/s</b>	Metre per second
<b>mbs</b>	Metres below surface
<b>MEFT</b>	Ministry of Environment, Forestry and Tourism
<b>mm/a</b>	Millimetres per annum
<b>MSDS</b>	Material Safety Data Sheet
<b>PC</b>	Physical/Chemical
<b>PDSI</b>	Palmer Drought Severity Index
<b>PPE</b>	Personal Protective Equipment
<b>ppm</b>	Parts per million
<b>SANS</b>	South African National Standards
<b>SC</b>	Sociological/Cultural
<b>SHEQ</b>	Safety, Health, Environment and Quality
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>WHO</b>	World Health Organization

## **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** - means a body or person empowered under the local authorities act or Environmental Management Act to enforce the rule of law.

**Conservation Tillage** - is a generic term that covers any tillage system that reduces loss of soil and water compared with conventional tillage.

**Construction** - means 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)** - 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** - 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** - means an impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

**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).

**Tillage** - The agricultural preparation of soil by mechanical agitation of various types, such as digging, stirring, and overturning. Examples of human-powered tilling methods using hand tools include shoveling, picking, mattock work, hoeing, and raking.

## 1 BACKGROUND AND INTRODUCTION

Geo Pollution Technologies (Pty) Ltd was appointed by Hinze Investment CC (the Proponent), to undertake an environmental assessment for the agricultural activities on Farms Okasondana No. 264, Evare No. 265 and Okatjukuri No. 269 in the Omaheke Region (Figure 1-1). The main commercial activities of the Proponent on the farm are crop cultivation and cattle farming. Hinze Investments has cleared 600 ha, of which 82 ha is under irrigation and the remainder dryland cropping. In compliance with best agricultural practices, the fields are cultivated or left fallow on a rotational basis. For instance, only 36 ha of the 82 ha irrigated land is planted per season, while the remaining 46 ha remains fallow. Planned future diversification of agricultural activities will consider clearing an additional 152 ha of which 56 ha will be for irrigation purposes and remainder dryland cropping. These areas will also be planted or left fallow on a rotational basis. Irrigation is from production boreholes, by means of centre pivot, micro sprinkler and drip irrigation systems, however augmented largely by rainwater. The main produce are wheat, maize and oats. The main operational activities include:

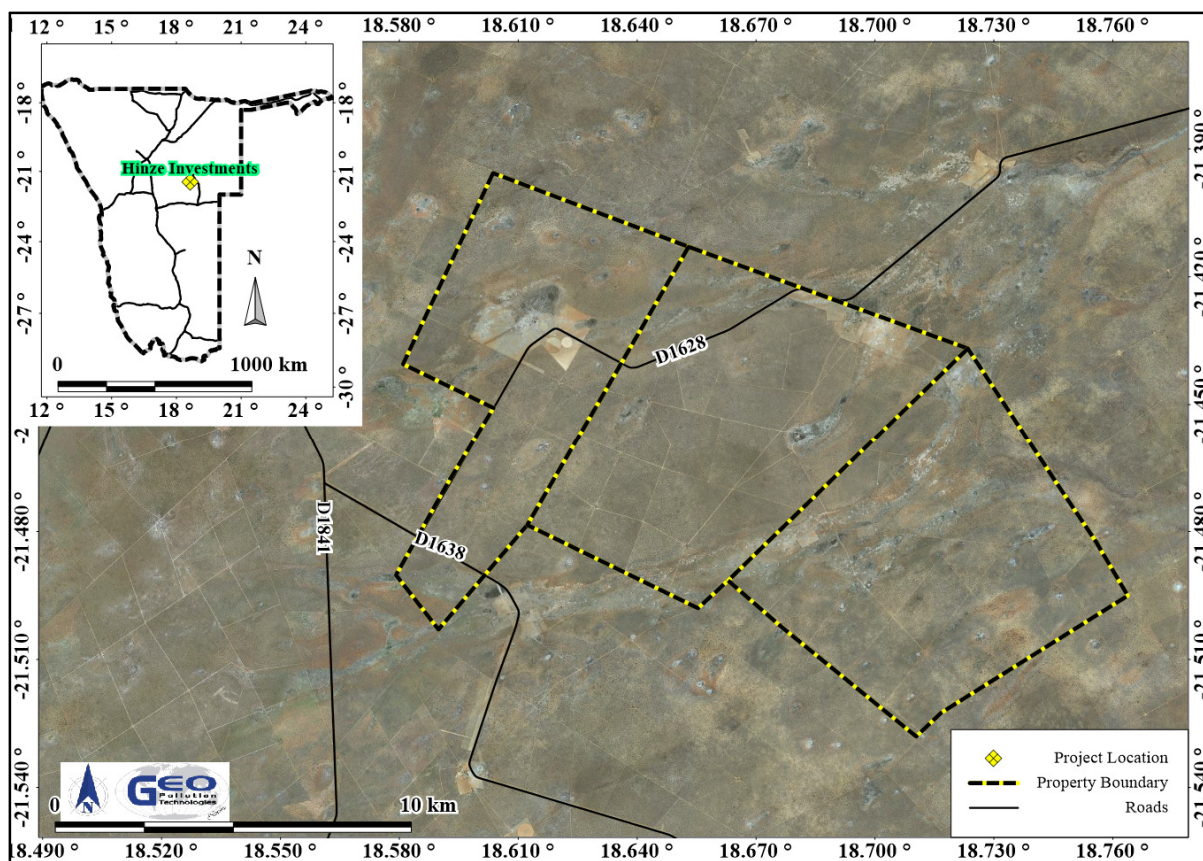
- ◆ cattle production,
- ◆ land preparation,
- ◆ planting,
- ◆ water abstraction and irrigation,
- ◆ fertilizer application and pest control, and
- ◆ harvesting, processing and transporting activities specific to each crop.

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** – To realise agricultural related sustainability goals of the 5<sup>th</sup> National Development Plan of Namibia (NDP5), the then Ministry of Agriculture Water and Forestry (now Agriculture, Water and Land Reform) established a strategic plan 2017/18 -2021/22. As part of this plan the Ministry aims to, amongst others, increase the percentage of farmers conducting conservation agriculture while also setting targets for increased irrigation based agriculture. Both of these strategies are focussed on increasing sustainable food production and ensuring food security in Namibia. The Proponent has a well-established agriculture development, which sees an optimisation of crop production by means of irrigation, augmented by rainwater. In addition, the proponent employs several conservation agricultural techniques. Existing and planned agricultural activities require employment, which is required to be maintained for continued operations. Pivot irrigation systems also requires significant investment costs and therefore the development of the irrigation areas has ensured a sizeable investment into the area and the Omaheke Region.

Benefits of the agricultural activities conducted by the Proponent include:

- ◆ Food production and enhanced food security for local and potential international markets.
- ◆ Employment and supporting of livelihoods of both unskilled and skilled labourers.
- ◆ Generation of income that contributes to the national treasury.
- ◆ Support for economic resilience in the area through diversified business activities and opportunities.



**Figure 1-1. Project location**

## 2 SCOPE

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

1. Present a detailed project and environmental description related to the Proponent's operational activities.
2. Determine the potential environmental impacts emanating from the Proponent's operational 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) 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 operational 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 was obtained from primary information (hydrogeological assessment), existing secondary information as well as from a reconnaissance site visit.
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 conducting agricultural activities on the farms Evare, Okasondana and Katjikuri for a number of years. Agriculture has always been the main economic activity conducted on the farms. Over recent years, agricultural practises were intensified and diversified through various agricultural initiatives on the properties. Where traditional farming practices mainly involved livestock production, it is now supplemented with crop cultivation by means of irrigation and dryland cropping. The following sections provide a brief description of the infrastructure, operations and services supply on the farms.

### 4.1 LAND CLEARING

Mechanical clearing of rangeland for crop cultivation and infrastructure purposes was performed on suitable portions of the farms. Land clearing entailed the removal of trees and bushes. Grass is only removed when land preparation for crop cultivation is conducted (Photo 4-2). Some areas around crops fields are also cleared since there is greater competition for water resources when trees and bushes are too close to crop fields. Total cleared areas for irrigation, dryland crop production and rangeland amounts to approximately 600 ha as indicated in Figure 4-1. An additional 152 ha of area is planned to be cleared on the farm Okasondana.

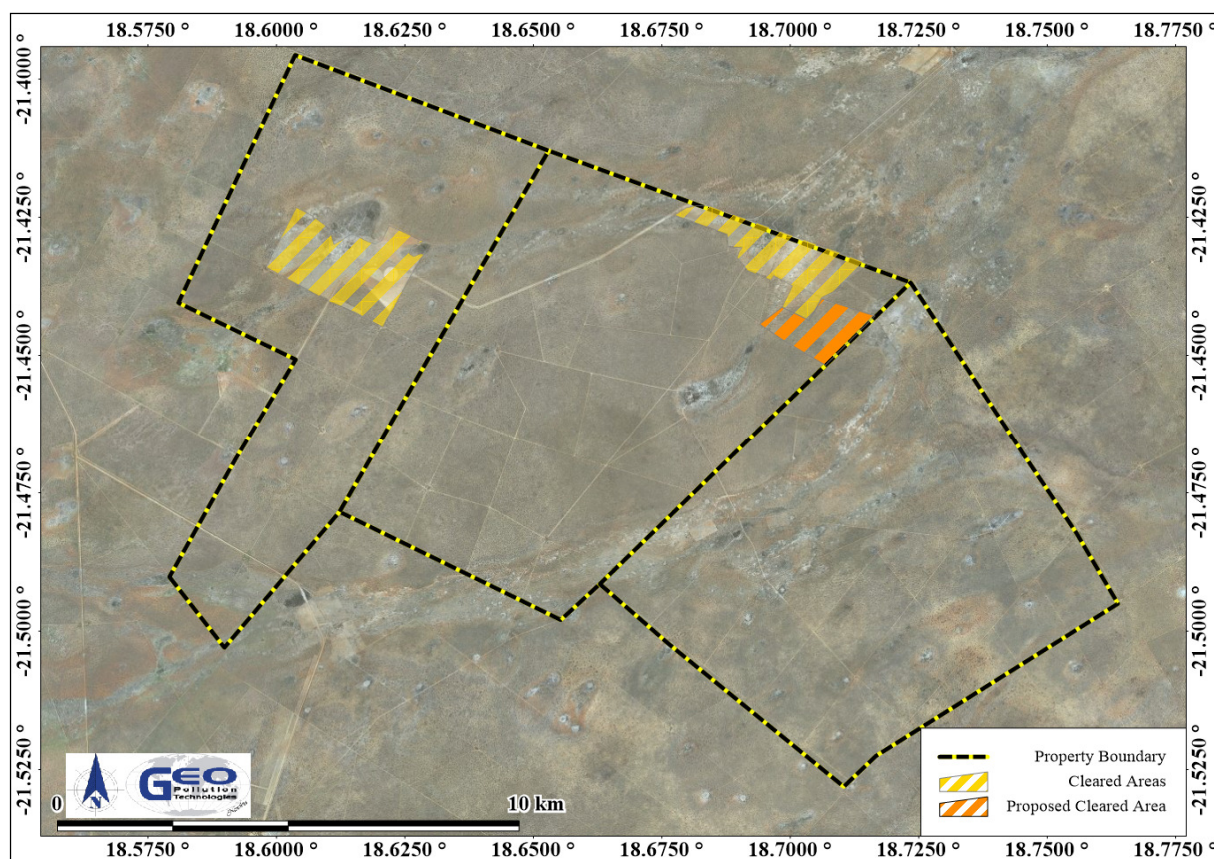


Figure 4-1. Cleared areas of the project area

### 4.2 CROP PRODUCTION AND CONSERVATION AGRICULTURE

The main cultivated produce are maize, oats and wheat. A combined area of approximately 215 ha is used for dryland cropping of such produce. Crop cultivation by means of irrigation is conducted over 82 ha. Of the irrigated land, 36 ha is cultivated in a rotational basis while the remainder is left fallow to allow the soil to rest and regenerate as well as for pest control purposes. This is repeated on a rotational basis, each successive year allowing a new area to remain fallow.

The main crop under irrigation on the 82 ha is maize, which is sold to local Namibian mills. An additional 56 ha of irrigated area is planned to diversify current agricultural production.



**Photo 4-1. Cleared rangeland area**



**Photo 4-2. Dryland crop production**

Preparation of the land and planting entails mechanical activities like ripping, tilling and seeding of the soil, with tractors and specialised implements. Harvesting is performed with maize harvester machines. The proponent conducts conservation agriculture on all crop fields. By utilising a semi-tillage approach, soil disturbance is kept to a minimum while the organic component of the soil is increased. The type of semi-tillage utilised ensures a significant reduction in the chemical (fertilizer and pesticides) management component of the cultivation proses. The ecological and economic benefits of the approach is compared to other agricultural approaches in Section 5.

Fertilizers and pesticides are applied as required and according to the specifications for application. For irrigated fields, fertilisers are mixed with water in large mixing tanks (Photo 4-3 and Photo 4-4). Once the desired mixing ratio is achieved, the fertilisers are fed into the respective irrigation systems for administration onto the crops. The proponent utilises a low-soluble-nutrient fertilizers which may be readily absorbed by crops and requires less water. Pesticides are administered as per the specified application procedures for the corresponding pest by means of tractor spraying. To ensure correct and safe application of pesticides, a pesticide plan is implemented and regularly updated. The proponent requires a minimum amount of pesticides as compared to conventional agricultural production. All pesticides are stored in a dedicated chemical store.



**Photo 4-3. Chemical (fertiliser) mixing unit on the Farm Evare**



**Photo 4-4. Chemical (fertiliser) mixing unit on the Farm Okasondana**

Irrigation agriculture is mainly conducted to the Farms Okasondana and Evare, with the former having four pivot systems (Figure 4-2) and the latter having two such systems (Figure 4-3).



Irrigation related agriculture on Okasondana is supported by six licenced irrigation boreholes. In this area, supporting infrastructure include fuel storage and a chemical mixing unit as indicated in Figure 4-3. Dryland crop production is conducted in the central areas between the pivots and on the cleared area west of the pivots. An additional four pivots are considered for future diversification on cultivated crops. The planned expansion area is located to the south and south-east of existing operations



**Figure 4-2. Irrigation and infrastructure layout on the Farm Okasondana**

Water pumping is enabled by electricity as supplied by NamPower while equipment used in cultivation (e.g. tractors) is powered by diesel stored on the farm (Photo 4-5). As part of conservation agriculture, all organic material which remains on the fields after harvesting, are left on the field.



**Photo 4-5. Chemical (fertiliser) mixing unit on the Farm Evare**



**Photo 4-6. Chemical (fertiliser) mixing unit on the Farm Okasondana**

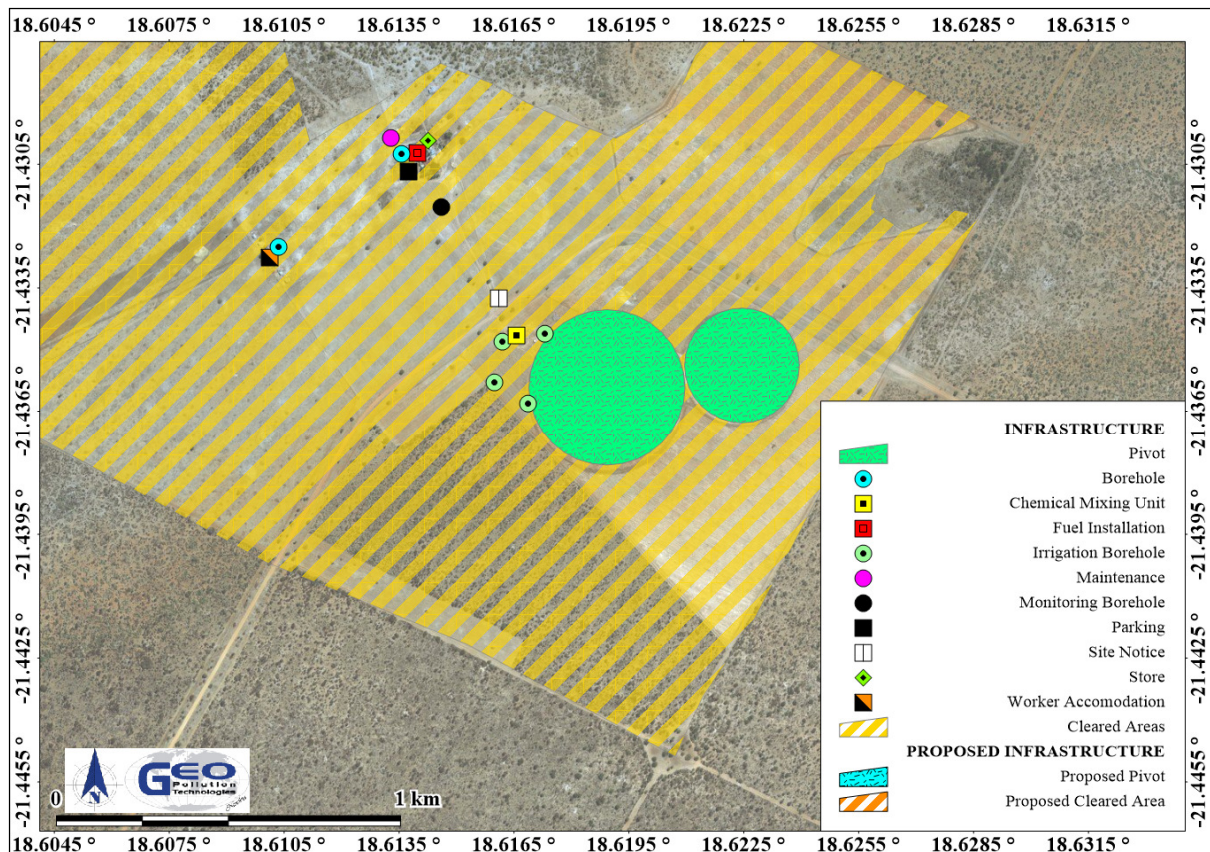


**Photo 4-7. Fuel storage on the Farm Evare**



**Photo 4-8. Power and water supply infrastructure on the Farm Evare**

The Farm Evare has two pivots surrounded by rangeland and dryland crop fields. The pivots are supported with four licensed boreholes. The farm further has all the main amenities supporting farming operations including the irrigation based crop production. These include fuel storage, chemical storage and a maintenance yard. The locations of these in relation to the cleared areas and pivots are indicated in Figure 4-3. All operations are serviced by NamPower while waste is sorted and where possible reused (such as using old oil to coat fencing posts). Crop cultivation is conducted in the same fashion as on the farm Okasondana.



**Figure 4-3. Irrigation and infrastructure layout on the Farm Evare**



**Photo 4-9. Fuel storage tanks**



**Photo 4-10. Equipment storage area**

### **4.3 IRRIGATION SYSTEMS**

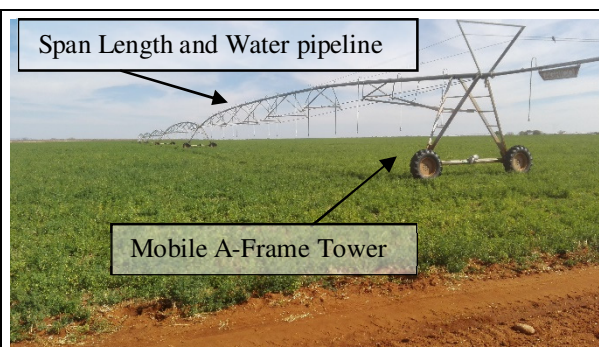
Irrigation systems employed on the farm are centre pivots. A brief description of the system is provided below.

Phocaides (2007) provides a concise description of the center pivot, being a low to medium pressure fully mechanised, automated irrigation of permanent assembly. It basically comprise 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. The pipeline is connected to a central tower with the “pivot mechanism” and main control panel. The central tower is a fixed structure with a concrete base secured at a fixed water supply point, in the centre of the pivot (field). The entire system is self-propelled to slowly rotate around the central tower while dispensing water through sprinklers (emitters) connected to the pipeline. An automatic alignment systems ensures the irrigation pipeline remains straight while a drive system enables the system movement.

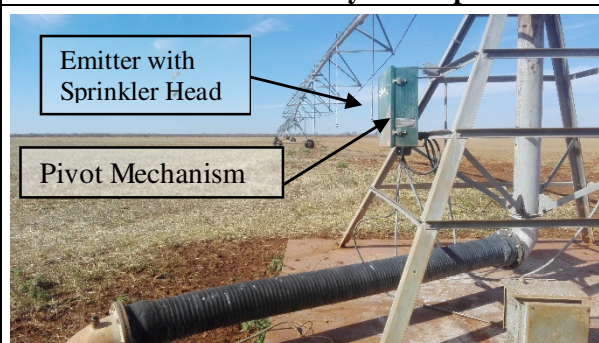
Mobile towers are typically approximately 3 m in height while being spaced about 30 m apart. The spans are therefore roughly 30 m in length. The entire length of the system may vary from design to design and therefore the size of the irrigated area will also vary. Longer systems will have a greater circumference and larger range. Photo 4-11 depicts a typical centre pivot system while Photo 4-12 and Photo 4-13 presents some of the pivots systems which are being employed in Namibia. The system depicted in Photo 4-12 and Photo 4-13 has a system length of 300 m with spans at a width of 50 m. The irrigated area therefore covered by these systems are 30 ha.



**Photo 4-11. Typical Center Pivot System with Fixed Central Tower (Phocaides (2007))**



**Photo 4-12. Centre Pivot System Pipeline**



**Photo 4-13. Centre Pivot System Employed in Namibia**

#### 4.4 WATER SUPPLY

The only available water source for the project is groundwater and the farms in the project area rely thus on boreholes and wells for water supply for potable use, irrigation and livestock.

Although the project area fall outside a water control area, the proponent is in possession of an abstraction permit for abstraction boreholes on farm Evare no 265 received from the Department of Water Affairs (DWA) of the MAWLR. The permit for irrigation boreholes WW205183 through to WW205186 on farm Evare no 265, dated 18 September 2018, allows for the abstraction of maximum 180,000 m<sup>3</sup> per year (15,000 m<sup>3</sup> per month). The permit is valid for 5 years (Appendix A).

Thirty six (36) boreholes are present on the three farms operated by the Proponent. A summary of the available borehole data received from the Proponent is provided in Table 4-1. The boreholes are used for purposes of potable water supply (domestic use), irrigation, livestock watering and testing/monitoring.

Of the 36 boreholes, 10 are used for irrigation: four on farm Evare no 265 and six on farm Okasondana no 264. All irrigation boreholes are installed with submersible pumps. Irrigation boreholes of farm Evare no 265 is connected to one single flow meter. Abstracted water is used to irrigate maize, oats and wheat fields via centre pivot irrigation systems.

There is a total of 14 boreholes on farm Evare no 265. The four irrigation boreholes is known as borehole WW205183, WW205184, WW205185 and WW205186. Three boreholes at the farmhouse are utilised for domestic use and one is used for monitoring/testing purposes. Unfortunately monitoring/testing data from this point could not ascertained during the study. Six boreholes are used for stock watering purposes on this farm.

On farm Okasondana no 264 there are 14 boreholes and one well. The six irrigation boreholes is known as no. 1 through to no. 6. Six boreholes and one well is used for stock watering purposes. Only one borehole is used for domestic use and another borehole is currently not used.

Farm Okatjukuri no. 269 is currently exclusively used for livestock farming, thus having seven stock watering boreholes.

Table 4-1 illustrates all the borehole data as received from the Proponent as well as contained in the DWA database on the farms and immediate vicinity. Note that some of the DWA boreholes is not in use any more and also not displayed in Table 4-1

**Table 4-1. Summary of borehole information obtained from client**

Map Ref.	Farm Name	Borehole Name	Use	Depth (m)	Yield (m <sup>3</sup> /h)	Initial Water Level (mbs)
1	Evare no. 265	WW205186	Irrigation	70	20	8.2
2	Evare no. 265	WW205184	Irrigation	90	20	8.2
3	Evare no. 265	WW205183	Irrigation	70	20	8.2
4	Evare no. 265	WW205185	Irrigation	60	10	8.2
5	Evare no. 265	Garden Borehole	Domestic	28	1.5	5.5
6	Evare no. 265	Staff Borehole	Domestic			
7	Evare no. 265		Domestic		9	17
8	Evare no. 265	Test Borehole	Testing and Monitoring	70		5.5
9	Evare no. 265	WW12992	Stock Watering		9	17
10	Evare no. 265		Stock Watering		9	17
11	Evare no. 265	WW12994	Stock Watering B		9	17
12	Evare no. 265	WW12993	Stock Watering		9	17
13	Evare no. 265	WW12995	Stock Watering		9	17
14	Evare no. 265	WW18439	Stock Watering		11.4	9.14
15	Okasondana no. 264	1	Irrigation	65	27	6
16	Okasondana no. 264	2	Irrigation	65	27	6
17	Okasondana no. 264	3	Irrigation	65	27	6
18	Okasondana no. 264	5	Irrigation	60	40	6
19	Okasondana no. 264	4	Irrigation	60	80	6
20	Okasondana no. 264	6	Irrigation	25	15	6
21	Okasondana no. 264		Domestic			6
22	Okasondana no. 264		Stock Watering			
23	Okasondana no. 264		Stock Watering			18
24	Okasondana no. 264		Stock Watering			18
25	Okasondana no. 264		Stock Watering			18
26	Okasondana no. 264		Stock Watering			18
27	Okasondana no. 264		Stock Watering			18
28	Okasondana no. 264		Stock Watering			18
29	Okasondana no. 264		Not Used			
30	Okatjukuri no. 269		Stock Watering		5	18
31	Okatjukuri no. 269		Stock Watering		5	18
32	Okatjukuri no. 269		Stock Watering		5	18
33	Okatjukuri no. 269		Stock Watering		5	18
34	Okatjukuri no. 269		Stock Watering		2	
35	Okatjukuri no. 269		Stock Watering		2	
36	Okatjukuri no. 269	Put 1	Stock Watering			

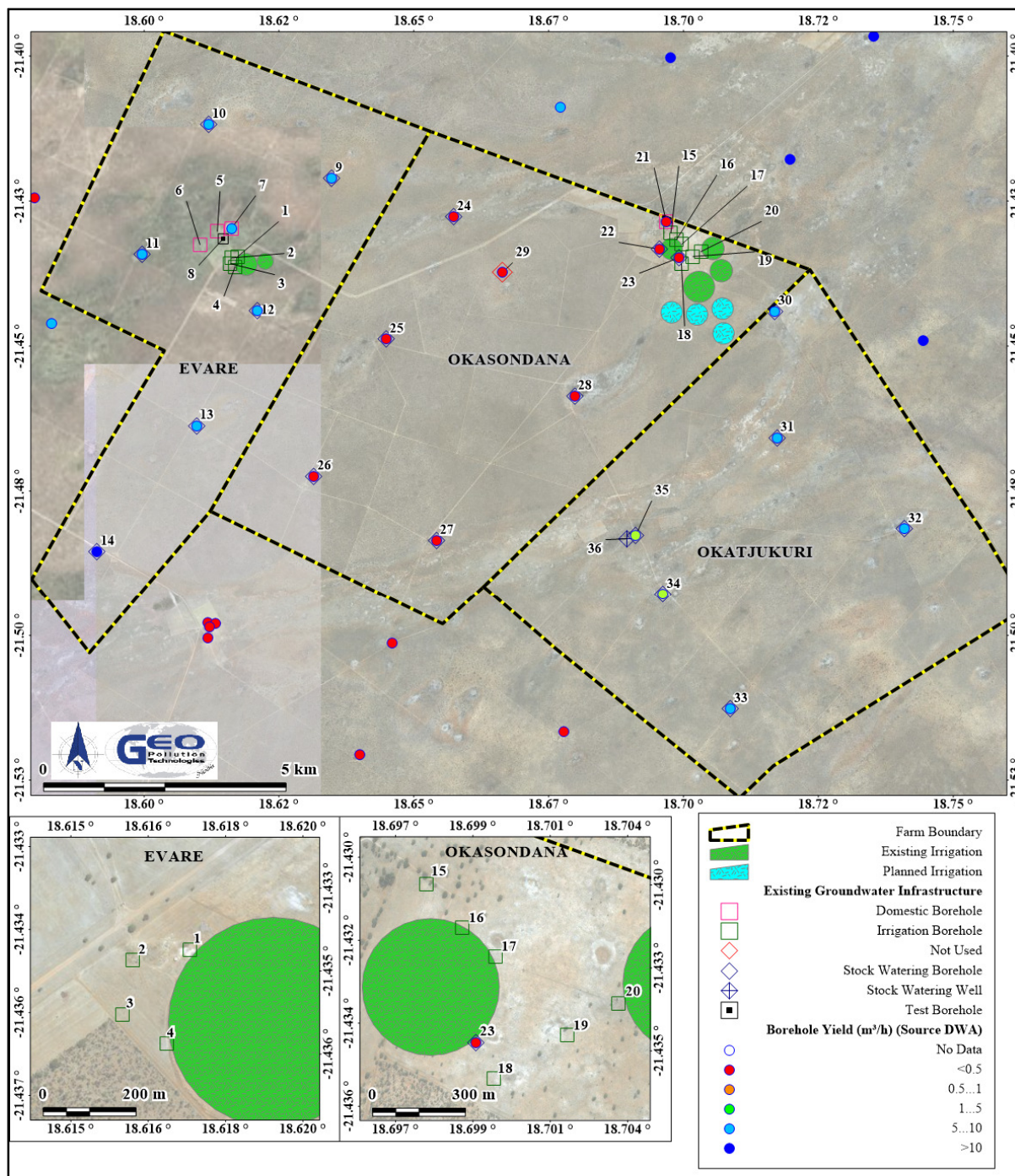


Figure 4-4. Locations of boreholes as received from the Client

#### 4.5 LIVESTOCK

The main agricultural activity on the project area remains cattle ranching for commercial purposes. Cattle are accommodated in all areas of the farms except the pivot and crop cultivation areas. Cattle are transported to national markets when they are market ready. Bush clearing was previously conducted on the farm in an attempt to improve rangeland conditions.



**Photo 4-14 Typical borehole installation on Farm Okasodana**



**Photo 4-15. Typical flowmeter installation on the Farm Evare**

#### **4.6 SUPPORT INFRASTRUCTURE**

Operations are enabled and supported by a variety of infrastructure on the farms. In many instances operations will not be possible without the support infrastructure

**Fuel storage** comprises of four aboveground diesel tanks of 2 m<sup>3</sup> each. The farms Okasondana and Evare both have two tanks as depicted in Photo 4-7 and Photo 4-9. Each tank is equipped with a fuel line and nozzle for gravity dispensing of diesel into vehicles. Diesel is supplied with tanker trucks by a fuel wholesaler. All tanks have been on the farm prior to 2013.

**Waste disposal** sites are present on each of the three farms. They consist of excavated pits where waste is regularly burned. Due to a lack of any recyclers in the area, recycling of certain wastes are not possible. However, where possible, certain waste items are not discarded, but rather re-used for alternative purposes. Empty chemical containers such as pesticide containers are stored in a safe location and periodically disposed at approved sites. Operations do not realise agricultural waste, as all is reused.

**Electricity** is provided by NamPower and supplemented through the use of solar geysers.

Employees are provided with **housing**. Employee houses are serviced with running hot water. All ablution facilities are connected to french drain systems for the treatment of **sewage**.

Various **storage and maintenance areas** are located on the properties and comprise of sheds and storerooms where implements and other maintenance material are stored under roof. Each farm has its own locked chemical store for pesticides and other hazardous chemicals. Maintenance and general repairs are conducted in a workshop.

#### **4.7 EMPLOYMENT**

Operations on the farm sustain 10 permanent employment opportunities. In addition, approximately 10 seasonal workers are employed. Permanent workers are provided with housing on the farm. Seasonal workers are sourced from the area.

## **5 ALTERNATIVES**

Various alternatives related to the project are considered and each of these discussed. The alternatives can roughly be grouped into three main categories, namely:

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

## 5.1 LOCATION ALTERNATIVES

The proposed location for irrigation is 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. In addition the Ministry of Agriculture, Water and Land Reform has provided the Proponent with groundwater abstraction permit from boreholes (as located on the farms). No location alternatives are therefore considered feasible, as the proponent owns and or manages the properties (on behalf of the family), on which operations are conducted.

## 5.2 PROJECT IMPLEMENTATION AND DESIGN ALTERNATIVES

Various alternatives are continually considered to optimise crop production. Boreholes are already in place and no surface water is available. Therefore, there are no alternative water sources for the proposed 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.

### 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 constraints 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. 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)**

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

In the area, climatic and soil conditions necessitate an irrigation system with a high rate of water deposition (due to evaporation and soil salinization). For purposes of irrigation, centre pivot, sprinkler and drip systems are suitable.



### 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 advantageous over traditional tilling. Conservation tillage practises aims at less disturbance of the soil and has advantages of less erosion, less evaporation and saves on time and costs of traditional tilling. Conservation tillage can either be just 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.

**Table 5-2. Advantages and disadvantages of land preparation systems (adapted from <https://cropwatch.unl.edu/tillage/advdisadv>)**

System	Major advantages	Major disadvantages
<b>Plow</b>	Suited for poorly drained soils. Excellent incorporation (mixing of soil for easy combination with chemical and organic elements). Well-tilled seedbed.	Major soil erosion. High soil moisture loss. Timeliness considerations. Highest fuel and labour costs. Reducing soil organic matter (micro flora and fauna), reduced soil structural stability. Increased surface runoff and water or wind erosion.
<b>Disk</b>	Less erosion with more residue. Well adapted for well-drained soils. Good incorporation.	Little erosion control with more operations. High soil moisture loss. Destroys soil structure. Compacts wet soil.
<b>Strip-till</b>	Tilled residue-free strip warms quickly. Injection of nutrients into row area. Well suited for poorly drained soils. Less wear on machinery, less use of fuel or animal power, less time devoted to soil preparation by the farmer thus a possible overall improvement in gross returns for the farm. Heavy rain, is more likely to concentrate in the seeder slots and thereby penetrate directly to the crop's root zone. Improve general water use efficiency by the crop.	Cost of preplant operation. Strips may dry too much, crust, or erode without residue. Not suited for drilled crops (mechanised seeding). Timeliness in wet falls. It also disturbs the soil but limits that disturbance to rows or slots in which the crop seeds and fertilizer are placed.
<b>No-till</b>	Excellent erosion control. Soil moisture conservation. Minimum fuel and labour costs. Builds soil structure and health.	No incorporation. Increased dependence on herbicides. Slow soil warming on poorly drained soils. Problems of disease and residue handling. Herbicides have long-term impacts on the environment. Some weeds have developed resistance to some herbicides, leading to a need to rotate both crops and herbicide groups in order to keep crops weed-free, or to plant GMO crop.

The Proponent has adopted a semi-tillage (a variation on strip-tillage) method of cultivation with a specialist conversion application, which will allow for the optimal use of water and minimal use of pesticides. The application pushes the organic material left from the previous harvest, into the first 5 to 10 cm of the soil while also cutting the roots of remaining plants and any weeds. The method of soil preparation has increased the organic content of the soil while reducing the pesticide regime. No alternative related to soil preparation is therefore suggested, as the proponent is employing the most advantageous system, in line with the national strategies on conservation agriculture.

### 5.3 NO GO ALTERNATIVE

Agriculture has been a core activity in the area for years. Maize is supplied to Namibian mills and the stover used for fodder and organic material. Cattle are sold to local markets. This reduces the need for importing of crops, meat and fodder. The proponent further employs best suited practises for conservation agriculture to increase the food security in Namibia. Should the project not receive an environmental clearance certificate, there would be a loss in capital investment and employment and also in the production of food. This will lead to a decrease in the spending power of the local to national community. Finally, less revenue will be generated for Namibia and more money will be required for importing of feed and food.

## 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
<b>The Namibian Constitution</b>	<ul style="list-style-type: none"> <li>◆ Promote the welfare of people</li> <li>◆ Incorporates a high level of environmental protection</li> <li>◆ Incorporates international agreements as part of Namibian law</li> </ul>
<b>Environmental Management Act</b> Act No. 7 of 2007, Government Notice No. 232 of 2007	<ul style="list-style-type: none"> <li>◆ Defines the environment</li> <li>◆ Promotes sustainable management of the environment and the use of natural resources</li> <li>◆ Provides a process of assessment and control of activities with possible significant effects on the environment</li> </ul>
<b>Environmental Management Act Regulations</b> Government Notice No. 28-30 of 2012	<ul style="list-style-type: none"> <li>◆ Commencement of the Environmental Management Act</li> <li>◆ List activities that requires an environmental clearance certificate</li> <li>◆ Provide Environmental Impact Assessment Regulations</li> </ul>
<b>Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act</b> Act No. 36 of 1947; Government Notice No. 1239 of 1947	<ul style="list-style-type: none"> <li>◆ Governs the registration, importation, sale and use of fertilizers, farm feeds, agricultural remedies and stock remedies</li> <li>◆ Various amendments and regulations</li> </ul>
<b>Seed and Seed Varieties Act 23 of 2018</b> Act No. 23 of 2018, Government Notice No. 368 of 2018	<ul style="list-style-type: none"> <li>◆ Provides for restrictions on the importation of seed</li> <li>◆ Not in force yet</li> </ul>
<b>The Water Act</b> Act No. 54 of 1956	<ul style="list-style-type: none"> <li>◆ Remains in force until the new Water Resources Management Act comes into force</li> <li>◆ Defines the interests of the state in protecting water resources</li> <li>◆ Controls water abstraction and the disposal of effluent</li> <li>◆ Numerous amendments</li> </ul>

<b>Law</b>	<b>Key Aspects</b>
<b>Water Resources Management Act</b> Act No. 11 of 2013	<ul style="list-style-type: none"> <li>◆ Provides for management, protection, development, use and conservation of water resources</li> <li>◆ Prevention of water pollution and assignment of liability</li> <li>◆ Not in force yet</li> </ul>
<b>Forest Act</b> (Act 12 of 2001, Government Notice No. 248 of 2001)	<ul style="list-style-type: none"> <li>◆ Makes provision for the protection of the environment and the control and management of forest fires</li> <li>◆ 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.</li> </ul>
<b>Forest Regulations: Forest Act, 2001</b> Government Notice No. 170 of 2015	<ul style="list-style-type: none"> <li>◆ Declares protected trees or plants</li> <li>◆ Issuing of permits to remove protected tree and plant species.</li> </ul>
<b>Soil Conservation Act</b> Act No. 76 of 1969	<ul style="list-style-type: none"> <li>◆ 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 in Namibia</li> </ul>
<b>Biosafety Act</b> Act No. 7 of 2006	<ul style="list-style-type: none"> <li>◆ Regulate activities involving the research, development, production, marketing, transport, application and other uses of genetically modified organisms and specified products derived from genetically modified organisms</li> <li>◆ Prohibits planting of genetically modified organisms without registration</li> </ul>
<b>Petroleum Products and Energy Act</b> Act No. 13 of 1990, Government Notice No. 45 of 1990	<ul style="list-style-type: none"> <li>◆ Regulates petroleum industry</li> <li>◆ Makes provision for impact assessment</li> <li>◆ Petroleum Products Regulations (Government Notice No. 155 of 2000)</li> <li>◆ Prescribes South African National Standards (SANS) or equivalents for construction, operation and decommissioning of petroleum facilities (refer to Government Notice No. 21 of 2002)</li> </ul>
<b>Local Authorities Act</b> Act No. 23 of 1992, Government Notice No. 116 of 1992	<ul style="list-style-type: none"> <li>◆ Defines the powers, duties and functions of local authority councils</li> </ul>
<b>Public Health Act</b> Act No. 36 of 1919	<ul style="list-style-type: none"> <li>◆ Provides for the protection of health of all people</li> </ul>
<b>Public and Environmental Health Act</b> Act No. 1 of 2015, Government Notice No. 86 of 2015	<ul style="list-style-type: none"> <li>◆ Provides a framework for a structured more uniform public and environmental health system, and for incidental matters</li> <li>◆ Deals with Integrated Waste Management including waste collection disposal and recycling, waste generation and storage, and sanitation</li> </ul>
<b>Labour Act</b> Act No 11 of 2007, Government Notice No. 236 of 2007	<ul style="list-style-type: none"> <li>◆ Provides for Labour Law and the protection and safety of employees</li> <li>◆ Labour Act, 1992: Regulations relating to the health and safety of employees at work (Government Notice No. 156 of 1997)</li> </ul>

Law	Key Aspects
<b>Atmospheric Pollution Prevention Ordinance</b> Ordinance No. 11 of 1976	<ul style="list-style-type: none"> <li>◆ Governs the control of noxious or offensive gases</li> <li>◆ Prohibits scheduled process without a registration certificate in a controlled area</li> <li>◆ Requires best practical means for preventing or reducing the escape into the atmosphere of noxious or offensive gases produced by the scheduled process</li> </ul>
<b>Hazardous Substances Ordinance</b> Ordinance No. 14 of 1974	<ul style="list-style-type: none"> <li>◆ Applies to the manufacture, sale, use, disposal and dumping of hazardous substances as well as their import and export</li> <li>◆ Aims to prevent hazardous substances from causing injury, ill-health or the death of human beings</li> </ul>
<b>Pollution Control and Waste Management Bill (draft document)</b>	<ul style="list-style-type: none"> <li>◆ Not in force yet</li> <li>◆ Provides for prevention and control of pollution and waste</li> <li>◆ Provides for procedures to be followed for licence applications</li> </ul>

Table 6-2. Relevant multilateral environmental agreements

Agreement	Key Aspects
<b>Stockholm Declaration on the Human Environment, Stockholm 1972.</b>	<ul style="list-style-type: none"> <li>◆ 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</li> </ul>
<b>United Nations Framework Convention on Climate Change (UNFCCC)</b>	<ul style="list-style-type: none"> <li>◆ The Convention recognises that developing countries should be accorded appropriate assistance to enable them to fulfil the terms of the Convention</li> </ul>
<b>Convention on Biological Diversity, Rio de Janeiro, 1992</b>	<ul style="list-style-type: none"> <li>◆ Under article 14 of The Convention, EIAs must be conducted for projects that may negatively affect biological diversity</li> </ul>
<b>International Treaty on Plant Genetic Resources for Food and Agriculture, 2001</b>	<ul style="list-style-type: none"> <li>◆ Promote conservation, exploration, collection, characterization, evaluation and documentation of plant genetic resources for food and agriculture</li> <li>◆ Promote the sustainable use of plant genetic resources for food and agriculture</li> </ul>

Table 6-3. Standards or codes of practise

Standard or Code	Key Aspects
<b>South African National Standards (SANS)</b>	<ul style="list-style-type: none"> <li>◆ The Petroleum Products and Energy Act prescribes SANS standards for the construction, operations and demolition of petroleum facilities.</li> <li>◆ SANS 10131 (2004) is aimed at above-ground storage tanks for petroleum products. <ul style="list-style-type: none"> <li>○ Provide requirements for spill control infrastructure</li> </ul> </li> </ul>

The agricultural and related activities, listed in the Environmental Management Act Regulations (Government Notice No. 29 of 2012), as activities requiring an environmental clearance certificate, include the following:

#### **Section 4: Forestry Activities**

- ◆ 4. The clearance of forest areas, deforestation, afforestation, timber harvesting or any other related activity that requires authorisation in term of the Forest Act, 2001 (Act No. 12 of 2001) or any other law. The Proponent is not conducting any tree harvesting or charcoal production. Encroacher bush was cleared in the past to improve cattle rangelands and have dryland crops. Additional de-bushing initiatives may be undertaken in the future.

### **Section 7: Agriculture and Aquaculture Activities**

- ◆ **7.5 Pest control:** The proponent will use conventional pest control products as approved by the Namibian government for some of the produce. These may include herbicides and pesticides.

### **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:** Water is abstracted from boreholes for cultivation and sale of crops.
- ◆ **8.6 Construction of industrial and domestic wastewater treatment plants and related pipeline systems:** The proponent has installed wastewater treatment facilities (french drain systems) on the properties to manage mainly black and grey water.
- ◆ **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 farms 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.** The project has two consumer fuel installations for diesel (on separate properties), each storing diesel in aboveground tanks with a combined capacity of 4 m<sup>3</sup> per installation.
- ◆ **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 project has two consumer fuel installations for diesel (on separate properties), each storing diesel in aboveground tanks with a combined capacity of 4 m<sup>3</sup> per installation.
- ◆ **9.3 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:** The project has two consumer fuel installations for diesel (on separate properties), each storing diesel in aboveground tanks with a combined capacity of 4 m<sup>3</sup> per installation.

#### **Additional national planning legislation considered include:**

- ◆ Harambee Prosperity Plan.
- ◆ 5<sup>th</sup> National Development Plan (NDP5).
- ◆ Ministry of Agriculture, Water and Forestry: Strategic Plan 2017/18 – 2021/22.

The Harambee Prosperity Plan (HPP) is a targeted action plan to accelerate development in clearly defined priority areas, which lay the basis for attaining prosperity in Namibia. The Plan does not replace, but complements the long-term goal of the National Development Plans (NDPs) and Vision 2030. The rationale behind the HPP is to introduce an element of flexibility in the Namibian 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 NDPs. It is the purpose of NDP5 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 primarily to the “Economic Progression” pillar by increasing the volumes of locally produced goods.

One of the focus areas of the economic progression pillar of NDP5 is agriculture and food security. The NDP5 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 NDP5. The farms contribute to the amount of productive, irrigated land in Namibia, provide employment, produce crops for local and international markets, and produces fodder for livestock farming.

The strategic plan of the Ministry of Agriculture, Water and Land Reform, was designed to achieve the Namibia Harambee Prosperity Plan and NDP5’s desired outcomes. The formulation of the strategic

plan followed an extensive stakeholder consultation process and forms the basis of annual work plans of various directorates and departments within the ministry. A key pillar of the strategy is sustainable food production.

Achieving sustainable food production is hinged on two strategic objectives. The first being the implementation of appropriate technologies e.g. comprehensive conservation agriculture and mechanization. The second being to strengthen the coordination between research and advisory services. The proponent not only adopted a specific and effective conservation agriculture regime, but also commissioned specialist investigations to advise on the feasibility of irrigation. Such information being made available to the governing bodies to support their information database. The proponent not only incorporated all legal requirements from the state, but also evidently implements and embraces policies and strategies in the related sector.

## **7 ENVIRONMENTAL CHARACTERISTICS**

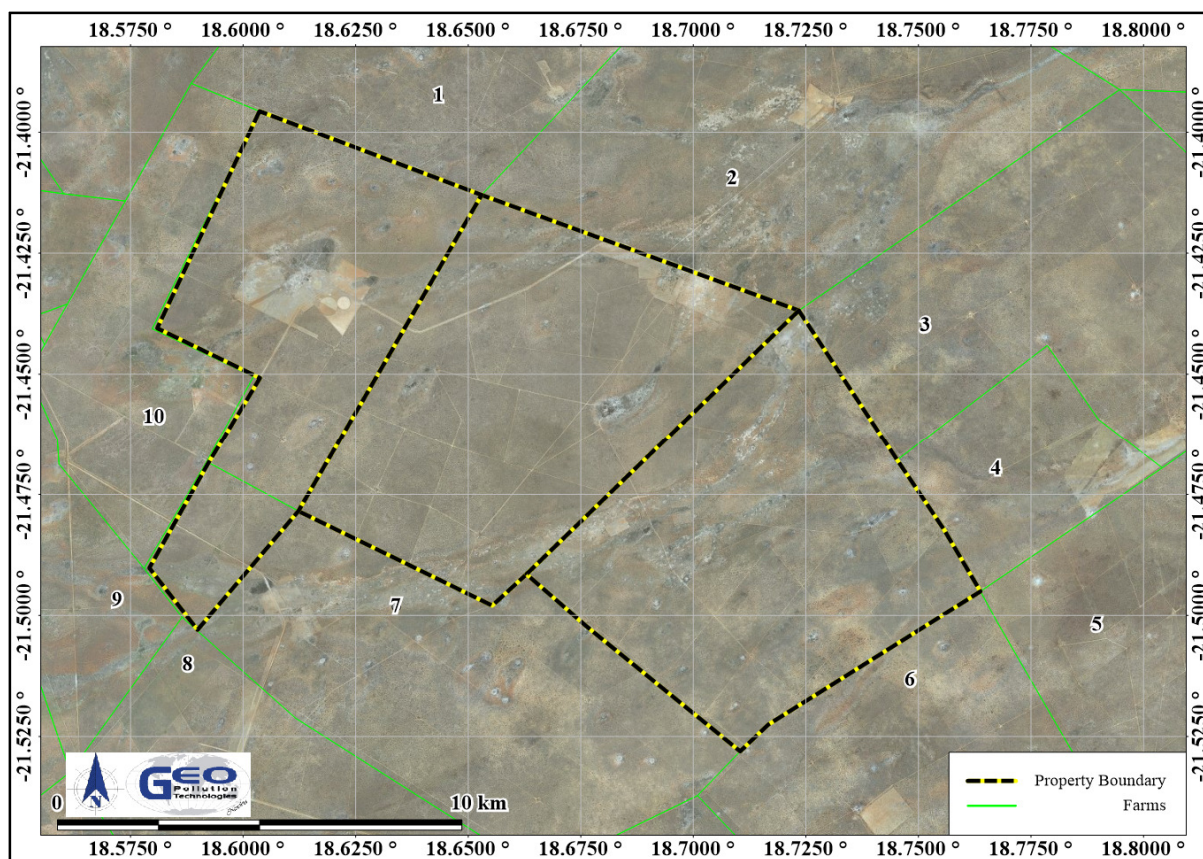
This section lists pertinent environmental characteristics of the study area and provides a statement on the potential environmental impacts on each.

### **7.1 LOCALITY AND SURROUNDING LAND USE**

The farms are located approximately 10 km east of Summerdown centred on 21.4523 °S and 18.6589 °E. They straddle the D1628 road connecting the D1638 leading to Summerdown with the T1402 (C22) connecting Gobabis with Otjinene. All adjacent properties are commercial farms. The adjacent properties are listed in the table below and their locations are depicted in Figure 7-1.

**Table 7-1. Adjacent properties**

<b>Number on Map</b>	<b>Farm Name and Number</b>
1	Boesmanpan FML/00661/00REM
2	Okambekere FML/00662
3	Smutsville FML/00663/00REM
4	FML/00663/00001
5	FML/00665
6	Chibra FML/00262/00001
7	Meyerville FML/00825
8	Springvale FML/00337
9	FML/00334/00001
10	Oroana FML/00971



**Figure 7-1. Properties adjacent to the project area**

### *Implications and Impacts*

The location is well suited for the agricultural activities. It is already zoned for agricultural use and is situated in an area suitable for irrigation. The farm is further surrounded by activities of similar nature. The farm will follow sustainable agricultural practices ensuring impacts on the surrounding land-users are minimised and in line with the current landscape character.

## **7.2 CLIMATE**

Long term climate data was obtained from Atlas of Namibia Project (2002) and the CHIRPS-2 database (Funk, et.al 2015), (see Appendix B for a detailed interpretation and discussion of the data). Atlas of Namibia data was compiled from almost 300 rainfall stations across Namibia, the data was contoured in 50 mm intervals prior to 1999 for variable length data sets. The CHIRPS-2 dataset (Climate Hazards Group Infra-Red Precipitation with Station data version 2) consist of long term rainfall data (1981 to near-present) obtained from satellite imagery and in-situ station data.

The project area is situated in a semi-arid climatic region. Days are mostly warm with very hot days during the summer months, while nights are generally cool. Average annual temperatures are about 20 to 21 °C (Table 7-2). The rain season normally starts in October and last until May, peaking in January and February. Variability in annual rainfall is about 30%. This coefficient of variance seem to correlate with Atlas of Namibia Project data. Average annual evaporation rates are high with a significant water deficit as a result (Table 7-2).

Average annual rainfall is 388 mm (Table 7-3) with above average rainfall of between 600 mm and 700 mm and below average rainfall lower than 300 mm in some years (Figure 7-2) (based on 39 years' data). Namibia is furthermore known for thunderstorms with heavy rainfall in short periods of time. The maximum rainfall recorded for single day rain events is 76.6 mm for the month of April while January to March also have significant single day rain events (Table 7-3). This extremely high rainfall years will have a significant positive impact on groundwater levels,

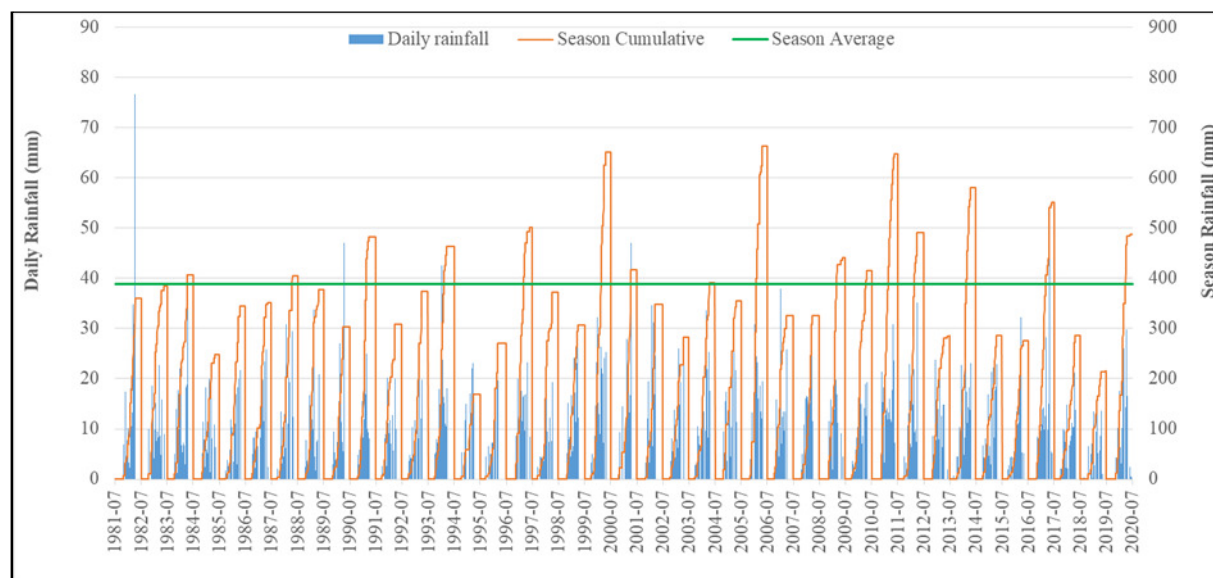
especially in the sandy aquifer condition of the site, where recharge will occur fast and groundwater levels will increase.

**Table 7-2. Summary of climate conditions (Atlas of Namibia Project, 2002)**

Variation in annual rainfall (%)	30-40
Average annual evaporation (mm/a)	2,800-3,000
Water deficit (mm/a)	1,501-1,700
Temperature (°C)	20-21

**Table 7-3. Rainfall statistics (Funk, et.al 2015)**

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Minimum (mm)	15.8	22.1	19.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Maximum (mm)	295.8	193.9	126.5	128.2	13.6	2.6	0.9	0.7	9.1	39.7	93.2	159.3	
Average (mm)	87.3	82.5	66.8	33.0	1.7	0.2	0.0	0.0	1.8	11.6	38.2	65.3	
Daily maximum (mm)	42.5	33.7	35.1	76.6	9.1	2.6	0.9	0.7	4.5	15.9	23.8	37.9	
Average rain days	10	9	6	2	0	0	0	0	1	3	6	8	
Season July - June average: 388 mm			Coefficient of variation: 30 %										
Data range	1981-Jul-01 to					2020-Jun-30					Lat: -21.4301°S Long: 18.614°E		



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

#### ***Implications and Impacts***

Water is a scarce and valuable resource in Namibia. 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 water remains a vulnerable resource. Heavy rainfall can lead to soil erosion when improper agricultural practises are employed.

The current drought conditions may impact on groundwater availability due to reduced aquifer recharge.

### **7.3 TOPOGRAPHY, DRAINAGE AND SOILS**

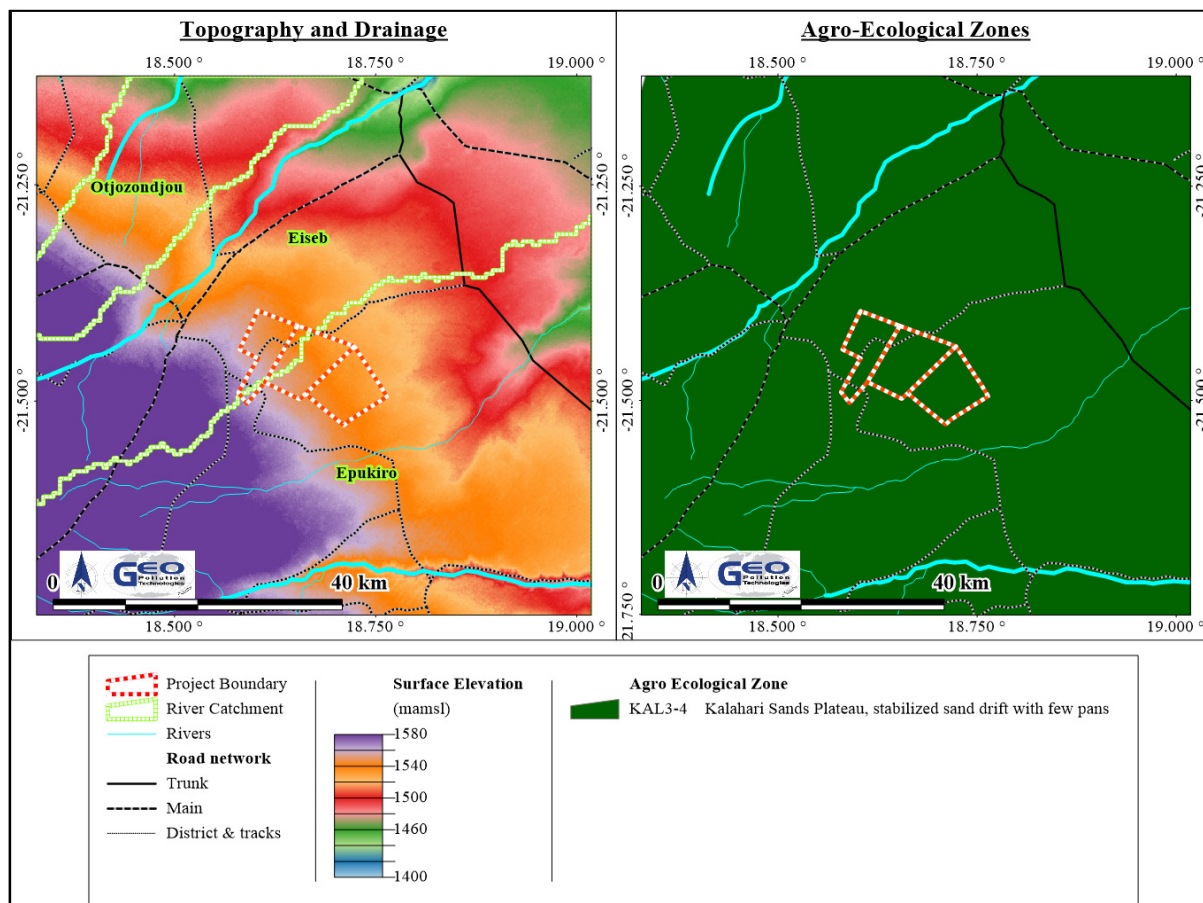
The general topography of the project area can be described as relatively flat, with the elevation decreasing towards the east. Regional surface runoff is therefore generally directed toward the east. The project area forms part of the Kalahari Sandveld landscape known for its palaeo dunes and pans, which can be observed in the larger study area.

Due to the fat terrain, drainage in the area is poorly developed. Surface runoff near around the project collects in the Eiseb and Alexest Rivers, which is located about 9 km northwest and 7 km southeast of the project respectively. However, Local drainage is expected to drain more towards



the east to the Alexest River. The Alexest River flows downstream into the Epukiro River which flows toward Lake Ngami south of the Okavango Delta (Margane, et.al. 2004).

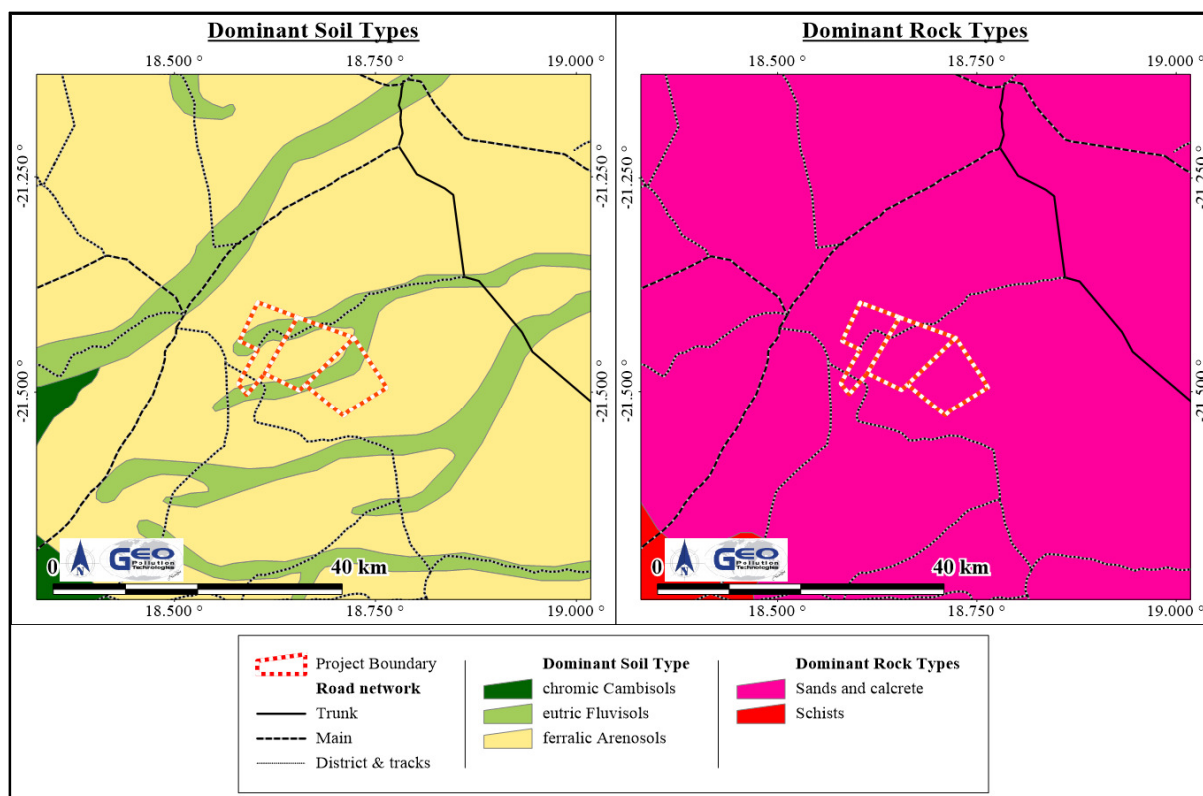
The farm is situated within the Kal3-4 agro-ecological zone (AEZ) which is a Kalahari Sands Plateau characterised by stabilized sand drift with few pans (Figure 7-3). The average growing period is 61 to 90 days and it has a very short dependable growing period. The Kalk3-4 AEZ is ranked 4<sup>th</sup> in Namibia in terms of agricultural potential and is deemed most suitable for large stock grazing. The availability of groundwater and suitable soils does however allow for crop cultivation.



**Figure 7-3. Topography, drainage and agro-ecological zones**

The soils of the Kalahari Group can be locally classified as feralic Arenosols for a large area of the farm with the remainder comprising of eutric Fluvisols. Arenosols can be described as sandy soils with poor capacity to retain nutrients. These soils are common in arid and semi-arid environments and are associated with flat to undulating topography. Landforms associated with Arenosols are typically dunes, sand plains and sand ridges. Its parent material is aeolian sand.

Fluvisols are described as well drained fine to loamy sand. A Fluvisol is associated with flat to almost flat topography in drainage lines or valley bottoms. Its parent material is alluvial deposits. Figure 7-4 indicate the soil and surface geology of the project area. Surface geology is depicted as sand and calcrete.



**Figure 7-4. Dominant soil and rock types**

#### *Implications and Impacts*

The lack of major surface runoff and drainage may lead to pooling and even flooding of plains during heavy rainfall events which may negatively impact soil quality and crop production.

Irrigation attempts outside of suitable areas may be less productive than alternatives such as livestock farming. This may lead to debushing and habitat destruction ultimately leading to desertification if farming on this land is ceased due to unproductivity.

#### **7.4 GEOLOGY AND HYDROGEOLOGY**

The regional stratigraphic succession of the project area can be divided into geology belonging to the Namibian Age (Damara Sequence), Cambrium Age and Late Cretaceous- to Quaternary Age (Kalahari Group), see Figure 7-5. Kalahari Group surficial deposits occur as overburden of varying thickness over hard rock substrata. Rock outcropping is relatively rare and scattered in the project region.

Although not indicated in Figure 7-5, Naudé (2012) inferred that the subsurface geology of the western section farm Evare no 265 is pre-Damara origin, derived from geophysical-, mapping- and drill-hole data. Pre-Damara geology typically comprise of gneiss, metagranite and granite.

Rocks of the Damara Sequence predominantly make up the bedrock of the project. The Damara Sequence is divided into various tectonostratigraphic zones, the project area being within the Southern Zone. This Zone is characterized as a low temperature-high pressure zone that locally contains formations comprising of schist, graphitic schist, quartzite, marble and calc-silicate of the undifferentiated Nosib and Swakop Group. Swakop Group granite intrusions also occur in the study area.

Moderate folding of the Damara and Pre-Damara Sequence strata occurred during the Pan African Orogeny (680 - 450 Ma) and resulted in the formation of thrusts, synclines and anticlines. Rocks south of the Okahandja Lineament (about 50 km to the northwest) have isoclinal, overturned and thrust fold structures, which can be extended throughout the Southern Zone.

Within the Southern Zone the foliation is mainly northwest-dipping, with a dip angle of 20° to 40° (Goscombe, et al. 2017).

A small extent of Cambrium Age geology comprising of serpentinite, chlorite schist and talc schist is mapped on farm Okasondana no. 264.

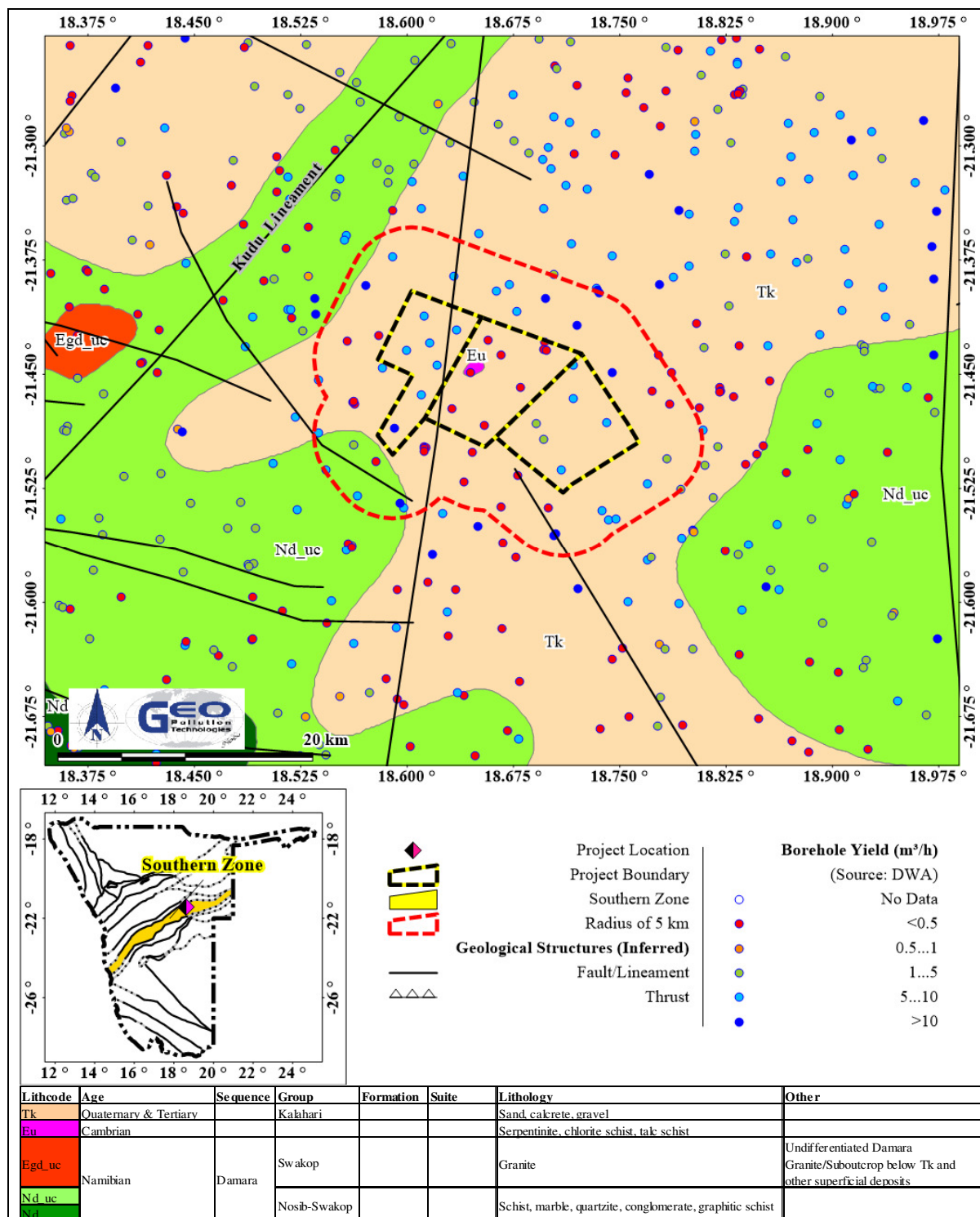


Figure 7-5. Regional geology map (GSN, scale 1:1,000,000)

Late Cretaceous to Quaternary Age Kalahari Group deposits rest unconformably over older pre-Kalahari rock formations and consist of a wide range of terrestrial sediments. These sediments originate mainly from fluvial deposition with some reworking through aeolian processes. The expected thickness of the surficial deposits at the project farms is approximately 50 - 100 m.

Figure 7-5 indicates the dominant geology of the area and boreholes used for irrigation on the farm, as well as boreholes captured in the DWA database, with their yields.

For more detail on the geology refer to the hydrogeology specialist study conducted for this project.


The farms occur in the Omaheke groundwater basin (Figure 7-6). It should be noted that this Groundwater Basin is a management basin and that the actual groundwater basins differ from these boundaries. The project area also fall in the Eiseb-Epukiro Catchment. Groundwater in this catchment generally flows eastward toward the Northern Kalahari/Karoo Basin Transboundary Aquifer system (IGRAC & UNESCO-IHP, 2015) stretching into Botswana (Figure 7-6). The project area is located about 34 km north of the documented groundwater divide as delineated by the southernmost extent of the Eiseb-Epukiro Catchment.

Locally, flow patterns may vary due to groundwater abstraction. Localised groundwater flow occur along preferred flow paths in different directions, but the larger scale groundwater flow is expected to be from west to east toward the Northern Kalahari/Karoo Basin Transboundary Aquifer system. Local groundwater flow is expected to take place through primary porosity in the surface cover (Kalahari Group), while it is expected to flow along fractures, faults, dykes/mineralised faults or along contact zones (secondary porosity) and other geological structures present within the underlying rock formations.

Table 7-4 indicates the groundwater statistics for a radius of 5 km around the project farms. The groundwater information was obtained from Department of Water Affairs (DWA) borehole database. The DWA database is generally outdated and more boreholes might be present. Groundwater is widely utilised in the study area, with a total of 13 boreholes within a 5 km radius. The boreholes were drilled to an average depth of 34 m below surface and yield between 9 and 11 m<sup>3</sup>/h. Groundwater levels within the 5 km radius is generally shallow, varying between 9 and 18 mbs. The groundwater quality falls under Group A with some boreholes having elevated levels of nitrates. The Group A category indicates that the water is of an excellent quality, based on the provided parameters.

According to the Ministry of Agriculture, Water and Forestry (MAWF; 2006) the project is located outside a water control area. Government therefore do not regulate groundwater usage in this area, e.g., drilling, cleaning or deepening of boreholes and rates of water abstraction. However all groundwater remains property of the government of Namibia. See Figure 7-6 for a map indicating the water control areas relative to the project location.

**Table 7-4. Groundwater statistics**

Query Centre: Evare; -21.4301°S; 18.614°E		Query Box Radius: 5.0km										
		NUMBER OF KNOWN BOREHOLES	LATITUDE	LONGITUDE	DEPTH (mbs)	YIELD (m <sup>3</sup> /h)	WATER LEVEL (mbs)	WATER STRIKE (mbs)	TDS (ppm)	SULPHATE (ppm)	NITRATE (ppm)	FLUORIDE (ppm)
Data points		13			11	9	12	2	12	12	12	12
Minimum			-21.385104	18.565662	18	9	9	24	191	4	0	0
Average					34	9	17	24	457	27	10	0
Maximum			-21.475096	18.662338	46	11	18	24	963	82	43	1
Group A					100.00%	11.11%	8.33%	0.00%	100.00%	100.00%	75.00%	100.00%
Limit					50	>10	10	10	1000	200	10	1.5
Group B					0.00%	88.89%	91.67%	100.00%	0.00%	0.00%	0.00%	0.00%
Limit					100	>5	50	50	1500	600	20	2.0
Group C					0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%
Limit					200	>0.5	100	100	2000	1200	40	3.0
Group D					0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	8.33%	0.00%
Limit					>200	<0.5	>100	>100	>2000	>1200	>40	>3

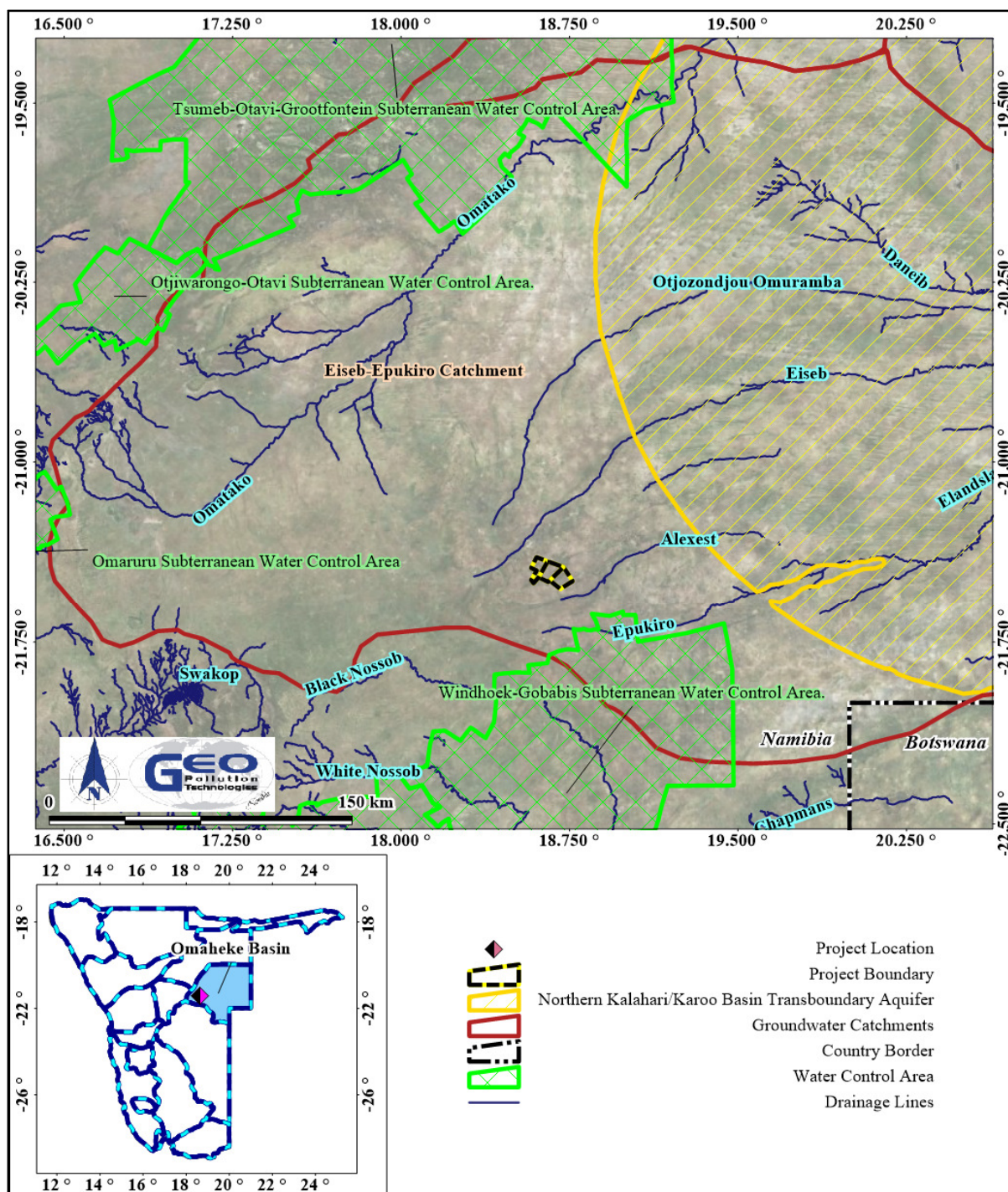
Statistical grouping of parameters is for ease of interpretation, except for the grouping used for sulphate, nitrate and fluoride, which follow the Namibian guidelines for the evaluation of drinking-water quality for human consumption, with regard to chemical, physical and bacteriological quality. In 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 7-6. Groundwater catchments, water control area and transboundary aquifer**

Groundwater quality data is presented in Figure 7-7 as a Maucha Plot. From the figure it is clear that the groundwater of the project location is mostly of a calcium - magnesium - bicarbonate water type which suggest the water is recently recharged. Groundwater to the west and northwest of the project has higher concentrations of magnesium (Mg) and less dominance in calcium (Ca) than the rest of the area. Localised occurrences of water with more dominant sodium (Na), sulphate (SO<sub>4</sub>) and chloride (Cl) concentrations are present mainly to the southeast and southwest of the project area. In the immediate farm area there seems to be an increase in total dissolved solid content, associated with an increase in the chloride (Cl) concentration.

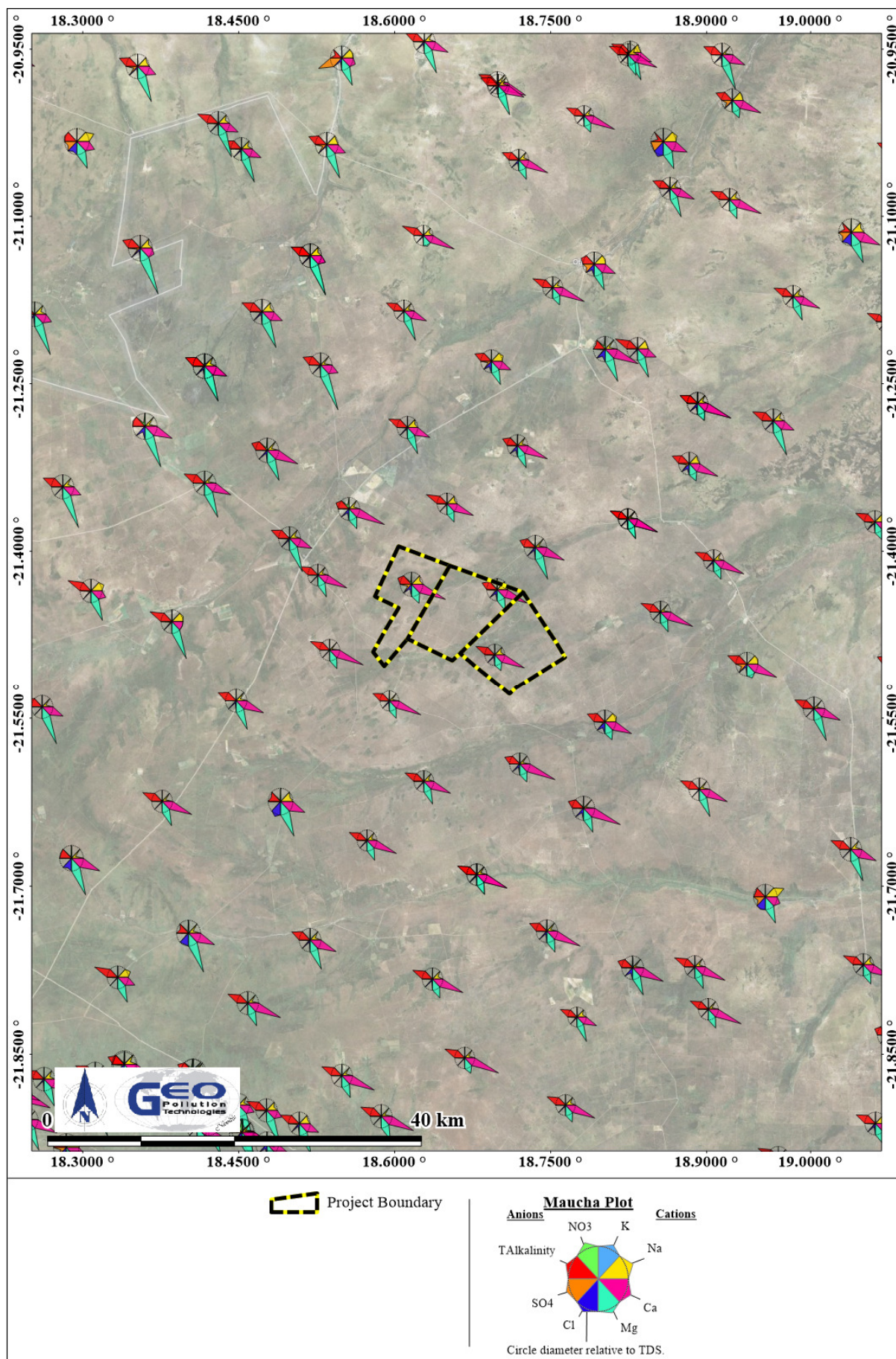


Figure 7-7. Groundwater quality (Maucha Plot)

***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, herbicides and pesticides, which in turn will increase nitrates, herbicide and pesticide concentration in the groundwater.

Over abstraction may also impact on other users of the aquifer.

**7.5 PUBLIC WATER SUPPLY**

Local communities are completely reliant on groundwater as a source of potable water supply. In the nearby settlement of Summerdown and surrounding farm owners supply their own water from various boreholes on their properties. These boreholes tap into the Omaheke groundwater basin, which falls outside of a water control area (permit area).

***Implications and Impacts***

Groundwater is a valuable resource in the area. Groundwater contamination may negatively impact surrounding boreholes, widely utilised for public water supply. No alternative water supply options exist if extensive contamination or deterioration of groundwater occur.

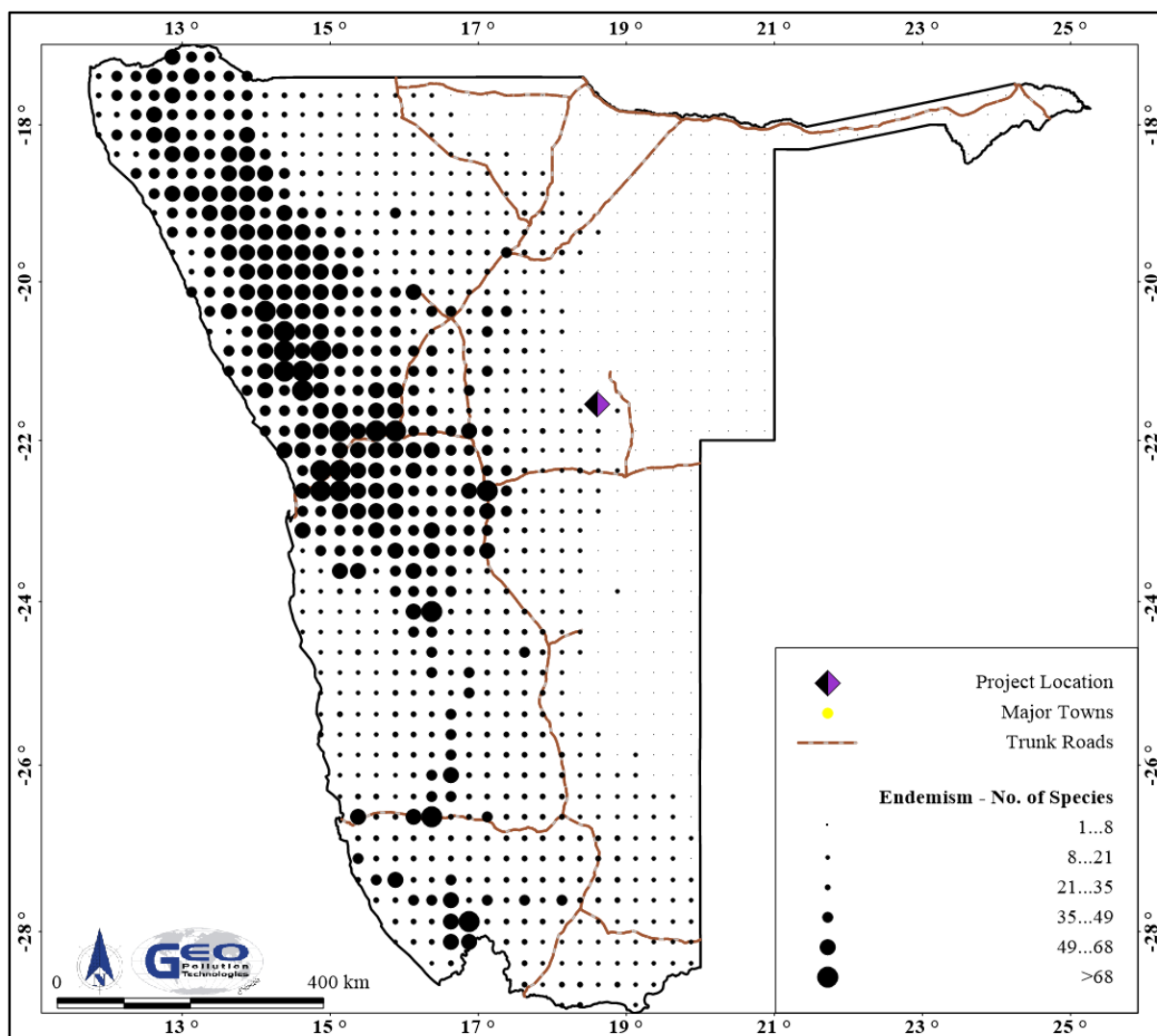
**7.6 ECOLOGY**

The project location is situated in the Savanna Biome with a Central Kalahari vegetation type and shrubland-woodland mosaic structure (Digital Atlas of Namibia, 2002). Vegetation diversity is medium to low with between 100 and 150 plant species (Digital Atlas of Namibia, 2002). The most common trees of the Central Kalahari vegetation type are *Acacia erioloba*, *Acacia mellifera*, *Tarchonanthus camphoratus*, *Grewia flava*, *Ozoroa paniculosa* and *Acacia hebeclada*. Low vegetation diversity is linked to lower animal diversity (Table 7-5), and for both the level of endemism is low. Based on the combined known endemism of selected higher taxa, not more than ten endemic species are expected (Figure 7-8). The farms falls mostly within the 2118BC quarter degree square, with small areas in 2118DA and 2118BD and only a very small corner in 2118DB. An inventory of trees present in these quarter degrees are presented in Appendix C and those with protected status or conservation concerns are presented in Table 7-6. Approximately 50 species of trees have been identified to occur in the area (number will vary depending on the presence of specific species of some alien genera) and five of these are specifically protected by forestry legislation. Four species have invasive tendencies typically associated with irresponsible land use practises such as overgrazing and five species are alien species that typically requires eradication where present.

Animal biodiversity inventories in Namibia are mostly focussed on vertebrates with stronger focus on mammals, reptiles and birds. Furthermore, inventories of animals are often associated with specific areas of interest or frequently travelled roads. Limited detailed information is available for the project area. Mammals of particular importance that may be encountered here include cheetah (*Acinonyx jubatus*), Aardwolf (*Proteles cristatus*), leopard (*Panthera pardus*) bat-eared fox (*Otocyon megalotis*) honey badger (*Mellivora capensis*) African wild dog (*Lycaon pictus*) and brown hyaena (*Hyaena brunnea*). Birds like the Lappet-faced vulture (*Torgos tracheliotus*), White-backed vulture (*Gyps africanus*), African spoonbill (*Platalea alba*), Pearl-spotted owlet (*Glaucidium perlatum*), Wahlberg's eagle (*Aquila wahlbergi*) and Secretary bird (*Sagittarius serpentarius*) may be present in the area. A number of these mammals and birds are listed as threatened by extinction by the IUCN and include cheetahs, leopards and secretary birds (vulnerable), brown hyaena (near threatened), African wild dog, Lappet-faced vulture (endangered) and white-backed vulture (critically endangered) (IUCN 2020).

**Table 7-5. General animal data (Digital Atlas of Namibia, 2002)**

Plant Diversity	100-150 Species
Mammal Diversity	61 - 75 Species
Rodent Diversity	20 - 23 Species
Bird Diversity	111-140 Species
Reptile Diversity	61 - 70 Species
Snake Diversity	30 - 34 Species
Lizard Diversity	24 - 27 Species
Frog Diversity	8 - 11 Species
Termite Diversity	7 - 9 Genera
Scorpion Diversity	6 - 9 Species



**Figure 7-8. Combined higher taxa endemism in Namibia (Digital Atlas of Namibia, 2002)**



**Table 7-6. Trees with conservation concerns in quarter degree squares 2118BC, 2118BD, 2118DA and 2118DB (Curtis & Mannheimer 2005)**

Name	Common Name	Conservation Concerns
<i>Acacia erioloba</i>	Camel-thorn	Protected by forestry legislation
<i>Acacia mellifera</i> subsp <i>detinens</i>	Blue-thorn Acacia	Aggressive invader
<i>Acacia reficiens</i> subsp <i>reficiens</i>	Red-thorn	Very aggressive invader
<i>Albizia anthelmintica</i>	Worm-cure Albizia; Aru	Protected by forestry legislation
<i>Boscia albitrunca</i>	Shepherd's Tree	Protected by forestry legislation
<i>Burkea africana</i>	Burkea	Protected by forestry legislation
<i>Catophractes alexandri</i>	Trumpet-thorn;Rattlepod	Invasive in some areas
<i>Dichrostachys cinerea</i> subsp <i>africana</i>	Kalahari Christmas Tree; Sickle-bush	Invasive in some areas
<i>Melia azedarach</i>	Syringa	Alien and should be eradicated
<i>Opuntia spp</i>	Spiny Cactus; Prickly-pear	Alien and some species are problematic and should be eradicated
<i>Prosopis spp</i>	Prosopis	Alien and invasive in some areas
<i>Schinus molle</i>	Pepper Tree	Alien but not a threat in Namibia
<i>Ziziphus mucronata</i>	Buffalo-thorn	Protected by forestry legislation

***Implications and Impacts***

Agricultural activities of the Proponent have long been established. Poaching and illegal collection of plant and animal material may impact on the local environment. 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. Deep rooted terrestrial plants dependent on groundwater will dry out and eventually die.

**7.7 DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS**

The project area is located in the Okorukambe Constituency of the Omaheke Region. It is located 10 km south of the Summerdown settlement. The constituency has a lower unemployment rate than the Omaheke Region and Namibia as a whole. Demographic information of the 2011 population and housing census is indicated in Table 7-7 (Namibia Statistics Agency, 2011), which includes the details for the Okorukambe Constituency in relation to the National and regional averages.

**Table 7-7. Demographic characteristics of the Okorukambe Constituency, the Omaheke Region and Nationally (Namibia Statistics Agency, 2011)**

	<b>Okorukambe Constituency</b>	<b>Omaheke Region</b>	<b>Namibia</b>
<b>Population (Males)</b>	5,498	37,217	1,021,912
<b>Population (Females)</b>	4,562	34,016	1,091,165
<b>Population (Total)</b>	10,060	71,233	2,113,077
<b>Population density (people/km<sup>2</sup>)</b>	0.5	0.8	2.6
<b>Unemployment (15+ years)</b>	29%	40%	37%
<b>Literacy (15+ years)</b>	65%	73%	89%

The Okorukambe Constituency relies heavily on the agricultural sector in terms of employment, with the sector being the largest contributor to the employment sector (Table 7-8). The economy of the area is built largely on commercial livestock farming supplemented with crop production and charcoal manufacturing. Unemployment is at 29% which is significantly lower than the nearby Otjinene Constituency's 48.9%.

**Table 7-8. Main industry of employed population aged 15 years and above for the Okorukambe Constituency and Omaheke Region**

<b>Main industry</b>	<b>Omaheke Region</b>	<b>Okorukambe Constituency</b>
<b>Total</b>	17,048	3,225
<b>Agriculture Forestry and Fishing</b>	7,692	2,096
<b>Construction</b>	1,236	289
<b>Administrative and Support Service Activities</b>	1,457	195
<b>Public Administration and Defence</b>	1,013	40
<b>Activities of Private Households</b>	1,145	167

The farming unit as a whole provide for a variety of employment opportunities. Although general cattle farming is considered to use unskilled labour, some experience sharing is required to conduct certain tasks. Similarly, skills and training are required to maintain and operate the irrigation systems. The conservation agricultural systems are relatively unique and may be seen as a pioneering enterprise in Namibia. Skills and training related thereto are required from cultivation to marketing of the products. The farming unit as a whole provide more than 10 permanent and 10 seasonal job opportunities of which a portion receives training.

***Implications and Impacts***

Operations on the farm sustain valuable full time as well as seasonal employment opportunities in a constituency that has a high unemployment rate. Some skills development and training also benefit employees during the operational phase.

**7.8 CULTURAL, HERITAGE AND ARCHAEOLOGICAL ASPECTS**

There are no cultural, heritage or archaeological aspects known to be present on the farm.

***Implications and Impacts***

No implications or expected impacts.

**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 notices appeared in the *Republikein* and the *Namibian Sun* on 05 and 12 August 2020. A site notice was placed on site and notification letters were e-mailed to neighbours as well as the local farmers union. See Appendix D for proof of the public participation processes and registered IAPs. Various responses from interested and or affected parties were received. These are detailed in the issues and responses report (Appendix D).

## **9 MAJOR IDENTIFIED IMPACTS**

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During the scoping exercise, a number of potential environmental impacts were identified. The following section provides a brief description of the most important of these impacts.

### **9.1 SOIL AND GROUNDWATER CONTAMINATION**

Soil and groundwater contamination are possible when large quantities of fertilizers or pesticides are applied. Excessive fertilizer use may result in increased soil nutrient levels (i.e. nitrogen, phosphorus and potassium), to a point that soil is regarded as contaminated. Similarly, pesticides can accumulate in soil at levels detrimental to biota. Fertilizers and pesticides can leach deeper into the ground and eventually reach and contaminate groundwater. Chemical spills, inclusive of fertilizers and pesticides, may result in very high but localised contamination of soil, increasing the risk of groundwater pollution if spill clean-up is not performed.

Hydrocarbon pollution, resulting from the spilling of fuel, oil or hydraulic fluids, is possible. Tractor and other vehicle breakdowns, or incorrect refuelling and storage of fuel, are the most likely causes of hydrocarbon pollution.

### **9.2 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 conducted in a sensible way to prevent impacts 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 groundwater over abstraction, see Figure 9-1.

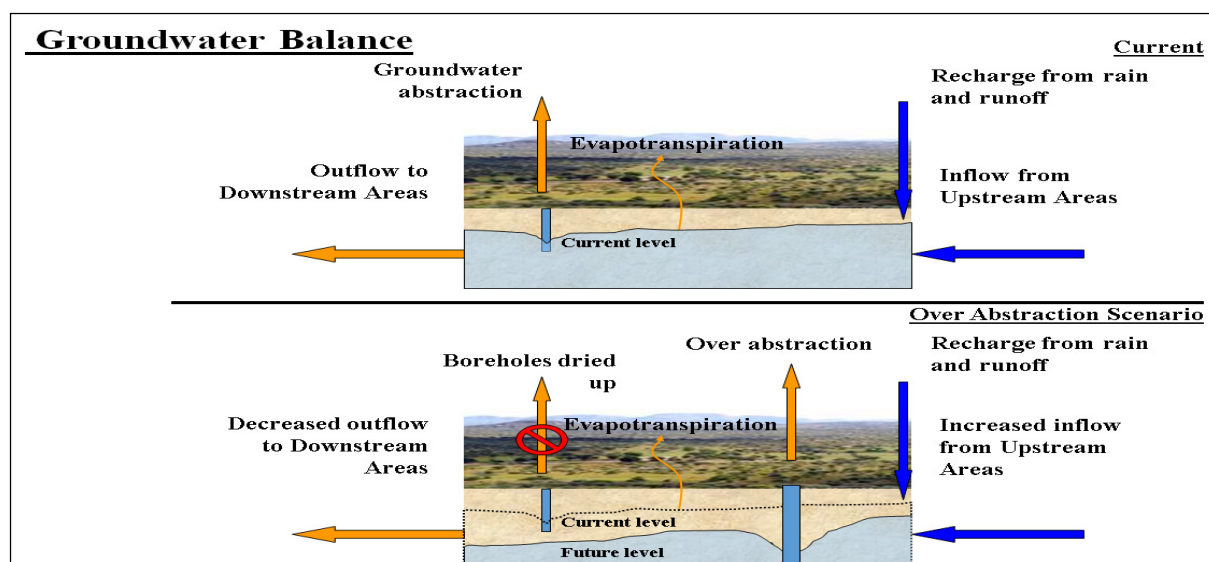
Recharge to the area is considered to be relatively high. In a typical groundwater environment, a water balance would consist of inflow and outflow of the groundwater system. Over time an equilibrium (or steady state) is normally reached with rising water tables following good recharge events and declining 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 alluvial sand and gravel 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 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.

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

It is important to note that the groundwater basin forms a transboundary aquifer that extent from Namibia into Botswana. Over abstraction in any of the countries will have a negative impact on the other countries and can causes disputes.

Based on current water level fluctuations in the area, as presented in the specialist hydrogeology report, 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.



**Figure 9-1. Conceptual groundwater balance with over abstraction scenario**

### 9.3 FIRE

A risk of veld fires exist. Fires, used for example to cook food in areas not designated for this purpose, may spread to the nearby veld. Machinery can ignite dry vegetation if sufficient heat (e.g. exhaust pipes) or sparks are produced. Chemicals and fuels stored and used for general activities may be flammable. Electrical shorts on the electricity supply network can cause fires in buildings. Improper burning of waste and discarding of cigarettes. Lightning can be a natural ignition source for veld fires which in turn can spread and damage infrastructure and crops or pose health impacts.

### 9.4 HEALTH AND SAFETY

Injuries related to working with machinery (e.g. moving parts), chemicals, pesticides, etc. can occur. Inhalation and dermal contact with pesticides are possible where pesticides are for example applied by means of tractor mounted sprayers or via the irrigation system. Spray drift in windy conditions can reach nearby workers or the tractor driver. Vehicle accidents involving staff when transported to and from work, or during movement of machinery like tractors on the farm, can occur. Venomous animals like snakes, scorpions and spiders may be present.

### 9.5 ECOSYSTEM AND BIODIVERSITY IMPACT

No additional land clearing is foreseen for irrigation fields in the near future. Poaching and illegal collection of plant and animal material by staff and/or non-staff members is possible. Pollution of the environment and groundwater, especially by fuel, pesticides and fertilizers, can deteriorate or alter the ecosystem structure and function. Irresponsible pesticide use may negatively impact ecology in the short and long term.

### 9.6 SOCIO-ECONOMIC IMPACTS

The project contribute to food security at a national level and contribute towards a positive trade balance by exporting produce and cattle. Permanent employees and seasonal employees work on the farm. Housing and amenities are available to permanent employees and their families. Proper sanitation facilities are present for all workers.

Existing and planned developments typically entice jobseekers to migrate to the area. This may lead to high levels of unemployment and its associated social ills. This include increased spread of HIV/AIDS and other diseases, alcohol or drug abuse, and theft or violence.

## 10 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 farm. An EMP based on these identified impacts is present 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 10-1).

The environmental classification is calculated as follows:

Environmental classification =  $A1 \times A2 \times (B1 + B2 + B3)$  The environmental classifications of impacts and the respective classes are provided in Table 10-2.

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 10-1. Assessment criteria**

Criteria	Score
<b>Importance of condition (A1) – assessed against the spatial boundaries of human interest it will affect</b>	
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
<b>Magnitude of change/effect (A2) – measure of scale in terms of benefit/disbenefit of an impact or condition</b>	
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
<b>Permanence (B1) – defines whether the condition is permanent or temporary</b>	
No change/Not applicable	1
Temporary	2
Permanent	3
<b>Reversibility (B2) – defines whether the condition can be changed and is a measure of the control over the condition</b>	
No change/Not applicable	1
Reversible	2
Irreversible	3
<b>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.</b>	
Light or No Cumulative Character/Not applicable	1
Moderate Cumulative Character	2
Strong Cumulative Character	3

**Table 10-2. 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

### 10.1 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 farms 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 farms;
- ◆ to prescribe the best practicable control methods to lessen the environmental impacts associated with the farms;
- ◆ 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 mostly be mitigated to have a low significance. The extent of impacts are mostly 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.

### 10.1.1 Planning

During the phases of planning for the operations, maintenance/construction and decommissioning phases of the farms, it is the responsibility of 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 farms remain valid. This includes the consumer fuel 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.
- ◆ Have a system in place to deal with complaints, keeping record thereof and allowing for a grievance mechanism.
- ◆ 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.

### 10.1.2 Skills and Development

During the operations and maintenance/construction phases, some training is provided to a portion of the workforce, to allow them to conduct certain tasks according to the required standards. Training include safety and technical aspects. Skills are transferred to an unskilled workforce for general tasks and irrigation system operation and management. Development of people and technology are key to economic development and the success of operations. The Proponent plays a role in promoting and sustaining the agricultural industry.

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	Probable
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.

##### **Responsible Body:**

- ◆ Proponent

##### **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.



### 10.1.3 Revenue Generation and Employment

Skilled and unskilled labour are required for the operations and maintenance/construction activities associated with the farms. Livelihoods are thus sustained and the spending power of the local community increased. Revenue is generated through the sale of products (maize, wheat and cattle,) 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:**

- ◆ Employee remuneration records be kept.

#### 10.1.4 Demographic Profile and Community Health

Farming activities rely on labour. Jobseekers migrating to the Summerdown area may lead to increased unemployment and expansion of informal settlements. Here, factors such as communicable disease like HIV/AIDS as well as alcoholism and drug abuse may thrive. These are typically aggravated when an influx of seasonal workers, and possible foreign construction teams and contractors, occur. An increase in foreign people in the area, linked to unemployment, may potentially increase the risk of criminal and socially/culturally deviant behaviour. It is however not foreseen that the project will result in significant migration to the Summerdown settlement.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	In-migration and social ills related to foreign contractors temporarily on site	2	-1	1	1	2	-8	-1	Probable
Daily Operations	Social ills possibly associated with staff and jobseekers	2	-1	1	2	2	-10	-2	Probable
Indirect Impacts	The spread of disease	2	-1	2	2	2	-12	-2	Improbable

**Desired Outcome:** To prevent the occurrence of social ills and prevent the spread of diseases such as HIV/AIDS.

#### **Actions:**

##### **Prevention:**

- ◆ Appointment of reputable contractors where applicable.
- ◆ Adhere to all local authority by-laws relating to environmental health, which includes, but is not limited to, sanitation requirements for employees.
- ◆ Provide educational, awareness information for employees on various topics of social behaviour and HIV/AIDS.
- ◆ Disciplinary steps, within the legal parameters of Namibia, to be taken for socially deviant behaviour at the employee-housing compound or during working hours should be clearly stipulated in employment contracts.

##### **Mitigation:**

- ◆ Take disciplinary action against employees not adhering to contractual agreements with regard to socially deviant behaviour (e.g. alcohol or drug abuse during working hours).

##### **Responsible Body:**

- ◆ Proponent

##### **Data Sources and Monitoring:**

- ◆ Summary report based on educational programmes and training conducted.
- ◆ Employee contracts on file.
- ◆ Employee remuneration records be kept.

### 10.1.5 Agricultural Produce

The project is in line with the objectives of Namibia's NDP5 and related implementation plans and strategies. It contributes to the economy of, and food security in, Namibia. It employs mechanised and conservation agriculture technologies. Locally produced crops decrease the amount of crops that needs importing and increases food security in Namibia. Production of crops and cattle for export to international markets strengthens the Namibian economy.

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	3	1	3	3	2	24	3	Definite
Indirect Impacts	Reduced import needs, increase in trade balance, spread of knowledge and skills, increased crop productivity	3	1	3	3	3	27	3	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 products.

**Actions:**

**Enhancement:**

- ◆ Train 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:**

- ◆ Recording of educational programmes and training conducted.

### 10.1.6 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. Security risks relates to unauthorized entry on the farms, 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.
- ◆ 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 (PPE) 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.
- ◆ Record all training which was conducted and when safety equipment and structures were inspected and maintained.

### 10.1.7 Fire

Fires may be ignited in a number of ways. Lightning can be a natural ignition source for veld fires, which in turn can spread and damage infrastructure and crops or pose health impacts. Failing electrical infrastructure and fires outside of designated areas may increase the risk of the occurrence of uncontrolled fires which may spread into the nearby fields and surrounding farms. Similarly machinery can ignite dry vegetation if sufficient heat (e.g. exhaust pipes) or sparks are produced. Chemicals and fuels stored and used for general activities may be flammable. Improper waste burning or discarding of cigarette buds further increases fire risks.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	Fire risk	2	-2	2	2	1	-20	-3	Probable
Daily Operations	Fire risk	2	-2	2	2	1	-20	-3	Probable

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

#### **Actions:**

##### **Prevention:**

- ◆ Prepare a holistic fire protection and prevention plan. This plan must include evacuation plans and signage, an emergency response plan and a firefighting plan.
- ◆ 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

##### **Data Sources and Monitoring:**

- ◆ Maintain a register of all incidents is. Include measures taken to ensure that such incidents do not repeat themselves.
- ◆ Record when fire drills were conducted and when firefighting equipment were tested and training given.

### 10.1.8 Noise

Noise is generated by various operational and possible construction/maintenance activities. Machinery like grinders and hammers 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 farms. The nature of the noise is related to typically operations on a farm with elevated noise levels being of short duration.

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/maintenance 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 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

##### **Data Sources and Monitoring:**

- ◆ WHO Guidelines.
- ◆ Maintain a complaints register.
- ◆ Record any complaints and actions taken to address complaints and prevent future occurrences.

### 10.1.9 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/maintenance waste may include building rubble and discarded material and equipment. Domestic waste will be generated by the residents and employees on the farm. 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 is 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.
- ◆ 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.
- ◆ Train employees on the importance of proper waste handling and disposal in the professional and domestic setting.

##### **Mitigation:**

- ◆ Alternative waste disposal methods should be investigated for hazardous waste or waste that present specific pollution risks. This include transporting such wastes to recyclers in Windhoek when empty trucks travel there to collect goods.
- ◆ Discarded waste should be disposed of and burned regularly 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.
- ◆ Ensure all ablution facilities are connected to properly constructed effluent treatment systems to prevent groundwater contamination.

##### **Responsible Body:**

- ◆ Proponent

##### **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.

### 10.1.10 Ecosystem and Biodiversity Impact

Agriculture and related activities are ongoing at the farms and no expansion is foreseen in the nearby future. However, should the current environmental investigation and operations prove operations and water abstraction feasible, and expansion of current operations may be considered. Such expansion may be included in areas already debused. No further impacts on vegetation are thus expected from additional land clearing. Pollution of the environment may however impact on the ecosystem and biodiversity. Poaching and illegal collection of plant and animal materials may occur. 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.

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.
- ◆ Prevent pesticides from ending up in the hands of potential poachers.
- ◆ 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.
- ◆ Over-abstraction of groundwater may potentially have devastating effects on plant and animal populations reliant on it. This include the drying up of springs, dying of trees and migration or dying of animals.

##### **Mitigation:**

- ◆ For construction/maintenance 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 Ministry of Environment, Forestry and Tourism.
- ◆ Mitigation measures related to waste handling and the prevention of groundwater, surface water and soil contamination should limit ecosystem and biodiversity impacts.
- ◆ Avoid 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:**

- ◆ 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.

### 10.1.11 Groundwater, Surface Water and Soil Contamination

Contamination risks include: leakages and spillages of hazardous substances such as chemicals, fuel and hydraulic oil from vehicles such as tractors. Contamination also relate to increases in nutrient levels in the soil from over application of fertilizers; and over-application of pesticides, resulting in its build-up in soil. Where soil is contaminated, such contaminants can leach into groundwater or run-off into surface water where present.

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 should be stored in a sufficiently bunded area.
- ◆ 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:**

- ◆ Immediately clean any spills that occur and dispose of contaminated material according to the relevant MSDS information.
- ◆ For any major spills a suitably qualified specialist must be consulted on the proper clean-up and rehabilitation methods.

##### **Responsible Body:**

- ◆ Proponent

##### **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.

### 10.1.12 Groundwater Abstraction

The over abstraction of groundwater for irrigation and other activities may lead to declining water levels. This may negatively impact on surrounding users as well as existing habitats that depend on groundwater. For example the availability of groundwater may have an impact on the farm and surrounding farms, as well at a wider spatial scale due to the cumulative impact. Over abstraction of groundwater by surrounding users may contribute to the decline in water levels (cumulative impact). Such an impact may have significant implications for the continued operations of the farms and surrounding enterprises. It is important to note that the groundwater basin forms a transboundary aquifer that extent from Namibia into Botswana. Over abstraction in any of the countries will have a negative impact on the other countries and can causes disputes.

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.

##### **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 water rest water level monitoring.
- ◆ Baseline values should be reviewed every 3 years based on all historic water level data.
- ◆ A summary report on all monitoring results must be prepared.

### 10.1.13 Visual Impact

This impact relates to the aesthetic appearance of the site during operations. This impact will be minimal due to the area already being disturbed and widely utilised for agricultural activities. The impact will therefore mostly relate to poor housekeeping and waste not disposed of timeously. This impact that not only affects the aesthetic appearance, but also the integrity of the farm related infrastructure. De-bushing activities has resulted in aesthetically pleasing rangelands. Well maintained rangelands enhance the original landscape character of the area. The overall visual impact from ongoing activities are positive.

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 farms	1	1	2	2	2	6	1	Probable
Daily Operations	Aesthetic appearance and integrity of the farms	1	1	2	2	2	6	1	Probable

**Desired Outcome:** To enhance the aesthetic appearance associated with the farms.

#### Actions

##### **Enhancement:**

- ◆ 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.
- ◆ Maintenance of rangelands and crop field through implementation of a de-bushing aftercare programme where applicable.

##### **Responsible Body:**

- ◆ Proponent
- ◆ Contractors

##### **Data Sources and Monitoring:**

- ◆ Record all complaints received and actions taken.

#### 10.1.14 Cumulative Impact

Possible cumulative impacts associated with the operational phase and any maintenance/construction activities are grouped in positive and negative impacts. Negative impacts are strongly linked to groundwater quality and groundwater availability seeing that all persons and operations in the area use and are reliant on groundwater. Additional cumulative impact relate to the condition of the road and related traffic impacts, security concerns such as poaching and overall change in biodiversity. Positive cumulative impacts relate to increased national food security, strong contribution to employment in the agricultural sector and region and revenue generation.

Project Activity/Resource	Nature (Status)	(A1) Importance	(A2) Magnitude	(B1) Permanence	(B2) Reversibility	(B3) Cumulative	Environmental Classification	Class Value	Probability
Construction	The build-up of minor impacts to become more significant	2	-1	2	2	1	-10	-2	Improbable
Daily Operations	The build-up of minor impacts to become more significant	2	-1	2	2	1	-10	-2	Probable

**Desired Outcome:** To minimise negative cumulative all impacts associated with the farm while enhancing positive cumulative impacts.

#### 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:**

- ◆ Create a summary report based on all other impacts to give an overall assessment of the impacts of the operational phase.

## 10.2 DECOMMISSIONING AND REHABILITATION

Closure and decommissioning of agricultural and related activities on the farms 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 WHO standards and waste should be contained and disposed in an environmentally safe manner. The EMP for the farms 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.

## 10.3 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; and
- ◆ Periodic (internal and external) audits and reviews of environmental performance and the effectiveness of the EMS.
- ◆ The EMP.

## 11 CONCLUSION

Agricultural and related activities as performed on the farms Okasondana No. 264, Evare No. 265 and Okatjukuri No. 269, contributes positively to the economy of Namibia. Food and fodder is produced for national markets while cattle (beef) is produced for 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 farm, as summarised in Table 11-1, 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 while regular monitoring of water levels and related abstraction be conducted and the results provided the Ministry of Agriculture, Water and Land Reform. 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 10) should be used as an on-site reference document for the operations of the farms. 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 DEA 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.

**Table 11-1. Impact summary class values**

Impact Category	Impact Type	Construction		Operations	
	<i>Positive Rating Scale: Maximum Value</i>	5		5	
	<i>Negative Rating Scale: Maximum Value</i>		-5		-5
EO	Skills and Development	2		2	
EO	Revenue Generation and Employment	2		2	
SC	Demographic Profile and Community Health		-1		-2
EO	Agricultural Produce and Economic Diversification		3	3	
SC	Health, Safety and Security		-2		-2
PC	Fire		-3		-3
PC	Noise		-1		-1
PC	Waste Production		-2		-2
BE	Ecosystem and Biodiversity Impact		-2		-2
PC	Groundwater, Surface Water and Soil Contamination		-2		-2
BE/EO	Groundwater Abstraction				-3
SC	Visual Impact		1		1
	Cumulative Impact		-2		-2

BE = Biological/Ecological    EO = Economical/Operational    PC = Physical/Chemical    SC = Sociological/Cultural

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## **Appendix A: Drilling and Water Abstraction Permit**





REPUBLIC OF NAMIBIA

---

**MINISTRY OF AGRICULTURE, WATER AND FORESTRY**

---

Telephone: (061) 2087111

Fax: (061) 2087227

Enquiries: E Coetzee

Reference: PL 1086

Department of Water Affairs

Private Bag 13193

Windhoek

9000

Mr L Hinze  
P. O. Box 868  
GOBABIS

Dear Sir

**APPLICATION FOR A PERMIT FOR THE ABSTRACTION OF WATER FOR IRRIGATION PURPOSES ON THE FARM EVARE NO. 1086, GOBABIS DISTRICT**

1. The above-mentioned application has been approved. Attached please find permit number 11390 which authorizes the abstraction of water for irrigation purposes.
2. You are kindly requested to comply with all the permit conditions, especially conditions number 4, 5 and 6.

Yours sincerely

  
  
Percy W Misika  
**PERMANENT SECRETARY**

All official correspondence must be addressed to the Permanent Secretary



## REPUBLIC OF NAMIBIA

---

**MINISTRY OF AGRICULTURE, WATER AND FORESTRY**


---

Telephone: (061) 2087111

Department of Water Affairs

Fax: (061) 2087227

Private Bag 13193

Enquiries: E Coetzee

Windhoek

Reference: PL 1086

9000

PERMIT NUMBER: 11390

DATE: 18 September 2018

**PERMIT ISSUED IN TERMS OF REGULATIONS 5 AND 9 OF GOVERNMENT NOTICE R1278 OF 23 JULY 1971 AS PROMULGATED UNDER SECTION 30(2) OF THE WATER ACT, 1956 (ACT 54 OF 1956), AS AMENDED**

---

NAME OF PERMIT HOLDER	:	Mr L Hinze
ADDRESS	:	P. O. Box 868, Gobabis
REGISTERED PROPERTY	:	Farm Evare No. 1086
DISTRICT	:	Gobabis
CONTROL AREA	:	Windhoek- Gobabis-Mariental- Keetmanshoop Artesian Area
VALIDITY PERIOD	:	5 (five) years
BOREHOLES TO BE USED	:	Serial numbers WW 205183-WW 205186
PURPOSE FOR WHICH WATER MAY BE USED	:	Irrigation purposes
ABSTRACTION PER YEAR	:	180 000 m <sup>3</sup> maximum

---

All official correspondence must be addressed to the Permanent Secretary

## 2.

This permit authorizes the holder (or his successors in title) to abstract and use water for the purpose as stated above, from the existing boreholes identified as WW 205183-WW 205186 on the farm planning map, attached as Annexure A, subject to the following conditions:

1. The validity period shall be from 18 September 2018 to 17 September 2023.
2. An application for the extension of the validity period shall be in the possession of the Permanent Secretary at least 6 (six) months before the expiry date of the permit.
3. The permit is incident to the property and if the present owner sells the property, the permit shall be handed over to the new owner.
4. Enclosed please find the number plates for the boreholes. The number plates shall be prominently placed for easy identification of the boreholes. (Do not attached to movables such as the pump or engine or to the concrete block around the casing).
5. All water abstracted shall pass through a water meter and the permit holder shall bear all costs for the supply, installation and maintenance of this meter. The Permanent Secretary shall be informed beforehand if a water meter is to be installed so that an inspection, if necessary, can be conducted. Installation of the meter shall be to the satisfaction of the Permanent Secretary.
6. The permit holder shall keep monthly readings in cubic metres of the above-mentioned water meter and enter it quarterly on the prescribed return form, which shall be submitted on or before the 10th day of the following quarter, in respect of the previous quarter, to the Control Officer: Abstraction Control. If no water was abstracted during a quarter, a nil return form shall be submitted. Should you have inquiries regarding the completion of the above-mentioned form, you may contact the Geohydrology or Law Administration Division at telephone numbers (061) 2087121 or 2087184.
7. The permit holder shall record the water levels of the pumped sources once in three months at a time before the pump is switched on in order to obtain the rest water levels and enter it on the above-mentioned return form.
8. Where a borehole is situated in a riverbed no embankments shall be constructed around the borehole in the riverbed which could result in the river damming up or its normal flow being impeded.
9. All installations, reservoirs, pipes, taps troughs and reticulation systems shall be leak proof to prevent any spillage of water. The permit holder shall take the necessary precautions to use the water on his property to the best advantage.
10. The Permanent Secretary or his authorized representative in consultation with the Minister shall have the right to:
  - (a) withdraw, amend or replace any condition of this permit or withdraw this permit in its entirety, after reasonable notice to the permit holder.
  - (b) inspect the sources and installations at all reasonable times to determine whether the permit conditions are adhered to.

3.

11. The Permanent Secretary shall not accept liability for damage or loss suffered by the permit holder should the relevant sources wane or run dry or the period of validity of the permit not be extended or renewed.
12. Should the permit holder not comply with any of the permit conditions:
  - (a) the Permanent Secretary may seal the boreholes until the conditions are complied with;
  - (b) the permit holder may be held liable for any costs which the Permanent Secretary may incur as a result thereof, and
  - (c) the permit holder shall be guilty of an offence and shall, on conviction, be liable to the penalties prescribed in Section 170 of the Water Act, 1956 (Act 54 of 1956).

  
Percy W Misika  
PERMANENT SECRETARY

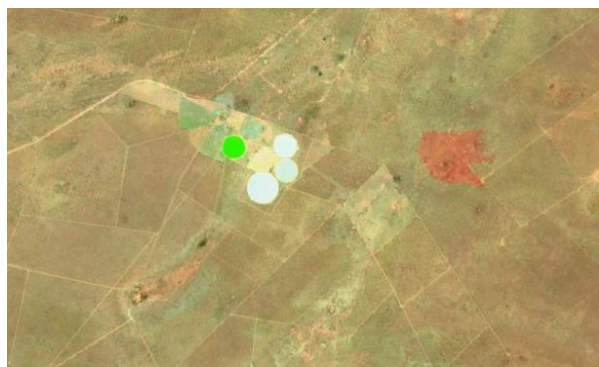




## **Appendix B: Hydrogeological Specialist Study**



**IRRIGATION ACTIVITIES ON FARMS  
OKASONDANA NO. 264, EVARE NO. 265  
AND OKATJUKURI NO. 269, OMAHEKE  
REGION  
HYDROGEOLOGICAL SPECIALIST STUDY**



**Assessed by:**



**Assessed for:**

**Hinze Investments cc**

December 2020



<b>Project:</b>	<b>IRRIGATION ACTIVITIES ON FARMS OKASONDANA NO. 264, EVARE NO. 265 AND OKATJUKURI NO. 269, OMAHEKE REGION, HYDROGEOLOGICAL SPECIALIST STUDY</b>	
<b>Report Version/Date</b>	V1/ December 2020	
<b>Prepared for</b>	Hinze Investments cc P O Box 868 Windhoek Namibia	
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<b>Cite this document as:</b>	Botha P.; Brunette C., December 2020; Irrigation Activities on Farms Okasondana No. 264, Evare No. 265 and Okatjukuri No. 269, Omaheke Region, Hydrogeological Specialist Study.	
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<b>Report Approval</b>	Pierre Botha Managing Director	

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### LIST OF ABBREVIATIONS

<b>CHIRPS-2</b>	Climate Hazards Group Infra-Red Precipitation with Station data version 2
<b>DWA</b>	Department of Water Affairs
<b>EIA</b>	Environmental Impact Assessment
<b>EMP</b>	Environmental Management Plan
<b>EMS</b>	Environmental Management System
<b>GPT</b>	Geo Pollution Technologies
<b>ha</b>	Hectare
<b>IGRAC</b>	International Groundwater Resources Assessment Centre
<b>m/s</b>	Metre per second
<b>Ma</b>	Million years
<b>mamsl</b>	Meters Above Mean Sea Level
<b>MAWLR</b>	Ministry of Agriculture, Water and Land Reform
<b>MAR</b>	Magnesium Adsorption Ratio
<b>mbs</b>	Metres below surface
<b>MEFT</b>	Ministry of Environment, Forestry and Tourism
<b>mm/a</b>	Millimetres per annum
<b>Mm<sup>3</sup></b>	Million cubic metres
<b>SRTM</b>	Shuttle Radar Topography Mission
<b>TPA</b>	Test Pump Analyses
<b>UNESCO-IHP</b>	UNESCO International Hydrological Programme

## 1 INTRODUCTION

Geo Pollution Technologies (Pty) Ltd was appointed by Hinze Investments cc (the Proponent) to undertake a hydrogeological specialist study for irrigation activities on farm Okasondana no. 264, Evare no. 265 and Okatjukuri no. 269, adjacent to the D1628 district road in the Omaheke Region (Figure 1-1). Hinze Investments cc has cleared 600 ha, of which 82 ha is under irrigation and the remainder dryland cropping. Of the existing 82 ha irrigated land, 36 ha is irrigated during one planting season, on a rotational basis, while the remaining 46 ha is left fallow (uncropped). Planned future crop cultivation diversification will consider an additional 152 ha of which about 56 ha will be irrigated. The main produce are maize, oats and wheat, while potatoes, onions and vegetables are considered for future farming diversification. Irrigation is from production boreholes, by means of centre pivot irrigation systems. Additional activities performed include livestock farming.

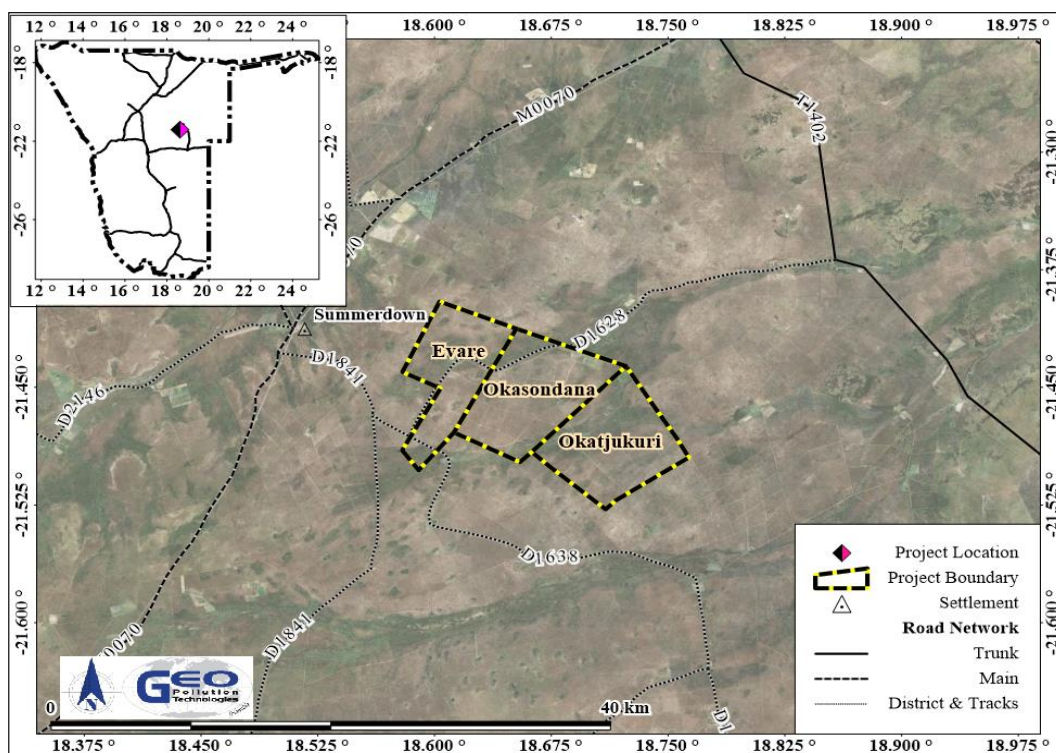


Figure 1-1. Project location

## 2 SCOPE OF WORK

The aims of the study were to:

1. Conduct a hydrogeological assessment based on a hydrocensus-survey of the project area.
2. Gather historic information and compile a hydrogeological assessment based on the information.

## 3 METHODOLOGY

Available geological and hydrogeological information/reports for the investigation area were obtained and reviewed. The hydrogeological catchment and sub-catchments within the investigation area were reviewed and delineated. This was based on historic groundwater level data contained in the Department of Water Affairs (DWA) database and on hydrocensus data done on behalf of the proponent. Satellite imagery such as SRTM 30 m data (Shuttle Radar Topography Mission) was utilised for the catchment delineation and elevation mapping purposes. Utilizing the various data sources, a specialist report for the investigation was prepared.



## 4 LEGAL

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 study.

**Table 4-1. Namibian law applicable to the project**

Law	Key Aspects
<b>The Namibian Constitution</b>	<ul style="list-style-type: none"> <li>◆ Incorporate a high level of environmental protection.</li> <li>◆ 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.</li> </ul>
<b>Environmental Management Act</b> Act No. 7 of 2007, Government Notice No. 232 of 2007	<ul style="list-style-type: none"> <li>◆ Defines the environment.</li> <li>◆ Promote sustainable management of the environment and the use of natural resources.</li> </ul>
<b>The Water Act</b> Act No. 54 of 1956	<ul style="list-style-type: none"> <li>◆ Defines the interests of the state in protecting water resources.</li> <li>◆ Defines and prohibits pollution of water resources.</li> <li>◆ Controls the disposal of effluent.</li> <li>◆ Whenever an owner of land obtains, by artificial means on his own land, a supply of water which is not derived from a public stream, such water shall be deemed to be private water.</li> <li>◆ Remains in force until the new Water Resources Management Act comes into force.</li> </ul>
<b>Water Resources Management Act</b> Act No. 11 of 2013	<ul style="list-style-type: none"> <li>◆ Provide for management, protection, development, use and conservation of water resources.</li> <li>◆ Prevention of water pollution and assignment of liability.</li> <li>◆ Not in force yet.</li> </ul>
<b>Soil Conservation Act</b> (Act No. 76 of 1969)	<ul style="list-style-type: none"> <li>◆ 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.</li> </ul>

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

- 8.1 The abstraction of ground or surface water for industrial or commercial purposes.
- 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 the act defining such a threshold, if any, is not known. The Water Resources Management Act (Act No. 11 of 2013) is likely to define such a threshold and it is expected to make the whole of Namibia a water control area in which abstraction permits would be required. The current Water Act (Act No. 54 of 1956) only requires abstraction permits within water control areas, see Figure 5-1. Abstraction permits are currently issued by the Ministry of Agriculture Water and Land Reform (MAWLR). The project falls outside a control area, thus an abstraction permit is not required.

Within the Water Act (Act No. 54 of 1956) 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 also questionable. It however remains important to consider all activities that would/may impact on the groundwater.

## 5 DESCRIPTION OF NATURAL ENVIRONMENT

### 5.1 LOCALITY AND SURROUNDING LAND USE

The project (21.4301 °S; 18.614 °E) is located approximately 10 km east of Summerdown, along the D1628 district road in the Gobabis District. All adjacent properties are farms and land use consists of agriculture. The farms occur in the Omaheke Groundwater Basin. It should be noted that this groundwater basin is a management basin and that the actual groundwater basins differ from these boundaries. The project area forms part of the Northern Kalahari/Karoo Basin Transboundary Aquifer (IGRAC & UNESCO-IHP, 2015), see Figure 5-1.

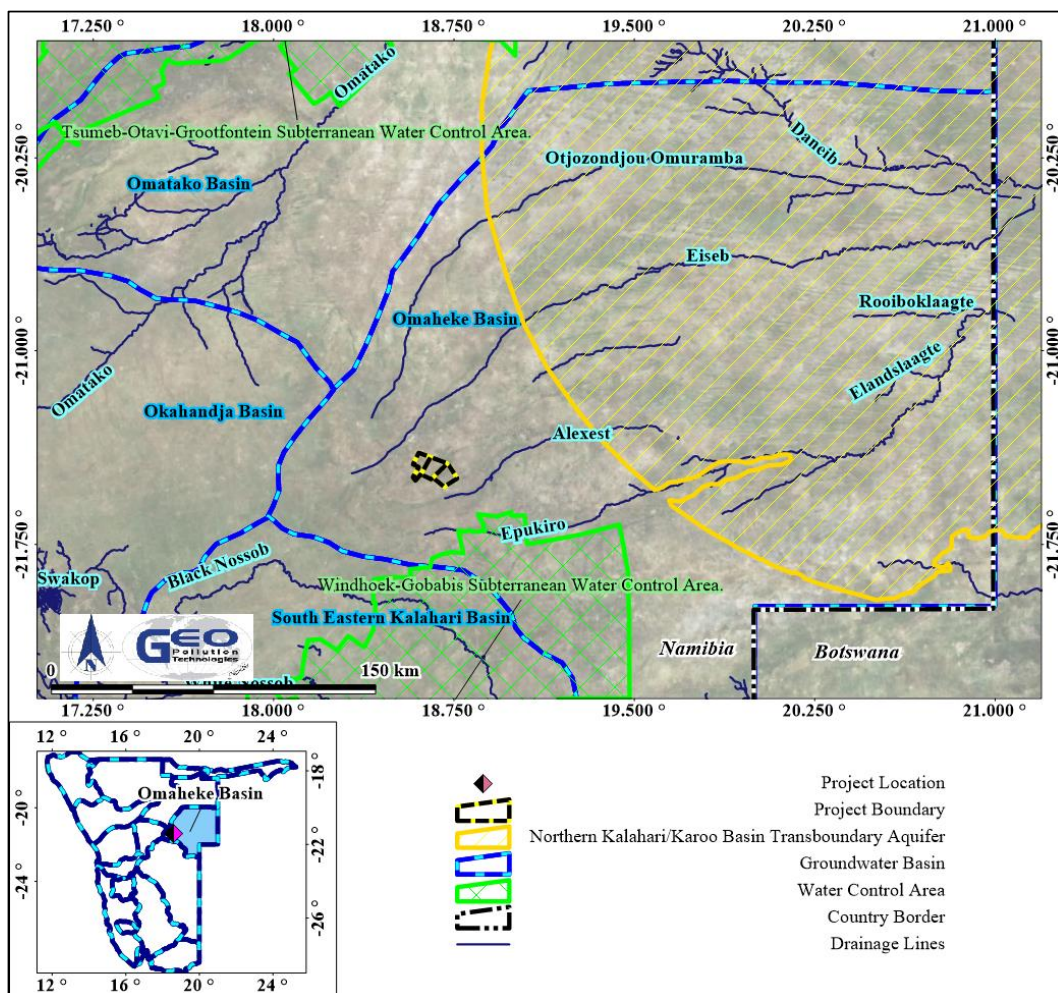


Figure 5-1. Groundwater basins, water control areas and transboundary aquifer

## 5.2 CLIMATE

Long term climate data was obtained from Atlas of Namibia Project (2002) and the CHIRPS-2 database (Funk et al., 2015), see Figure 5-2, Table 5-1 and Table 5-2. Atlas of Namibia Project (2002) data was compiled from almost 300 rainfall stations across Namibia, the data was contoured in 50 mm intervals prior to 1999 for variable length data sets. The CHIRPS-2 dataset (Climate Hazards Group Infra-Red Precipitation with Station data version 2) consists of long term rainfall data (1981 to near-present) obtained from satellite imagery and in-situ station data.

The project area is situated in a semi-arid climatic region. Days are mostly warm with very hot days during the summer months, while nights are generally cool. The rain season normally starts in October and last until May, peaking in January and February. Heavier rainfall (single day events) occur between November and April, with a single event of 76 mm in April (last 39 years data) being the highest. This is an obvious anomaly with most of the single day maximums being less than 50 mm.

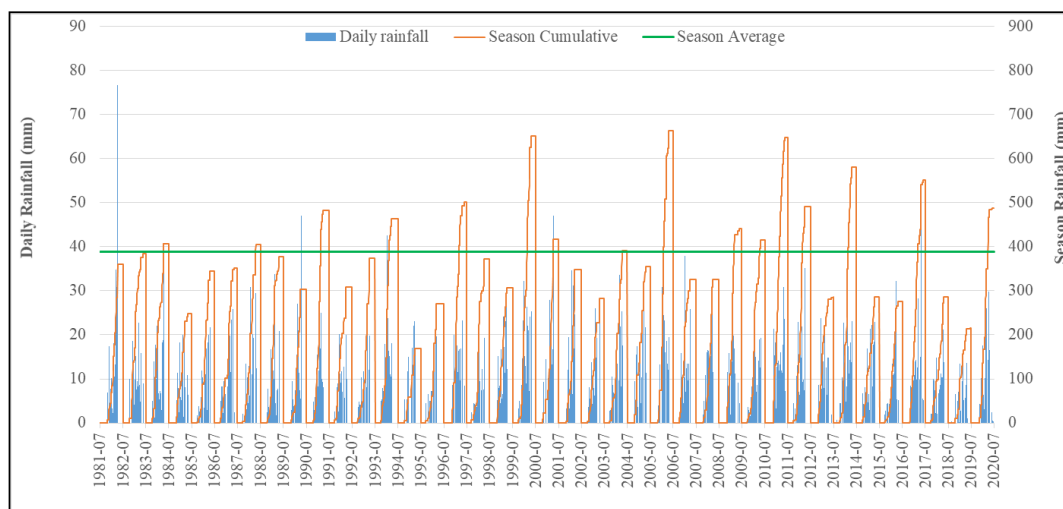
The average annual rainfall for the last 39 years was calculated as 388 mm/a, with a coefficient of variance of 30% (Table 5-2). This coefficient of variance seem to correlate with Atlas of Namibia Project data (Table 5-1). Daily and seasonal rainfall data (Funk et al., 2015) is presented in Table 5-2. Seasonal (July to June) total rainfall, centred on the average line for the last 39 years, is presented, with the daily total rainfall and the seasonal cumulative rainfall. From the figure it is clear that from 2010 to 2020 six seasons received above average rainfall, namely 2009-2010, 2010-2011, 2011-2012, 2013-2014, 2016-2017 and 2019-2020. The rest were all below average with the driest year (last 39 years data) being 1994-1995, followed by 2018-2019. The 2018-2019 rain season is part of a dry period of July 2017 to June 2019.

**Table 5-1. Summary of climate conditions (Atlas of Namibia Project, 2002)**

<b>Variation in annual rainfall (%)</b>	30-40
<b>Average annual evaporation (mm/a)</b>	2,800-3,000
<b>Water deficit (mm/a)</b>	1,501-1,700
<b>Temperature (°C)</b>	20-21

**Table 5-2. Rainfall statistics (Funk et al., 2015)**

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Minimum (mm)</b>	15.8	22.1	19.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Maximum (mm)</b>	295.8	193.9	126.5	128.2	13.6	2.6	0.9	0.7	9.1	39.7	93.2	159.3
<b>Average (mm)</b>	87.3	82.5	66.8	33.0	1.7	0.2	0.0	0.0	1.8	11.6	38.2	65.3
<b>Daily maximum (mm)</b>	42.5	33.7	35.1	76.6	9.1	2.6	0.9	0.7	4.5	15.9	23.8	37.9
<b>Average rain days</b>	10	9	6	2	0	0	0	0	1	3	6	8
<b>Season July - June average: 388 mm</b>					<b>Coefficient of variation: 30 %</b>							
<b>Data range</b>	1981-Jul-01 to				2020-Jun-30				Lat: -21.4301°S Long: 18.614°E			



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

### 5.3 TOPOGRAPHY & DRAINAGE

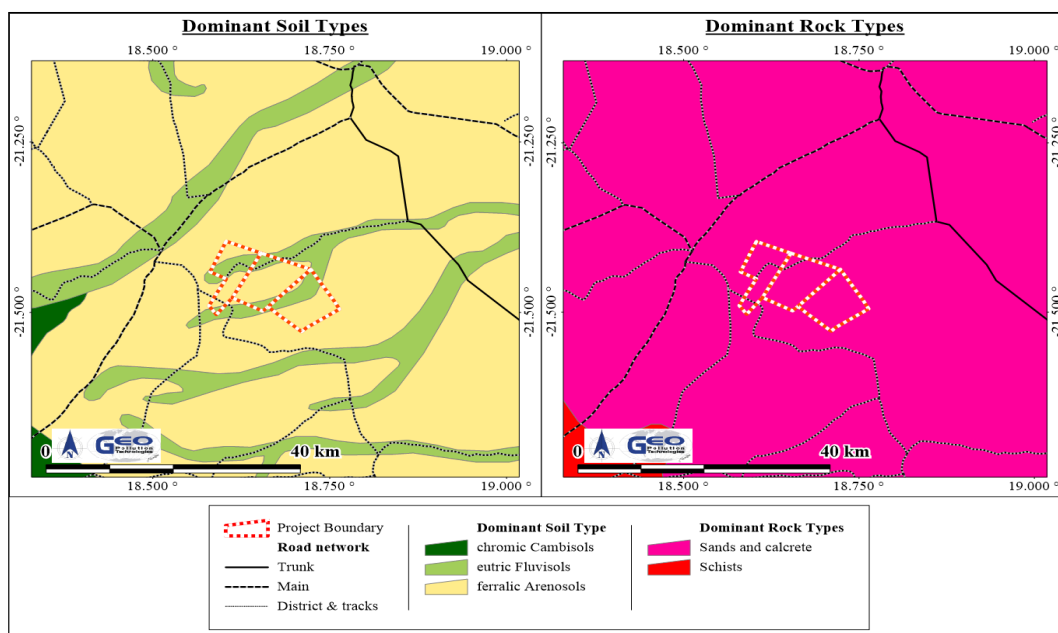
The general topography of the project area can be described as relatively flat, with the elevation decreasing towards the east. Regional surface runoff is therefore generally directed toward the east. The project area forms part of the Kalahari Sandveld landscape known for its palaeo dunes and pans, which can be observed in the larger study area.

Regionally, the project falls in the catchment of the Okavango River. Locally, surface runoff collects in the Eiseb and Alexest Rivers, which is located about 9 km northwest and 7 km southeast of the project respectively. However, local drainage is expected to drain more towards the east to the Alexest River. The Alexest River flows downstream into the Epukiro River which flows toward Lake Ngami south of the Okavango Delta.

### 5.4 SOILS

The soils of the Kalahari Group can locally be classified as feralic Arenosols for the most of the area of the farms. Arenosols can be described as sandy soils with poor capacity to retain nutrients. These soils are common in arid and semi-arid environments and is associated with flat to undulating topography. Landforms associated with Arenosols are typically dunes, sand plains and sand ridges. Its parent material is aeolian sand.

Fluvisols is described as well drained fine to loamy sand. A Fluvisol is associated with flat to almost flat topography in drainage lines or valley bottoms. Its parent material is alluvial deposits. Figure 5-3 indicate the soil and surface geology of the project area. Surface geology is depicted as sand and calcrete.



**Figure 5-3. Dominant soil and rock type (Atlas of Namibia Project, 2002)**

### 5.5 GEOLOGY AND HYDROGEOLOGY

The regional stratigraphic succession of the project area can be divided into geology belonging to the Namibian Age (Damara Sequence), Cambrium Age and Late Cretaceous- to Quaternary Age (Kalahari Group), see Figure 5-4. Kalahari Group surficial deposits occur as overburden of varying thickness over hard rock substrata. Rock outcropping is relatively rare and scattered in the project region.

Although not indicated in Figure 5-4, Naudé, (2012) inferred that the subsurface geology of the western section of farm Evare no. 265 is pre-Damara origin as derived from geophysical-, mapping- and drill-hole data. The pre-Damara geology typically comprise of gneiss, metagranite and granite.

Rocks of the Damara Sequence predominantly make up the bedrock of the project. The Damara Sequence is divided into various tectonostratigraphic zones, the project area being within the Southern Zone, see Figure 5-4 and Figure 5-5. This zone is characterized as a low temperature-high pressure zone that locally contains formations comprising of schist, graphitic schist, quartzite, marble and calc-silicate of the undifferentiated Nosib and Swakop Group. Swakop Group granite intrusions also occur in the study area.

Moderate folding of the Damara and Pre-Damara Sequence strata occurred during the Pan African Orogeny (680 - 450 Ma) and resulted in the formation of thrusts, synclines and anticlines. Rocks south of the Okahandja Lineament (about 50 km to the northwest) have isoclinal, overturned and thrust fold structures, which can be extended throughout the Southern Zone. Within the Southern Zone the foliation is mainly northwest-dipping, with a dip angle of 20° to 40° (Goscombe et al., 2017).

A simplified structural profile across the Damara Belt is provided in Figure 5-5 with the approximate location of the project. 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.

A small extent of Cambrium Age geology comprising of serpentinite, chlorite schist and talc schist is mapped on farm Okasondana no. 264.

Late Cretaceous to Quaternary Age Kalahari Group deposits rest unconformably over older pre-Kalahari rock formations and consist of a wide range of terrestrial sediments. These sediments originate mainly from fluvial deposition with some reworking through aeolian processes. The expected thickness of the surficial deposits at the project farms is approximately 50 - 100 m (Klock, 2001). The borehole completion sheets for WW2824, WW2827 and WW2828, located 8 to 13 km northeast of the project boundary, indicate that bedrock was not intercepted its entire depth. WW2824, WW2827 and WW2828 have drill depths of 59.4, 61.9 and 54.9 mbs.

The onset of Kalahari Group sedimentation is assumed to have started during the late Cretaceous (~ 65 Ma) when isostatic uplift of the continental margin of Namibia and South Africa started (Klock, 2001). Isostatic uplift led to the uplift of coastal escarpments and the evolution of the intracontinental hinterland basin where down warping took place. This down warping caused a change in drainage patterns into the Kalahari Basin that formed.

Rivers crossing the escarpment subsequently underwent rejuvenation due to the increase in drainage gradient with subsequent increased erosion. Rivers draining into the Kalahari Basin had a lower drainage gradient and therefore caused sedimentation in the flatter terrain. Figure 5-6 illustrates the Kalahari Basin with a profile indicating the escarpment and interior down warp. This profile example extend from the Atlantic Ocean through the Windhoek Municipal area toward the eastern border of Botswana. Elevation was obtained from SRTM 30 m data.

Terrestrial sediments tend to vary significantly between the stratigraphically equal units in the regional setting of the Kalahari Group. Within the Kalahari Group, a general upward-fining trend of the clast-population and an upward decrease in clast abundance are observed (Klock, 2001), consisting of the basal Tsumkwe Formation, overlying Eiseb Formation, overlying Omatako Formation and most recent Aeolian Unit.

The project is located near the southwestern edge of the Omatako Basin of the Kalahari Basin deposit area. It is expected that the Tsumkwe Formation is locally absent with only the Eiseb Formation and overlaying formations being present. The Eiseb Formation geology is dominated by alternating fluvial sands, carbonate deposits and pebble horizons. The Omatako Formation consists of a narrow unit of fluvial sand and ferruginous soil. Aeolian sand overlies the older geology, inter-fingering with inter-dune deposits. Palaeochannels present in these formations might cause local lateral changes over short distances.

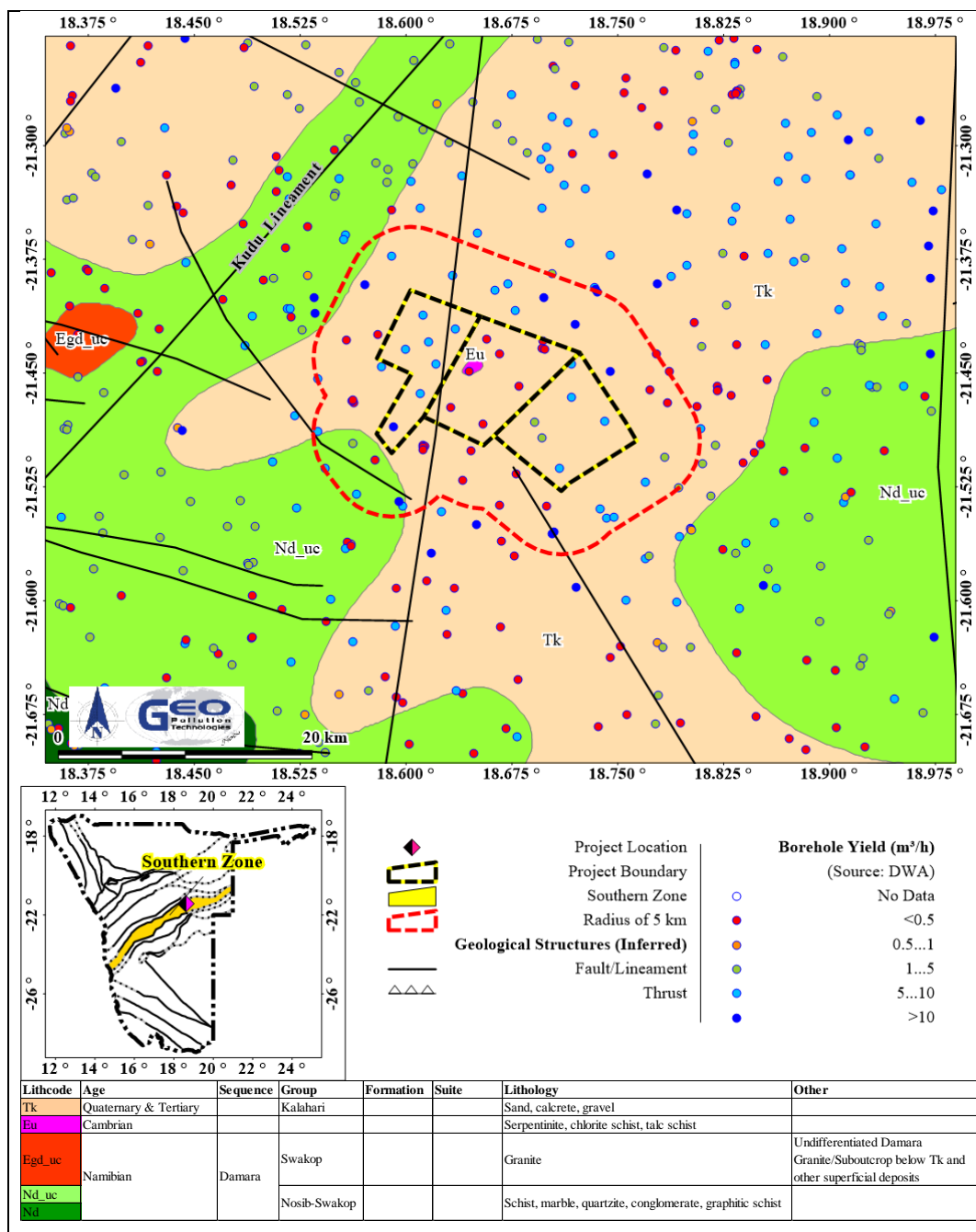


Figure 5-4. Geology map (GSN, scale 1:1,000,000)

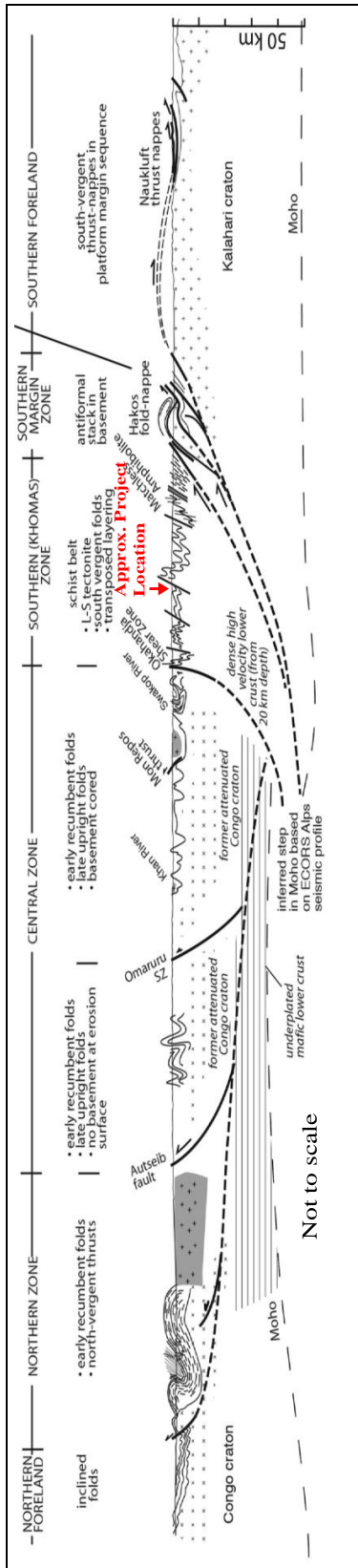


Figure 5-5. Simplified structural profile across the Damara Belt of Namibia (Goscombe et al., 2017)

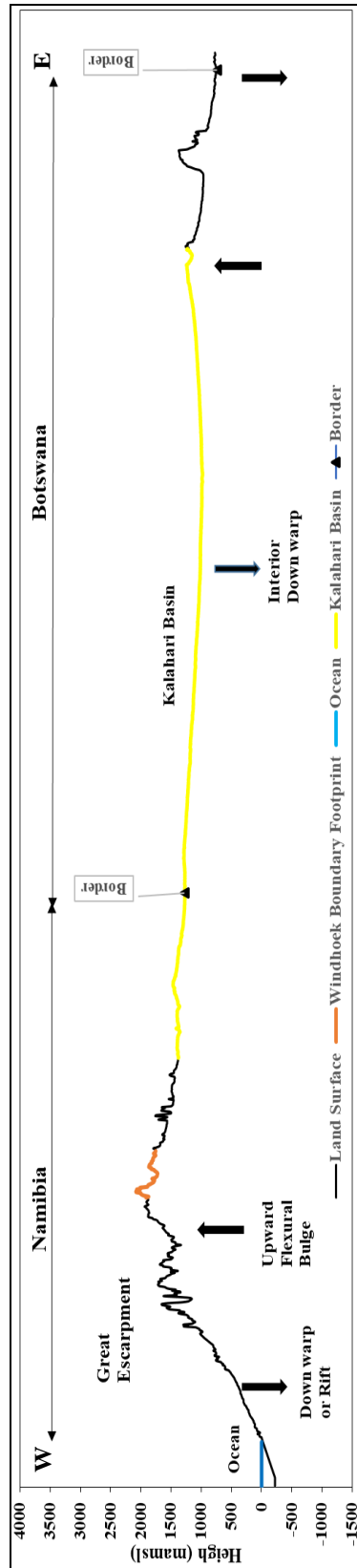


Figure 5-6. Profile across central Namibia and Botswana



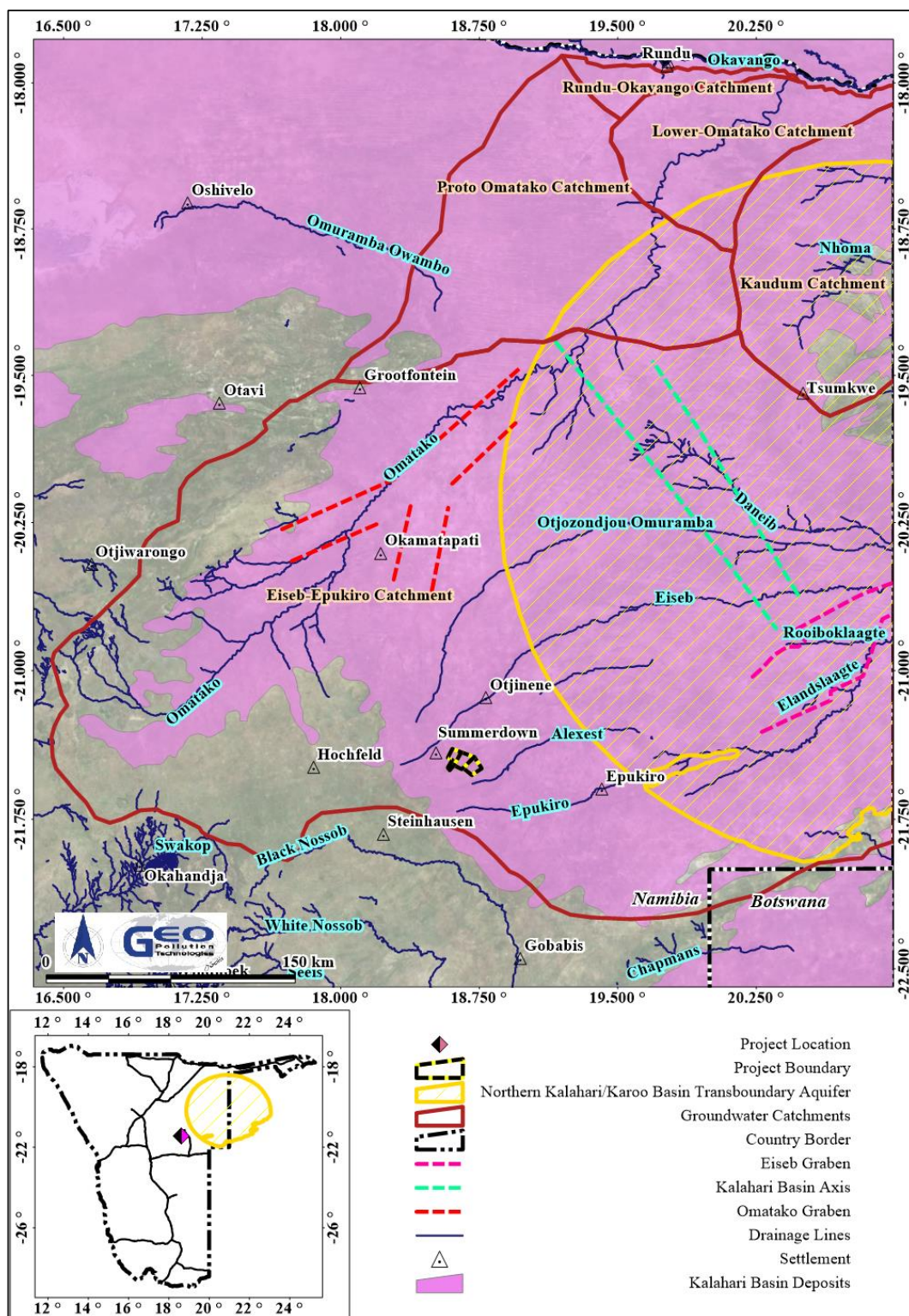
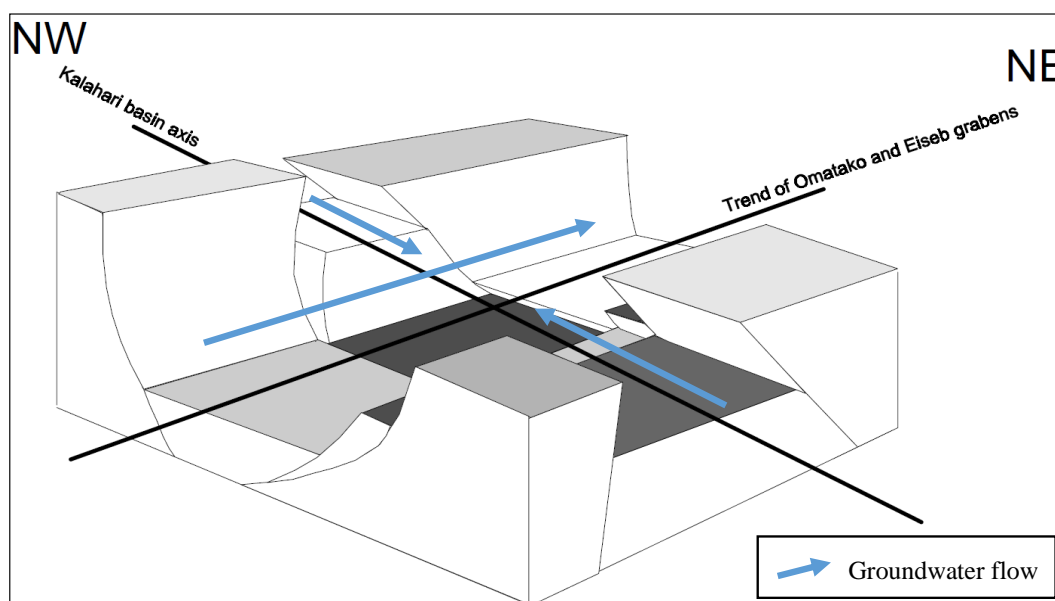


Figure 5-7. Groundwater catchments (Klock, 2001), transboundary aquifer (IGRAC & UNESCO-IHP, 2015) and Kalahari Basin Deposits

A groundwater basin for the area was determined through the calculation of water levels above mean sea level using borehole data contained in the DWA borehole database (Klock, 2001). The project area falls in the Eiseb-Epukiro Catchment, named after the Epukiro and Eiseb Rivers which flow in a similar direction as the groundwater, see Figure 5-7. Groundwater in this catchment generally flows eastward across the Botswana border in the Northern Kalahari/Karoo Basin Transboundary Aquifer system stretching the Namibian border.

Regionally, northwest - southeast and southwest - northeast depocenters occur in the area. Northwest - southeast trending depocenters are related to the uplift of the continental margin, as illustrated in Figure 5-8. An example of such a structure feature in Namibia is the Kalahari Basin axis as illustrated in Figure 5-7 and Figure 5-8. This feature is related to compressional tectonics that take place during the interior down warping.

Depocenters that trend southwest - northeast, like that of the Eiseb Graben, are related to rifting and extensional tectonics. This feature forms part of the larger Okavango Rift Zone, a still active tectonic setting thought to represent an extension of the East African Rift System which started during the Oligocene. The Eiseb Graben is the westernmost extension of the Linyanti and Gomare Fault (Stadtler et al., 2005). According to Klock (Klock, 2001), northeast trending graben structures (e.g., Omatako and Eiseb Graben) developed along Damara pre-weakened crustal structures and are recently reactivated. Figure 5-8 represents the schematic profile of the depocenters in the region (Klock, 2001). Both these depocenters formed during and after deposition of Kalahari sediments, placing such sediments deeper than in the surrounding areas.

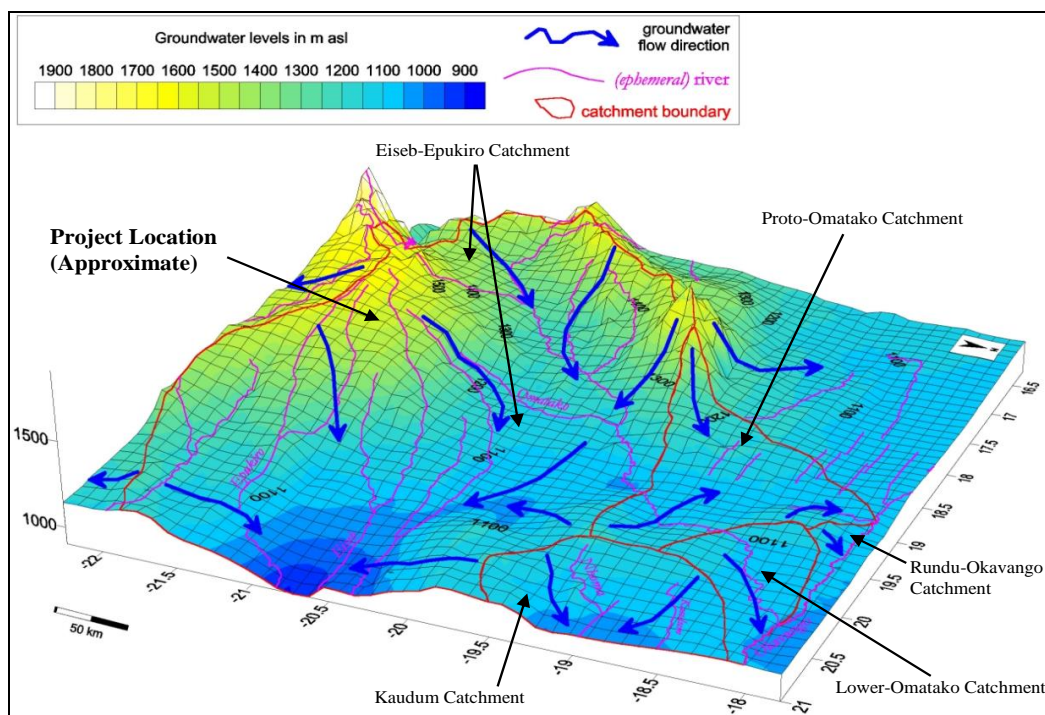


**Figure 5-8. Schematic profile of extensional (southwest striking) and compressive (northwest striking) depocenters (after Klock, 2001)**

A northeast-striking graben feature straddling the Namibian and Botswana border, namely the Eiseb Graben, occurs within the transboundary aquifer setting. Due to the depth of the sediments in the graben structure, favorable groundwater conditions occur (Eiseb Graben Aquifer). The thickness of alluvial filling tends to be more towards the eastern extent of the Eiseb Graben.

Groundwater recharge to the Eiseb Graben Aquifer is assumed to take place through lateral flow from localized aquifers in the main ephemeral rivers (Eiseb, Rooiboklaagte and Epukiro) that make up the catchment of the Eiseb Graben. Recharge is also assumed to take place through lateral flow from localized aquifers in surrounding Kalahari Group deposits. Groundwater flow is generally projected towards Lake Ngami to the east (Margane et al., 2004). Figure 5-9 indicates

the approximate project location relative to the groundwater flow within the Eiseb-Epukiro Catchment. The extent of the groundwater catchment can be correlated to Figure 5-7.



**Figure 5-9. Groundwater flow and groundwater sub-catchments (adapted from Klock, 2001) relative to project location**

Locally, flow patterns may vary due to groundwater abstraction and due to geological constraints, but the larger scale groundwater flow is expected to be from west to east towards the Eiseb Graben Aquifer. Local groundwater flow is expected to take place through primary porosity in the surface cover (Kalahari Group), while it is expected to flow along fractures, faults, dykes/mineralised faults or along contact zones (secondary porosity) and other geological structures present within the underlying rock formations.

A profile was made through boreholes WW21223, WW10210, WW204963, WW204964, WW30530, WW28819, WW200054 and WW200053 to review the regional water level changes in the basin (Figure 5-10). The orientation of the profile is mainly directed down gradient toward the Eiseb Graben and has a length of about 450 km (Figure 5-11). Boreholes WW21223 and WW10210, are located near Seeis and Omitara respectively, in the South Eastern Kalahari groundwater basin. Boreholes WW204963 and WW204964 are located within the Eiseb-Epukiro Catchment (Omaheke Basin) and near the groundwater divide. Boreholes WW30530 and WW28819 are located near the Epukiro settlement and WW30530 forms part of the Epukiro Pos 3 NamWater scheme (Du Plessis, 2020). Boreholes WW200054 and WW200053 are located within the Eiseb Graben.

Regional water level monitoring data, sourced from the MAWLR - DWA, is presented in Figure 5-12. Monthly and seasonal (July to June) CHIRPS-2 rainfall data (Funk et al., 2015) is also presented in Figure 5-12. The locations of the selected monitoring boreholes are presented in Figure 5-11.

Borehole WW21223 is situated in a different groundwater basin than that in which the project is located. Water level monitoring in this borehole started in July 1975 and ended in March 2018. The historic water level in the borehole ranges between 1.96 to 5.28 mbs. This borehole was drilled near the Seeis River and rely on the primary porosity from the sands in the river. A nearby

NamWater scheme may impact on water levels in this area. From Figure 5-12 it is evident that the water level in this borehole has a saw tooth pattern with a generally stable trend due to sufficient recharge from the Seeis River.

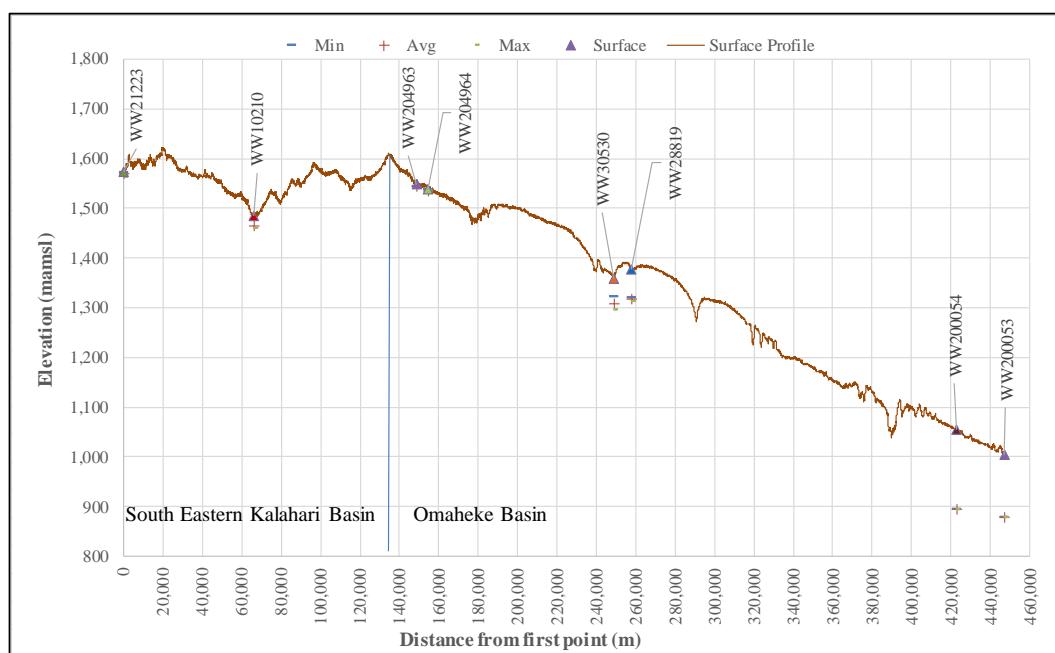
WW10210 is situated about 20 km east of the settlement of Omitara, and 500 m southwest of the White Nossob River. Data from this borehole is available from July 1985 up to June 2020, with some data gaps. The water level shows a slight downward trend, but a noticeable level increase is present during 2011, corresponding with a high rainfall season. After this, the water level generally decreased over time.

Water level data of both boreholes WW204963 and WW204964 is available from November 2014 to June 2020, including some data gaps. During the short period no major changes were noted in the water level of the boreholes. These two boreholes are located near the documented groundwater divide (southern extent of Eiseb-Epukiro Catchment).

Borehole WW30530 is part of the NamWater Epikiro Post 3 water supply scheme and is probably impacted by abstraction from this scheme. The water level here seems to have a general increase in level with a good correlation between its responses and above average rainfall seasons like in 2000, 2006 and 2011.

Borehole WW28819 is located near the NamWater Epikiro Post 10 water supply scheme and is probably impacted by abstraction from this scheme. The water levels of WW28819 generally has a slight rise in level with less clear responses to above average rainfall seasons, as compared to data from WW30530.

Water levels at WW200053 and WW200054 are the deepest in the profile suggesting flow towards these boreholes. Both boreholes are located in the Eiseb Graben. Very little data is available for these two boreholes. Both boreholes generally have stable water level conditions with no clear response to above average rainfall seasons.



**Figure 5-10. Regional surface elevation profile with water level information**

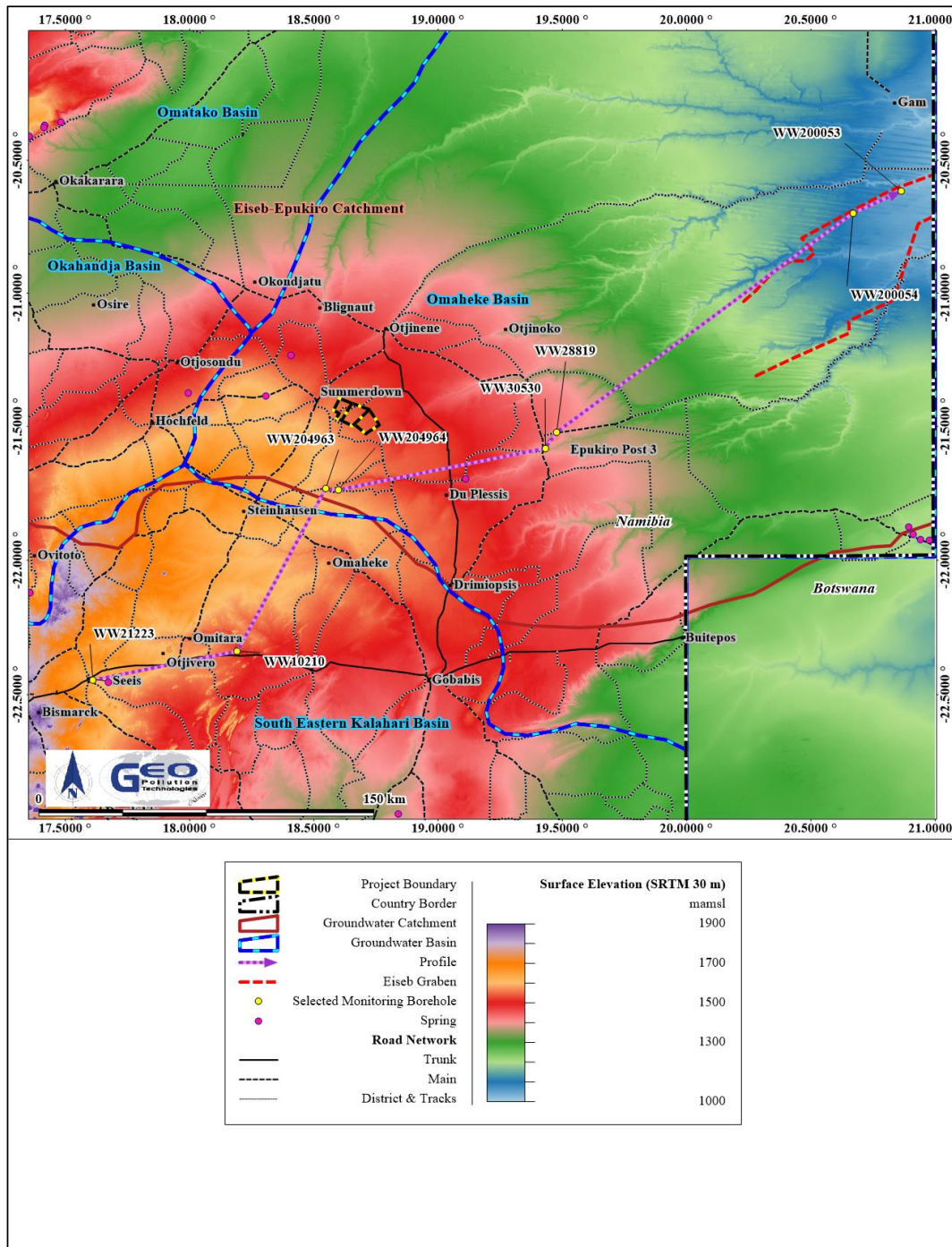


Figure 5-11. Monitor boreholes, profile, springs and Eiseb Graben with elevation

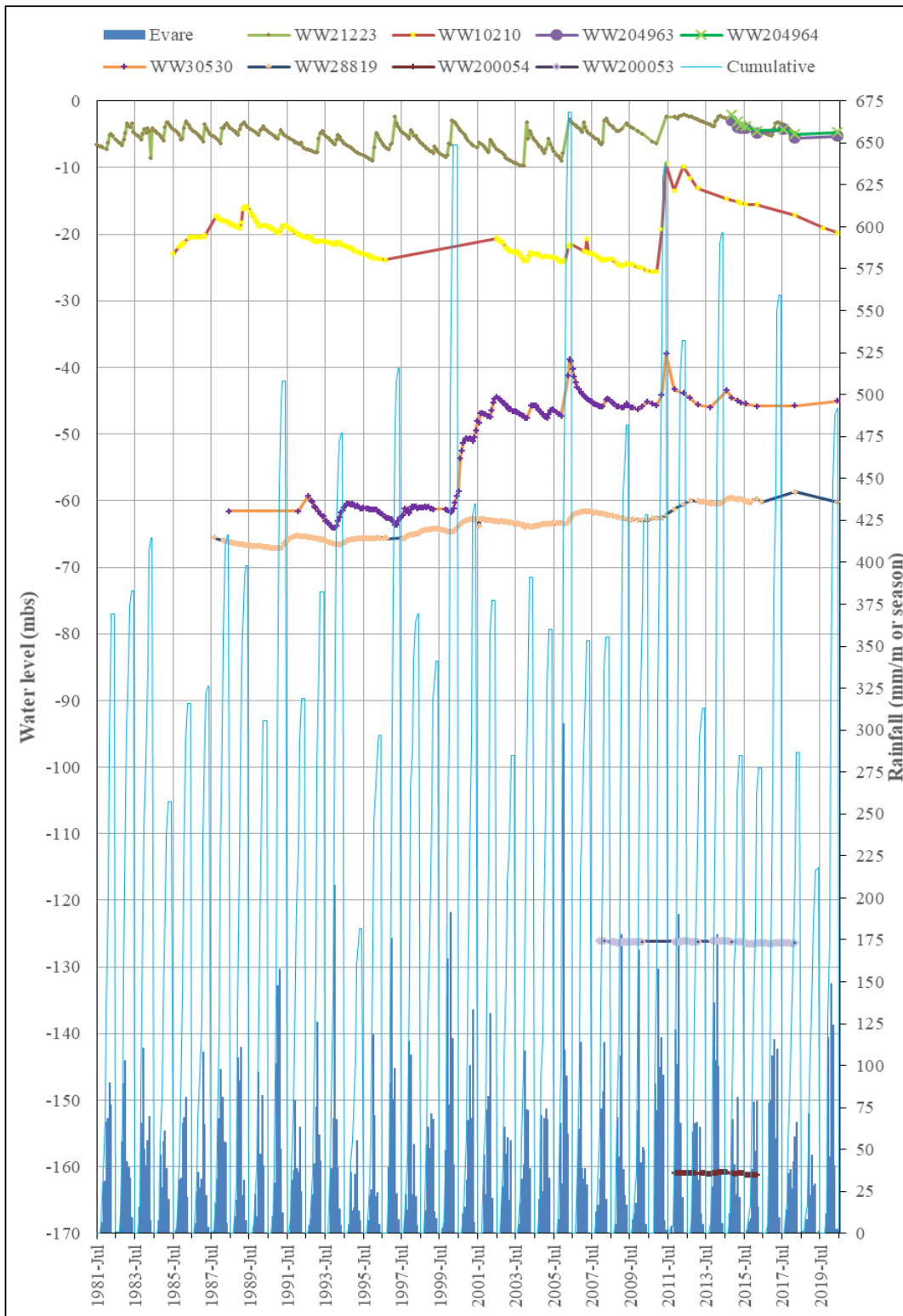



Figure 5-12. Regional water level changes (MAWLF, 2020) and monthly and seasonal cumulative rainfall at farm Evare no. 265

Table 5-3 indicates the groundwater statistics for a radius of 5 km 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. Groundwater is widely utilised in the study area, with a total of 13 boreholes within a 5 km radius. The boreholes were drilled to an average depth of 34 mbs and yield between 9 and 11 m<sup>3</sup>/h. Groundwater levels within the 5 km radius is generally shallow, varying between 9 and 18 mbs. The groundwater quality falls under Group A with some boreholes having elevated levels of nitrate. The Group A category indicates that the water is of an excellent quality, based on the provided parameters.

Springs, possibly related to the contact zones between relatively impermeable formations and more permeable formations, or shallow groundwater conditions occur as scattered points throughout the area. The two nearest springs are present approximately 31 km to the west and northwest of the project, see Figure 5-11. No caves or lakes are known of near (< 10 km radius) the project.

According to the Ministry of Agriculture, Water and Forestry (MAWF, 2006) the project is located outside a water control area (Figure 5-1). Government therefore does not regulate groundwater usage in this area, e.g., drilling, cleaning or deepening of boreholes and rates of water abstraction. However, all groundwater remains property of the Government of Namibia.

**Table 5-3. Groundwater statistics**

Query Centre: Evare; -21.4301°S; 18.614°E		Query Box Radius: 5.0km										
		NUMBER OF KNOWN BOREHOLES	LATITUDE	LONGITUDE	DEPTH (mbs)	YIELD (m <sup>3</sup> /h)	WATER LEVEL (mbs)	WATER STRIKE (mbs)	TDS (ppm)	SULPHATE (ppm)	NITRATE (ppm)	FLUORIDE (ppm)
Data points		13			11	9	12	2	12	12	12	12
Minimum			-21.385104	18.565662	18	9	9	24	191	4	0	0
Average					34	9	17	24	457	27	10	0
Maximum			-21.475096	18.662338	46	11	18	24	963	82	43	1
Group A					100.00%	11.11%	8.33%	0.00%	100.00%	100.00%	75.00%	100.00%
Limit					50	>10	10	10	1000	200	10	1.5
Group B					0.00%	88.89%	91.67%	100.00%	0.00%	0.00%	0.00%	0.00%
Limit					100	>5	50	50	1500	600	20	2.0
Group C					0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%
Limit					200	>0.5	100	100	2000	1200	40	3.0
Group D					0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	8.33%	0.00%
Limit					>200	<0.5	>100	>100	>2000	>1200	>40	>3

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.

Groundwater quality data is presented in Figure 5-13 as Maucha plots and in Figure 5-14 and Figure 5-15 as Piper plots. From Figure 5-13 and Figure 5-14 it is clear that the groundwater of the project location is mostly of a calcium - magnesium - bicarbonate water type which suggest the water is recently recharged. Groundwater to the west and northwest of the project has higher concentrations of magnesium (Mg) and less dominance in calcium (Ca) than the rest of the area. Localised occurrences of water with more dominant sodium (Na), sulphate (SO<sub>4</sub>) and chloride (Cl) concentrations are present mainly to the southeast and southwest of the project area. In the immediate farm area there seems to be an increase in total dissolved solid content, associated with an increase in the chloride (Cl) concentration.

Regionally, elevated total dissolved solids (TDS) generally tend to correlate with the extent of the ephemeral rivers, see Figure 5-15. Localised evaporite mineral deposits in pans along river courses contribute to the elevated TDS concentration. However, note that some areas away from river courses also indicates an elevated TDS concentration. Although the hydrochemistry for the Eiseb-Epukiro Catchment is assumed to be relatively variable, there seem to be a trend from a

magnesium bicarbonate type to a sodium chloride- and calcium chloride type water toward the down gradient area of the Eiseb-Epukiro Catchment.

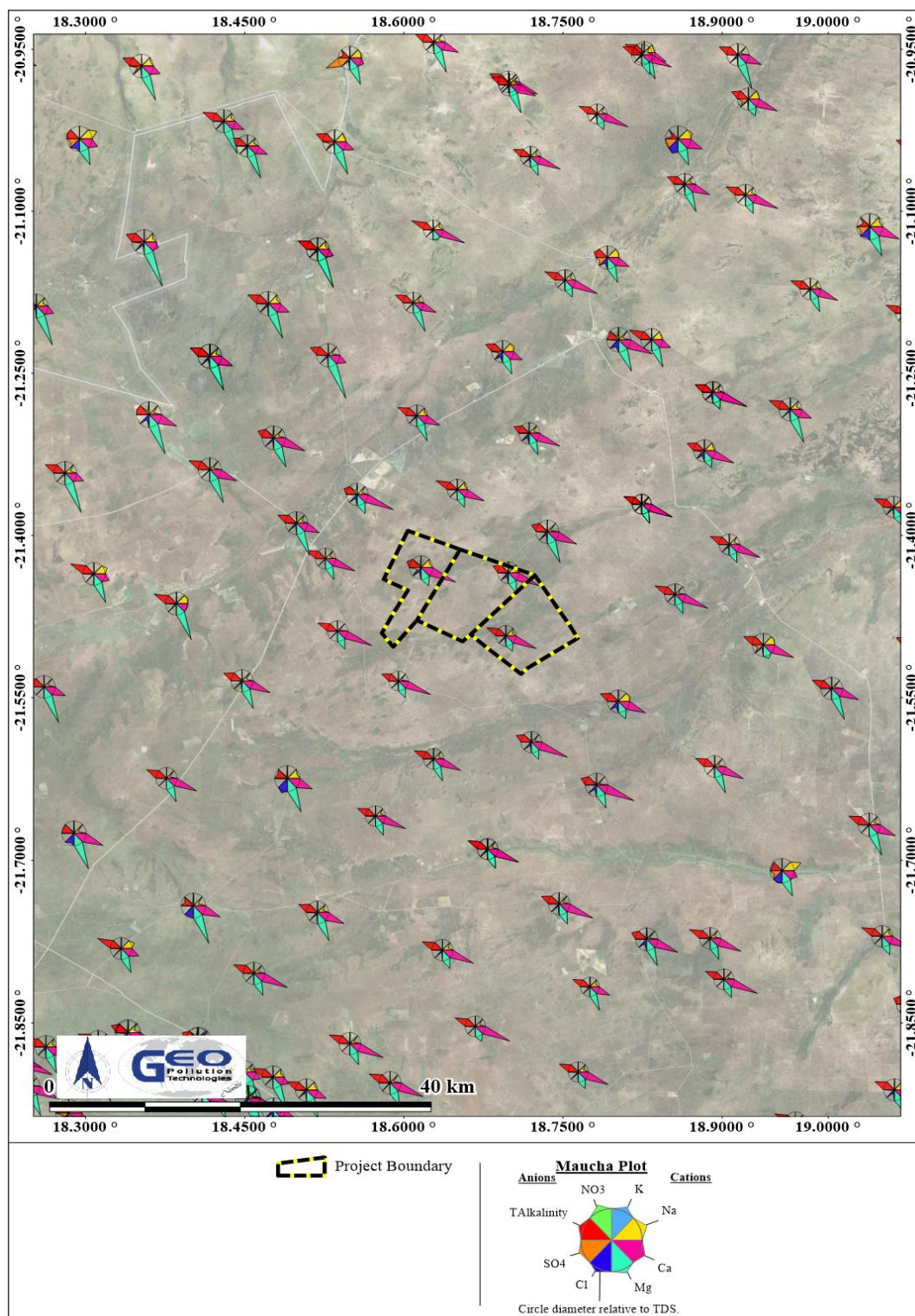


Figure 5-13. Groundwater quality (Maucha plot)



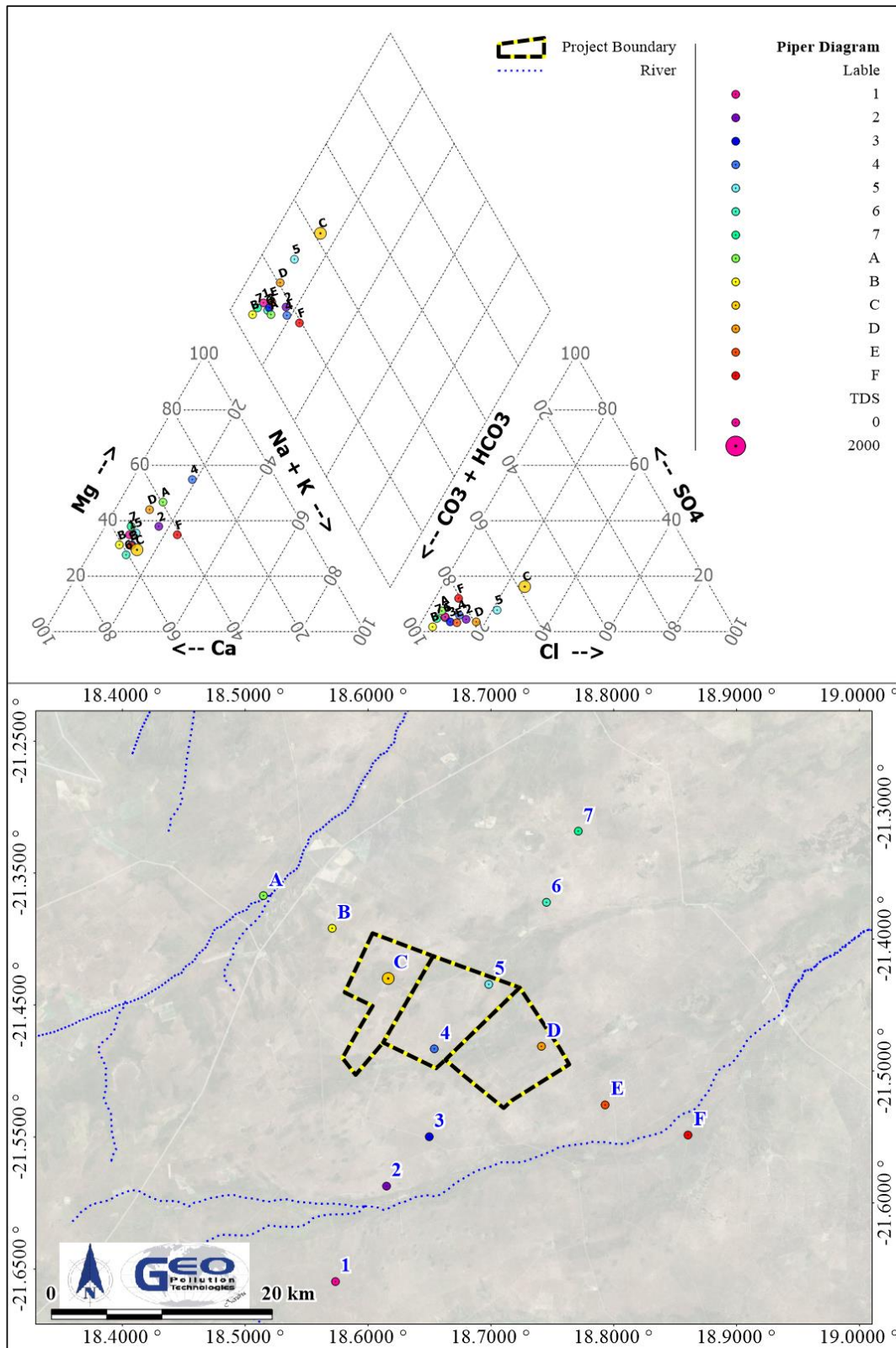


Figure 5-14. Historical hydrochemical data Piper plot for project vicinity

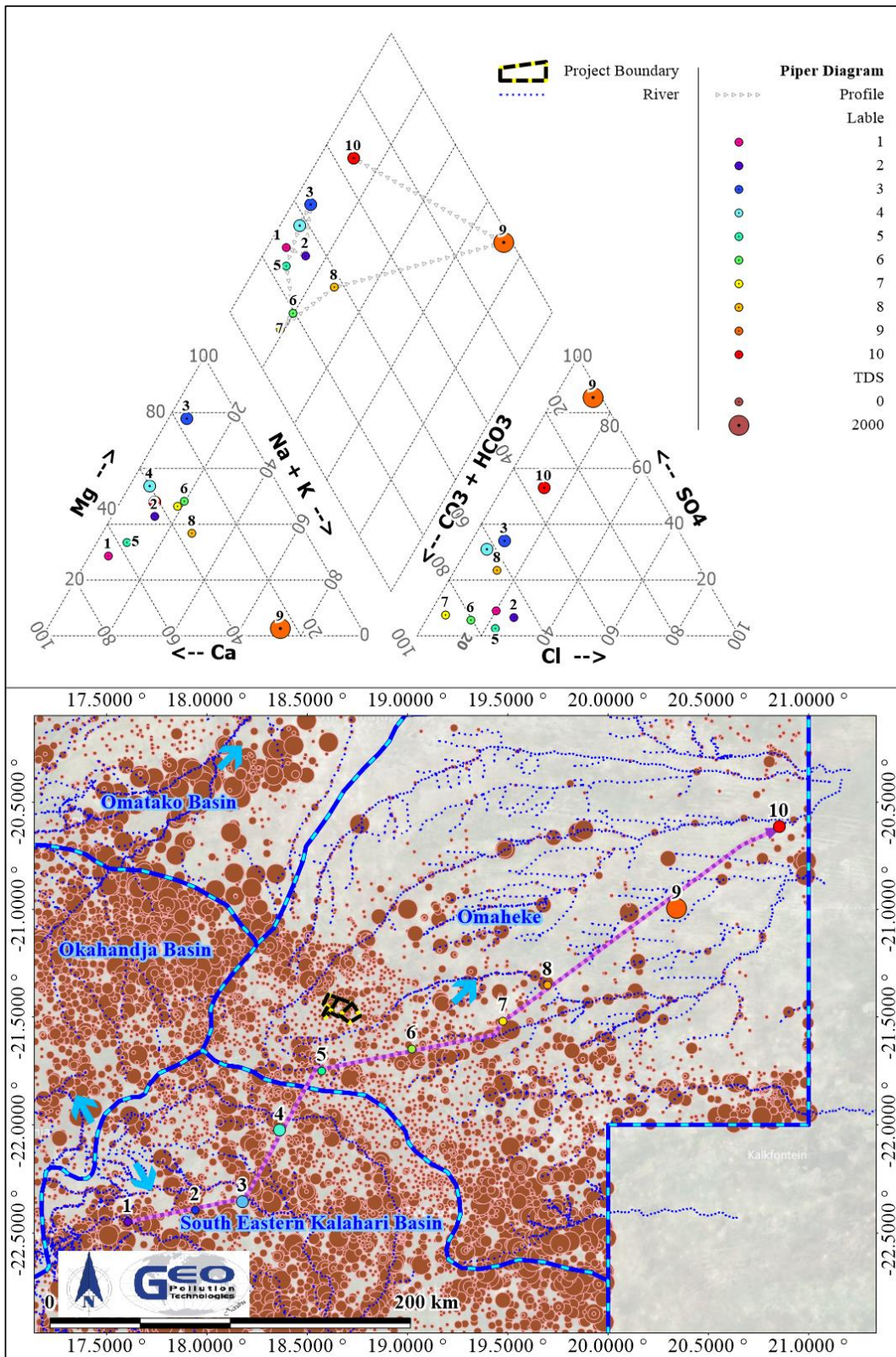


Figure 5-15. Historical hydrochemical data Piper plot for the region

## 5.6 PROJECT GROUNDWATER USAGE

The only available water source for the project is groundwater and the farms in the project area thus rely on boreholes and wells for water supply for potable use, irrigation and livestock.

Although the project area fall outside a water control area, the proponent is in possession of an abstraction permit for abstraction boreholes on farm Evare no. 265 received from the Department of Water Affairs (DWA) of the MAWLR. The permit for irrigation boreholes WW205183 through to WW205186 on farm Evare no. 265, dated 18 September 2018, allows for the abstraction of maximum 180,000 m<sup>3</sup> per year (15,000 m<sup>3</sup> per month). The permit is valid for five years.

Thirty six (36) boreholes are present on the three farms operated by the Proponent. A summary of the available borehole data received from the Proponent is provided in Table 5-4. The boreholes are used for purposes of potable water supply (domestic use), irrigation, livestock watering and testing/monitoring.

Of the 36 boreholes, 10 are used for irrigation: four on farm Evare no. 265 and six on farm Okasondana no. 264. All irrigation boreholes are installed with submersible pumps. Irrigation boreholes of farm Evare no. 265 are connected to one single flow meter. Abstracted water is used to irrigate maize, oats and wheat fields via centre pivot irrigation systems. Existing irrigation and planned irrigation areas is presented in Figure 5-16.

There are a total of 14 boreholes on farm Evare no. 265. The four irrigation boreholes are known as borehole WW205183, WW205184, WW205185 and WW205186. Three boreholes at the farmhouse are utilised for domestic use and one is used for monitoring/testing purposes. Six boreholes are used for stock watering purposes on this farm.

On farm Okasondana no. 264 there are 14 boreholes and one well. Six boreholes are used for irrigation and are known as no. 1 through to no. 6. Six boreholes and the well is used for stock watering purposes. Only one borehole is used for domestic purposes and one borehole is currently not used.

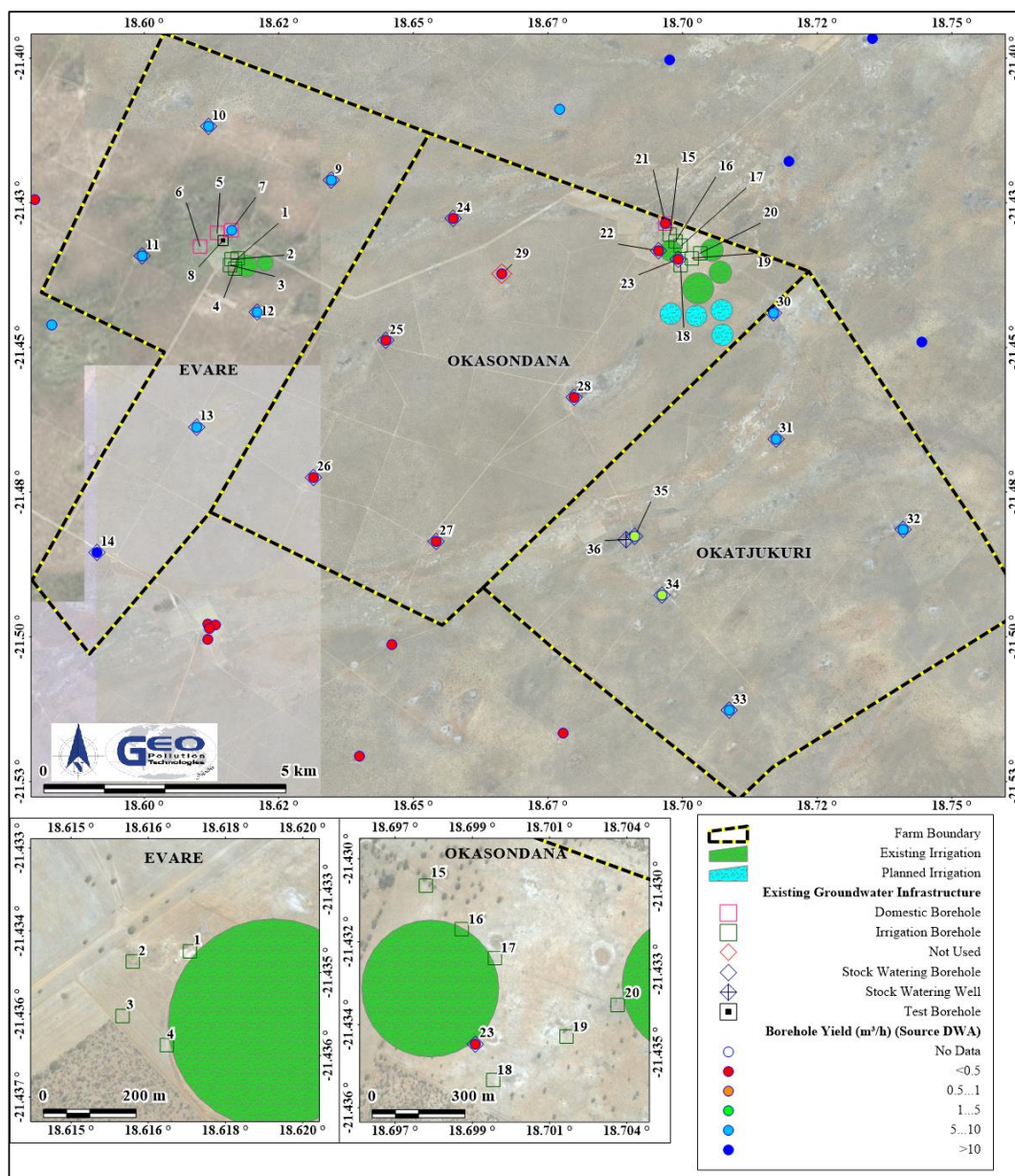
Farm Okatjukuri no. 269 is currently exclusively used for livestock farming, and has seven livestock watering boreholes.

Figure 5-15 illustrates all the borehole data as received from the Proponent as well as contained in the DWA database on the farms and immediate vicinity. Note that some of the DWA boreholes is not in use any more and also not displayed in Table 5-4.

**Table 5-4. Summary of borehole information obtained from client**

Map Ref.	Farm Name	Borehole Name	Use	Borehole Depth (m)	Yield (m <sup>3</sup> /h)	Water Level (mbs)
1	Evare no. 265	WW205186	Irrigation	70	20	8.2
2	Evare no. 265	WW205184	Irrigation	90	20	8.2
3	Evare no. 265	WW205183	Irrigation	70	20	8.2
4	Evare no. 265	WW205185	Irrigation	60	10	8.2
5	Evare no. 265	Garden Borehole	Domestic	28	1.5	5.5
6	Evare no. 265	Staff Borehole	Domestic			
7	Evare no. 265		Domestic		9	17
8	Evare no. 265	Test Borehole	Testing and Monitoring	70		5.5
9	Evare no. 265	WW12992	Stock Watering		9	17
10	Evare no. 265		Stock Watering		9	17
11	Evare no. 265	WW12994	Stock Watering		9	17

Map Ref.	Farm Name	Borehole Name	Use	Borehole Depth (m)	Yield (m <sup>3</sup> /h)	Water Level (mbs)
12	Evare no. 265	WW12993	Stock Watering		9	17
13	Evare no. 265	WW12995	Stock Watering		9	17
14	Evare no. 265	WW18439	Stock Watering		11.4	9.14
15	Okasondana no. 264	1	Irrigation	65	27	6
16	Okasondana no. 264	2	Irrigation	65	27	6
17	Okasondana no. 264	3	Irrigation	65	27	6
18	Okasondana no. 264	5	Irrigation	60	40	6
19	Okasondana no. 264	4	Irrigation	60	80	6
20	Okasondana no. 264	6	Irrigation	25	15	6
21	Okasondana no. 264		Domestic			6
22	Okasondana no. 264		Stock Watering			
23	Okasondana no. 264		Stock Watering			18
24	Okasondana no. 264		Stock Watering			18
25	Okasondana no. 264		Stock Watering			18
26	Okasondana no. 264		Stock Watering			18
27	Okasondana no. 264		Stock Watering			18
28	Okasondana no. 264		Stock Watering			18
29	Okasondana no. 264		Not Used			
30	Okatjukuri no. 269		Stock Watering		5	18
31	Okatjukuri no. 269		Stock Watering		5	18
32	Okatjukuri no. 269		Stock Watering		5	18
33	Okatjukuri no. 269		Stock Watering		5	18
34	Okatjukuri no. 269		Stock Watering		2	
35	Okatjukuri no. 269		Stock Watering		2	
36	Okatjukuri no. 269	Put 1 (well)	Stock Watering			



**Figure 5-16. Locations of boreholes and irrigation areas as received from the Client**

Water level-, abstraction- and rainfall data, as supplied by the Proponent, are presented in Figure 5-17 and Figure 5-18. The proponent has groundwater monitoring installations at boreholes WW205183, WW205184, WW205185 and WW205186. Aspects monitored comprise of monthly groundwater levels and monthly abstracted groundwater data and available data is from December 2018 to September 2020.

From the data it is clear that water levels over the monitoring period remained stable. An increase in water levels were noticed after March 2020 for all the boreholes. The increase of water levels may be related to the higher rainfall that occurred during the 2019-2020 rainfall season. The highest recorded rainfall events during the monitor period were January 2020 (172 mm) and March 2020 (265 mm), see Figure 5-17. Abstraction data indicates a seasonal relationship related

to monthly rainfall figures. The total volume of water abstracted for 2019 was 136,317 m<sup>3</sup> and for 2020 (up to September 2020) was 92,856 m<sup>3</sup>.

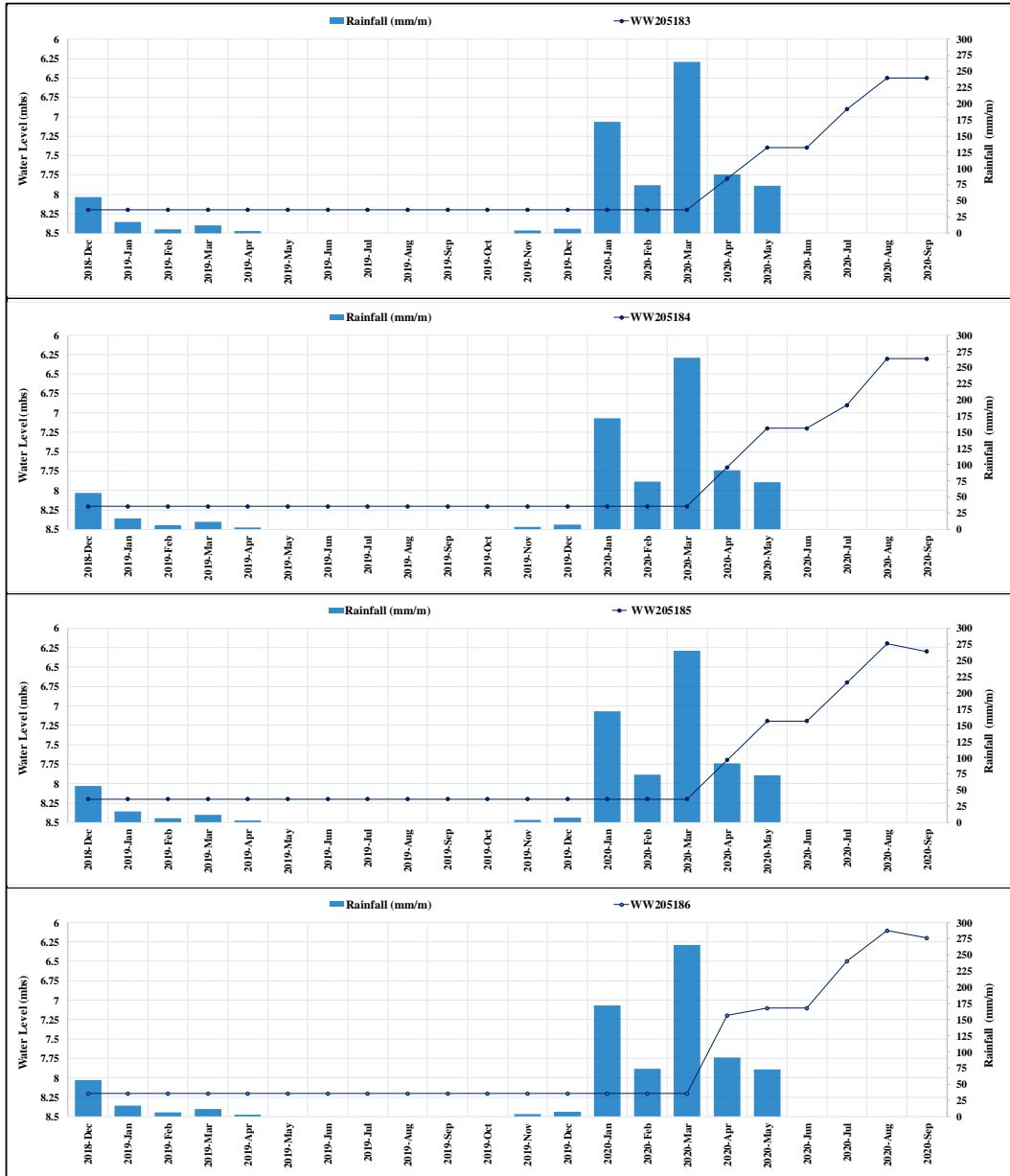


Figure 5-17. Monthly rainfall and borehole monitoring data

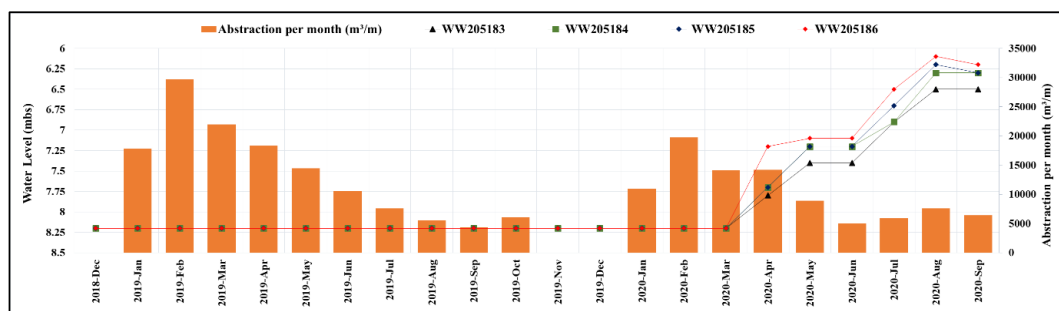


Figure 5-18. Abstraction and borehole monitoring data

## 6 WATER SUITABILITY FOR IRRIGATION PURPOSES

Water sample analysis data for the project area is not available. However, water quality is discussed in Section 4 of this report. According to data obtained from the Department of Water Affairs (DWA) borehole database there are a total of 13 boreholes within a 5 km radius around the project. The groundwater quality falls under Group A category which indicates that the water is of an excellent quality, based on the provided parameters.

## 7 SOIL SUITABILITY FOR IRRIGATION PURPOSES

Twenty nine (29) soil samples were collected on the farms and underwent laboratory chemical analyses. Of the samples, 12 were collected in August 2018 and 17 in September 2018. The exact locations of the sampling points are not known, but the results give a general idea of the soil type and quality for the project area.

The soil had a pH value ranging between 4 and 8.3. The soil can be described as acidic to medium alkaline soil. An increase in alkalinity (increase in pH) or acidity (decrease in pH) can cause deficiency of nitrogen, phosphorus, calcium, magnesium and micro elements such as iron, manganese, boron, copper and zinc. Figure 7-1 indicates the solubility of elements at different pH levels, the red square representing the pH levels of the soil.

A summary of the soil samples' results are depicted in Table 7-1. All elements highlighted in blue has low concentrations of the elements as required by plants. All highlighted in orange has high concentrations of the elements that can be harmful to plants. All the elements highlighted in white is in the most efficient range as required by plants. Eleven (11) of the samples showed pH levels best for crop production (pH between 5.5 and 6.7). At this level, exchange of plant nutrient cations will take place, ensuring effective plant growth. The pH of thirteen (13) of the soil samples were slightly high (elevated alkalinity) and not ideal for crop production. This can be expected in a calcrete rich environment, as calcrete have acid buffering properties and therefore elevate soil pH, making the soil more alkaline.

Most of the soil is deficient in organic carbon with only two samples showing sufficient organic carbon. When laboratories analyse for organic matter it includes hydrogen, oxygen, nitrogen and other elements that are components of organic compounds, not just carbon. In contrast, total organic carbon is a measure of only the carbon contained within soil organic matter.

All samples showed predominantly insufficient concentrations of potassium and calcium. The most common symptom of plant potassium deficiency is yellowing of older plant leaves and death of leaf tissue. Calcium deficiency cause blossom end rot that cause fruit tissue to die at the flower end of the fruit, notably in tomatoes. Other symptoms of calcium deficiency include chlorosis of new leaves and death of new leaf buds. Five of the 29 samples had deficiency in magnesium. A lack of magnesium cause stunted plant growth, thus reducing efficiency of crop production. Sodium is not a plant nutrient and therefore is not necessary for plant growth. However, high levels of sodium are detrimental to soil tilth and plant growth.

The 17 samples collected in September 2018 also underwent a sieve analyses. The purpose of the sieve analysis is to determine the grain size of the soil and to determine what percentage of the soil comprise of sand, clay and silt. Knowing these physical properties of the soil enables one to calculate the amount of water the plants will need. Sandy soils will have much faster infiltration rates and will be well drained, whereas a clay rich soil will have a higher water retention rate and will stay moist for longer. Almost all the samples plotted in the bottom left corner of the soil texture triangle (Figure 7-2), which means it is sand rich soils with very small amounts of clay and silt. The soil will be well drained and will require more regular watering. Some samples however did plot in the loamy sand range of the soil texture triangle, meaning these may have more water retention properties than the other samples.

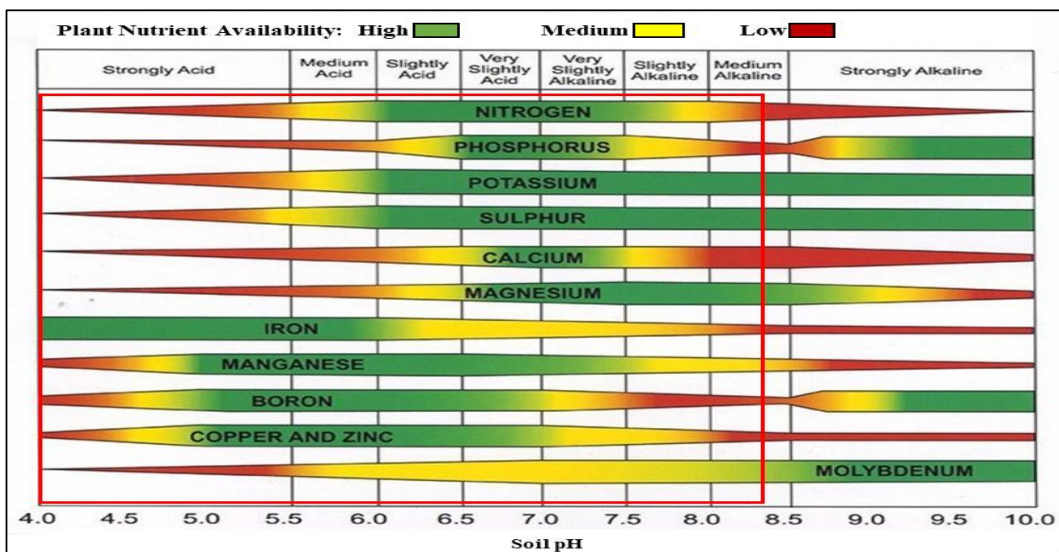


Figure 7-1. Soil pH effects on availability of elements (after University of California, 2019)

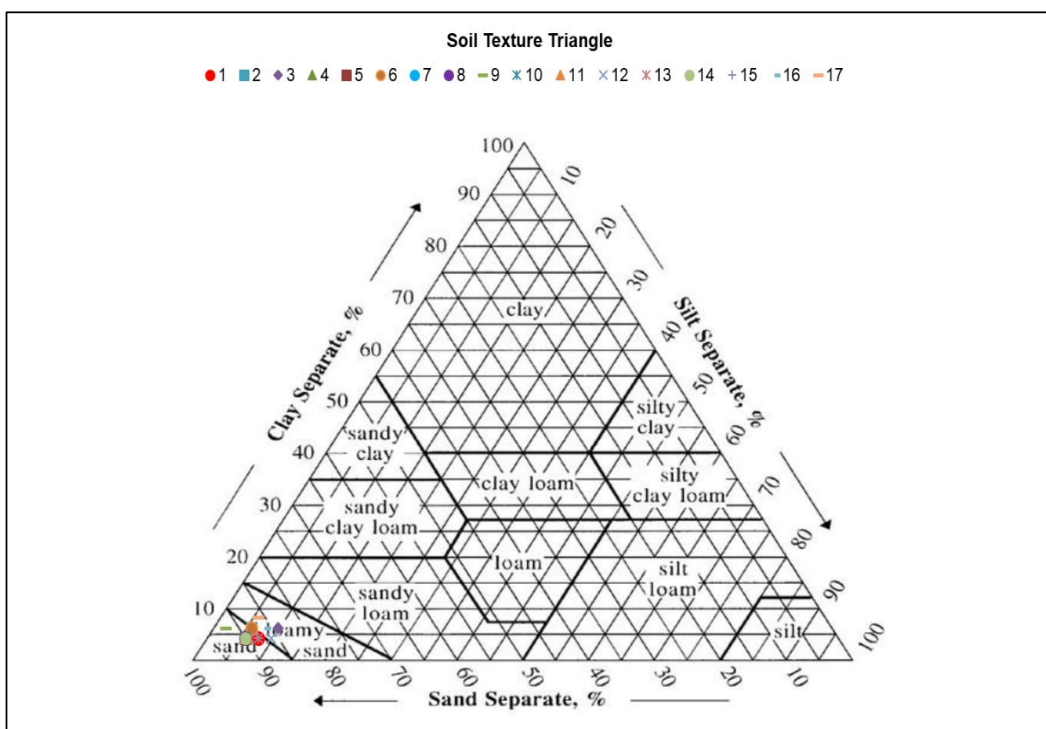


Figure 7-2. Soil texture analyses



**Table 7-1. Soil sample results**

Type of Test:		pH	Organic carbon (C)	Potassium (K)	Magnesium (Mg)	Calcium (Ca)
Method details:		KCL	Walkey Black			
Lab No.	Sample Reference		% m/m C	mg K/kg	mg Mg/kg	mg Ca/kg
1	28 NR2	4	0.54	78	38	202
2	MIDDEL 13 NR 1	5.7	0.12	90	55	561
3	TURF NR 2	5	0.7	134	114	992
4	TURF NR 1	5.4	0.48	113	80	792
5	28 NR 1	5.4	0.4	77	48	229
6	HOEK NR 1	4.9	0.66	121	88	779
7	MIDDEL 13 NR 2	6.2	0.54	75	51	754
8	OKAS 123 NR 2	6.2	0.76	155	79	558
9	OKAS 12 NR 1	6.4	0.54	45	63	341
10	EVARE 13 NR 3	6.5	0.72	101	86	748
11	ONDER 13 NR 1	5.6	0.52	132	71	498
12	EVARE 13 NR 4	6.3	0.86	104	124	975
13	EVARE 13 NR 2	5.8	0.8	159	77	708
14	ONDER 13 NR 2	6.5	0.58	81	37	792
15	EVARE 1A	5.9	0.72	141	107	888
16	EVARE 13 NR 1	6.1	0.64	123	105	861
17	EVARE 7 NR 4 A	7.6	0.92	241	109	2808
18	EVARE 7 1A	7.6	0.50	151	91	842
19	EVARE 7 1B	8.2	0.50	131	107	1112
20	EVARE 7 2A	7.8	0.70	141	107	802
21	EVARE 7 2B	7.5	0.50	121	147	1102
22	EVARE 7 3A	7.9	0.60	141	73	502
23	EVARE 7 3B	6.9	0.40	91	97	562
24	EVARE 7 4A	8.3	1.00	117	117	3042
25	EVARE 7 4B	8.3	0.70	127	127	3062
26	OKAS 13 NR 1	7.5	0.40	65	65	262
27	OKAS 13 NR 2	7.3	0.30	68	68	302
28	OKAS 13 NR 3	7.2	0.40	71	71	222
29	OKAS 13 NR 4	7.2	0.30	69	69	302
	<b>Low</b>	<b>Medium</b>	<b>High</b>			
pH	<5.4	5.5 - 6.7	>6.8			
Organic Carbon	<0.9%	0.9% - 1.3%	>1.3%			
K	<150 mg/kg	150 mg/kg - 250 mg/kg	>250 mg/kg			
Mg	<60 mg/kg	60 mg/kg - 180 mg/kg	>180 mg/kg			
Ca	<1000 mg/kg	1000 mg/kg - 2000mg/kg	>2000mg/kg			

## 8 ASSESSMENT OF IMPACTS

The purpose of this section is to assess and identify the most pertinent environmental impacts and provide possible mitigation measures that are expected from the project. The Rapid Impact Assessment Method (Pastakia, 1998) will be used during the assessment. The Environmental Classification of impacts is provided in Table 8-1.

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 8-2).

Environmental Classification =  $A1 \times A2 \times (B1 + B2 + B3)$

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). See Table 8-3 and Table 8-4 for the final assessment of expected impacts.

**Table 8-1. Environmental classification of impacts according to the rapid impact assessment method of Pastakia 1998.**

<b>Environmental Classification (ES)</b>	<b>Class Value</b>	<b>Description of Class</b>
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

**Table 8-2. Assessment criteria**

<b>Criteria</b>	<b>Score</b>
<b>Importance of condition (A1) – assessed against the spatial boundaries of human interest it will affect</b>	
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
<b>Magnitude of change/effect (A2) – measure of scale in terms of benefit / detriment of an impact or condition</b>	
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
<b>Permanence (B1) – defines whether the condition is permanent or temporary</b>	
No change/Not applicable	1
Temporary	2
Permanent	3
<b>Reversibility (B2) – defines whether the condition can be changed and is a measure of the control over the condition</b>	
No change/Not applicable	1
Reversible	2
Irreversible	3
<b>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.</b>	
Light or No Cumulative Character/Not applicable	1
Moderate Cumulative Character	2
Strong Cumulative Character	3

**8.1 GROUNDWATER ABSTRACTION**

Groundwater abstraction is a very sensitive topic in a dry country where the value of land is drastically reduced if no or unusable groundwater is present on the land. Abstraction of groundwater must be conducted in a sensible way to prevent impacts on other groundwater users that depend on such groundwater. These include 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 (Figure 8-1). Over time an equilibrium (or steady state) is normally reached with rising water table following good recharge events and declining water table when recharge is below average. Inflow into the system would typically be from infiltration following rainfall in the recharge 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 dependant on the abstracted groundwater.

The project is located about 34 km north of the Eiseb-Epukiro Catchment documented groundwater divide. Although the project is a considerable distance away, excessive abstraction may influence upstream or downstream receptors on the long run. Typical consequences of over abstraction will include a lowering in the water table. Lowering of water table may further lead to the drying up of boreholes and springs. Vegetation will also be impacted where such vegetation has access to groundwater. It is important to note that the groundwater basin forms a transboundary aquifer that extend from Namibia into Botswana. Over abstraction in any of the countries will have a negative impact on the other country and can causes disputes. As the groundwater flows from the recharge area in Namibia, out to Botswana, care must be taken in Namibia to ensure that the quality of water is not affected as this will later on affect the neighbouring country.

Based on current water level fluctuations in the area, as presented in this report (Figure 5-12), a short term threshold of 5 m below the average rest water level of borehole data is set from where abstraction rates should be reduced.

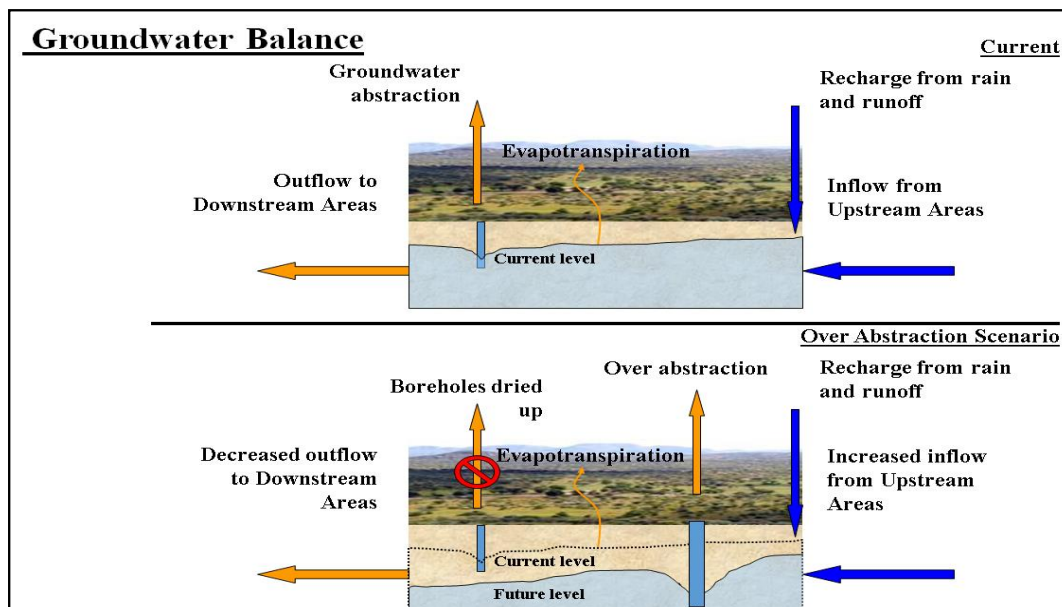


Figure 8-1. Conceptual groundwater balance with over abstraction scenario

**Table 8-3. 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 on a sustainable level.

**Actions**

**Prevention:**

- ◆ Spread the water abstraction points over a larger area to diffuse the impact.
- ◆ Monthly water level monitoring.

**Mitigation:**

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

**Responsible Body:**

- ◆ The proponent

**Data Sources and Monitoring:**

- ◆ Monthly water rest water level monitoring.
- ◆ Baseline values should be reviewed every 3 years based on all historic water level data.
- ◆ A summary report on all monitoring results must be prepared.

## 8.2 GROUNDWATER, SURFACE WATER AND SOIL CONTAMINATION

Leakages and spillages of hazardous substances from vehicles and accidental fuel, oil or hydraulic fluid spills during the operational phase. Increase of nutrient levels (from over application of fertilizers) in the soil that can leach to the groundwater. Pollution due to sewerage system overflow or leakage. Overuse / incorrect application of herbicides / pesticides may also pose a risk.

**Table 8-4. 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, herbicides / pesticides, etc. Sewerage system malfunction.	2	-1	2	2	2	-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 should be stored in a sufficiently bunded area.
- ◆ 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 information and a suitably qualified specialist where needed.

#### **Responsible Body:**

- ◆ The 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.

## 9 CONCLUSION

Groundwater on the farm is high yielding and can be used for irrigation. Although groundwater monitoring data on farm Evare no. 265 is only short term (December 2018 to September 2020), the data does not indicate a declining trend in water levels (Figure 5-17). Data from the long-term groundwater monitoring installations generally show stable groundwater level conditions. Based on current water level fluctuations in the region, as presented in Figure 5-12, a short term rest water level threshold of 5 m below the average rest water level of each borehole 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 farms utilising water from the aquifer, on 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.

Groundwater vulnerability to contamination would be the highest around boreholes, around geological structures as well as where shallow groundwater is present. Contamination risks can be reduced through proper fertilizer, herbicide and pesticide application. Annual groundwater and soil analysis from irrigation areas will serve as early warning of contamination problems. These impacts are normally of a low magnitude and can be managed through proper housekeeping.

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**Appendix A: Chemical Analyses**

**SGS** **GRONDONTLEDINGSVERSLAG / SOIL ANALYSIS REPORT** **SGS**

LEON HINZE NAMIBIA

Reg. Nr. : 96/17268/07 BTW / VAT Reg. No. : 4049162804

Datum : 11 / 09 / 2018

Verw. Nr. : 266811

Vertw. : Van Zyl Trading

SGS Kaap Laboratoriums

Posbus 927, Somersret-Wes 7129

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Lab. Nr.	Land	WB % C	GF %	Diepte cm	Tekstuur hidrometer %			pH	H+	P	Makro-elemente in mg/kg								KNO3	S-Wide	Base-Vers.	Mikro-elemente mg/kg		
					Klei	Silk	Sand				K	Ca	Mg	Na	S	Cl	Cu	Zn				Mn	B	
I18-037-2	28 NR 2	0,54	-	8	4	88	2741	4,0	0,98	Bray I	78	202	38	4	4,1			61	1,5	2,5	0,13	0,27	11,9	0,13
I18-037-3	MIDDEL 13 NR 1	0,12	-	6	6	88	2669	5,7		Bray I	90	561	55	1	5,4			100	3,5	3,5	0,31	0,24	5,2	0,14
I18-037-4	TURF NR 2	0,70	-	10	6	84	1533	5,0	0,51	Bray I	134	992	114	2	10,0			93	6,2	6,8	0,46	0,36	7,4	0,14
I18-037-5	TURF NR 1	0,48	-	6	4	90	1770	5,4	0,30	Bray I	113	792	80	4	7,3			95	4,9	5,2	0,27	0,51	5,1	0,08
I18-037-6	28 NR 1	0,40	-	6	4	90	3091	4,5	0,41	Bray I	77	229	48	2	3,3			82	1,7	2,2	0,10	0,15	2,1	0,10
I18-037-7	HOEK NR 1	0,66	-	10	4	86	1747	4,9	0,64	Bray I	121	779	88	2	7,4			91	4,9	5,5	0,45	0,48	9,8	0,15
I18-037-8	MIDDEL 13 NR 2	0,54	-	6	4	90	3381	6,2		Bray I	75	654	51	1	5,5			100	3,9	3,9	0,10	0,20	4,4	0,12
I18-037-9	OKAS 123 NR 2	0,76	-	6	4	90	878	6,2		Bray I	155	568	79	17	6,5			100	3,9	3,9	0,11	2,42	10,7	0,34
I18-037-10	OKAS 12 NR 1	0,54	-	2	6	92	3103	6,4		Bray I	45	341	63	36	4,1			100	2,5	2,5	0,10	0,63	5,6	0,16

This Laboratory participates in one or more disciplines of the AgrilASA's Control Scheme. A certificate of participation and performance is available at [www.agrilasa.co.za](http://www.agrilasa.co.za)

Lab. Nr.	Land	WB % C	% GF	cm Diepte	Tekstuur Hidrometer %			pH	H+	P	Mikro-elemente in mg/kg							Mikro-elemente mg/kg					
					Klei	Slik	Sand				K	Ca	Mg	Na	S	Cl	T-Wide	S-Wide	Base-Vers.	Cu	Zn	Mn	B
118-037-11	EVARE 13 NR 3	0,72	-	6	4	90	1570	6,5	14	101	748	86	11	7,6		4,8	4,8	100	0,12	3,48	16,8	0,38	
				Sa <= Tekstuur					Bray I	5	79	15	1	<= me%	<= Versadig								
118-037-12	ONDER 13 NR 1	0,52	-	6	4	90	1616	5,6	1	132	498	71	1	4,7		3,4	3,4	100	0,10	0,28	4,7	0,13	
				Sa <= Tekstuur					Bray I	10	73	17	1	<= me%	<= Versadig								
118-037-13	EVARE 13 NR 4	0,86	-	10	4	86	1272	6,3	46	104	975	124	17	10,7		6,2	6,2	100	0,46	4,20	16,2	0,41	
				Sa <= Tekstuur					Bray I	4	78	16	1	<= me%	<= Versadig								
118-037-14	EVARE 13 NR 2	0,80	-	8	4	88	1105	5,8	23	159	708	77	6	7,3		4,6	4,6	100	0,23	4,56	13,8	0,42	
				Sa <= Tekstuur					Bray I	9	77	14	1	<= me%	<= Versadig								
118-037-16	ONDER 13 NR 2	0,58	-	6	4	90	3061	6,5	1	81	792	37	1	7,0		4,5	4,5	100	0,34	0,43	10,7	0,14	
				Sa <= Tekstuur					Bray I	5	88	7	1	<= me%	<= Versadig								
118-037-16	EVARE 1A	0,72	-	8	4	88	1206	5,9	27	141	888	107	8	7,9		5,7	5,7	100	0,29	5,04	8,9	0,44	
				Sa <= Tekstuur					Bray I	6	78	15	1	<= me%	<= Versadig								
118-037-17	EVARE 13 NR 1	0,64	-	8	6	86	1094	6,1	20	123	861	105	17	8,0		5,6	5,6	100	0,15	2,58	9,1	0,36	
				Sa <= Tekstuur					Bray I	6	78	16	1	<= me%	<= Versadig								
118-037-18	EVARE 7 NR 4 A	0,92	-	6	8	86	610	7,6	8	241	2808	109	11	26,3		15,6	15,6	100	0,10	4,66	8,2	0,42	
				Sa <= Tekstuur					Bray I	4	90	6	1	<= me%	<= Versadig								

This Laboratory participates in one or more disciplines of the AgriLISA's Control Scheme. A certificate of participation and performance is available at [www.agrilisa.co.za](http://www.agrilisa.co.za)



**GRONDONTLEDINGSVERSLAG / SOIL ANALYSIS REPORT**



LEON HINZE  
NAMIBIA

SGS Kaap Laboratoriums

Posbus 927, Somerset-Wes 7129

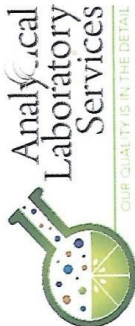
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Verw. Nr. : 266811

Van Zyij Trading

Datum : 11 / 09 / 2018



OUR QUALITY IS IN THE DETAIL

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71 Newcastle Street • PO Box 86782 • Eros • Windhoek • Namibia

**TEST REPORT**

To: **Hinze Investments cc**  
P.O. Box 868  
Gobabis

Attn: **Mr Leon Hinze**  
e-mail: **leonhinze@live.com**

Date received: **30-Jul-18**  
Date completed: **10-Aug-18**  
Your Reference: **QU-1754**  
Lab Reference: **T181380**

Lab No.	pH (H <sub>2</sub> O) electrometric 2:5	Conductivity electrometric 2:5 mS/m	Calcium carbonate equivalent acid neutralisation % CaCO <sub>3</sub> equivalent	Organic carbon Walkley Black % m/m C	Organic matter calculated factor = 1,724 % m/m OM	Phosphorus extractable Ohlsen mg P /kg	Sodium 1M ammonium acetate (pH 7.0) mg Na/kg	Potassium extracell/exchangeable mg K/kg	Magnesium mg Mg/kg	Calcium mg Ca/kg
1	Evare 7 1A	7,6	13,6	0,3	0,5	9	12	151	91	842
2	Evare 7 1B	8,2	7,4	0,4	0,5	2	18	131	107	1112
3	Evare 7 2A	7,8	13,3	0,4	1,1	7	12	141	107	802
4	Evare 7 2B	7,5	8,1	0,6	0,9	9	22	121	147	1102
5	Evare 7 3A	7,9	8,3	0,7	1,0	8	7	141	73	502
6	Evare 7 3B	6,9	7,6	0,3	0,7	5	12	91	97	562
7	Evare 7 4A	8,3	22,2	0,3	1,7	8	9	291	117	3042
8	Evare 7 4B	8,3	17,5	1,0	1,2	4	11	171	127	3062
9	Okas 13 Nr1	7,5	8,0	0,4	0,6	7	28	131	65	262
10	Okas 13 Nr2	7,3	8,3	0,3	0,5	5	43	49	68	302
11	Okas 13 Nr3	7,2	6,1	0,3	0,7	9	32	131	71	222
12	Okas 13 Nr4	7,2	7,9	0,3	0,6	1	30	91	69	302

Silke Rügheimer  
Laboratory Manager

## **Appendix C: Tree Information**



**Trees recorded in quarter degree squares 2118BC, 2118BD, 2118DA and 2118DB (Curtis & Mannheimer 2005)**

Name	Common Name
<i>Acacia ataxacantha</i>	Flame-thorn
<i>Acacia erioloba</i>	Camel-thorn
<i>Acacia fleckii</i>	Sand-veld Acacia
<i>Acacia hebeclada</i> subsp <i>hebeclada</i>	Candle-pod Acacia
<i>Acacia hereroensis</i>	Mountain-thorn
<i>Acacia karroo</i>	Sweet-thorn
<i>Acacia luederitzii</i> var <i>luederitzii</i>	Kalahari Acacia
<i>Acacia mellifera</i> subsp <i>detinens</i>	Blue-thorn Acacia
<i>Acacia reficiens</i> subsp <i>reficiens</i>	Red-thorn
<i>Albizia anthelmintica</i>	Worm-cure Albizia; Aru
<i>Bauhinia petersiana</i> subsp <i>macrantha</i>	White Bauhinia
<i>Boscia albitrunca</i>	Shepherd's Tree
<i>Burkea africana</i>	Burkea
<i>Catophractes alexandri</i>	Trumpet-thorn; Rattlepod
<i>Combretum collinum</i> subsp <i>gazense</i>	Bi-coloured Variable Combretum
<i>Combretum hereroense</i> subsp <i>hereroense</i>	Mouse-eared Combretum
<i>Combretum psidioides</i>	Peeling-twig Combretum
<i>Dichrostachys cinerea</i> subsp <i>africana</i>	Kalahari Christmas Tree; Sickle-bush
<i>Diospyros lycioides</i> subsp <i>lycioides</i>	Bluebush
<i>Ehretia alba</i>	White-puzzle Bush
<i>Elephantorrhiza elephantina</i>	Elands-bean
<i>Euclea undulata</i> var <i>myrtina</i>	Common Guarri; Mountain Ebony
<i>Gomphocarpus fruticosus</i>	Milkweed
<i>Grewia flava</i>	Velvet Raisin
<i>Grewia flavescens</i>	Sandpaper Raisin
<i>Grewia retinervis</i>	Kalahari Raisin
<i>Gymnosporia buxifolia</i>	Common Spikethorn
<i>Gymnosporia senegalensis</i>	Confetti Spikethorn
<i>Lycium bosciifolium</i>	Limpopo Honey-thorn
<i>Lycium eenii</i>	Broad-leaved Honey-thorn
<i>Lycium prunus-spinosa</i>	Part of Honey-thorn bushes
<i>Melia azedarach</i>	Syringa
<i>Opuntia spp</i>	Spiny Cactus; Prickly-pear
<i>Ozoroa hereroensis</i>	Herero Resin-bush
<i>Ozoroa insignis</i>	Africa Resin-tree
<i>Ozoroa paniculosa</i>	Common Resin-bush
<i>Phaeoptilum spinosum</i>	Brittle-thorn
<i>Philenoptera nelsii</i> subsp <i>nelsii</i>	Kalahari Omupanda; Kalahari Apple-leaf
<i>Prosopis spp</i>	Prosopis

<i>Rhigozum brevispinosum</i>	Simple-leaved Rhigozum
<i>Searsia ciliata</i>	Sour Karee
<i>Searsia lancea</i>	Sour Karee
<i>Searsia pyroides</i>	Fire-thorn Rhus; Common Currant
<i>Searsia tenuinervis</i> var <i>tenuinervis</i>	Kalahari Currant
<i>Schinus molle</i>	Pepper Tree
<i>Tarchonanthus camphoratus</i>	Camphor Bush
<i>Terminalia sericea</i>	Silver Cluster-leave
<i>Ziziphus mucronata</i>	Buffalo-thorn



## **Appendix D: Proof of Public Consultation**



**Registered and Notified IAPs**

<b>Name</b>	<b>Surname</b>	<b>Organisation</b>
Hrtmund	Riedel	Boesmanpan
Frans	Nel	Okambekere
ED	ED	Ministry of Land & Resettlement (Farm Smutsville 663)
Percy	Tjatelua	Farm Smutsville 663
Azor	Tjatu	Chibra 262/1 / Libra
C	Heimstead	Hartebeespoort
Erna	Van Der Merwe	Meyerville
Tjivi	Gurura	Keilands
Karl-Heinz	Heimstädt	
		Omaheke Regional Council
Paul	van der Merwe	Polytechnic - Director Curriculum Planning
Lima	Maartens	Environmental Consultant
Stephnie	Roseman	Tokat
Udo	Riedel	Uilpan 731, Bospan 661 and Magda 671

**Environmental Assessment Scoping Assessment and Environmental Management Plan for the Crop Cultivation of Farms Okasondana No. 264, Evare No. 265 and Okatjukuri No. 269**  
**Comments and Responses Table**

<b>IAP</b>	<b>Correspondence</b>	<b>Issue / Concern</b>	<b>Response</b>
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Namibia is a Semi Desert country, where water availability in most parts of the country is limited. Forecasts are stating that Namibia will become drier in future. Great concern is raised that there are no detailed quantifications of water aquifers in the impacted surrounding area and Omaheke region.	Noted. Aquifer management and quantification of the resource is the responsibility of the DWA in the Ministry of Agriculture, Water and Land Reform. Based on existing information as provided by the DWA and as supplied by the proponent a hydrogeological assessment was conducted to determine the current sustainability of water resources on the farming unit of the proponent. It is strongly suggested that all farmers conduct borehole monitoring, even if not required by the DWA, in order to develop a database of groundwater levels and abstraction rates and volumes. This will be beneficial not only to the groundwater user him/herself, but also for users of groundwater in the entire basin.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Concern is raised as to ensure that water subtraction/management will be done sustainably.	The purpose of the EIA and EMP is to ensure that environmental impacts, including those on groundwater availability, are prevented or minimized. The Proponent commissioned the EIA and EMP even though he is not situated in a groundwater control area that requires such assessment. Groundwater level monitoring is proposed in the EMP with water levels indicated at which abstraction should be reduced. See section 10.1.12.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Concern is raised that a subtraction of large amounts of waters will negatively impact the environment, ecosystem, human existence and therefor the economy as a whole.	The purpose of the EIA and EMP is to ensure that environmental impacts, including those on groundwater availability, are prevented or minimized. The Proponent commissioned the EIA and EMP even though he is not situated in a groundwater control area that requires such assessment. Groundwater level monitoring is proposed in the EMP with water levels indicated at which abstraction should be reduced. See section 10.1.12.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Omaheke region is known as the "Cattle Country" where the livelihood of farmers are dependent on cattle that utilize the water of the aquifers. Concern is raised that the livelihood of all consumers who are	The purpose of the EIA and EMP is to ensure that environmental impacts, including those on groundwater availability, are prevented or minimized. The Proponent commissioned the EIA and EMP even though he is not situated in a groundwater control area that requires such assessment. Groundwater level monitoring is proposed in the EMP with water levels indicated at which abstraction should be reduced. See section 10.1.12.

IAP	Correspondence	Issue / Concern	Response
		linked to specific underground water aquifers may be affected negatively if water levels are declining due to subtraction of large amounts of water (this will not only effect neighbours of the above mentioned parties but a much larger area).	reduced. See section 10.1.4. The Proponent also produces fodder which in dry years is invaluable for feeding of such cattle.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	The effects of large amounts of water subtractions cannot be comprehended fully and are unknown, as long as there are no detailed quantifications of water aquifers and how they are linked to each other.	See point 1.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Great concern is raised that strong water at some places suggest that there is a great availability of water in the whole area. Boreholes in close proximity may differ greatly.	Yes agreed. Thus the need for a hydrocensus and hydrogeological study as indicated in point 1 as well as the need for DWA to do adequate monitoring.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Borehole monitoring data in the surrounding area show a decline trend of water levels.	Such borehole monitoring data was requested from the Proponent's neighbours and other relevant IAPs during the public consultation phase. No data was however received. In order for holistic investigations into water abstraction and availability it is crucial for all parties to monitor and supply information, especially to the DWA. The data used in the specialist study is clearly referenced and does not indicate a decline in decreasing levels, but rather an increase in level over a 20 year period. Boreholes used by NamWater for water supply in nearby communal areas indicate a drawdown while being pumped yet recovering quickly when not pumped.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Great concern is raised that borehole monitoring is done by the applicants of water permit holders only (which have strong water to cultivate crops) instead of a much wider spread area, which will inevitably be effected.	Aquifer management and quantification of the resource is the responsibility of the DWA in the Ministry of Agriculture, Water and Land Reform. They do have monitoring wells for example in the Omaheke Groundwater Management Basin at Epukiro Post 3, Epukiro Post 10, Plessisplaas, Otjinene, Witvlei and Hochveld state water schemes. It is noted that monitoring at these schemes can be improved.

<b>IAP</b>	<b>Correspondence</b>	<b>Issue / Concern</b>	<b>Response</b>
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Great concern is raised that fertilizers, pesticides and herbicides which are used for the Crop Cultivation and Related Activities may impact and pollute the underground water aquifers as well as the whole ecosystem.	This potential impact is addressed in section 10.1.11.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	If water resources are depleted (also in future generations) it will degrade the whole ecosystem and economic potential of the area and country will be erased completely. Overutilisation of natural resources in general are a major concern.	Noted. The purpose of the EIA and EMP is to ensure that environmental impacts, including those on groundwater availability, are prevented or minimized. The Proponent commissioned the EIA and EMP even though he is not situated in a groundwater control area that requires such assessment. Groundwater level monitoring is proposed in the EMP with water levels indicated at which abstraction should be reduced.10.1.12.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	If water levels are dropping in surrounding areas due to the subtraction of great amounts of water for Crop Cultivation and Related Activities, who will be responsible for drilling deeper boreholes?	Assigning of responsibility for such an eventuality falls outside of the scope of the environmental assessment. The mitigation measures as proposed in Section 10.1.12 are aimed at preventing such eventuality from occurring.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Great concern is raised that a few people who are residing on strong water aquifers benefit of those, while others loose their livelihood due to the subtraction of great amounts of water.	The mitigation measures as proposed in section 10.1.12 are aimed at preventing such eventuality from occurring.
Stephanie Rösemann	<i>Email received</i> 21 August 2020	Currently all are tapping in the dark concerning the water aquifers in the Omaheke Region, because there is no reliable data available. Can water subtraction be guaranteed to be sustainable under these circumstances?	Aquifer management and quantification of the resource is the responsibility of the DWA in the Ministry of Agriculture, Water and Land Reform. Based on existing information as provided by the DWA and as supplied by the proponent a hydrogeological assessment was conducted to determine the current sustainability of water resources on the farming unit of the proponent. As a safety margin, the mitigation measures proposed include reduced abstraction rates by the proponent if the water level decrease to 5 m less than the long term average rest water level of each borehole.
Karl-Heinz Heimstädt	<i>Email received</i> 24 August 2020	The average rainfall in our area is between 350 and 400mm per year. Due	The hydrogeological study considered long-term rainfall data for the area (39 years), confirm rainfall between 350 and 400 mm.

IAP	Correspondence	Issue / Concern	Response
Karl-Heinz Heimstädt		<p>to information from a hydrologist about 1% of the rainwater reaches the aquifer (groundwater). This would mean that a total of 35000-40000 cubic meter of underground water per 1000Ha farmland, per year, would be available for livestock, human consumption and irrigation, without over utilising or even exhausting the underground water resources. Cattle on the 1000Ha, about 100 head, will need (40-50 L per head and day) 1500-1800 cubic meters per year. Average dwelling would use about 15000 cubic meter per year. Only about 35000 cubic meter of water per 1000Ha will be available for irrigation.</p>	<p>Note that groundwater recharge also takes place as a result of through flow from upstream areas in the groundwater catchment. Both rainfall and through flow of groundwater therefore contribute to groundwater recharge in the Summerdown – Otjinene area. Studies show the groundwater moves from west to east in the local groundwater catchment towards the Botswana border. The more downstream in the catchment, the more accumulation of groundwater occurs. It is understood that the project area is located in an area where groundwater accumulation is considered high due to its distance from the upstream catchment boundary. Abstraction at NamWater schemes, e.g., Epukiro Post 3, Epukiro Post 10, Plessisplaas was considerable and however did not cause regional lowering of the water table. Water levels usually recover rapidly when abstraction is lifted, despite general elevated abstraction numbers. The Kalahari sediments are up to 100 m thick in the project area. With the observed shallow water levels, it can be assumed that the thick saturated zone (water-bearing zone) will exist in the area. Within the Kalahari sediments, more porous layers of strata or channels, thus also encouraging groundwater accumulation and recharge. Available data suggest recharge of groundwater is therefore dynamic in the project area. It is also to an extent not well understood due to lack of data. Self-monitoring of water levels is therefore crucial. However pump test data from the area suggest that the aquifer is high yielding at places.</p>
Karl-Heinz Heimstädt	<p><i>Email received</i> 24 August 2020</p>	<p>Irrigating maize and other crops needs about 700mm of water per planting cycle. Common practice is to plant at least 2 cycles per year. This would mean that a minimum of 14000 cubic meter of water is needed for every Ha under irrigation per year. Meaning that about 2,3Ha per 1000Ha could be planted under irrigation sustainably in our rainfall area. The concern is that other crops, like vegetables even need more water for a successful harvest.</p>	<p>Irrigation water will be lost due to evaporation losses. However the circulation of surface water to groundwater is expected due to the nature of the aquifer medium of the Kalahari sediment. A mentioned previously pump test data from the area suggest that the aquifer is high yielding and localised abstraction do not seem to affect the groundwater.</p>
Karl-Heinz Heimstädt	<p><i>Email received</i> 24 August 2020</p>	<p>Concern is raised that artificial watering of crop cultivation on big scale in this geographical area (semi-</p>	<p>An impact on the groundwater is expected on the long run, especially if the irrigation footprint of the area expands rapidly. Aquifer management and quantification of the resource is the responsibility of</p>

IAP	Correspondence	Issue / Concern	Response
Karl-Heinz Heimstädt	<i>Email received</i> 24 August 2020	desert environment) and subtracting these huge amounts of water from the aquifer could create an environmental disturbance.	the DWA in the Ministry of Agriculture, Water and Land Reform. They do have monitoring wells for example in the Omaheke Groundwater Management Basin at Epukiro Post 3, Epukiro Post 10, Plessisplaas, Otjinene, Witvlei and Hochveld state water schemes. It is noted that monitoring at these schemes can be improved. It's the also the role of the farmers to do continual self-monitoring and consult with the DWA. It is in the interest of the DWA that the whole country become a water control area to curb over-abstraction and manage the groundwater resources.
Karl-Heinz Heimstädt	<i>Email received</i> 24 August 2020	For high intensity crop and vegetable production vast quantities of fertilizers, pesticides and herbicides is common practice. Concern is raised that fertilizers, pesticides and herbicides could have a negative impact on the environment and could pollute underground water.	This potential impact is addressed in 10.1.11. Prescribed dosages should be applied as necessary to prevent impacts.
Karl-Heinz Heimstädt	<i>Email received</i> 24 August 2020	It has been witnessed with great concern on our farms and farmland in the greater surrounding, that a huge amount of Vachellia erioloba trees (Camel thorn) and to a lesser extent Boscia albitrunca (Witgat) and other tree species are dying. We have already send photos and samples of dead and dying trees to research teams at Southern African Universities, without clear feedback on causes. Speculation is great, that it is due to disappearing water levels and/or underground water pollution.	Defining the cause of flora mortalities will always be speculative, unless studied with detail. Flora that utilise the groundwater has adapted to cope with long term water level decline associated with natural through flow and evapotranspiration. Potential causes of tree mortality may be linked to old age, pests, groundwater water deficiency or groundwater surplus. It is known that a rapid unnatural drop of the water table impact the flora that depend on it. If a rapid drop of water level is apparent at your farm, then this may be the reason for loss of fauna. However local monitoring data from farmers indicate stable water levels and in contrary increasing water levels. Studies at other locations in Namibia also indicated that mortality of tree species (e.g., Camelthorn trees) also took place due to old age, rapid rising water levels and pests such as shot hole borers.
Karl-Heinz Heimstädt	<i>Email received</i> 24 August 2020	We would like to suggest that strict regulations have to be in place for regular monitoring of the water quantity, water quality and the aquifer table in the closer and greater	This potential impact is addressed in Section 10.1.12. It is encouraged that farmers do self-monitoring to quantify the status of their water levels. This data may be useful for the DWA in the Ministry of Agriculture, Water and Land Reform whom ultimately is responsible for the management of the groundwater basin and



IAP	Correspondence	Issue / Concern	Response
Karl-Heinz Heimstädt	<i>Email received</i> 24 August 2020	<p>surroundings of every irrigation site. The appropriate measurable and enforceable regulations derived from such monitored data are of utmost importance.</p> <p>We are most certainly aware of our responsibility to produce food for our country to become self-sufficient. But it is of utmost importance that this can only be done, if it is sustainable for our entire environment.</p> <p>For more information on our rainfall data and the findings of the impact of the environment, you are most welcome to contact us.</p>	<p>cooperation with the farmers. The ministry do have monitoring wells for example in the Omaheke Groundwater Management Basin at Epukiro Post 3, Epukiro Post 10, Plessisplaas, Ojinenene, Witvlei and Hochveld state water schemes. It is noted that monitoring at these schemes can be improved. The monitoring data is there to assist the DWA in making decisions beneficial to the future sustainable use of the groundwater catchment.</p> <p>Comment noted.</p>
Hendrik Prinsloo	<i>Email received</i> 4 August 2020	<p>Thank you email received concerning environmental study on Springvale. Kindly explain what the environmental study is regarding?</p>	<p>Email Response Provided 2020.08.04:</p> <p>Thank you for the confirmation of the email. According to the Environmental Management Act of 2007, various activities which are undertaken required an Environmental Clearance Certificate. Such a certificate is applied for by means of conducting an environmental assessment (in support thereof). The listed activities which are pertinent to this application are the following:</p> <p>Listed activity 8.1 of Government Notice 30 which state:</p> <p>“the abstraction of ground or surface water for industrial or commercial purposes”</p> <p>Together with:</p> <p>8.7. “Irrigation schemes for agriculture excluding domestic irrigation”</p> <p>Additional activities which may be of interest to farms include charcoal production and lodges / tourism facilities.</p> <p>The process of the environmental assessment is further stipulated in the Act and requires the completion of various actions. In short it entails:</p> <ul style="list-style-type: none"> <li>• Registration of the application with the Ministry of Environment, Forestry and Tourism (MEFT)</li> </ul>

IAP	Correspondence	Issue / Concern	Response
			<ul style="list-style-type: none"> <li>• Conduct public participation (notifying direct neighbours, newspaper advertisement, site notices)</li> <li>• Conduct a site investigation to determine physical attributes of the site and verify infrastructure and project component</li> <li>• Compile the environmental assessment (inclusive of an specialist groundwater assessment for this application).</li> <li>• Provide all registered interested and affected parties with an opportunity to review the report and provide comments (if so desired).</li> <li>• Notify commenting authorities such as the regional council and Ministry of Agriculture, Water and Land Reform (one also needs to obtain an approval letter in terms of a permit where possible)</li> <li>• Submit the report, authority authorisation and proof of public participation to MEFT.</li> </ul> <p>We have notified yourself as a direct neighbour of Elize as part of the public participation process. We trust you will find the above in order. You are further most welcome to contact us for any additional information. You are also welcome to call us should that be more convenient for you.</p>

## Notification Letter



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

**To:** Interested and Affected Parties 5 August 2020  
**Re:** Environmental Impact Scoping Assessment and Environmental Management Plan for Crop Cultivation Activities of Hinze Investments CC on the Farms Okasondana No. 264, Evare No. 265 and Okatjukuri No. 263, Omaheke Region

Dear Sir/Madam

Geo Pollution Technologies (Pty) Ltd was appointed by Hinze Investments CC to undertake an environmental assessment for the irrigation and associated activities on the Farms Okasondana No. 264, Evare No. 265 and Okatjukuri No. 263. The assessment will be conducted according to the Environmental Management Act of 2007 and its regulations as published in 2012.

**Project:** Environmental Impact Scoping Assessment and Environmental Management Plan for the Crop Cultivation Activities on Farms Okasondana No. 264, Evare No. 265 and Okatjukuri No. 263, Omaheke Region

**Proponent:** Hinze Investments CC

**Environmental Assessment Practitioner:** Geo Pollution Technologies (Pty) Ltd

Collectively the proponent has cleared 82 ha for irrigation. However, only 36 ha are irrigated during one planting season, on a rotational basis. Thus, the effective size of productive, irrigated land during one season is 36 ha and not 82 ha. Pending the outcome of a hydrogeological specialist study, the total hectares of land to be irrigated simultaneously, may be increased. For irrigation, water is abstracted from a number of boreholes under an existing water abstraction permit issued by the Ministry of Agriculture, Water and Forestry. An additional water allocation will be applied for. The main produce include maize, oats and wheat. These are on the farm before being transported to various markets. The environmental assessment will include all infrastructure and operational activities associated with the agricultural activities on the farm. This include land clearing, soil preparation, planting, pest control and fertilizer use, harvesting and support services such as electricity supply, fuel storage and use, staff accommodation and effluent disposal.

All Interested and Affected Parties (I&APs) are invited to register with the environmental consultant to receive further documentation and communication regarding the project. By registering, I&APs will 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 as an I&AP and provide comments by **21 August 2020**.

To register, please contact:

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

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

Thank you in advance.

Sincerely,  
**Geo Pollution Technologies**

**Quzette Bosman**  
 Social and Environmental Assessment Practitioner

Directors:

Page 1 of 2  
 P. Botha (B.Sc. Hons. Hydrogeology) (Managing)

Advertisements

Sun

WEDNESDAY 5 AUGUST 2020 NEWS

3



• GANJA USERS SAY POLICE OFFICERS ABUSE CITIZENS BECAUSE OF PALTRY SALARIES

PAY THEM: The Ganja Users Association of Namibia says police officers should be paid more. PHOTO: MMMPA

**GUN president Borro Ndungula says the low salaries police officers earn is the why they subject members of the public to abuse.**

OGONE TLHAGE WINDHOEK

The Ganja Users Association (GUN) of Namibia has encouraged government to pay members of the police service more. This call was made during a recent demonstration to denounce

the treatment members of the public experience at the hands of the police.

The organisation's president Borro Ndungula said the low salaries police officers earn is the reason why they subject members of the public to abuse.

"Maybe some of the reasons they

are beating people is because they are underpaid. We are calling on the line ministry or the inspector-general to give the police a raise," he said.

"We know that police officers do not have houses and such, but they provide an essential service. This is also why we are calling for a raise," he added.

**Apartheid laws**

The association urged the police not to use apartheid-era laws in the

execution of their duties.

"How is it that our police officers are made to enforce apartheid-era laws that in ways violate people's rights and freedoms, which are guaranteed to all Namibian citizens by the supreme law, the constitution? The very same document every man and woman in uniform swore to protect, defend and uphold?" Ndungula said.

The association also accused police officers of taking the law into their own hands during the

execution of their duties.

"Allegations of police brutality in all regions of Namibia continue despite a stern warning from President Hage Geingob," Ndungula said. According to him, those who act brutally often do not account for their actions.

"Nationwide police brutality and killings have been rampant against civilians by police officers. Police officers continue to shoot unarmed civilians, with little, and in most cases, no consequences," he said.

**Erongo travel permits still on the table**

ADOLF KAURE SWAKOPMUND

A notice displayed in one of the Swakopmund police station's windows was removed on Saturday after it created uproar amongst the town's residents.

On the 'Namibians United Against Lock-down' Facebook group, Hannelie Horn Turner expressed her disapproval regarding the notice, which read: "No permits will be issued until further notice. The

public is encouraged to stay home and stay safe. Thank you."

"I suppose this means we are now officially prisoners," she wrote.

She also sent a message to Erongo 24/7's Facebook page to voice her frustration, adding that the notice was placed in the window on Saturday at 09:50.

Meanwhile, a police officer on duty who chose to remain anonymous, later removed the notice, saying residents are allowed to apply for travel permits.

"The notice was put on the window earlier in the year and it is old. It is not even supposed to still be on the wall, so let me remove it now."

"People have been queuing up for permits, even on Friday, and they are allowed to apply for travel permits," she said.

When approached for comment, Inspector Il-eni Shapumba, the police unit commander of community affairs for the region, reiterated that residents can apply for permits to travel out of Swakopmund. "We

are issuing travel permits strictly in line with the law," he said.

Shapumba made these remarks after consulting with the Swakopmund police station command-

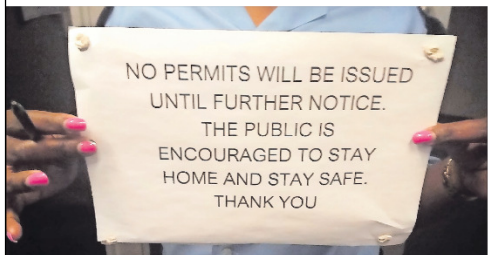
er. Last Friday, President Hage Geingob urged the country's citizens to avoid unnecessary travel.

He made these remarks during a statement on the country's Covid-19

response. "I hereby inform the nation that the Erongo Region and the special dispensation for the local authority areas of Walvis Bay, Swakopmund and Arandis will

remain unchanged and is hereby extended from Tuesday, 4 August, until midnight Monday, 31 August 2020."

adolf@erongo.com.na



MISLEADING: A notice on the window of the Swakopmund police station created confusion on social media. PHOTO: ADOLF KAURE

**PUBLIC PARTICIPATION NOTICE**  
**ENVIRONMENTAL ASSESSMENT:**  
**IRRIGATION AND RELATED ACTIVITIES ON**  
**VARIOUS FARMS IN THE OMAHEKE**  
**REGION**

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The environmental assessments will be conducted according to the Environmental Management Act of 2007 and its regulations as published in 2012.

The proponents currently irrigate land by means of drippers, sprinklers and centre pivot systems. For irrigation, groundwater is abstracted from boreholes. All boreholes used for irrigation will be registered with the Ministry of Agriculture, Water and Land Reform. The main produce are maize, wheat, oats and moringa.

All Interested and Affected Parties are invited to register with the environmental consultant. By registering you are provided with the opportunity to share any comments, issues or concerns related to the project, for consideration in the environmental assessments. Additional information can be requested from Geo Pollution Technologies. All comments and concerns should be submitted to Geo Pollution Technologies by 21 August 2020.

**Quzette Bosman**  
 Geo Pollution Technologies  
 Telephone: +264-61-257411  
 Fax: +264-88626368  
 E-Mail: [gpt@thenamib.com](mailto:gpt@thenamib.com)



**ENVIRONMENTAL IMPACT ASSESSMENT FOR NAMEX MINERALS (PTY) LTD FOR EXPLORATION ACTIVITIES ON EXCLUSIVE PROSPECTIVE LICENCE (EPL) 7304**

Earth Environmental Services herewith gives notice in terms of the Environmental Management Act, 7 of 2007 and Regulation 21 of the Environmental Impact Assessment (EIA) Regulations for the proposed exploration activities on the abovementioned EPL.

**Description of proposed activities:** NamEx Minerals (Pty) Ltd wishes to conduct a comprehensive exploration program for base and rare metals, industrial minerals and precious metals on EPL 7304.

**Location of the EPL area:** Kunene region, Opuwo magisterial district.

Interested and Affected Parties (I&AP) are invited to register with Earth Environmental Services for the proposed exploration activities within 14 days of the advertisement. Registration can be done by requesting of the Background Information Document provided in the email below. Any persons having any comments to the proposed activity may lodge them, duly motivated in writing to the address below by the 19th August 2020.

Email: [ees.earthservices@gmail.com](mailto:ees.earthservices@gmail.com)



# The politics of accidental opinion remarks on Fishrot

OPINION

TOBIAS NANDE NANDJIGWA

**A**ccidental opinion of the day' was first echoed by the author of the American Declaration of Independence, Thomas Jefferson.

In 1789, 12 years after American independence, Thomas Jefferson cemented the psychology behind the expression of accidental opinions through a self-dialogue between his 'Heart and the Head'. His dialogue educates us that situations often produce a crisis of clinging to what is dearest to a being. Hence, the head absorbs the heart but the heart keeps on beating in the mind. Thus, the Bible verse: "Out of the abundance of the heart the mouth speaks." (Mathew 12v34)

So, the above is the premise through which one can filter to understand Swapo's position on the Fishrot scandal.

Lately, the remarks of accidental opinions and from the least expected questions and answers by Namibia's executives speak more volumes than the official written correspondences.

"I don't think they are guilty," was a recent accidental remark by President Hage Geingob, referring to the Fishrot accused. Even if he subsequently corrected it to mean innocent until proven guilty, it did not happen in a vacuum but in a quantum of psychological intent at influencing that perception.

If there are unhitched legal or ethical boundaries to bear undue influence on a matter that is before a court (Samerji Fishrot) through any commentaries by President Hage Geingob and Prime Minister Saara Kuugongelwa-Amadhila, then their zeal to midwife the term and defend it as "a so-called Fishrot"

(Sona, parliament, 2020) fuel a cynical appeal harbouring an undue prejudice and influence that they are indeed claiming to avoid.

"So-called Fishrot" is a flash-point and rightly so a directional difficulty in itself: the perfect phraseology in seeding up a conspiracy to galvanise the dark force against the scandal's graphic details in the light. It exposes the underbelly's first tender piece of the executive's weight in being complicit.

The language used by these political players creates an unnecessary conundrum of reducing something (global scandal) to simply nothing and discreetly influencing the public narrative of Fishrot at a time when we are living at the edge of the post-truth Fishrot environment.

As Nigerian Nobel Laureate Wole Soyinka once said, "Language can be an instrument

of war". Beautifully crafted words can shape lives and a single pronouncement can stir conviction and change the face of a nation.

Such remarks of accidental opinion by state actors qualify to serve to decrease the likelihood of investigators and the jury of the court to act upon independently if not unbiased against the top executive wishes. It promises to destroy the Fishrot power it carries in identifying where all the illicit proceeds got stuck. It also reduces the seriousness in fronting the corruption fight in this particular case. It signalled that our leaders are operating under a different stimulus that defies analysis of Fishrot reality and that of the nation at large.

Another remark with a harmonic beat joined the fray from Netumbo Nandi Ndaitwah, minister of foreign affairs, when she told the world that "the Fishrot Saga had been spoken about too much and must be left in the hands of authority" (parliament, NBC live stream, 2020).

It's unacceptable for her to dictate quietness in the court of public opinion. Netumbo's pronouncement simply sharpened the irony and intensified the pain of people.

She is willing to put the truth to sleep even if it just rose to the light. Hers is simply a sceptical protective device counting on the nation's ability to forget a scandal since she is from the exile school of thought where "there is no comfort in the truth".

There is a clear insensibility located and grounded in the conviction of either abetting, hiding, avoiding or concealing, the Fishrot power it carries in identifying where all the illicit proceeds got stuck. It also reduces the seriousness in fronting the corruption fight in this particular case. It signalled that our leaders are operating under a different stimulus that defies analysis of Fishrot reality and that of the nation at large.

The attitude on a display is nothing but an overt softening of a crime (scandal) with an artificial hypersensitivity of downplaying it without acknowledging it since their harmonic remarks are not saying anything but they are taking away the nation's

instinct that comes with the sociology around the Fishrot scandal. Why the reluctance to offend the Fishrot culprit by the top Namibian leadership?

It seriously depicts an attitude that is hard to fathom but yet easily compatible to link all these accidental opinions in the catapulting-removal of the country's chief criminal investigator, Commissioner Nelius Becker (Police chief investigator moved to forensics, *The Namibian* 2020) and the shameless senseless removal of Hannu Shipena (Intelligence official replaces ACC executive director, *The Namibian*, 2020) in a wolf pack model-style to make it look like the proactive, outspoken Shipena is not the main target: a retribution for speaking out against government underfunding the graft watchdog.

In the realm of spotting out the recipients of Fishrot proceeds elements in its functional ranks, the question for the ruling Swapo leadership is from the Nigerian Yoruba tribe asking, "How many teeth do we have to count in the multiple layers of a dental deformity?"

*Tobias Nande Nandjigwa is a social science educator.*

# The criminalisation of poverty in Katutura

OPINION

ELIFAS HELAO NGHITOMOKA

**H**ave you ever wondered why there is always a large police presence visible in Katutura and not in other parts of Windhoek? The poor are being monitored constantly.

A simple conclusion is that if you have a higher presence of police in one area, more incidents will be reported. A

false narrative is drawn that crime is higher in that area.

Many minor infractions, that in other areas would not be picked up, are reported in informal settlements, placing young lives into a criminal justice system that does not rehabilitate, but instead churns out hardened criminals.

The masses in Havana, Goreangab and Babylon

have been living without basic services and have petitioned the City of Windhoek several times.

We were told there is no budget, yet the City of Windhoek seeks sponsorship from the Road Fund Administration for more police cars.

Did the City seek sponsorship for ablution facilities to service informal areas? Where is the appeal for donations to provide infrastructure for the street vendors?

Will the new police cars be available for our vendors to sell from? Will they be available for our people when they cannot afford the taxi money to get to work or the hospital?

Will they provide light at night when our children need to study? Will they help people fetch water easily? Will they be there to protect

our women and young girls who get raped in the riverbeds or in the bushes when they use these as toilets?

### Create opportunities

If the City is really serious about crime prevention, the best strategy is to create opportunities for all its inhabitants.

With electricity at home, the youth will be able to study without fear of knocking over a candle. They will go to university and prosper; they will not have time to engage in crime.

With land, people will be able to run their businesses without fear of eviction. They will start building their houses and employ others.

### Disinterested in solving problems

The City seems disinterested in solving the problems

of the poor, as clearly demonstrated when they arrested six citizens who were erecting a shack for a homeless man. City Police is not interested in protecting the poor, but rather enforcing arbitrary mandates that do not serve in the best interests of our community.

The City is expected to provide a conducive environment for all its inhabitants and having more police cars will not solve the crime problem. In fact, more crime will continue to emerge as long as what leads to crime is not addressed.

It is time the City looks at the majority of its residents as productive citizens, not only as a burden on resources.

We are people, we are residents of Windhoek, we are Namibians, and just because we live in a poor settlement

does not mean we are poor in mind. We too can think for ourselves; we too contribute meaningfully to this city.

It is us who sweep the streets, allowing Windhoek to be declared one of the cleanest cities in Africa.

It is us who build the roads that allow everyone to travel through this great city and this land.

It is us who ensure businesses are safe and houses are clean and schools are painted. The City must create an environment for collaboration. With our unique skills and talents, we are more than ready to move our city forward.

*Elifas Helao Nghitomoka is a community activist and a resident of Havana in the Samora Machel constituency. He is a member of the Students Christian Movement.*

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<b>2</b>	<b>NUUS</b>	<b>Republiekin</b>	<b>Woensdag 12 Augustus 2020</b>	
	<p>»» <b>KONTAKPERSENE</b></p>			
<p><b>GENL. MURTALA MUHAMMEDRYLAAN. POSBUS 3436, WINDHOEK TEL: 061 297 2000; FAKS: 061 223 721</b></p>				
<p>ISSN 1560-9448</p>				
<p>»» <b>WEER</b></p>		<p><b>WINDHOEK</b> Koue toestand sal in die Suide voorkom.</p> <p><b>BINNELAND:</b> Sonning en matig in die Suide. Elders sal dit sonnig en warm tot baie warm wees.</p> <p><b>KUS:</b> Gedeeltlik bewolk en koud tot matig met miskolle plek-plek.</p> <p><b>GETYE BY WALVISBAAI:</b> H 09:13 L 15:01 H 21:41</p>		
<p>»» <b>VOORUITSIGTE</b></p>				
<p><b>WINDHOEK</b> 8° 26°</p> <p><b>GOBABIS</b> 5° 28°</p> <p><b>KATIMA MULILO</b> 9° 31°</p> <p><b>KEETHAMSHOOP</b> 3° 19°</p> <p><b>MARIENTAL</b> 3° 23°</p> <p><b>OPUWO</b> 8° 31°</p> <p><b>OSHAKATI</b> 10° 32°</p> <p><b>REHOBOTH</b> 6° 26°</p> <p><b>RUNDU</b> 8° 30°</p> <p><b>WALVISBAAI</b> 7° 21°</p> <p><b>JOHANNESBURG</b> 6° 24°</p> <p><b>KAAPSTAD</b> 12° 15°</p>		<p><b>REDAKTEUR</b> Dani Booyens 081 129 3781 / 061 297 2038 dani@republiekin.com.na</p> <p><b>NUUSREDAKTEUR</b> Ronelle Rademeyer 081 127 8159 / 061 297 2114 ronelle@republiekin.com.na</p> <p><b>SPORTNUUS</b> Andrew Poolman 081 247 2837 / 061 297 2011 andrew@republiekin.com.na</p> <p><b>VERKEPE EN AFWERING</b> Ertienne Kotze 081 244 0928 ertienne@nmh.com.na Tel: 061 297 2171</p>		
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### Covid-19: Verkiessings

»» **BL 1**

Dit is volgens hom 'n moontlike aanduiding van hoe deurdag die plan is. Naas om daarop aan te dring dat alle rolspelers by die nasionale regulasies hou om die verspreiding van die siekte te bestay, sal gevolge ook kom vir politieke partye wat agente afvaardig wat as kwesbaar beskou kan word, veral weens hul ouderdom.

Mujoro sê van die voorbereidingsprosesse, soos die opleiding van kiesbeamptes, moet in persoon geskied.

“Verskeie geleenthede onder meer die registrasie van kiesers, die opleiding van verkiesingsamptenare en politieke veldtogte vereis mense om in nabye kontak te wees. Die strategie beoog om oordrag te verhoed en mense teen die virus te beskerm,”



Mr. Theo Mujoro FOTO VESKAF

het Mujoro Vrydag gesê. Van die kwelpunte sluit in wanneer iemand wat stemgeregtig is op stembag in kwarantyn of isolasie sal wees.

Die plan, sê Mujoro, is om dié mense wel te bereik en beamptes sal toegerus wees met persoonlike beskermende drag (PPE’s).

Hulle besef ewenens dat die perk op die aantal mense wat tans ged – 100 vir die 13 streke en 50 en tien vir

onderskeidelik Erongo en die drie geraakte areas (Walvisbaai, Swakopmund en Erongo) – kan mense ook op stembag omtomendig om hul demokratiese reg uit te oefen.

“n Aanvullende registrasieproses word vir 7 tot 15 September beplan. Kragtens ‘n hooggereshofuitspraak van vroeër vanjaar mag elektroniese stemtoestelle (EVM’s) net weer in ‘n nasionale verkiesing gebruik word, mits dit vergesel word met ‘n naspeurbare papierspoor.

Tjipeja het vroeër gesê dit is nie in dié stadium ‘n lonende moontlikheid nie.

Derhalwe sal vanjaar se beplande verkiessings by wyse van tradisionele stembriewe geskied.

“Ons glo dat die land steeds ‘n suksesvolle verkiesing kan hou as belanghebbendes elkeen ‘n bydrae lewer en almal die strategie ter harte neem,” het Tjipeja gesê.

-denver@republiekin.com.na en kristien@republiekin.com.na

# Sluit van howe in openbare belang - Dausab

»» **Regter blootgestel**

Ofskoon ‘n regsbeampte onlangs in kontak was met ‘n bevestigde Covid-19-geval, werp die regbank alles in die stryd vir die voortsetting van hofverrigtinge.



Die minister van justisie, me. Yvonne Dausab. FOTO STAATSHUIS

**M**e. Yvonne Dausab, die minister van justisie, sê hoewel hofdienste, wat ‘n integrale deel van geregtigheid vorm, beperk sal wees vanweë beskikbaarheid van personele, sal dit nie tot stilstand kom nie.

Sy het gereageer op nuus dat ‘n regter onlangs in kontak gekom het met ‘n bevestigde Covid-19-geval by die boekhandelstand van die regter-president en adjunkhoofregter Petrus Damaseb.

Dausab het Maandag by navraag gesê: “Soos dit was tydens die inperking sal sekere dienste steeds voorkom en toegang tot howe geniet, soos kinder-angeleenthede, sake van huishoudelike en seksuele geweld, eerste verskyninge en dringende sake en appelle.”

Die huidige toedrag van sake skep nuus die uitdaging dat dit teveg bring ook moontlikhede, sê die justisiesentrum.

“Dit gee ons ook die geleentheid om aan nuwe maniere te dink oor hoe ons goed doen. Die howe en die justisieselsel moet meer dienste deur middel van digitale platforme beskikbaar stel.”

Die betaling van onderhoud geskied reeds deur middel van elektroniese fondoordrag, sê sy.

“So, dit is nie nodig om fisiek teenwoordig te wees om jou geld te ontvang nie, maar ons moet ons beskikbaarheid verbeter op e-pos en die telefoon in die gevalle wanneer daardie platforme probleme het.”

Dausab het tegegee agterstande en vertragsmet die afhandeling van sake kan nie volkome vermy word nie.

“Dié is moeilike tye en ons moet hoe ons goed doen, aanpas, en ons moet aanpasbaar wees, maar die waarheid is: Die coronavirus sal met ons, vir ons, wees en ons moet leer om daarmee en daarrondom te leef.”

Sy sê toegang tot geregtigheid sluit dié beskikbaarheid van regsdienste, soos onderhoudbetalings, regsbepaling en toegang tot die dienste van die meester van die hoërhof, in.

Baie van dié dienste, sê sy, is tans via die e-justice-platform beskikbaar.

Normaalweg staan regters, landdrosse en aanklaers vir mekaar in, behalwe in gedecentraliseerde verriestings.

-denver@republiekin.com.na

### Styging in Windhoek se gevalle ‘wek kommer’

»» **BL 1**

Die minister sê tans is vyf mense uiters siek; een in Khomas en vier in die Erongostreek. Ses is kritiek; vier in Khomas en twee in Erongo. Die aantal bevestigde Covid-19-gevalle in die land staan tans op 3 229 waarvan 2 495 gevalle aktief is. Die sterftesifer is steeds op 19 en tans is 1 605 mense in kwarantyn in geriewe oraloor die land. Tot op hede is 36 287 weesfelmsonters getoets, met die Universiteit van Namibië se mediese skool wat nou ook toetsing doen.

Intussen het die waarnemende uitvoerende hoof van die Namibiese Instituut vir Patologie (NIP), dr. David Uirab, in ‘n onderhoud met *Republiekin* erken ‘n groot agterstand met toetsing

word steeds ervaar. Uirab het dit as ‘n “voortdurende stryd” beskryf. Volgens hom is die standaard van 540 toetse per dag tot 720 by NIP verhoog, terwyl Pathcare se toetse nog gereken moet word.

Die Universiteit van Namibië se mediese skool en Namdeb op Oranjemund het intussen ook met toetsing begin.

**PLANNE**  
Volgens Uirab ontvang NIP tot 1 600 toetse op ‘n dag, meer as wat hulle in 24 uur kan verwerk. NIP se laboratoriums op Keetmanshoop, Oshakati en Walvisbaai kan ook nou vir Covid-19 toets, terwyl pogings onderweg is om laboratoriums op Katima Mulilo, Rundu, Onandjokwe en Otjiwarongo te betrek.

Met verwysing na die tydperk van kwarantyn en isolasie wat verkort is en ‘n tweede negatiewe toets

wat nie meer nodig is om ontslaan te word nie, sê Uirab hy verwag dit sal “hopelik in twee weke” ‘n positiewe uitwerking op die verwerking van toetse hê.

Met verwysing na die toets vir teenliggaampies teen die siekte by persone wat van Covid-19 herstel het, het hy gesê NIP is slegs by die diagnostiese proses betrokke.

“Dit is deel van die ministerie van gesondheid en maatskaplike dienste se openbare reaksie tot die siekte en hand onder meer van die vlak van blootstelling af,” het hy gesê.

Namibië se bevestigde gevalle was Maandag 0,1% van die totale bevolking teenoor die 0,9% van Suid-Afrika, wat beteken Suid-Afrika het per kapita neger keer meer gevalle as Namibië.

Die burland se sterftesifer uit bevestigde gevalle is 1,9% teenoor Namibië se 0,6%.

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**PUBLIC PARTICIPATION NOTICE**

**ENVIRONMENTAL ASSESSMENT UPDATE: OPERATIONS OF THE ZAMBIA DRY PORT FACILITY IN THE PORT OF WALVIS BAY**

Geo Pollution Technologies (Pty) Ltd was appointed by Africa Union Financial Services (Pty) Ltd to update their existing environmental assessment and environmental management plan. Background information for the project, containing a location map, is available at: [www.thenamib.com/projects/projects.html](http://www.thenamib.com/projects/projects.html)

The update of the environmental assessment will be according to the Environmental Management Act of 2007 and its regulations as published in 2012.

Africa Union Financial Services acts as a logistic hub, not only for cargo to and from Zambia, but for other SADC countries as well. The update is required to include the handling and storage of various types of cargo at both their sites in the Port of Walvis Bay, including but not limited to, containers, reefer containers and the handling and bagging of commodities, including hazardous cargo.

All interested and affected parties are invited to register with the environmental consultant. By registering you are provided with an opportunity to share any comments, issues or concerns related to the facility, for consideration in the updated environmental assessment. Additional information can be requested from Geo Pollution Technologies.

All comments and concerns should be submitted to Geo Pollution Technologies by 27 August 2020.

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**PUBLIC PARTICIPATION NOTICE**

**ENVIRONMENTAL ASSESSMENT: IRRIGATION AND RELATED ACTIVITIES ON VARIOUS FARMS IN THE OMAHEKE REGION**

Geo Pollution Technologies (Pty) Ltd was appointed by O. M. Steyn, Hinze Investments CC, E. van Nisiekri via Vision Farming and N. Steenkamp (the proponents), to undertake environmental assessments for crop cultivation and related activities on the farms: Springvale No. 337, Okatamba No. 266, Bosville West No. 755, Rika No. 266, Tokat No. 343, Conellan No. 247, Owingo No. 246 Okatondana No. 264, Evare No. 265 and Okajikuri No. 263 in the Omaheke Region. The detailed project locations may be viewed at: <http://www.thenamib.com/projects/projects.html>

The environmental assessments will be conducted according to the Environmental Management Act of 2007 and its regulations as published in 2012.

The proponents currently irrigate land by means of drippers, sprinklers and centre pivot systems. For irrigation, groundwater is abstracted from boreholes. All boreholes used for irrigation will be registered with the Ministry of Agriculture, Water and Land Reform. The main produce are maize, wheat, oats and moringa.

All Interested and Affected Parties are invited to register with the environmental consultant. By registering you are provided with the opportunity to share any comments, issues or concerns related to the project, for consideration in the environmental assessments. Additional information can be requested from Geo Pollution Technologies. All comments and concerns should be submitted to Geo Pollution Technologies by 21 August 2020.

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**Site Notice**





## **Appendix E: Consultants' Curriculum Vitae**



**ENVIRONMENTAL ASSESSMENT PRACTITIONER****Quzette Bosman**

Quzette Bosman has 14 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	:	14
Nationality	:	South African
Position	:	Senior Environmental Consultant
Specialisation	:	ESIA & ESMP; SIA
Languages	:	Afrikaans – speaking, reading, writing – excellent English – speaking, reading, writing – excellent German –speaking - fair

First Aid Class A	EMTSS, 2017
Basic Fire Fighting	EMTSS, 2017

**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	:	+180
Publications	:	1