

# A SCOPING REPORT ON THE ENVIRONMENTAL IMPACT ASSESSMENT FOR MINERAL EXPLORATION ACTIVITIES ON EPL 7572, CENTRAL NAMIBIA

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# ENVIRONMENTAL ASSESSMENT FOR MINERAL EXPLORATION ON EPL 7572, CENTRAL NAMIBIA

## EXECUTIVE SUMMARY

### 1. Introduction

#### 1.1 Overview

The proponent was granted an exclusive prospecting licence (EPL) by the Ministry of Mines and Energy. The licence holder intends to explore for base metals (copper and gold) within the marble and schist rock units that are found within the vicinity of the area

#### 1.2 Location

The project is located 34 km Northwest of Otjiwarongo. It covers farms Kleinhuis, Goedbegin, Fresnaye, Karachas, Woodholme, Friedenstal, Homestead, Clifton, Grosvenor, and Waverle.

#### 1.3 Environmental Assessment Requirements

The Environmental Regulations procedure (GN 30 of 2012) stipulates that no mining and mineral exploration activities may be undertaken without an environmental clearance certificate. As such, an environmental clearance certificate must be applied for in accordance with regulation 6 of the 2012 environmental regulations. It is imperative that the environmental proponent must conduct a public consultation process in accordance with regulation 21 of the 2012 environmental procedure, produce an environmental scoping report and submit an Environmental Management Plan for the proposed mineral exploration activities.

#### 1.4 Project Alternatives

An alternative to the proposed mineral exploration activity would be to allocate the land-usage to other income generating activities tourism activities. Although the above-mentioned activities may generate revenue for the government and provide employment to a few individuals, they may not have a significant impact on the community in comparison to the proposed project. The proposed project will strictly employ locals from nearby towns and settlements.

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# ENVIRONMENTAL ASSESSMENT FOR MINERAL EXPLORATION ON EPL 7572, SOUTHERN NAMIBIA

## FINAL SCOPING REPORT

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## 1. Project Background

### 1.1 Introduction

The proponent, Ignatius Theodore, was granted an exclusive prospecting licence (EPL) by the Ministry of Mines and Energy. The licence holder intends to explore for base metals (copper and gold) within the marble and schist rock units that are found within the vicinity of the area. An outline of the area is shown in the image below.

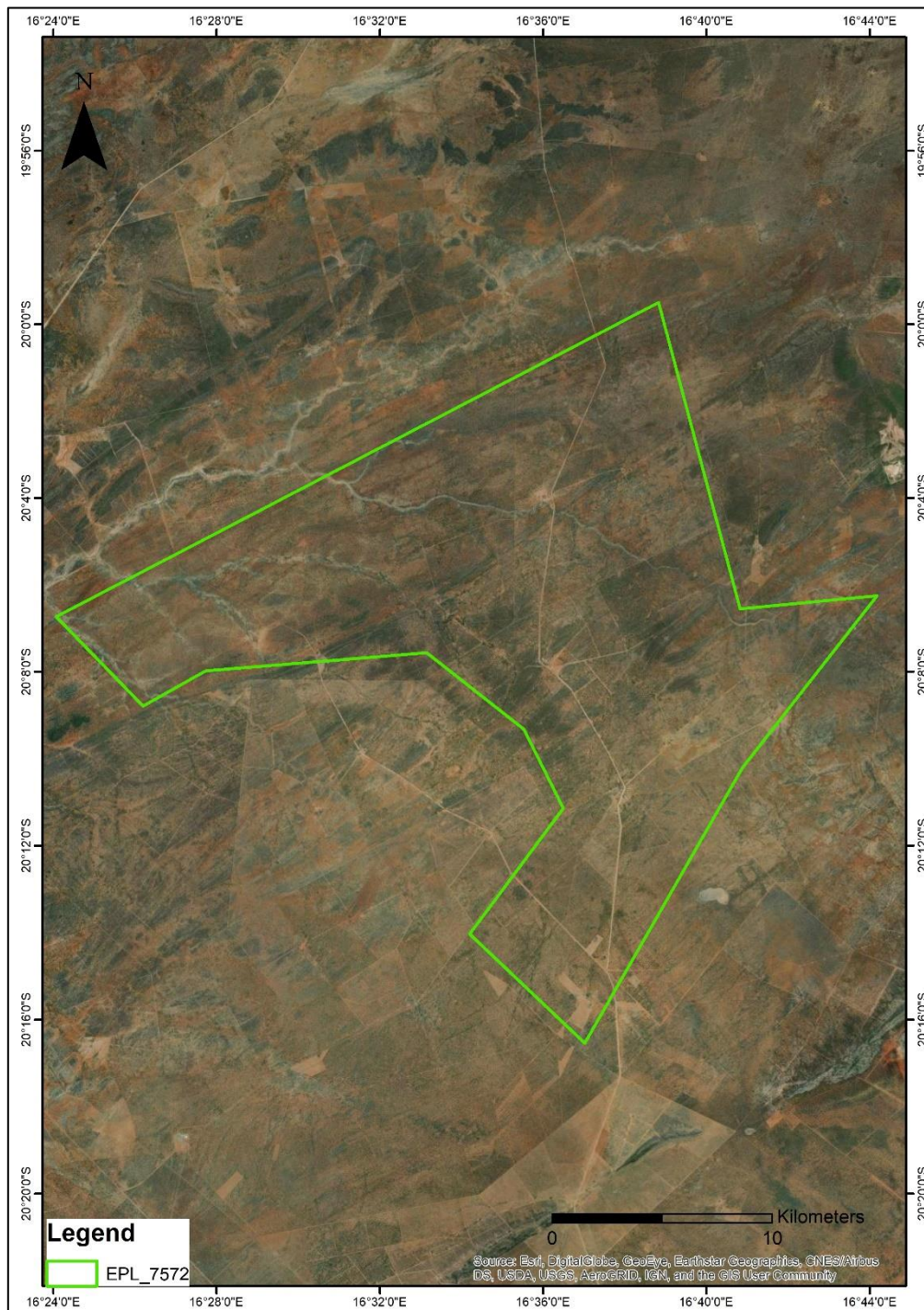
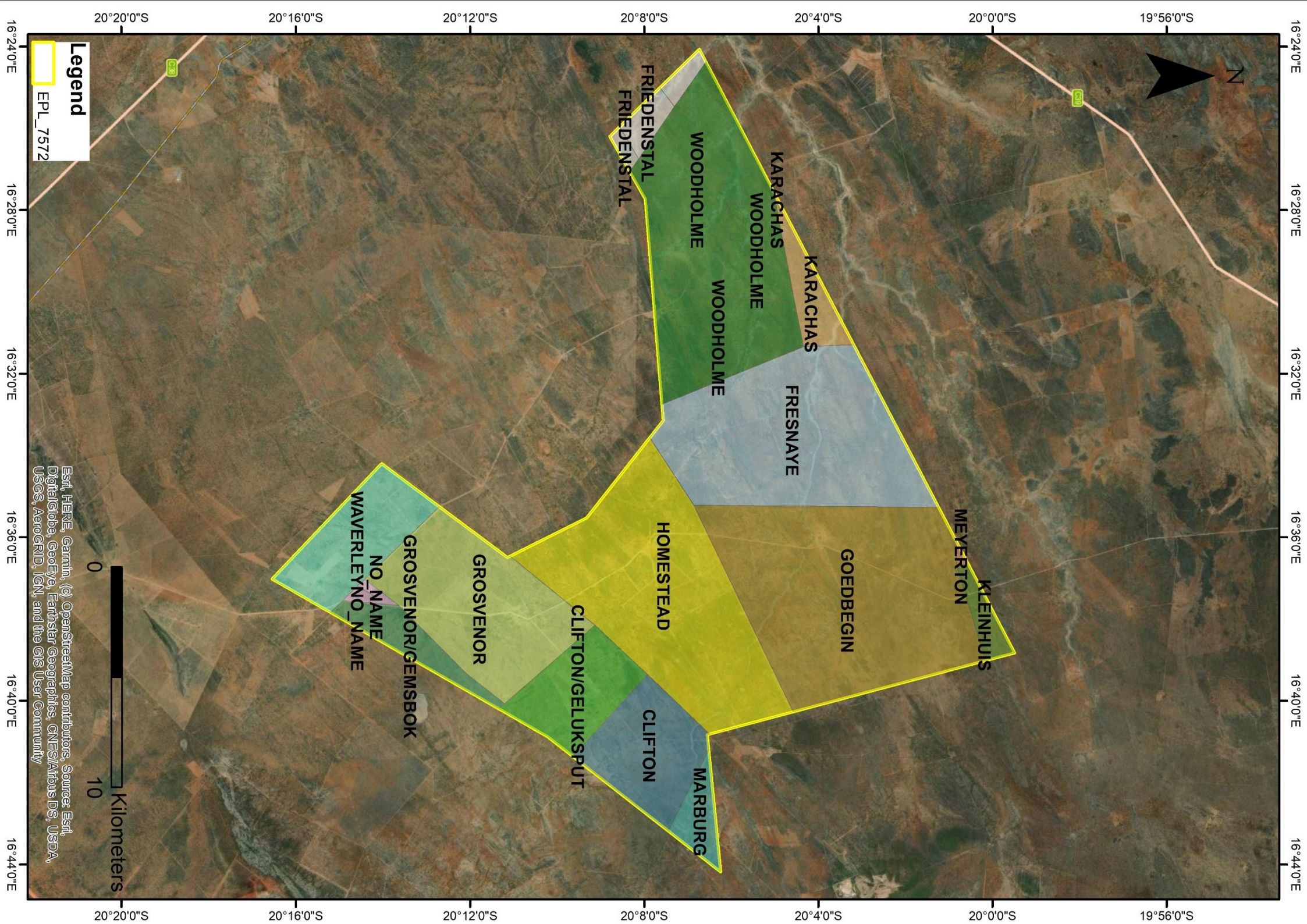


Figure 1 A satellite imagery showing the orientation of the mineral exploration licence.



Although mineral exploration is very costly and risky, environmentally friendly exploration is a cornerstone, yet the mineral exploration process must never be at the expense of people or the environment. The proponent believes that social and environmental responsibility is a prerequisite for providing a conducive environment for mineral exploration and future mining activities.

Impala Consulting cc was appointed by the proponent to undertake an Environmental Assessment (EA) and Environmental Management Plan (EMP) for the mineral exploration project. Figure 2 shows the surrounding farms of the project area. Some of the farms are resettlement farms while the rest are privately owned.



Esri, HERE, Garmin, (c) OpenStreetMap contributors, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

## 1.2 Project Location

The project is located 34 km Northwest of Otjiwarongo. It covers farms Kleinhuis, Goedbegin, Fresnaye, Karachas, Woodholme, Friedenstal, Homestead, Clifton, Grosvenor, and Waverle.

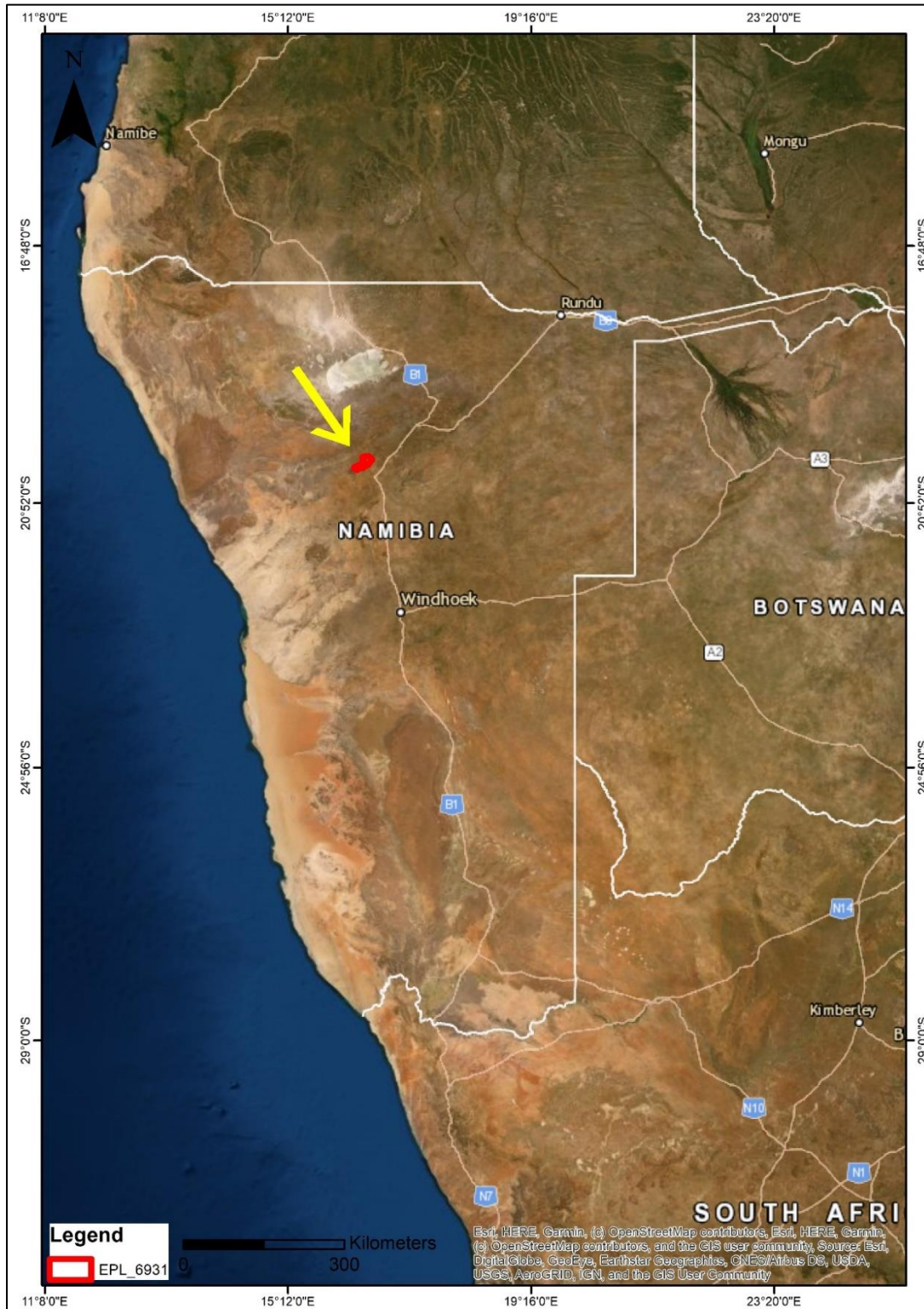


Figure 3 Locality map of the exclusive prospecting licence area

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### 1.3 Environmental Impact Assessment Requirements

The Environmental Regulations procedure (GN 30 of 2012) stipulates that no mineral exploration activities may be undertaken without an environmental clearance certificate. As such, an environmental clearance certificate must be applied for in accordance with regulation 6 of the 2012 environmental regulations. It is imperative that the environmental proponent must conduct a public consultation process in accordance with regulation 21 of the 2012 environmental procedure, produce an environmental scoping report and submit an Environmental Management Plan for the proposed mineral exploration activities.

### 1.4 Purpose of the Scoping Report

The scoping report is prepared for the Environmental Impact Assessment for mineral exploration on an area which is located 34 km Northwest of Otjiwarongo and covers farms Kleinhuis, Goedbegin, Fresnaye, Karachas, Woodholme, Friedenstal, Homestead, Clifton, Grosvenor, and Waverle. The coordinates for the centre of the licence are -20.090200 and 16.582872. Environmental scoping is a critical step in the preparation of an EIA for the proposed mineral exploration activities. The scoping process identifies the issues that are likely to be most important during the EIA and eliminates those that are of little concern. The scoping process shall be concluded with the establishment of terms of reference for the preparation of an EIA, as set out by the Ministry of Environment and tourism. The purpose of this scoping report is to:

- Identify any important environmental issues to be considered before commencing with mineral exploration activities on the proposed mineral exploration sites.
- To identify appropriate time and space boundaries of the EIA study.
- To identify information required for decision-making.

As such, the key objectives of this scoping study are to:

- Inform the public about the proposed mineral exploration activities.
- Identify the main stakeholders, their comments and concerns.
- Define reasonable and practical alternatives to the proposal.

- To establish the terms of reference for an EIA study.

### **1.5 Project Alternatives**

An alternative to the proposed mineral exploration activities would be to allocate the land-usage to other income generating activities such as farming and tourism activities. Although the above-mentioned activities may generate revenue for the government and provide employment to a few individuals, they may not have a significant impact on the surrounding community in comparison to the proposed mineral exploration project and potential mine. The proposed project will strictly employ locals from nearby towns and settlements.

## 2. Summary of applicable legislation

All mineral rights, related to mineral exploration activities in Namibia, are regulated by the Ministry of Mines and Energy whereas the environmental regulations are regulated by the Ministry of Environment and Tourism. The acts that affect the implementation, operation and management of mineral exploration activities in Namibia are shown below.

### 2.1 Environmental Management Act of 2007

**Line Ministry:** Ministry of Environment and Tourism

The regulations that accompany this act lists several activities that may not be undertaken without an environmental clearance certificate issued in terms of the Act. The act further states that any clearance certificate issued before the commencement of the act (6 February 2012) remains in force for one year. If a person wishes to continue with activities covered by the act, he or she must apply for a new certificate in terms of the Environmental Management Act.

### 2.2 The Minerals Prospecting and Mining Act of 1992

**Line Ministry:** Ministry of Mines and Energy

The Minerals Prospecting and Mining Act No.33 of 1992 approves and regulates mineral rights in relation to exploration, reconnaissance, prospecting, small scale mining, mineral exploration, large-scale mining and transfers of mineral licences.

### 2.3 Water Resources Management Act of 2004

**Line Ministry:** Ministry of Agriculture, Water and Forestry

The act provides for the management, protection, development, usage and conservation of water resources; to provide for the regulation and monitoring of water resources and to provide for incidental matters.

### 2.4 Nature conservation ordinance, ordinance No. 4 of 1975

**Line Ministry:** Ministry of Environment and Tourism

The Nature Ordinance 4 of 1975 covers game parks and nature reserves, the hunting and protection of wild animals (including reptiles and wild birds), problem animals, fish, and the protection of indigenous plants. It also establishes a nature

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conservation board. The basic set of regulations under the ordinance is contained in GN 240/1976 (OG 3556). The topics covered in the regulations include tariffs (game parks), regulations relating to game parks, swimming baths, use of boats in game parks, inland fisheries, keeping game and other wild animals in capturing. In addition, the ordinance also regulates game dealers, game skins, protected plants, birds kept in cages, trophy hunting of hunt-able game, hunting at night, export of game and game meat, sea birds, private game parks, nature reserves, regulations of wildlife associations and registers for coyote getters.

## **2.5 National Heritage Act, 2004 (Act No. 27 of 2004)**

**Line Ministry/Body:** National Heritage Council

The National Heritage Act provides for the protection and conservation of places and objects of heritage significance and the registration of such places and objects; to establish a National Heritage Council; to establish a National Heritage Register; and to provide for incidental matters.

## **2.6 Petroleum Products and Energy Act No. 13 of 1990**

**Line Ministry/Body:** Ministry of Mines and Energy

The act regulates the importation and usage of petroleum products. The act reads as “To provide measures for the saving of petroleum products and an economy in the cost of the distribution thereof, and for the maintenance of a price thereof; for control of the furnishing of certain information regarding petroleum products; and for the rendering of services of a particular kind, or services of a particular standard; in connection with motor vehicles; for the establishment of the National Energy Fund and for the utilization thereof; for the establishment of the National Energy Council and the functions thereof; for the imposition of levies on fuel; and to provide for matters incidental thereof”.

## **2.7 Forest Act, No. 12 of 2001**

**Line Ministry/Body:** Ministry of Agriculture, Water and Forestry

The act regulates the cutting down of trees and reads as follows “To provide for the

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establishment of a Forestry Council and the appointment of certain officials; to consolidate the laws relating to the management and use of forests and forest produce; to provide for the protection of the environment and control and management of forest trees; to repeal the preservation of Bees and Honey proclamation 1923, preservation of Trees and Forests Ordinance, 1952 and the Forest Act, 1968; and to deal with incidental matters”.

The constitution defines the function of the Ombudsman and commits the government to sustainable utilization of Namibia’s natural resources for the benefit of all Namibians and describes the duty to investigate complaints concerning the over-utilization of living natural resources for the benefit of all Namibians and describes the duties to investigate complaints concerning the over-utilization of living natural resources, the irrational exploitation of non-renewable resources, the degradation and the destruction of ecosystem and failure to protect the beauty and character of Namibia. Article 95 states that “*the state shall actively promote and maintain the welfare of the people by adopting; inter-alia policies aimed at maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of natural resources on a sustainable basis for the benefit of all Namibians both present and future*”.

## **2.8 Atmospheric Pollution Prevention Ordinance (1976)**

**Line Ministry/Body:** Ministry of Health and Social Services

This ordinance provides for the prevention of air pollution and is affected by the Health Act 21 of 1988. Under this ordinance, the entire area of Namibia, with the exception of East Caprivi, is proclaimed as a controlled area for the purposes of section 4(1) (a) of the ordinance.

## **2.9 Hazardous Substance Ordinance, No. 14 of 1974**

**Line Ministry/Body:** Ministry of Safety and Security

The ordinance provides for the control of toxic substances. It covers manufacture, sale, use, disposal and dumping as well as import and export. Although the



environmental aspects are not explicitly stated, the ordinance provides for the importing, storage and handling.

## **2.10 Namibian Water Corporation (Act 12 of 1997)**

**Line Ministry/Body:** Namibian Water Corporation

The act caters for water rehabilitation of prospecting and mineral exploration areas, environmental impact assessments and for minimising or preventing pollution.

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### 3. Description of Proposed Mineral exploration Project

#### 3.1 Introduction

Most gold occurs as native metal, nearly all alloyed with various amounts of silver as the mineral electrum, but not with copper. Certain minerals are characteristically associated with gold, and the most important are pyrite [FeS<sub>2</sub>], galena [PbS], zincblende [ZnS], arsenopyrite [FeAsS], stibnite [Sb<sub>2</sub>S<sub>3</sub>], pyrrhotite [Fe(1-x)S], and chalcopyrite [CuFeS<sub>2</sub>]. Various selenium minerals and magnetite [Fe<sub>3</sub>O<sub>4</sub>] may also be present. Gold has a special place among metals. It is the oldest metal exploited by man, it plays an important role in world economics, it is highly prized, it was the ultimate goal of alchemists, and it is stored in the vaults of banks. Gold has been used in gilding, to make funeral masks, and for many other uses. Different processes were used for its recovery: panning, amalgamation, chlorination, and cyanidation. (Calcutt, 2001).

The first gold discovery in Namibia was made during early German colonial times (1850s) in the Sinclair Sequence, Rehoboth District. Production was negligible up to 1899, after which mining was very limited. A highly speculative pegging boom took place on the Rehoboth gold fields during 1933 and 1934, and subsequently up to 1941, 199.2 kg of gold was produced from small oxidised and supergene-enriched deposits. The 1917 discovery of the Ondundu gold fields in the Omaruru District marked the first, and only, true Namibian “gold rush”. Mining of primarily alluvial/eluvial deposits and some hard-rock mining produced 614.4 kg of gold until closure in 1963. During the period 1937 to 1943, alluvial gravels were worked in the Epako–Otjua area, Omaruru District, producing some 46.9 kg gold (Miller, 1992). The commissioning and coming into production of the Navachab Gold Mine in the Karibib District in 1989 was a result of the more recent upswing in gold exploration that started in the early 1980s and continues today. The current production of some 2000 kg gold from 1.3 million t of ore per year dwarfs all previous production. Up to the 1960s, approximately 662 kg of gold was produced from several small mines. Between 1965 and 1989 an additional 1878 kg of gold was produced, mostly as by-product from base metal mines. Since 1989, an additional 16 546 kg (up to 1997) has been produced, primarily from Navachab (Miller, 1992).

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## 3.2 Mineral Exploration Method

### 3.2.1 Target Generation

Gold target generation involves certain stages, such as mapping, geochemical survey, geophysical survey, and remote sensing. Mapping includes development of the geological, topographical (base), geochemical, geophysical, and structural maps. Geological map focuses on identifying and mapping outcrops, describing mineralization and alteration zones, and making geological cross sections. In other words, it relies on the identification of rocks and minerals and the understanding of the environment in which they form. It aims to find what rock types occur at or close to the surface and how these rock types are related to each other, e.g., by defining their boundaries, ages, and structure. Topographical map, which is a base map, depicts the topographical features (contour, hill, stream, etc.). Geochemical map includes surface sample locations and results, including analyses of rock, silt, and soil samples. Geophysical map depicts the geology and results obtained from geophysical survey. Structural map shows the orientation data (strike, dip, type, etc.) of bedding planes, faults, folds, joints and other structural features. They are all gathered to be used for the interpretation in copper mineral exploration (Mentes, 2012).

#### 3.2.1.1 Geochemical Survey

Geochemical survey is a kind of sampling method in mineral exploration and results in 'Assay' after laboratory works. Exploration geochemistry has evolved from its early origins using the chemistry of the environment surrounding a deposit in order to locate it. A wide variety of copper bearing rocks such as quartzites can be chemically analyzed in laboratory for this survey. In mineral exploration studies, geochemical methods involve the geochemical analysis of geological materials, including rock, soil, and stream sediment or silt sediment. In addition to these surface samples, any materials obtained from drilling can be analyzed for the evaluation. The results of sampling may reveal patterns that point to the location of a potential copper deposit, which may be present either underground or at the surface. This survey provides physical results to be worked on for the further interpretation and is used for identifying geochemical anomalies, which are used for geochemical mapping

(Mentes, 2012). During the first phase, the type of sampling methods that will be applied are soil sampling, stream sediment sampling, and bulk sampling.

### **3.2.1.2 Geophysical Survey**

Geophysical survey focuses on measuring physical characteristics (e.g., magnetism, density, conductivity) of rocks at or near the Earth's surface and uses surface methods to measure these properties to designate a potential ore body. The measured values are then used to compare with the values and models of known gold deposits. The results obtained from this survey are gathered together to make a geophysical anomaly maps, which is a good way for evaluation.

### **3.2.1.3 Remote Sensing**

Remote Sensing, which is also useful for gold exploration, is the collection of information about an object or area without being in physical contact with it. Data gathering systems used in remote sensing are photographs obtained from manned space flights or airborne cameras, and electronic scanner or sensors such as multispectral scanners in satellites or airplanes and TV cameras, all of which record data digitally. Aerial photography and satellites allow people to work with modern techniques. Aerial photography is used to sense the amount (quantity) of mineral in a particular area. The mineral exploration team collects information such as tracks, roads, fences, and habitation, as well as maps of outcrops, regolith, and vegetation cover across a region. Landsat image (satellite imagery) is used both for the visible light spectrum over mineral exploration (Mentes, 2012).

### **3.2.2 Target Drilling**

Target drilling is the process whereby rigs or some operated tools are used to make boreholes to intercept an ore body. It can be done by contractors with more experienced operators. This method is used to obtain very detailed information about rock types, mineral content, and rock fabric, and the relationships between rock layers close to the surface and those at depth. Then, subsurface geology in a area is evaluated after the results are obtained. That indicates if the potentially economic resources are present or not. In general, the purpose of drilling is to: determine the absence or presence of copper ore bodies, define the volume of and depth to the ore

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body; estimate reserve of ore body reservoir. Then, ore deposit is discovered before it is decided to be mined (Mentes, 2012). During the first exploration phase, RC Drilling and Diamond Drilling methods will likely be employed.

### **3.2.3 Resource Evaluation**

It is an evaluation of tonnage (volume) and grade (concentration or weight percent) of the ore body. The volume is determined by using drill data to outline the deposit in the subsurface, and by using geometric models to calculate the volume. The grade is the average concentration determined from numerous assays of drill samples. The purpose of the resource evaluation is to understand the possibility to expand the known size of the deposit and mineralization. In this way, the economic standards of an ore body are obtained, which is needed for the next step. This step should give an information or idea about proceeding of mineral exploration activities. Resources at this work are determined during exploration and do not provide certain results of grade and tonnage. In order to get an exact size, quality of the commercial mineral, 'reserve definition', which is next step of mineral exploration studies, is used (Mentes, 2012).

### **3.2.4 Resource Definition**

Reserve definition is important to transform a gold mineral resource into an economic asset, which is an ore reserve and find the answer if it is valuable or not. 'Reserve' is more intensive, technical, and well characterized term with its exact quality and size relative to 'Resource'. Also, reserve estimation may be changed over time because of the assessments during and after the mining. The main purpose of this stage is the making decision on the techniques just before extraction as a result of the results. It includes technical, economic evaluation, geotechnical assessment, and engineering studies of the rocks surrounding the deposit to determine the potential parameters of proposed open pit or underground mining methods. At the end of this process, a feasibility study is published, and the ore deposit is supposed either uneconomic or economic. At this stage, a decision is made whether to mine the mineral deposit from the surface, called as 'open-pit mining', or by tunnelling, called as underground mining (Mentes, 2012).

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### 3.3 Labour Requirements

The proponent intends to employ about 5-15 personnel, including 3 management staff for the first phase of the project. The employees will be sourced from the local community including people from Otjiwarongo. All employees will undergo a safety induction, first aid training course and wildlife awareness program. The Labour Act of 2007 will always be adhered to.

### 3.4 Waste Dumps

In choosing a waste dumpsite, the following aspects will be strongly considered by the explorer:

- Topography
- Land-use in the area
- The presence of any hazardous geological structures
- Groundwater considerations
- The prevailing wind direction in the area
- Visual impacts that the waste dump might have
- Presence of surface water in the vicinity of the area
- Presence of sensitive ecological areas

Since the area contains a range of wildlife, all waste will be transported and disposed out of the area.

### 3.5 Services

#### 3.5.1 Electricity requirements

At this stage, electricity requirements for the project are minimal. The bulk of the power supply to the exploration site will be sourced from the proponent's own generator. The power requirements for the proposed project will be minimal as power will only be required for the following activities:

- Emergency lighting
- Powering small machinery during the mineral exploration process
- Power supply for temporary office block or container if necessary.

### **3.5.2 Water Supply**

For the purpose of the scoping study costing requirements, a separate geo-hydrological study will be undertaken at an advanced stage of the EIA. The water requirements for the project are minimal. Water containers will be brought on site and utilised whenever necessary. The water will mostly be used for general consumption and cleaning. The water used for diamond drilling or RC drilling will be recycled.

## **3.6 Infrastructure**

### **3.6.1 Refuse and waste removal**

The proponent will negotiate directly with all suppliers of consumables such as grease, oil etc. to remove these materials for disposal once they have been used and need to be discarded. The proponent will provide adequate temporary sanitary facilities and such facilities must be maintained in a hygienic condition. Sewerage will be disposed of in a manner not polluting the environment. The proponent will remove all refuse pertaining to the proponent's activities, domestic or otherwise, from the property. The Miner will undertake environmental rehabilitation, both during and at the conclusion of the mineral exploration operations.

### **3.6.2 IT Systems and communication**

Provision will be made for two-way radios to enable the drill rig operators and the on-site staff to communicate effectively.

### **3.6.3 Security and Fencing**

No provision has been made for fencing although strict access to and from the drilling site will be facilitated by personnel.

### **3.6.4 Buildings**

At this stage, no exploration camp will be set up and so provision will be made for prefabricated containers.

### **3.6.5 Roads**

Access to the mineral exploration sites is limited as there are currently no convenient

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roads, except for 4x4 tracks. From Otjiwarongo, the mineral exploration site will be accessed via the D2430 road from the B1 main road.

### **3.6.6 Mobile Equipment**

The proponent's vehicle fleet will be optimised during the next project phase. Provision will be made 4x4 vehicles and a drill rig.

### **3.6.7 Fuel Distribution, storage and supply**

During the drilling phase, diesel will be delivered to the by road transport and offloaded into the vehicles by offloading pumps.

### **3.6.8 Storage of Lubrication and consumables**

During the drilling phase, consumables and lubricants will be stored in a designated area within a container. These substances will only be used for mechanical purposes and are assumed to be non-hazardous.

### **3.6.9 Fire Fighting Provision**

Portable fire-extinguishers will be fitted, as required, in vehicles and, as well as in the mobile containers where possible.



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## 4. Description of the Current Environment

### 4.1 Introduction

This section aims to document the present state of the environment, the likely impact of changes being planned and the regular monitoring to attempt to detect changes in the environment. As such, this area represents a high fauna diversity.

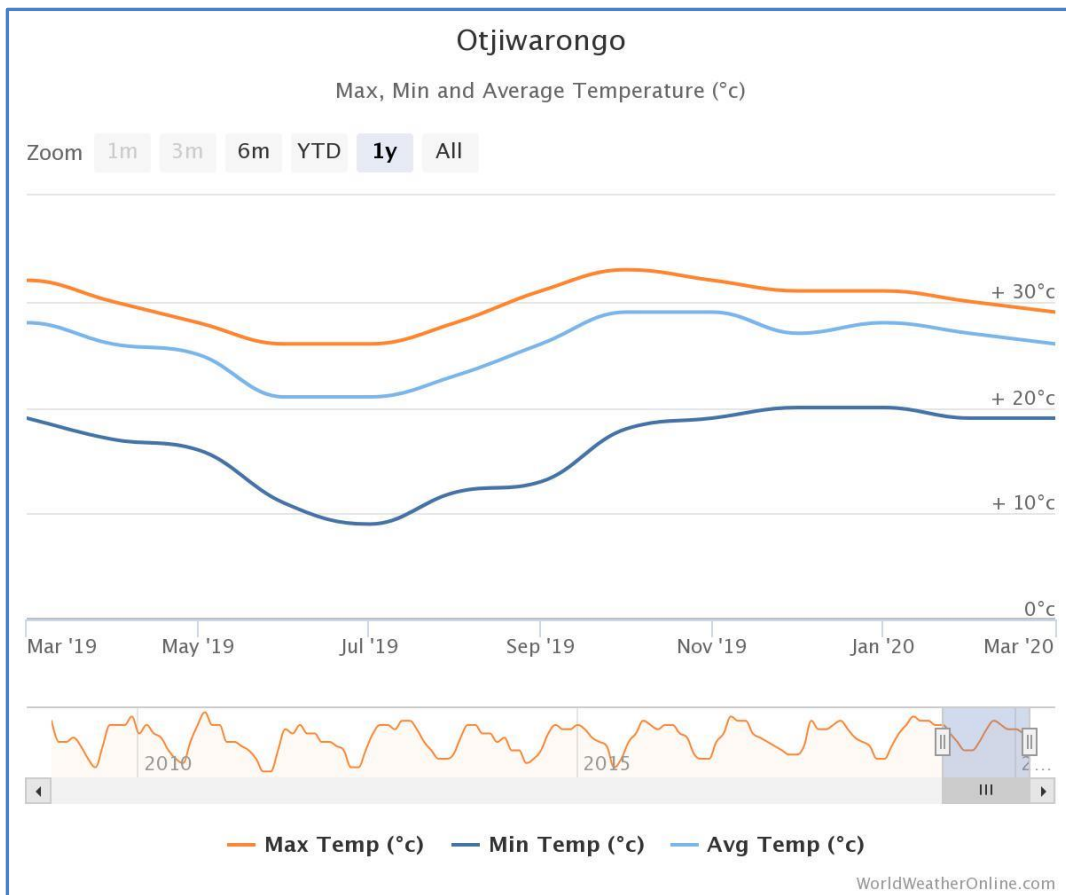
Namibia has four very large and arid regions which set them apart in various ways from the rest of the country; Kunene and Erongo region in the west and Karas and Erongo in the south (Mendelsohn, et al., 2002). Kunene Region occupies the north-west corner of Namibia. The Skeleton Coast Park forms its entire western boundary with the Atlantic Ocean. The Kunene River with its Epupa Falls forms an international boundary with Angola to the north. Nationally, Kunene is bordered by Omusati Region and the western boundary of Etosha National Park. In the south it forms the southern boundary of most of Etosha National Park and borders Erongo and Otjozondjupa regions. The region is home to the Skeleton Coast Park and a large number of conservancies. Otjozondjupa is one of the central regions in Namibia with a size of 105,185 square kilometers, with vegetation ranging from open savanna around Otjiwarongwe, to lush vegetation and massive bright red sandstone cliffs.

The majority of people living in the Otjozondjupa regions depend on livestock farming, conservancy related tourism, and the use of biodiversity products for their livelihoods. Some people have irrigated household gardens.

### 4.2 Climatic Conditions

#### 4.2.1 Temperature

In the mineral exploration area, September is the warmest month with an average temperature of 29°C at noon. July is the coldest month with an average temperature of 21°C at night. Otjiwarongwe, which is in the vicinity of the project area, has distinct temperature seasons, the temperature varies during the year.



**Figure 4** A graph showing the temperature patterns in Otjiwarongo, from [www.worldweatheronline.com](http://www.worldweatheronline.com). In winter, temperatures can get to below degrees centigrade. Overall, winters are mild in temperature, with coldest month most often being July.

#### 4.2.2 Precipitation

In the mineral exploration area, the highest rainfall is usually experienced in February which may reach 150 mm with average rainfall days. In January months, rainfall may reach about 50 mm with average rainfall days. The graph below shows the rainfall patterns in the area.

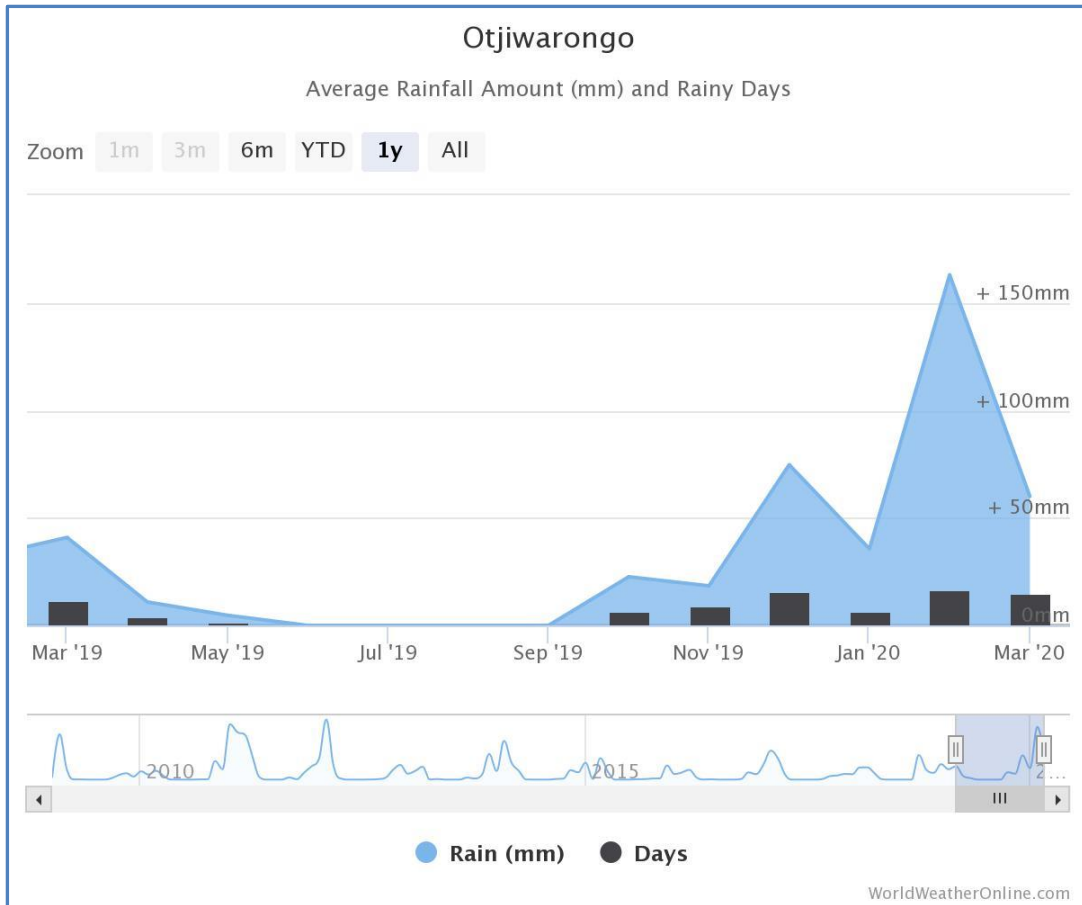
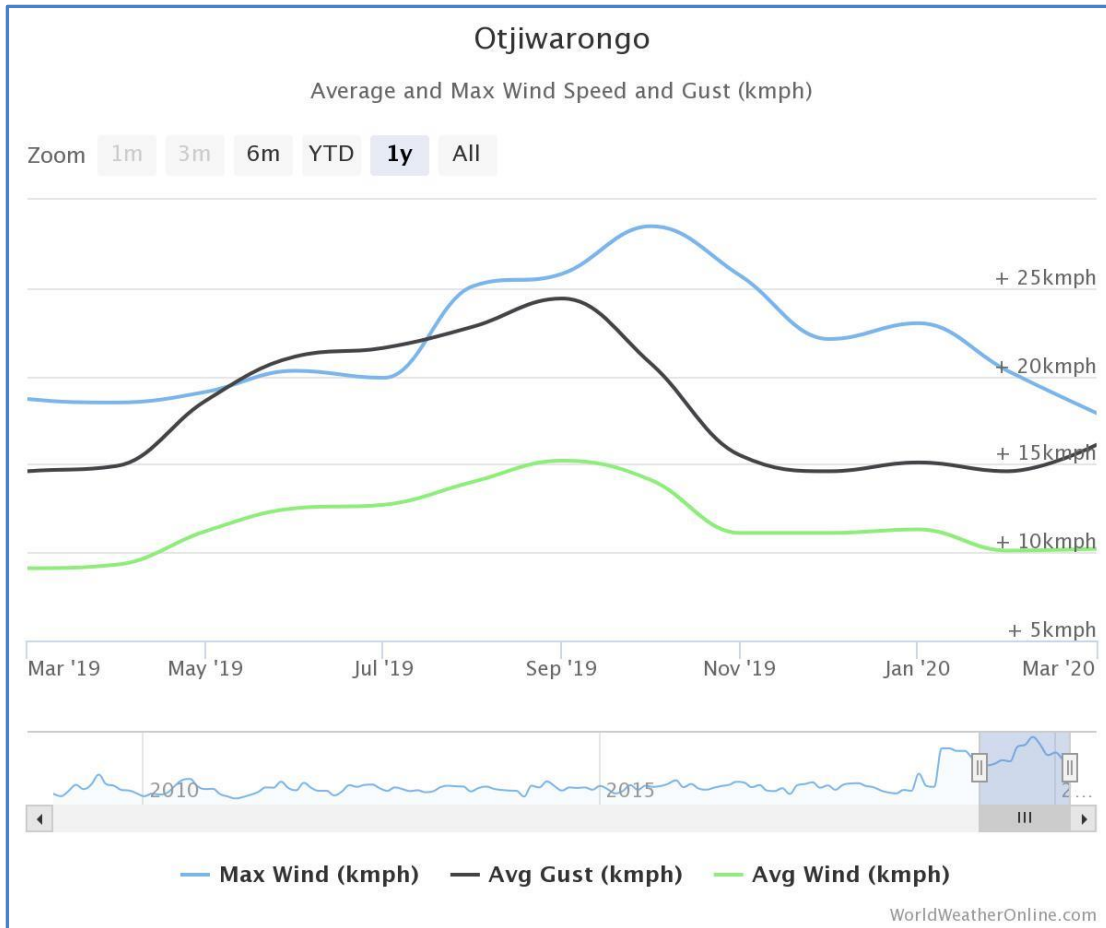


Figure 5 A graph showing rainfall patterns in Otjiwarongo, from [www.worldweatheronline.com](http://www.worldweatheronline.com)

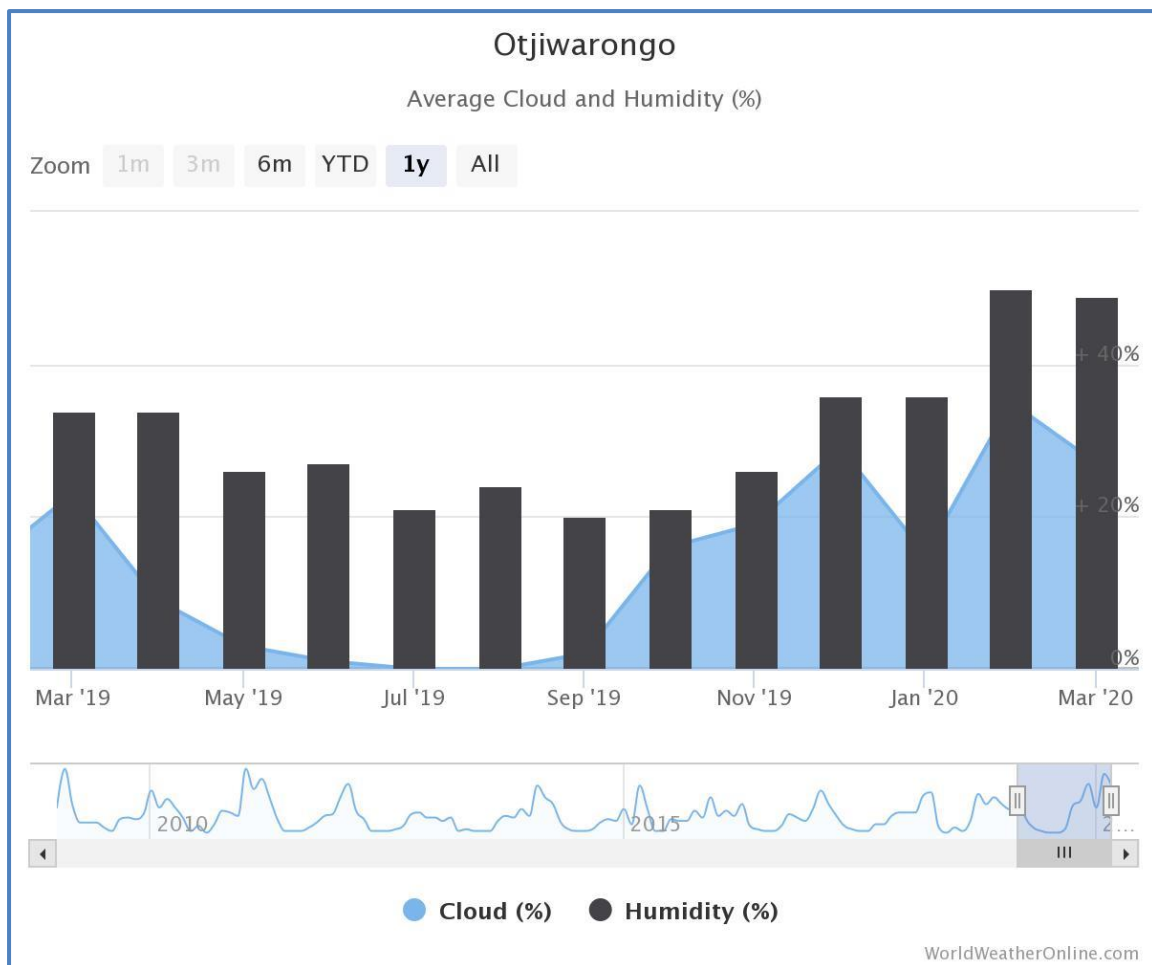
#### 4.2.3 Wind

Predominantly south easterly. Southerly, easterly and northerly airflow is common. The Otjiwarongo area is subject to erratic winds and considerable discrepancies despite short distances, due to the hilly terrain. The graph below depicts the wind patterns in the area. The highest wind speeds are attained in October as shown by the graph below.



#### 4.2.4 Humidity

The relative humidity during the least humid months of the year, i.e. November and September, is around 20 % and the most humid month is March with 43% humidity. Namibia has a low humidity in general, and the lack of moisture in the air has a major impact on its climate by reducing cloud cover and rain and increases the rate of evaporation.



## 4.3 Geology

### 4.3.1 Geological setting

The Exploration Project is set within the northeast-trending, intracratonic arm of the Damara Orogen. The EPL lies predominantly within the NZ. The edge of the Northern Platform (“NP”, also “Otavi Platform”) is to the north of the property in the vicinity of Kombat Mine. In this part of the orogen, fluvial sedimentation was initiated in intracontinental rift basins at about 1000Ma to form the Nosib Group.

Subsequently rifting gradually evolved into spreading and deepening of the basin southwards, culminating in continental rupture to form a mid-ocean ridge (Matchless Member) in the Southern Zone Ocean by about 700Ma ago.

Damara orogenic activity resulted from a reversal of spreading and the initiation of subduction of the Kalahari Craton below the Congo Craton. Episodes of granitoid intrusion, metamorphism and tectonic activity took place over an extended period from about 650Ma to 460Ma. These orogenic activities resulted in an increase in metamorphic grade and the generation of mineralizing metamorphic fluids which

resulted in mineral deposits forming within favourable structures. Most of the deposits in the area were dated and range from 490Ma to 540Ma.

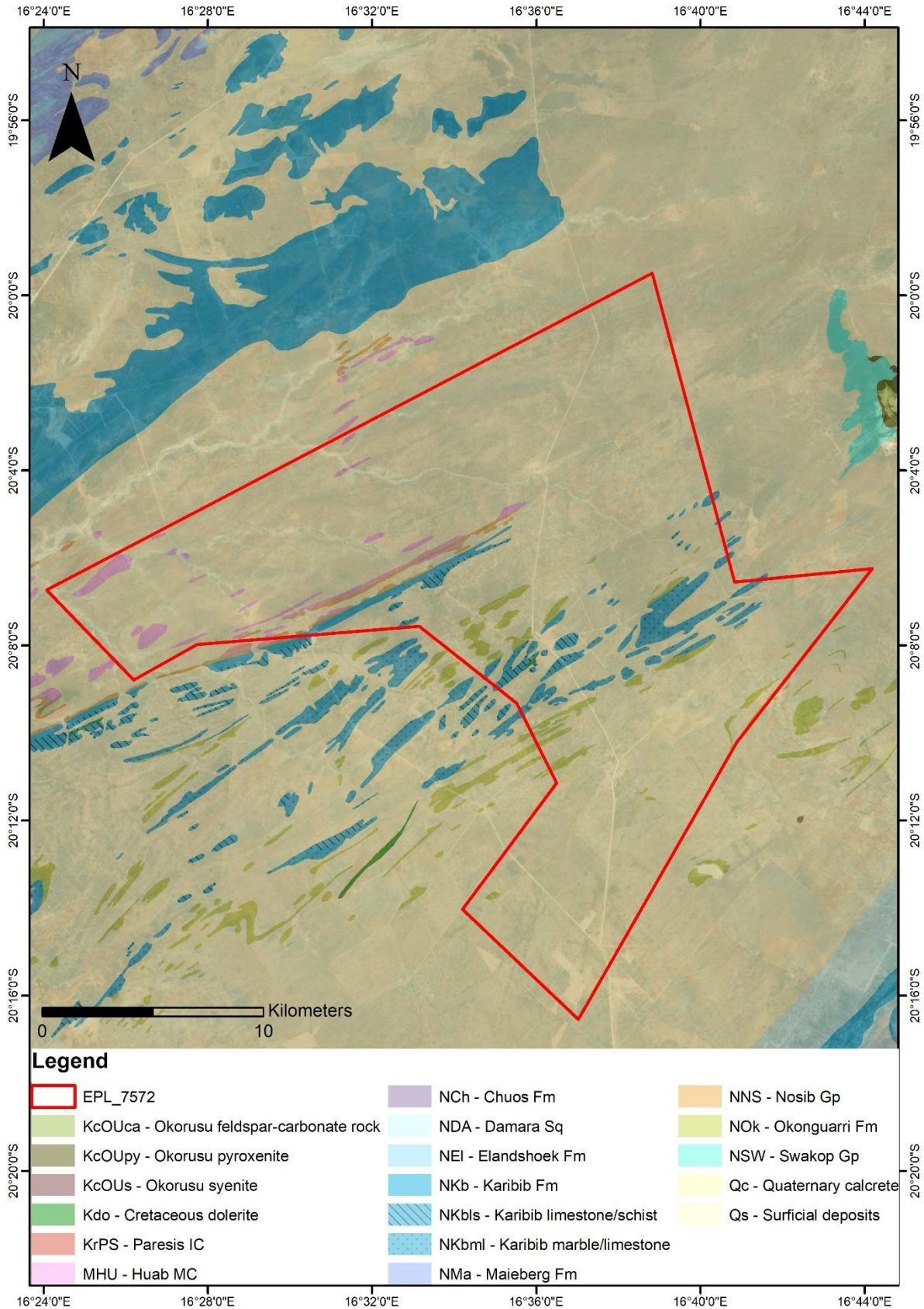
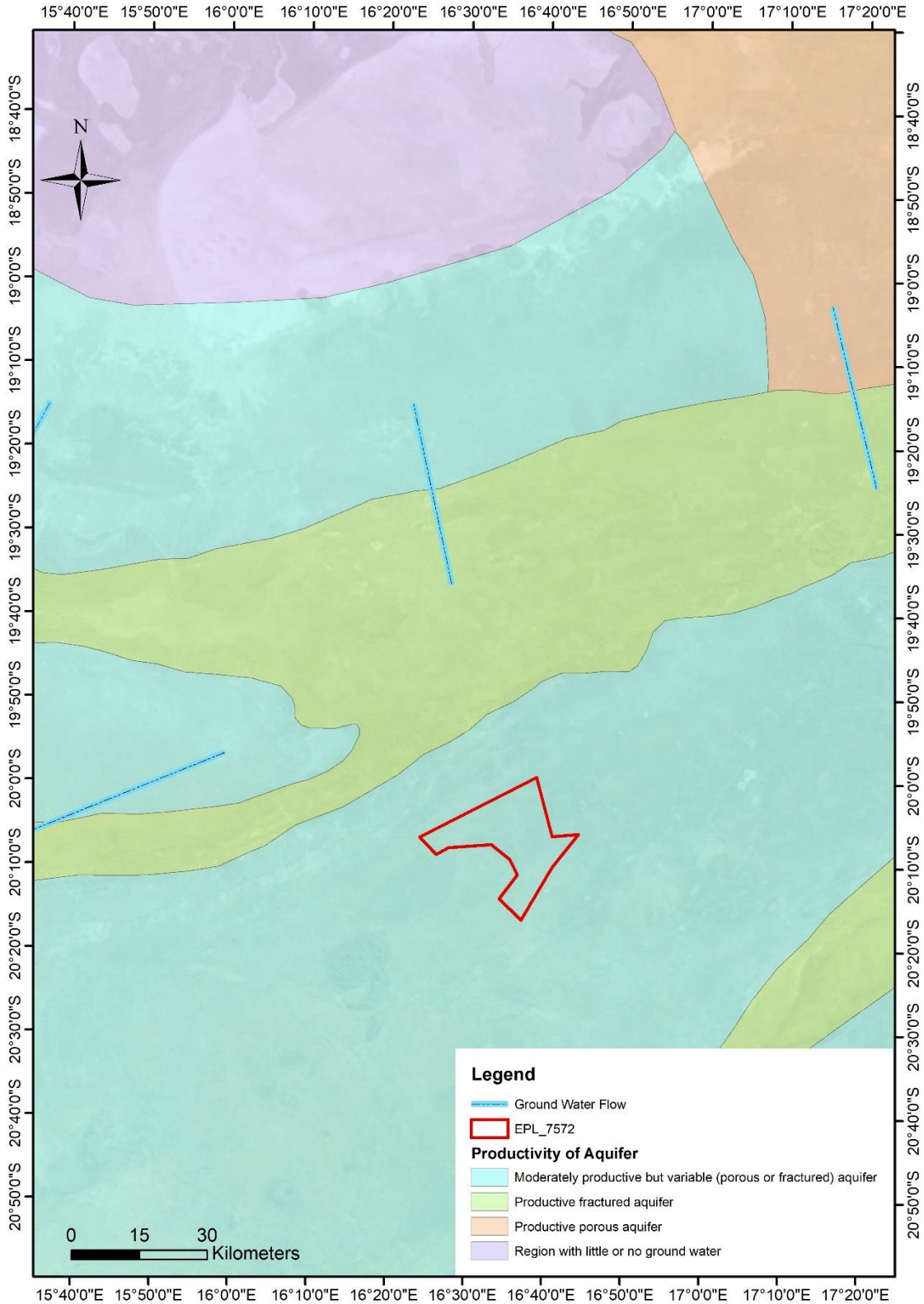


Figure 6 A geological map of the area

### 4.4 Hydrogeology and Water Resources

There are no major rivers that run through the licence area. There are a number of smaller tributaries of the ugab river that run through the licence area. The project area is underlain by a moderately productive but variable aquifer.



## 4.5 Flora

Rainfall in the Otjozondjupa Region is usually extremely variable which means that years of abundant rain often followed by dry conditions (Mendelsohn, et al., 2002). In form, vegetation is generally slightly dense, with a few trees and a variety of grass. The surrounding area is characterised by high botanical diversity. Based on the literature review and site visit, all the vegetation that are found within the vicinity of the area are of “low” to “medium” sensitivity against external conditions. The growing season is very short due to the semi-arid climate.

Grass is dependable on rainfall, which in-turn causes livestock and other animals to suffer during periods of minimal rainfall (Burke, 2003). The mineral exploration area contains diverse vegetation species which include several species endemic to Namibia. Table 1 below lists the different plant species which are most likely to occur within the project area.

**Table 1 A table showing plant species which are likely to occur in the area**

| SCIENTIFIC NAME                  | COMMON NAME           | STATUS IN NAMIBIA       |
|----------------------------------|-----------------------|-------------------------|
| <i>Acacia erioloba</i>           | Camel thorn           | Protected               |
| <i>Acacia mellifera</i>          | Black thorn           | Secure                  |
| <i>Acacia reficiens</i>          | False umbrella thorn  | Secure                  |
| <i>Acacia haematoxylon</i>       | Grey camel thorn      | Protected               |
| <i>Acacia erubescens</i>         | Blue thorn            | Secure                  |
| <i>Acacia karroo</i>             | Sweet thorn           | Secure                  |
| <i>Acacia tortolis</i>           | Umbrella thorn        | Secure                  |
| <i>Acacia hereroensis</i>        | False hook-thorn      | Secure                  |
| <i>Commiphora tenuipetiolata</i> | White-stem corkwood   | Secure                  |
| <i>Aloe littoralis</i>           |                       | Protected               |
| <i>Ozoroa crassinervia</i>       | Namibian resin tree   | Near endemic, protected |
| <i>Boscia albitrunca</i>         | Shepherd's tree       | Protected               |
| <i>Albizia anthelmintica</i>     | Worm-bark false-thorn | Protected               |
| <i>Ziziphus mucronata</i>        | Buffalo-thorn         | Protected               |
| <i>Catophractes alexandri</i>    | Trumpet thorn         | Secure                  |
| <i>Combretum apiculatum</i>      | Red bush willow       | Secure                  |
| <i>Commiphora dinteri</i>        |                       | Endemic                 |
| <i>Commiphora glandulosa</i>     | Tall common corkwood  | Secure                  |
| <i>Commiphora glaucescens</i>    | Blue-leaved corkwood  | Nearendemic             |
| <i>Croton gratissimus</i>        | Lavender fever-berry  | Secure                  |
| <i>Cyphostemma bainesii</i>      |                       | Endemic, protected      |
| <i>Dichrostachys cinerea</i>     | Sickle bush           | Secure                  |
| <i>Diospyros lycioides</i>       | Blue bush             | Secure                  |



|                                     |                         |              |
|-------------------------------------|-------------------------|--------------|
| <i>Dombeya rotundifolia</i>         | Common wild pear        | Endemic      |
| <i>Ehretia alba</i>                 |                         | Secure       |
| <i>Elephantorrhiza suffruticosa</i> |                         | Secure       |
| <i>Euclea pseudebenus</i>           | Ebony tree              | Protected    |
| <i>Euclea undulata</i>              | Common guarri           | Secure       |
| <i>Euphorbia guerichiana</i>        | Western woody milk bush | Secure       |
| <i>Euphorbia virosa</i>             |                         | Secure       |
| <i>Ficus cordata</i>                | Namaqua fig             | Protected    |
| <i>Ficus ilicina</i>                | Laurel fig              | Secure       |
| <i>Ficus sycomorus</i>              | Common cluster fig      | Protected    |
| <i>Grewia bicolor</i>               | White raisin            | Secure       |
| <i>Grewia flava</i>                 | Velvet raisin           | Secure       |
| <i>Grewia flavescens</i>            | Sand paper raisin       | Secure       |
| <i>Gymnosporia senegalensis</i>     | Red spike-thorn         | Secure       |
| <i>Ipomoea adenioides</i>           |                         | Secure       |
| <i>Lycium bosciifolium</i>          |                         | Secure       |
| <i>Lycium cinereum</i>              |                         | Secure       |
| <i>Lycium eenii</i>                 |                         | Secure       |
| <i>Lycium hirsutum</i>              |                         | Secure       |
| <i>Lycium villosum</i>              |                         | Secure       |
| <i>Maerua juncea</i>                |                         | Secure       |
| <i>Maerua schinzii</i>              | Ringwood tree           | Protected    |
| <i>Manuleopsis dinteri</i>          |                         | Endemic      |
| <i>Melianthus comosus</i>           |                         | Secure       |
| <i>Obetia carruthersiana</i>        |                         | Near endemic |
| <i>Pechuel-Loeschea leubnitziae</i> |                         | Secure       |
| <i>Sterculia africana</i>           | African star-chestnut   | Protected    |
| <i>Tarchonanthus camphoratus</i>    |                         | Secure       |
| <i>Tetragonia schenckii</i>         |                         | Secure       |
| <i>Vernonia cinerascens</i>         |                         | Secure       |
| <i>Searsia (Rhus) ciliata</i>       |                         | Secure       |
| <i>Searsia (Rhus) lancea</i>        | Karree                  | Protected    |
| <i>Searsia (Rhus) marlothii</i>     |                         | Secure       |

The density of vegetation in the vicinity of the mineral exploration site is fairly sparse. Every effort will be made to protect the existing trees and shrubs, as these are very important to the ambience and visual appeal of the mineral exploration site. A vegetation expert will be consulted throughout the lifecycle of the mineral exploration program. The protected plant species in the project area are shown in the table below.

Table 2 Table of plant species which are protected under the Forestry Act and likely to occur in the area.

| SCIENTIFIC NAME              | COMMON NAME           |
|------------------------------|-----------------------|
| <i>Acacia erioloba</i>       | Camel thorn           |
| <i>Acacia haematoxylon</i>   | Grey camel thorn      |
| <i>Albizia anthelmintica</i> | Worm-bark false-thorn |
| <i>Boscia albitrunca</i>     | Shepherd's tree       |
| <i>Euclea pseudebenus</i>    | Ebony tree            |
| <i>Ficus cordata</i>         | Namaqua fig           |
| <i>Ficus sycomorus</i>       | Common cluster fig    |
| <i>Maerua schinzii</i>       | Ringwood tree         |
| <i>Ozoroa crassinervia</i>   | Namibian resin tree   |
| <i>Searsia (Rhus lancea)</i> | Karree                |
| <i>Sterculia Africana</i>    | African star-chestnut |

## 4.6 Fauna

### 4.6.1 Introduction

The information is based on a detailed literature review and a site visit which was carried out. The purpose of the Fauna literature review is to identify all potential amphibians, reptiles, and mammals expected on the project area and the surrounding farms in the vicinity of the mineral exploration area. The proposed mineral exploration area supports numerous faunal species but there are no species that are exclusive to the study area.

Larger types of animals such as zebras, giraffes, lions and elephants are rare in this area. There are no species which are exclusively endemic to the exploration area. Based on literature review, development of a mineral exploration project in the area will not have a negative impact on any of the species in the project area.

### 4.6.2 Amphibians

Based on the literature review, there are generally 14 types of amphibian species that occur in project area. Nine of these amphibian species occur abundantly, two occur rarely and six of them occur uncommonly. Griffin (1998) highlighted that amphibian species are declining throughout the world due to various factors such as

climate change and habitat destruction. There are approximately 4000 species of amphibians worldwide of which over 200 species are present in Southern Africa and 57 in Namibia (Griffin, 1998). However, this low figure may be due to the lack of detailed studies carried out on amphibians. The table below shows the different amphibian species that are likely to occur within the study area.

**Table 3 A list of amphibian species which may occur in the project area**

| SCIENTIFIC NAME  | COMMON NAME         | STATUS                                 | OCCURRENCE | REFERENCE            |
|--|---------------------|--|------------|----------------------|
| <b>PLATANNAS</b>   |                     |  |            |                      |
|  |                     |  |            |                      |
| <i>Xenopus laevis</i>  | COMMON PLATANNA     | <b>SECURE</b>                          | ABUNDANTLY | (Daudin, 1802)       |
|  |                     |  |            |                      |
| <b>TOADS</b>   |                     |  |            |                      |
| <i>Breviceps adpersus</i>  | BUSHVELD RAIN FROG  | <b>SECURE</b>                          | ABUNDANTLY | Peters, 1882         |
| <i>Bufo dombensis</i>  | DOMBE DWARF TOAD    | <b>ENDEMIC &amp; INADEQUETLY KNOWN</b> | ABUNDANTLY | Bocage, 1895         |
| <i>Bufo poweri</i>   | MOTTLED TOAD        | <b>SECURE</b>                          | ABUNDANTLY | Hewitt, 1935         |
|  |                     |  |            |                      |
| <b>FOSSORIAL FROGS</b>   |                     |  |            |                      |
| <i>Phrynomantis affinis</i>  | SPOTTED RUBBER FROG | <b>AMBIGUOUS (RARE?)</b>               | RARELY     | (Boulenger, 1901)    |
| <i>Phrynomantis bifasciatus</i>                                      | BANDED RUBBER FROG  | <b>SECURE</b>                          | ABUNDANTLY | (Smith, 1848)        |
|  |                     |  |            |                      |
| <b>SAND FROGS, BULLFROGS, RIDGED FROGS, CACOS, PUDDLE FROGS etc.</b> |                     |  |            |                      |
| <i>Cacosternum boettgeri</i>   | COMMON CACO         | <b>SECURE</b>                          | ABUNDANTLY | (Boulenger, 1882)    |
| <i>Hildebrandtia ornata</i>  | ORNATE FROG         | <b>SECURE</b>                          | UNCOMMONLY | (Peters, 1878)       |
| <i>Phrynobatrachus mababiensis</i>                                   | MABABE PUDDLE FROG  | <b>SECURE</b>                          | UNCOMMONLY | FitzSimons, 1932     |
| <i>Phrynobatrachus natalensis</i>                                    | SNORING PUDDLE FROG | <b>SECURE</b>                          | UNCOMMONLY | (A. Smith, 1849)     |
| <i>Pyxicephalus adpersus</i>   | GIANT BULLFROG      | <b>SECURE</b>                          | ABUNDANTLY | Tschudi, 1838        |
| <i>Tomopterna krugerensis</i>  | KNOCKING SAND FROG  | <b>SECURE</b>                          | RARELY     | Passmore et al, 1975 |
| <i>Tomopterna tandyi</i>   | TANDY'S SAND FROG-  | <b>SECURE</b>                          | ABUNDANTLY | Channing et al, 1996 |

|  |                  |               |            |                       |
|--|------------------|---------------|------------|-----------------------|
|  |                  |               |            |                       |
| <b>TREE FROGS, REED FROGS &amp; KASSINAS</b> |                  |               |            |                       |
| <i>Kassina senegalensis</i>                  | BUBBLING KASSINA | <b>SECURE</b> | ABUNDANTLY | (Dumèril et al, 1841) |

#### 4.6.3 Mammals

Based on the literature review, there are generally about 68 species of mammals expected to occur within the immediate area. There are generally 25 species which rarely occur, 2 species that occur seasonally, 4 that occur occasionally, and 33 that occur abundantly within the project area. Considering the relative size of the mineral exploration area, the mammal fauna will not be affected by the mineral exploration activities of the proponent. Namibia is seemingly well endowed with mammal diversity with around 250 species known to be present within the country (Griffin, 1998). There are currently 14 mammal species which are considered to be endemic to Namibia, including 11 species of rodents and small carnivores which are not well known. Griffin (1998), points out that most of these endemic mammals are associated with the Namib and Escarpment with 60% of these appearing to be rock-dwelling species. The author, Griffin (1998) further highlights that the endemic mammal fauna is best characterized by the endemic rodent family *Petromuridae* (Dassie rat) and the rodent genera *Gerbillurus* and *Petromyscus*. The table below shows the mammal species which are likely to occur within the study area. A full list, of mammal species that are likely to occur within the area, is in the appendix section at the end.

**Table 4 Mammal species which are likely to occur within the project area.**

| <b>SCIENTIFIC NAME</b>            | <b>COMMON NAME</b>        |
|-----------------------------------|---------------------------|
| <i>Acinonyx jubatus</i>           | Cheetah                   |
| <i>Antidorcas marsupialis</i>     | Springbok                 |
| <i>Atelerix frontalis angolae</i> | Southern African Hedgehog |
| <i>Canis mesomelas</i>            | Black-backed Jackal       |
| <i>Caracal caracal</i>            | Caracal                   |
| <i>Crocuta crocuta</i>            | Spotted Hyena             |
| <i>Cynictis penicillata</i>       | Yellow Mongoose           |
| <i>Equus zebra hartmannae</i>     | Hartmann's Mountain Zebra |
| <i>Felis nigripes</i>             | Black-footed Cat          |

|                                     |                     |
|-------------------------------------|---------------------|
| <i>Felis silvestris/lybica</i>      | African Wild Cat    |
| <i>Galerella sanguinea</i>          | Slender Mongoose    |
| <i>Genetta genetta</i>              | Small Spotted Genet |
| <i>Ictonyx striatus</i>             | Striped Polecat     |
| <i>Lepus capensis</i>               | Cape Hare Secure    |
| <i>Lepus saxatilis</i>              | Scrub Hare          |
| <i>Manis temminckii</i>             | Ground Pangolin     |
| <i>Mellivora capensis</i>           | Honey Badger/Ratel  |
| <i>Oreotragus oreotragus</i>        | Klipspringer        |
| <i>Oryx gazella</i>                 | Gemsbok             |
| <i>Otocyon megalotis</i>            | Bat-eared Fox       |
| <i>Panthera pardus</i>              | Leopard             |
| <i>Parahyaena (Hyaena) brunnea</i>  | Brown Hyena         |
| <i>Phacochoerus africanus</i>       | Common Warthog      |
| <i>Proteles cristatus</i>           | Aardwolf            |
| <i>Raphicerus campestris</i>        | Steenbok            |
| <i>Suricata suricatta marjoriae</i> | Suricate            |
| <i>Sylvicapra grimmia</i>           | Common Duiker       |
| <i>Tragelaphus strepsiceros</i>     | Greater Kudu        |
| <i>Vulpes chama</i>                 | Cape Fox            |

#### 4.6.4 Reptiles

The literature review showed that there are approximately 60 reptile species that are expected to occur in the site area. According to the Namibia Conservation Ordinance of 1975, there are four reptile species protected, namely:

**Table 5 Protected reptile species in the project area**

| SCIENTIFIC NAME               | COMMON NAME             | STATUS    |
|-------------------------------|-------------------------|-----------|
| <i>Psammobates Oculiferus</i> | Kalahari Tent Tortoise  | Protected |
| <i>Python Natalis</i>         | Southern African Python | Protected |
| <i>Geochelone Pardalis</i>    | Leopard Tortoise        | Protected |
| <i>Varanus Albigularis</i>    | Veld Leguaan            | Protected |

Griffin (1998) highlighted the presence of 261 species of reptiles which are present in Namibia. These reptiles make up 30% of the reptile species found on the continent. 55 species of Namibian Lizards are classified as endemic (Griffin, 1998). The author, Griffin (1998), describes that more than 60% of the reptiles found in Namibia are protected by the conservation Ordinance. Although mineral exploration activities do affect reptile habitat, the project will not have any significant impact on the reptile species within the proposed mineral exploration area. Namibia, with 129 species of lizards, has one of the continent's richest lizard Fauna. The table in the appendix shows the reptile species which are likely to occur within the vicinity of the mineral exploration area.

#### 4.7 Avifauna (Birds)

Simmons et al (2003) points that although Namibia's Avifauna is comparatively sparse compared to the high rainfall equatorial areas elsewhere in Africa, approximately 658 species have already been recorded with a diverse unique group of arid endemics. There are approximately 650 species of birds that have been recorded in Namibia, although the country's avifauna is comparatively sparse compared to the high rainfall equatorial areas in Africa (Brown & Lawson, 1989). Brown et al (1989) mentions that 14 species of birds are endemic or near endemic to Namibia with the majority of Namibian endemics occurring in the Savannah of which ten species occur in a north-south belt of dry Savannah in Central Namibia. Simmons (2003) recorded 63 species of birds within the vicinity of the project area. 650 bird species are recorded in Namibia, of which 160 species are present in area, especially after good rains fall (Christian, 2005). These birds consist of raptors, chats, larks and karoid species. Christian (2005) recorded the presence of the following bird species in the vicinity of the area, which include:

**Table 6 Bird species which are likely to occur within the site area.**

| SCIENTIFIC NAME       | COMMON NAME         |
|-----------------------|---------------------|
| Agapornis roseicollis | Rosy-faced Lovebird |
| Eupodotis rueppellii  | Rüppell's Korhaan   |
| Lanioturdus torquatus | White-tailed Shrike |
| Parus carpi           | Carp's Tit          |

|                        |                     |
|------------------------|---------------------|
| Phoeniculus damarensis | Violet Wood-Hoopoe  |
| Poicephalus rueppellii | Rüppell's Parrot    |
| Pternistis hartlaubi   | Hartlaub's Spurfowl |
| Tockus damarensis      | Damara Hornbil      |
| Tockus monteiri        | Monteiro's Hornbill |

A full list of bird species within the area is shown in the appendix.

## 4.8 Archaeology

No rock art sites appear to be in the area reserved exclusively for mineral exploration at this stage of the project. Should the proponent find any archaeological/rock art sites during the next project phase, these will be acknowledged, and proper guidelines will be followed to have them protected.

## 4.9 Socio-Economic Environment

### 4.9.1 Demographics of Otjiwarongo

Otjiwarongo (Otjiherero: beautiful place) is a town with more than 30,000 inhabitants in the Otjozondjupa Region of Namibia. It is the district capital of the Otjiwarongo electoral constituency and the capital of Otjozondjupa. Otjiwarongo is situated in central-north Namibia on the TransNamib railway. It is the biggest business centre for Otjozondjupa Region. Otjiwarongo is located on the B1 road and its links between Windhoek, the Golden Triangle of Otavi, Tsumeb and Grootfontein, and Etosha National Park. It is one of Namibia's fast-growing towns, with a neat and peaceful quality environment, and many excellent facilities including supermarkets, banks, lodges and hotels. Some of Namibia's best-known private game farms and nature reserves are located in and around the town. Otjiwarongo is one of Namibia's towns with a large population of German-speaking people. German influence is also evident in its Germanic buildings.

Otjiwarongo has a well-developed road network. It is situated at the junction of the national road B1 that passes north-south through all of Namibia, the C38 to Outjo and further into Kunene Region in Namibia's north-west, and the C33 to Karibib, connecting the coastal towns of Swakopmund and Walvis Bay. Roads in town are

likewise well-maintained, making Otjiwarongo one of the few Namibian towns that has tarred roads even in the townships. The main interest for tourists is Otjiwarongo's proximity to the Waterberg Plateau Park. Otjiwarongo is home to the Cheetah Conservation Fund, an internationally recognized organization dedicated to ensuring the long-term survival of the cheetah through research, conservation and education.

Otjiwarongo suffers from a lack of economic development and employment opportunities, which leads to frustration and outward migration among many of the town's youth. Despite the high unemployment rate in the region, people in Otjozondjupa region are doing their best to provide for their living. Farming is the main source of income in this region, while other people operate their own businesses.

#### **4.9.2 Employment within the Otjozondjupa Region**

Despite the high unemployment rate in the region, people in Otjozondjupa region are doing their best to provide for their living. Farming is the main source of income in this region, while other people operate their own businesses. Mining companies, such as B2 Gold Namibia, have created additional jobs for the inhabitants of this town.

#### **4.9.3 Social Economic Impact**

Although a few people (including farmers) and animals might be negatively affected by dust and noise, the explorer will ensure that these aspects are properly mitigated. With the potential employment of 10 people, this means that 10 families will benefit from the project during the exploration phase. The project has great potential to improve livelihoods and contribute to sustainable development within the surrounding community. Community meetings will be held from time to time by the proponent wherever possible, with the purpose of effectively communicating with the local community and to avoid any unexpected social impacts.



## 5. Assessment of Impacts

The purpose of this assessments of impacts section is to identify and consider the most pertinent environmental impacts and to provide possible mitigation measures that are expected from the mineral exploration activities on EPL 7572. Two different phases are associated with the proposed development. Firstly, the target generation (mapping and sampling) phase, and secondly the drilling phase are being covered by this assessment. Should the mineral exploration activities cease in the future, an EIA will need to be conducted to deal with the associated changes to environment. Mitigation measures for the identified impacts are also provided in this Section.

The following assessment methodology was used to examine each impacts identified:

**Table 7 Assessment methodology used to examine the impacts identified**

| Evaluation Criteria           | Symbol        | Significance of Rating   |
|-------------------------------|---------------|--|
| <b>Nature of impact:</b>      | <b>P or N</b> | Effect the proposed activity would have on the affected environment which is positive ( <b>P</b> ) or negative ( <b>N</b> )  |
| <b>Extent of impact:</b>      | <b>O</b>      | <b>On-Site</b> (the site and it's immediate surrounds)   |
|                               | <b>L</b>      | <b>Local</b> (Mineral exploration Area)  |
|                               | <b>R</b>      | <b>Regional</b> (Otjozondjupa Region)  |
|                               | <b>N</b>      | <b>National</b> (Namibia)  |
|                               | <b>I</b>      | <b>International</b>   |
| <b>Duration of impact:</b>    | <b>SD</b>     | Short Duration (0 to 5 years)  |
|                               | <b>MD</b>     | Medium Duration (5 to 15 years)  |
|                               | <b>LD</b>     | Long Duration (lifetime of the development)  |
| <b>Intensity of impact:</b>   | <b>L</b>      | <b>Low</b> intensity where the natural, cultural and social functions and processes are not affected.  |
|                               | <b>M</b>      | <b>Medium</b> intensity where the affected environment is altered but natural, cultural and social functions and processes can continue.                                       |
|                               | <b>H</b>      | <b>High</b> intensity where the affected environment is altered to the extent that natural, cultural and social functions and processes will temporarily or permanently cease. |
| <b>Probability of impact:</b> | <b>LP</b>     | <b>Low probability</b> is when the possibility of the impact occurring is low.   |
|                               | <b>P</b>      | <b>Probable</b> is when there is a distinct possibility that it will occur.  |
|                               | <b>HP</b>     | <b>Highly probable</b> is when the impact is most likely to occur.   |
|                               | <b>D</b>      | <b>Definite</b> where the impact will occur.   |

|   |   |   |
|---|---|---|
| <b>Significance of Impact:</b><br><b>Further subdivided into impacts with mitigation (MM) measures and impacts with no mitigation measures (NMM).</b> | L | <b>Low Significance</b> is when natural, cultural, social and economic functions and processes are not affected. If the impacts are adverse, mitigation is either easily achieved or little will be required, or both. If impacts are beneficial, alternative means of achieving this benefit are likely to be easier, cheaper, more effective and less time-consuming  |
|   | M | <b>Medium Significance</b> is when the affected environment is altered but natural, cultural, social and economic functions and processes can continue. An impact exists but is not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of beneficial impacts, other means of achieving this benefit are about equal in time, cost and effort.   |
|   | H | <b>High Significance</b> is when the affected environment is altered to the extent that natural, cultural, social and economic functions and processes will temporarily or permanently cease. If impacts are adverse, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time consuming or a combination of these. In the case of beneficial impacts, the impact is of a Substantial order within the bounds of impacts that could occur. |

## 5.1. Overall socio-economic benefits and issues

### 5.1.1. Socio-economic benefits

With the potential employment of 10 people, this means that 10 families will benefit from the project during the exploration phase. The project has great potential to improve livelihoods and contribute to sustainable development within the surrounding community. Community meetings will be held from time to time by the proponent wherever possible, with the purpose of effectively communicating with the local community and to avoid any unexpected social impacts.

#### 5.1.1.1. Potential Direct Benefits

**Direct capital investment:** The mineral exploration project will require a significant capital investment of at least N\$ 10 million. This will be used for mapping, sampling and drilling.

**Stimulation of skills transfer:** Due to the nature of mineral exploration projects, the proponent will implement ad-hoc training programme for some of its staff members. Training programmes will be well structured and staff members will permanently benefit from these training programmes.

**Job creation:** With the potential employment of 10 people, this means that 10 families will benefit from the project during the on-going phase. The project has a great potential to improve livelihoods and contribute to sustainable development within the surrounding community.

#### 5.1.1.2. Potential Indirect Benefits

- The data generated from the exploration programme will be made available to the Ministry of Mines and Energy for future research purposes.
- General enhancement of the health conditions and quality of life for a few people in the surrounding settlements.
- Of significance is the prospect of diversification of the surrounding economy, which is presently mainly focussed on small-scale farming and small-scale mining of semi-precious stones.

#### 5.1.1.3. General socio-economic concerns

Notwithstanding the above benefits there are a few concerns that could reduce or counteract the above benefits related to the project, as follows:

- As the movement of staff and contractors to and from the area increases, the risk of spread of HIV/AIDS increases.
- Increased influx of people to the area as people come in search of job opportunities during the target generation and drilling phase of the mineral exploration project; and
- Increased informal settlement and associated problems.

**Table 8 Impact evaluation for socio-economy**

| Identified Impact                         | Significance |    | Duration | Extent | Intensity | Probability |
|---|--------------|----|----------|--------|-----------|-------------|
|   | NMM          | MM |          |        |           |             |
| Increased spread of HIV/AIDS              | M            | L  | LD       | N      | M         | LP          |
| Increased influx of people to the area    | L            | L  | SD       | L      | L         | P           |
| Increased informal settlement in the area | M            | L  | MD       | L      | L         | LP          |

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## **5.2. Mineral Exploration phases and associated issues**

### **5.2.1. Mapping and Geochemical Sampling Phase of the Project**

The following potential effects on the environment during the target generation phase of the mineral exploration project have been identified:

#### **5.2.1.1. Dust**

Dust may be generated during this phase and might be aggravated during the winter months when strong winds occur. Dust will be generated by the vehicles moving in the area. Fall out dust settling on vegetation is likely to cause local disruptions in herbivorous and predatory complexes and should be minimised as far as possible.

#### **5.2.1.2. Noise**

Noise will most likely be generated by vehicles during the target generation phase. It is recommended that vehicle movement be limited to normal daytime hours to allow nocturnal animals to roam freely at night.

#### **5.2.1.3. Safety and Security**

During mapping and sampling, small tools and equipment will be used on site. This increases the possibility of injuries and the responsible manager must ensure that all staff members are briefed about the potential risks of injuries on site. The manager is further advised to ensure that adequate emergency facilities, including first aid kits, are available on site. All Health and Safety standards specified in the Labour Act should be complied with.

Should a camp be necessary at a later stage, it should be in such a way that it does not pose a risk to the community members and wildlife that roam the area.

#### **5.2.1.4. Visual**

The proposed exploration area is situated more than 1 km from any main road. As such, any visual impact that might be caused by the exploration team are minimal. In some parts of the area, the topography of the mineral exploration site is slightly elevated.

**Table 9 Impact evaluation for the target generation phase of the project**

| Identified                   | Significance |    | Duration | Extent | Intensity | Probability |
|------------------------------|--------------|----|----------|--------|-----------|-------------|
|                              | NMM          | MM |          |        |           |             |
| Impact                       |              |    |          |        |           |             |
| <b>Dust</b>                  | L            | L  | SD       | L      | L         | P           |
| <b>Noise</b>                 | M            | L  | SD       | L      | M         | D           |
| <b>Safety &amp; Security</b> | L            | L  | SD       | O      | L         | P           |
| <b>Visual</b>                | L            | L  | MD       | O      | L         | LP          |

## 5.2.2. Drilling Phase of the Project

During the operation phase of the project, a few holes will be drilled into the orebody. For the purpose of conveniently refuelling company vehicles without driving long distances, a small portable fuel storage tank will be brought on site.

### 5.2.2.1. Air Quality

In terms of air quality, emissions will be given off by 4x4 vehicles and the drill rig but not to an extent that warrants concern. Dust will also be produced by the drill rig and the movement of vehicles in the area.

### 5.2.2.2. Fire and Explosion Hazard

Hydrocarbons are volatile under certain conditions and their vapours in specific concentrations are flammable. If precautions are not taken to prevent their ignition, fire and subsequent safety risks may arise.

All fuel storage and handling facilities in Namibia must however comply with strict safety distances as prescribed by SANS 10089. SANS 10089 is adopted by the Ministry of Mines and Energy as the national standard.

It must further be assured that enough water is available for fire firefighting purposes. In addition to this, all personnel must be sensitised about responsible fire protection measures and good housekeeping such as the removal of flammable materials including rubbish, dry vegetation, and hydrocarbon-soaked soil from the vicinity of the exploration area. Regular inspections should be carried out to inspect and test firefighting equipment and pollution control materials at the drilling site.

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All fire precautions and fire control at the site must be in accordance with SANS 10089-1:1999, or better. A holistic fire protection and prevention plan is needed.

Experience has shown that the best chance to rapidly put out a major fire, is in the first 5 minutes. It is important to recognise that a responsive fire prevention plan does not solely include the availability of firefighting equipment, but more importantly, it involves premeditated measures and activities to timeously prevent, curb and avoid conditions that may result in fires. An integrated fire prevention plan should be drafted before drilling.

#### **5.2.2.3. Generation of Waste**

Waste in the form of contaminated soil due to minor spillage might occur but should be prevented through the use of containment areas as provided. Solid waste will also be generated from contractors, staff members and other visitors to the area. Care should be taken when handling waste material.

#### **5.2.2.4. Health and Safety**

The drilling programme operations can cause serious health and safety risks to workers on site. Occupational exposures are normally related to the dermal contact with fuels and inhalation of fuel vapours during handling of such products. For this reason, adequate measures must be brought in place to ensure safety of staff on site, and includes:

- Proper training of operators;
- First aid treatment;
- Medical assistance;
- Emergency treatment;
- Prevention of inhalation of fumes;
- Protective clothing, footwear, gloves and belts; safety goggles and shields;
- Manuals and training regarding the correct handling of materials and packages should be in place and updated as new or updated material safety data sheets becomes available;
- And Monitoring should be carried out on a regular basis, including accident reports.

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#### **5.2.2.5. Fauna**

Mineral exploration activities may have minor disturbances on the habitat of a few species but no significant impacts on the animals are expected. The proponent shall ensure that no animal shall be captured, killed or harmed by any of the employees in any way. Wildlife poaching will strongly be avoided as this is an offence and anyone caught infringing in this regard will face suspension from the project and will be liable for prosecution.

#### **5.2.2.6. Vegetation**

The natural vegetation is seemingly undisturbed in the project area except for grasses, which have been grazed by livestock and wild animals. Some vegetation species in the area may be adversely impacted by the project. The type of vegetation that might be affected by the project are:

- Bushes
- Ephemeral grasses
- Small trees

Some of the sensitive vegetation types in the area include:

- Shallow drainage line vegetation
- Scrublands surrounding the mineral exploration area

Certain species regarded as particularly important for conservation may yet be identified and made known via an Addendum to this report. If particularly important species are found, they will be located by GPS and their locations communicated to the Ministry of Environment and Tourism. Such locations will then be demarcated and completely avoided.

#### **5.2.2.7. Avifauna**

Birds or Nest sites will not be disturbed by any employee, tourist or contractor. Should the employees observe any bird nesting sites for vultures, they will be reported to the Ministry of Environment and Tourism and the site will be avoided.

### 5.2.2.8. Alien Invasive Plants

Disturbance to the natural environment often encourages the establishment of alien invasive weed species. Some of the plant species that could become invasive in the area are listed below:

- *Prosopis glandulosa*
- *Lantana camara*
- *Cyperus esculentus*
- *Opuntia imbricate*
- *Cereus jamacara*
- *Melia azedarach*

There are numerous ways in which invasive species can be introduced deliberately or unintentionally.

### 5.2.2.9 Heritage Impacts

Although no archaeological sites have been identified yet in the project area, appropriate measures will be undertaken upon discovering any new archaeological sites. All archaeological remains are protected under the National Heritage Act (2004) and will not be destroyed, disturbed or removed. The Act also requires that any archaeological finds be reported to the Heritage Council Windhoek.

Table 10 Impact evaluation for the operational phase of the project

| Identified Impact       | Significance |    | Duration | Extent | Intensity | Probability |
|-------------------------|--------------|----|----------|--------|-----------|-------------|
|                         | NMM          | MM |          |        |           |             |
| Air Quality             | M            | L  | LD       | L      | M         | HP          |
| Fire & Explosion Hazard | H            | M  | SD       | O      | M         | LP          |
| Generation of waste     | M            | L  | LD       | O      | L         | D           |
| Health and Safety       | H            | M  | MD       | N      | L         | P           |
| Fauna                   | M            | L  | MD       | L      | M         | D           |
| Vegetation              | M            | L  | MD       | L      | M         | D           |
| Avifauna                | M            | L  | MD       | L      | M         | LP          |
| Alien Invasive Plants   | M            | L  | MD       | L      | M         | P           |
| Heritage                | M            | L  | LD       | O      | H         | LP          |