A SCOPING REPORT ON THE ENVIRONMENTAL IMPACT ASSESSMENTFOR THE PROPOSED DEVELOPMENT OF MARBLE MINE/QUARRY ON MINING LICENCE (ML218), KARIBIB, ERONGO REGION

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EXECUTIVE SUMMARY

Catseye Investments CC hereinafter referred to as the Proponent intends to carry out dimension stone (marble) mining operations on Mining License (ML 218) within Exclusive Prospecting Licence (EPL 6118). Mineral rights valid under this EPL are Base & Rare metals, Industrial Minerals, Dimension Stones and Precious Metals. The mining licence is located about 20 km southwest of the Town of Karibib and covers an area of about 5,418.30 Ha. The area falls under the Karibib Constituency jurisdiction and covers the farms Abbabis 70, Habis 7 and Mourepos 58.Catseye Investments (Pty) Ltd appointed Chem Papers CC to conduct the necessary assessments including public participation.

The proposed mining and ongoing exploration activities of dimension stone in the ML 218 falls under the activities that are listed in the Environmental Management Act, 2007 (Act No. 7 of 2007) and EIA Regulations (2012). These activities cannot be undertaken without an Environmental Clearance Certificate (ECC). In order to obtain an Environmental Clearance Certificate for the proposed activities, the proponent is required to have undertaken an Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) reports. These reports are a tool to identify, predict and evaluate the economic, environmental and social impact of proposed mining activities

The site of the proposed exploration activities already hosts other authorized dimension stone exploration activities; therefore the natural setting of the area is accustomed to similar operations and that potential negative impact of the proposed project on the natural environment of the surrounding area will be negligible. The proposed project will strictly employ locals from nearby towns and settlements.

It is hereby recommended that proposed marble mining and exploration operations as well as the supporting infrastructure be granted an Environmental Clearance Certificate, provided that: All mitigations provided in this report are implemented as stipulated and where required and emphasized, improvement should be effectively put in place.

Table of Contents

List of figures

List of tables

ACRONYMS AND ABBREVIATIONS

Below a list of acronyms and abbreviations used in this report.

Acronyms / Abbreviations	**Definition**
EPL	Exclusive Prospecting License
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
MEFT	Ministry of Environment, Forestry and Tourism
MEFT: DEA	Ministry of Environment, Forestry and Tourism: Department of Environmental Affairs
ML	Mining License
MME	Ministry of Mines and Energy
Target area	The area of the EPL intended for exploration activities

1. Introduction

1.1. Project background

Catseye Investments CC is a Namibian Registered close corporation. It is the holder of Exclusive Prospecting License (EPL 6118) located in Karibib District, Erongo Region. The EPL has been valid since 10/11/2016 and is currently pending renewal. The applicant has launched a mining licence application ML 218 on the 9th of August 2019with the Ministry of Mines and Energy (MME).The issuance of an Environmental Clearance Certificate by Ministry of Environment, Forestry and Tourism (MEFT) will pave way for the proposed mining activities. As soon as the mineral rights for ML218 has been granted and the Environmental Clearance Certificate has been issued by Ministry of Environment, Forestry and Tourism (MEFT), then mine development and the subsequent production phase and processing will follow.

1.2 Project location and description

The project area is located in central SSW of Karibib (Fig. 1), 20 km SSW of the Town of Karibib (Fig. 2) and covers the farms Abbabis 70, Habis 7 and Mourepos 58 in Karibib constituency, Erongo Region. Coordinate from the centre of the ML is -23.058889, 15.766389. The Mining licence (ML 218) is 2, 767.83 Ha while the exclusive prospecting license area (EPL 6118) under which the mining licence falls is 5,418.30 Ha. The ML area is located on a highly prospective area for marble of the Karibib Formation. Estimated economic potential of the study area is over 49 million tons of mineral resources and 29 million tons mineral reserves of white marble. In this perspective that part of a mineral resource (i.e. bodies of rock that are of potential economic interest due to their inherent properties), which has been fully evaluated and is deemed commercially viable to work, is called a mineral reserve.

Mining will be executed by means of quarrying with a diamond wire saws and stone cutting machines for cutting off rectangular blocks. Quarrying is similar to open-pit mining except the

term is commonly applied to the extraction of dimension stone and aggregates. Fewer benches are required in quarrying than in open-pit metal mining in quarrying, most of the material extracted is marketable .Mined blocks will be transported to the Port of Walvis Bay is situated 210 km from the proposed mining area by public road.

1.2.2 Environmental Consultant

Chem Papers Investments cc (Reg. No. CC/2010/4075) has been assigned to conduct an Environmental Impact Assessment (EIA) and develop and Environmental management plan (EMP) for the proposed development of the marble mine/quarry. The Environmental Assessment Practitioner (EAP) for this study was Ms. C Kanyama. Her main area of expertise includes Mineral exploration, Environmental Management and Groundwater resource management. The appointed EAP has a Master's Degree in Applied geology majoring in Hydrogeology and Environmental Management (University of Namibia), B.Science Degree in Geology (University of Namibia). CV is attached in Appendix B.

Fig. 1. Locality of EPL 6118 in central Namibia.

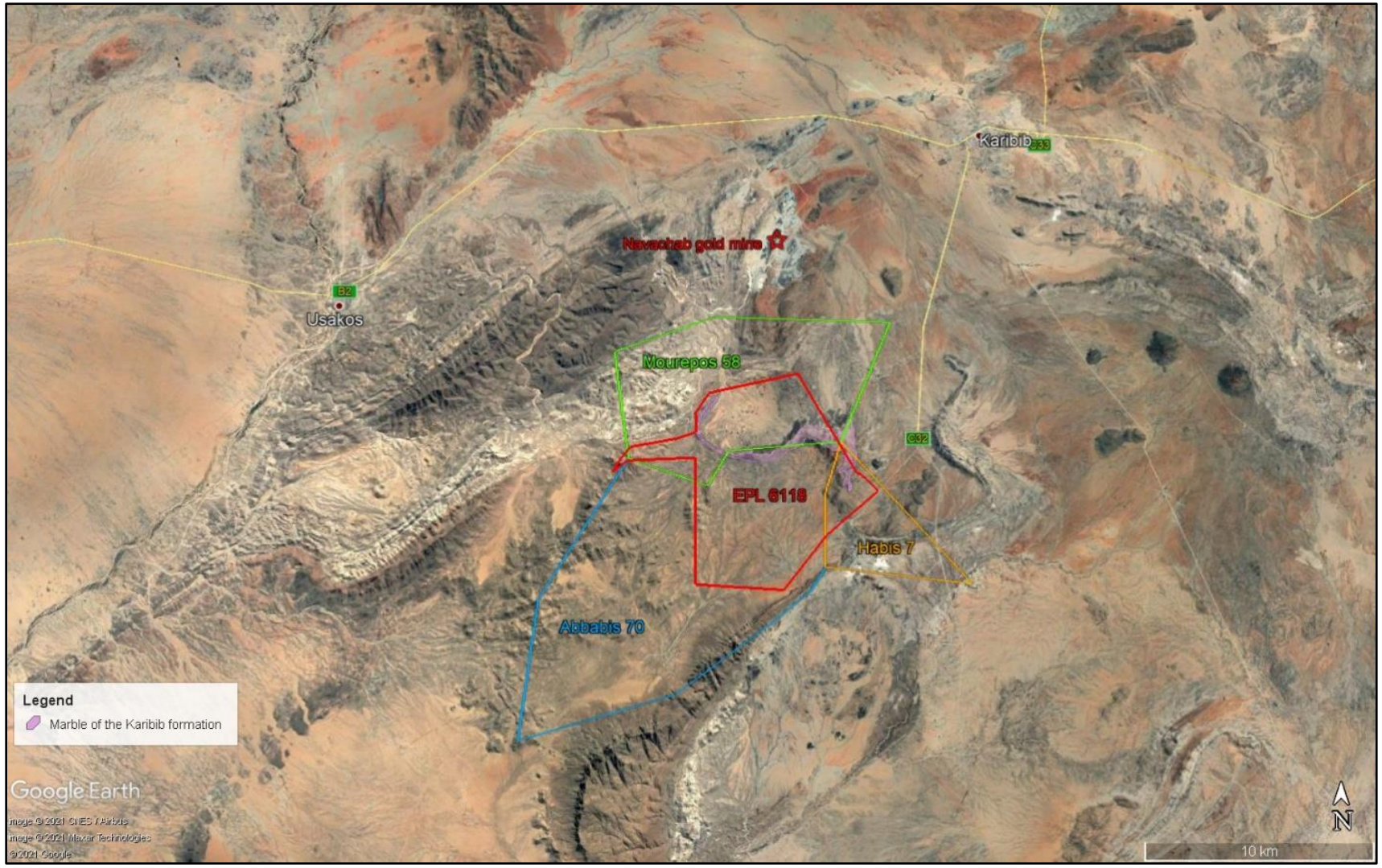

Fig. 2. Google image showing farms that are covered by EPL 6118.

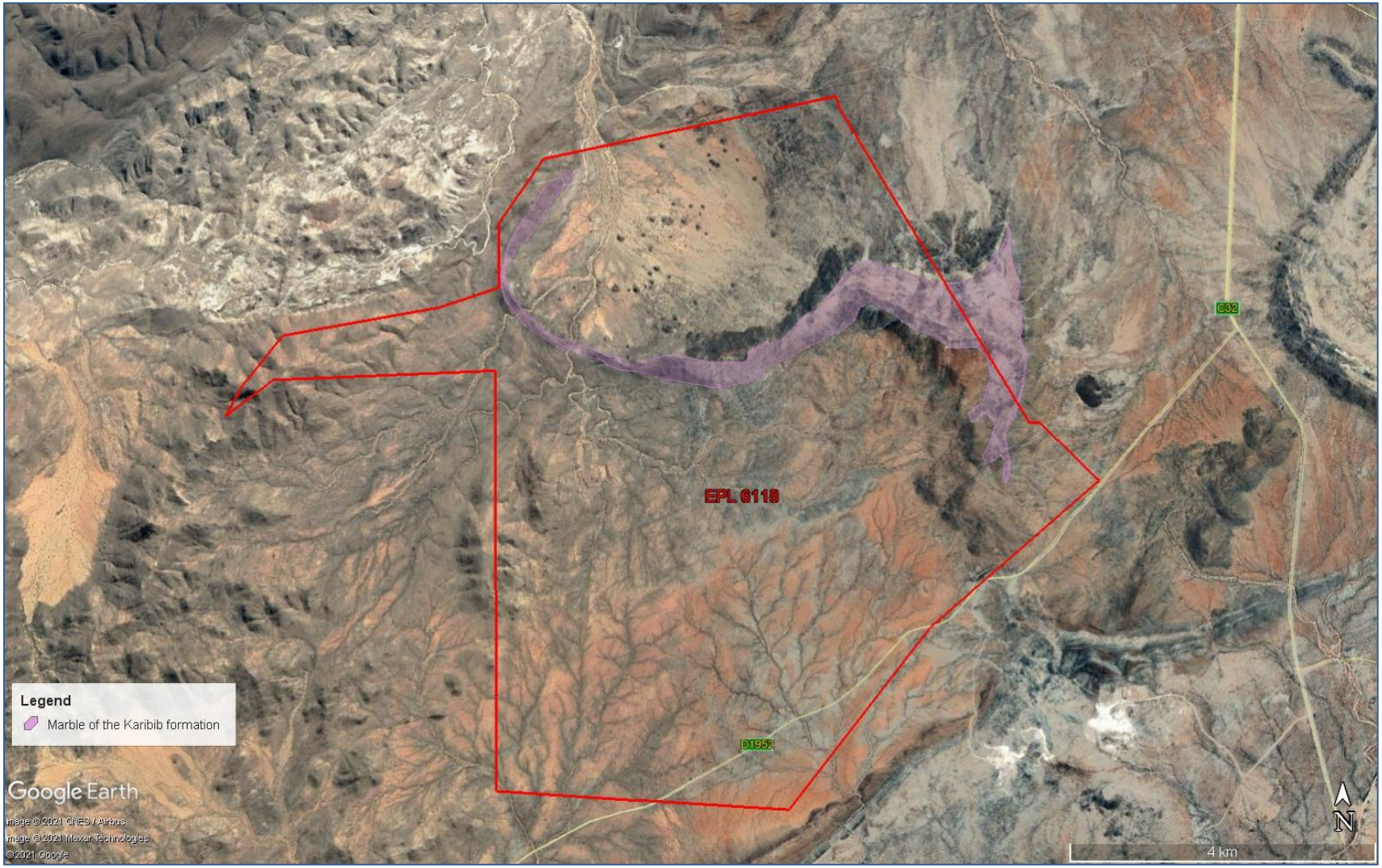

Fig. 3. Google maps showing the boundaries of EPL 6118.

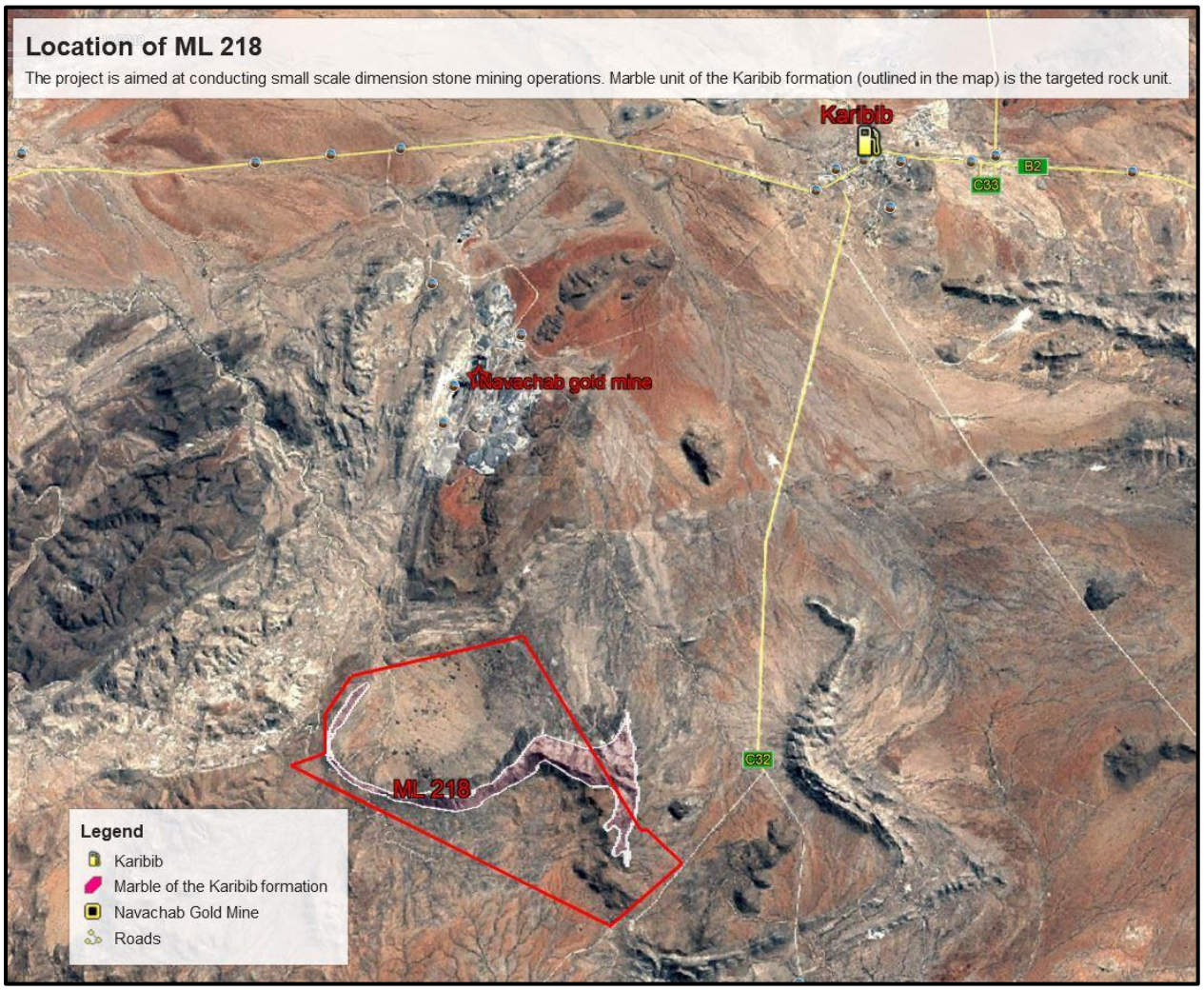

Fig.4. Google map image showing the targeted marble units within the mining licence ML218.

Current Land Uses

The current land use of the proposed ML area is mainly dominated by agriculture (cattle and small stock framing) and dimension stone (marble and granite) exploration and mining. The game farms offers visitors the opportunity to be close to nature with a variety of tailor made tourism products such game viewing, trails and hunting activities. The game farms are also important conservation areas for endemic and protected flora and are sanctuaries for endangered faunal species. The summary of other land uses activities found in the general areas includes: Karibib town lands, tourism, conservation, prospecting and small-scale and large-scale mining and quarry operati**ons.**

1.3 Supporting infrastructures and service

1.3.1 Water Supply

Due to the nature of dimension stone quarrying, the proposed mining operations are unlikely to require major water. While it would be more efficient to utilize existing boreholes on the property, this would depend on the agreement reached with each landowner. Additional boreholes can be drilled with permission from the Department of Water Affairs in the Ministry of Agriculture, Water and Land Reform. An alternative is to source water from the town of Karibib. Water containers will be brought on site and utilized whenever necessary. The water will mostly be used for mining, processing operations, general consumption and cleaning.

1.3.2 Roads

The supporting infrastructure such as roads will utilize the already existing roads and tracks (Fig. 4).The proposed ML area is accessible via the D1953 gravel road which is connecting to C32 gravel road from the town of Karibib. The two gravel roads are well-maintained. The B2 national highways connect Karibib to the port of Walvisbay which is located 210 km to the west. Access and transportation, whether by road or rail, are easily accessible within the region and within Namibia. The nearest railhead is at Karibib.

1.3.3 Electricity and Power supply

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. Electricity needs will be supplied by generators and solar installations while diesel and petrol will be the main sources of fuels and readily available in the Town of Karibib. The power requirements for the proposed project will be minimal as power will only be required for: emergency lighting, powering small machinery during the mining process and power supply for temporary office block or container if necessary.

1.3.4 Supporting infrastructure, transportation and accommodation

The proponent will utilize containerized systems for onsite administration and offices. This will later be upgraded to permanent structure as time goes on. 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. Diesel will be delivered to a small temporary on-site fuel storage facility by road transport and offloaded into the storage tanks by offloading pumps.

All the staff members except the security personnel will be based in Karibib town. Karibib based staff accommodation services will use the already existing properties in the town. Staff transport arrangements from Karibib to the mine sites will be provided by the proponent. The Proponent has planned to operate both the mining (quarrying), cutting, and polishing plant during normal working hours of the day.

Provision will be made for 6 off-road vehicles, an excavator and a front-end loader. The proponent's vehicle fleet will be optimised as the project advance to other quarries. Other tools include a genset, wire saws, an electric compressor and a water jacking plant. Portable fire-extinguishers will be fitted on all vehicles as well as in the mobile containers where possible. Provision will be made for two-way radios to enable the drill rig operators and the onsite staff to communicate effectively.

The following types of waste will be generated in small volumes during the mining operation:
• Domestic waste (non-hazardous): Domestic waste will stored in a manner that there can be no contamination to the environment and shall be disposed of correctly. Potential hydrocarbon spills from vehicles, heavy machineries and drilling equipment might lead to soil contamination and needs to be treated as a hazardous waste if not bio-remediated.

In choosing a waste dumpsite, the following aspects will be strongly considered:
• 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 is located on privately-owned farms, all waste will be transported and disposed out of the area.

1.3.5 Sanitation

The proposed project site will be provided with sufficient and suitable toilet facilities or workers to meet the proper standards of hygiene. Septic tanks followed by soak pits may be utilized to treat the domestic wastewater generated during the lifetime of the mine. Additionally, existing ablution facilities will be used by personnel if available and with consent from the landowner. Due to health and safety concerns, personnel may not relieve themselves in the surrounding bush.

1.3.6 Storage of hazardous material

The hazardous materials anticipated to be stored at the site include petrol and diesel, gas for welding, cutting purpose, paints, and solvents. These materials will be stored as per the international safety norms in ventilated enclosures.

1.4 The objectives of the Environmental Assessment Process

The overall goal of an EIA is to achieve better developmental interventions through protecting human, physical, and biotic environments. This is one component in the environmental planning and management of projects, in that it focuses upon the consent stage of the project. The study entails assessments of likely short and long term positive and negative environmental impacts of the activities related to the proposed mining project with the following objectives:

- To prepare and Environmental impact assessment (EIA) report including details of the proposed marble mine/quarry.
- To develop an Environmental Management Plan (EMP).

1.5 Regulatory Requirements

The proposed mining and ongoing exploration activities of dimension stone in the ML 218 falls under the activities that are listed in the Environmental Management Act, 2007 (Act No. 7 of 2007) and EIA Regulations (2012). These activities cannot be undertaken without an Environmental Clearance Certificate (ECC). In order to obtain an Environmental Clearance Certificate for the proposed activities, the proponent is required to have undertaken an Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) reports. These reports are a tool to identify, predict and evaluate the economic, environmental and social impact of proposed mining activities.

The Ministry of Mines and Energy (MME), through the department of Mines undertakes to exploit the country's mineral resources through issuance of mineral rights and it is through this process that EPL 6118 was issued to Catseye Investments CC. Since the resources in the study area has proven to be economically feasible, the subsequent mine development would provide social and economic development within the region and the country. All the mitigation measures for the proposed mining operations and ongoing exploration with significant impacts on the receiving environment are detailed in the Environmental Management Plan (EMP) Report.

The assessment covered the marble quarry and supporting infrastructures for the following developmental stages:

- Construction
- Operation
- Ongoing monitoring and rehabilitation
- Decommissioning, closure and aftercare

The assessment process took into considerations the ongoing activities, proposed activities, trade-offs, alternatives, and issues. Further inputs were provided by the specialist consultants. Archaeology specialist studies were undertaken as part of the environmental assessment process.

1.6 Purpose of the Scoping Report

The scoping report is prepared for the Environmental Impact Assessment for Mineral exploration on area which is located 20 km SSW of Karibib on farms Abbabis 70, Habis 7 and Mourepos 58.

The main purpose of this report is to provide information relating to the proposed mining activities and to indicate which environmental aspects and potential impacts that have been identified during the screening and scoping phases. Therefore the purpose of scoping is to identify issues, impacts and alternatives. Also integral to the Scoping Phase is the initial public participation process (PPP). This process ensures that all possible interested and affected parties (I&APs) are informed of the proposed activity and are provided with an opportunity to comment and identify issues

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, Forestry and tourism. The purpose of this scoping report is to:

- ❖ Identify any important environmental issues to be considered before the commencement of the proposed mining activities in ML236.
- ❖ 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 mining activities.
- ❖ Identify the main stakeholders and incorporate their comments and concerns.
- ❖ Define reasonable and practical alternatives to the proposal.
- ❖ To establish the terms of reference for an EIA study.

The scoping study provides a clear description of the environment that may be affected by the activity and the manner in which the activity may affect the environment. Information relating to the receiving environment and its social surroundings has been sourced through the following methods;

- ❖ Site visits to collect primary data;
- ❖ Legal and policy review;
- ❖ Gathering existing information relating to similar developments and issues;
- ❖ Discussions, meetings and site visits with authorities;
- ❖ Opinions and concerns raised by I&AP's and stakeholders; and
- ❖ Qualified opinions from professional studies.

Furthermore, Environmental Impact Assessment (EIA) is a comprehensive evaluation and study phase that addresses all the issues raised in the Scoping Phase. It is a substantial phase that has seven key objectives:

- Describe the biophysical and socio-economic environment that is likely to be affected by the proposed mining sites.
- Assess the significance of impacts that may occur from the proposed mining sites.
- Assess the alternatives proposed during the Scoping Phase.
- Provide details of mitigation measures and management recommendations to reduce the significance of impacts.
- Provide a framework for the development of the Environmental Management Programme (EMPr).
- Continue with the public participation process.

1.7 Terms of Reference

The terms and reference for the proposed project was set out in accordance with the Environmental Management Act (No. 7 of 2007) and Environmental Regulations of 2012, as well as the Terms of Reference (ToR) which were

provided by the proponent). It is a guiding document which forms part of the EIA which indicates the description of the environment that may be affected by the activity and the manner in which the activity may affect the environment. Information relating to the receiving environment and its social surroundings has been sourced through the following methods:

- Legal and policy review; Identify all legislation and guidelines that have reference to the proposed project.
- Identify existing environmental (both bio-physical and socio-economic) conditions of the area.
- Inform Interested and Affected Parties (I&APs) and relevant authorities of the details of the proposed development and provide them with a reasonable opportunity to participate during the process.
- Consider the potential (both bio-physical and socio-economic) impacts of the development and assess the significance of the identified impacts.
- Document opinions and concerns raised by I&AP's and stakeholders.
- Outline management and mitigation measures in an Environmental Management Plan (EMP) to minimize and/or mitigate potentially negative impacts.
- Submit the final scoping report to the competent authority and the Environmental Commissioner.

This report is the Scoping Report. Taking the above mentioned into consideration, this report, together with the attached EMP, will provide sufficient information for MEFT to make an informed decision regarding the proposed exploration activities, and whether an environmental clearance certificate can certificate can be issued or not. A schematic representation of the EIA process if given in Fig. 5.

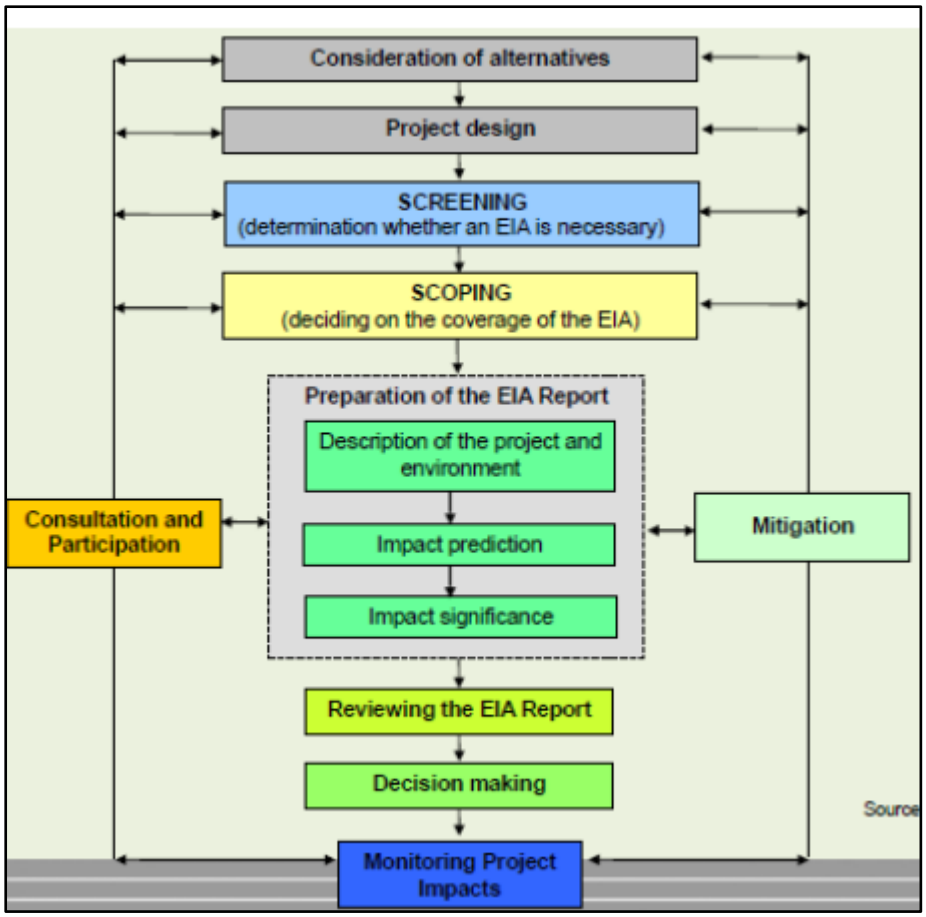

Fig. 5. General schematic presentation of the Environmental Impact Assessment process in Namibia.

1.8 Assumptions and limitations

This EIA report is based on currently available information and, as a result, the following limitations and assumptions are implicit:

- The report is based on project information provided by the proponent.
- Descriptions of the natural and social environments are based on limited fieldwork, relevant specialist studies and available literature

1.9 Environmental assessment approach and methodology

Environmental assessment process in Namibia is governed by the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 gazetted under the Environmental Management Act, (EMA), 2007, (Act No. 7 of

2007) and in line with the provisions of the Cabinet approved Environmental Assessment Policy for Sustainable Development and Environmental Conservation of 1995. This report has taken into consideration all the requirements for preparation of all the supporting documents and application for an Environmental Clearance Certificate and lodgments of such application to the Environmental Commissioner (EC), Department of Environmental Affairs (DEA) in the Ministry of Environment, Forestry and Tourism (MEFT). The purpose of the Scoping Phase was to communicate the scope of the proposed project to Interested and Affected Parties (I&APs), to consider project alternatives, to identify the environmental (and social) aspects and potential impacts for further investigation and assessment, and to develop the terms of reference for specialist studies to be conducted in the Impact Assessment Phase if necessary. The steps undertaken during the Scoping Phase are summarized below.

1.9.1 Project initiation and screening

Screening is a key activity to determine whether an EIA is required. The project was registered on the online ECC portal (eia.met.gov.na) in order to provide notification of the commencement of the EIA process and to obtain clarity on the process to be followed.

1.9.2 Initial scoping public participation process

The objective of the public scoping process was to ensure that interested and affected parties (I&APs) were notified about the proposed project, given a reasonable opportunity to register on the project database and to provide initial comments. Steps that were undertaken during this phase are summarized below:

1.9.2.1 I&AP identification:

A project specific I&AP stakeholder database was developed. This database has been maintained and updated as and when required. The farmers' contact details were obtained during site visit and some were provided by the proponent. Contact details of other interested and affected parties that were provided by the proponent. Furthermore, I&APs were added to the database based on responses to the advertisements and notification letters.

1.9.2.2 Notification letter and Background Information Document (BID):

BIDs were distributed via email to relevant authorities and stakeholder on the I&APs database. A notification letter was also distributed for review and comment for a period of 3 weeks after commencement of the project. The purpose of the BID was to inform I&APs about the proposed project, the assessment process being followed. Attached to the BID was a registration and response form, which provided I&APs with an opportunity to submit their names, contact details and comments on the project.

1.9.2.3 Advertisements and site notice:

Advertisements announcing the proposed project, the availability of the BID, public meetings and I&AP registration / comment period were placed in two newspapers namely: Confidénte newspaper and Windhoek Observer newspaper, for two consecutive weeks. Site notices were placed on the boundaries of farm fences, on the notice boards of the Regional Council and around Karibib town for public viewing. All issues raised were incorporated into the scoping report. These submissions were tabled and responded to as indicated in the public participation section of the scoping report.

1.9.2.4 Compilation and Review of Draft Scoping Report (DSR)

The Draft scoping report (DSR) was prepared in compliance with Section 8 of the EIA Regulations of 2012 and incorporated with comments received during the initial Public Participation Process. The DSR will be distributed for a 14-day review and comment period.

1.9.2.5 Final Scoping Report and Completion of the Scoping Phase

The Final Scoping Report (FSR) summarizes the following: the legal and policy framework; approach to the EIA and process methodology; the project's need and desirability; proposed project activities; key characteristics of the receiving environment; and key issues of concern that will be further investigated and assessed in the next phase of the EIA. The FSR complies with Section 8 of the EIA Regulations 2012. All written submissions received during the DSR review and comment period will be collated and responded to. The FSR will be submitted to the competent authority. In terms of Section 32 of the Environmental Management Act, 2007 (No. 7 of 2007), the competent authority is then required to make a recommendation on the acceptance or rejection of the report to Ministry of Environment, Forestry and Tourism (MEFT): Department of Environmental Affairs (DEA), who will make the final decision.

1.9.3 List of Specialist Studies Undertaken

Section 9(a) of the Environmental Regulations of 2012 requires a disclosure of all the tasks to be undertaken as part of the assessment process, including any specialist to be included if necessary. A specialist study on archaeology was undertaken by a qualified archaeologist. As part of the study, a foot survey was undertaken to identify any potential artefacts or human remains which may occur in the area. The archaeological specialist study, together with the consent letter from the Heritage Council of Namibia, is annexed A to this report.

1.10 Project need and desirability

Mining Sector is the backbone of Namibia's economy, since independence mining has been a major contributor in terms of employment, wealth creation and economic development. Annually, the mining industry pays over N$ 505 million in mining royalties, and N$ 2 million in for licence and export duties, excluding value added tax and pay as you earn. The mining industry contributes over N$300 million dollars to Government revenue annually and around N$ 2.2 billion annually to the national economy. A mining project which is the end result of the proposed ML 218 application, may assist in helping Namibia attain some of the goals set out in National Development Plans such as the Fifth National Development Plan (NDP5) and the Harambee Prosperity Plan (HPP).

1.11 Project alternatives

One of the objectives of an EIA is to investigate alternatives to the proposed project. Alternatives should include consideration of all possible means by which the purpose and need of the proposed activity could be accomplished. The no-go alternative must also in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed.

1.11.1 Location alternatives

After a mineral deposit has been identified through exploration, the proponent must make a considerable investment in mine development before production begins. Marble demand depends on color, scarcity, durability and market requirements. The proposed project is in an area dominated by dimension stone mining activities and extensive prospecting has indicated the presence of dimension stones on these properties. Since, dimension stones can only be mined where identified and their quality verified, it was not practical to select any other sites. Therefore no location alternative was considered.

1.11.2 Mining Method Alternatives

Opencast mining using excavators and transporting material using trucks is the most preferred mining method in this project. Topography and the physical characteristics of the deposit strongly influence the choice of method. Marble quarrying involves cutting channels on all sides of large, rectangular sections called quarry blocks. These blocks usually have an open face, and once the ends and backs of the doorstep-like ledges are channeled loose,

horizontal lift holes are drilled along the bottom of the open face. These long quarry blocks are being freed from the surrounding mass, with diamond wire sawing.

1.11.3 No-Go Alternatives

A comparative assessment of the environmental impacts of the 'no-go' alternative (a future in which the proposed ML and ongoing exploration activities do not take place) has been undertake. An assessment of the environmental impacts of a future, in which the proposed ML and ongoing exploration does not take place, may be good for the receiving environment because there be no negative environmental impacts due to the proposed mining and exploration operation that may take place in the ML area.

The environmental benefits will include no negative environmental impact on the receiving environment. However, it is important to understand that even if the proposed ML and ongoing exploration activities do not take place, to which the likely negative environmental impacts is likely to be low and localized, the current and other future land uses such as agriculture will still have some negative impacts on the receiving environment. The likely negative environmental impacts of other current and future land uses may still happen in the absence of the proposed mining activities.

In conclusion, no-go alternative will mean that the current land activities such as farming and important vegetation species will not be disturbed, that is, there will not be disturbance of the flora and fauna. No-go alternative will result in the non-mining of minerals and bring beneficiations to the receiving environment. However, the no-go alternative is not considered since it will lead to negative socio-economic impacts.

1.12 Potential Land Use Conflicts

Considering the current land use practices (agriculture and mining) it's likely that the development of a mine in the general area can still co-exist with the existing and potential future land use options of the general area. However, much more detail assessment of any likely visual and other socioeconomic impacts will need to be undertaken as part of the EIA. The use of thematic mapping thereby delineating zones for specific uses such as conservation, mining or tourism etc, within the EPL area will greatly improve the multiple land use practices and promote coexistence.

1.13 Potential benefits

1.13.1 Potential Direct Benefits

The following is summary of the positive socioeconomic impacts identified associated with the proposed project development:

Direct capital investment

The quarrying project will require a significant capital investment of at least N$ 40 million. This will be used for purchasing machinery required for the project as well as paying workers' salaries.

Stimulation of skills transfer

Due to the nature of quarrying operations, 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.

Employment creation

Provision of work provides an income which can potentially boost the quality of life for employees and their families. As a result, this will also reduce unemployment and sustain the Namibian economy. The project has a great potential to improve livelihoods and contribute to sustainable development within the surrounding community. Local recruitment will be encouraged by the proponent with a target of at least 65% locals. This operation thus contributes to the alleviation of unemployment which is severe in the country. The establishment and operation of the quarry will create both direct and indirect jobs for at least minimum 50 people. Employment on the new project will be attractive to the local workforce by virtue of the comparatively high wages offered; this will result in the local growth in the economy of Karibib constituency and surrounding areas.

- It is proposed that local people community members from Karibib Constituency should be considered first for employed. Especially where no specific skills are required.
- The Karibib Town Councilor could be requested to assist with the recruitment of workers.
- Gender equality considerations during recruitment process and employment preference will be afforded to previously disadvantaged Namibians.
- The proponent will introduce training programs (bursary schemes, on the job training etc) in order to boost the supply of local skills
- Transfer of knowledge, skills and technology associated with different aspects of the development , the use of new technologies will call for a new skills base which has to be transferred to employees;

Export taxes and VAT payments

Gross Domestic Products (GDP) contribution as well as contribution of taxes, royalties and dividends to the national economy. The government will benefit directly in the form of taxes, royalties and dividends. This also includes property and company income taxes to the Namibian Government.

Community development

The Company is committed in investments in community development of the local infrastructure such roads and water supply, education (particularly in the area of science and technology), health, welfare and sustainable income-generating community projects in Namibia. Development will aid in sustaining secondary industries in Karibib, Erongo Region and elsewhere in Namibia

Support to local retailers shop

Mining is the highest foreign currency earner and GDP contributor to the Namibian economy, therefore the presence of mining activities near local authorities stand to benefit the local economies from project-related purchases, for example, the retail, accommodation and recreation sectors. The proponent and his employees are encouraged to purchase or support local retailers in Karibib town unless the intended material/product to purchase is not available.

1.13.2. Potential Indirect Benefits

- The data generated from the quarrying activities 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 focused on farming, tourism and small-scale mining of semi-precious stones.

1.14 Way forward

The way forward for the EIA scoping phase is as follows:

- Distribute the Scoping Report and EMP for review by IAPs and receive comments.
- Submit the final Scoping Report (with comments) and EMP to MEFT.
- MEFT review the Scoping Report and EMP and provide record of decision.

2 Applications of marble

2.1 Background information to marble mining industry

Marble is mainly mined due to their aesthetic and attractive characteristics. For centuries, marble has been utilized in the construction and monument industries or sometimes as decorative materials for both exterior and interior of buildings. The physical properties such as durability, strength, and resistance to erosion enabled marble to be one of the most sought after dimension stone. Marble is formed from recrystallization of limestone or dolomite by heat and pressure in the earth's crust during metamorphism. The different colors and textures of marble are due to the presence of impurities like sand, oxides of iron, clay and chert.

Marble quarrying is started by the overburden removal which can be done through ripping. Similar to most metamorphic rocks, marble does not split easily into sheets of equal size and must be mined carefully. The rock may shatter if explosives are used, this makes marble mining environmental friendly. Blocks of marble are mined with channeling machines, which cut grooves and holes in the rock, next, the face and ground surface should be cleaned for producing an opening cut or slot across the quarry width. After that, it is necessary to cut or split dimension stone and then dividing it into transportable and saleable blocks for the market. In most marble quarries, the appropriate extraction strategy is to cut large volumes of rocks about 1000 m^3 blocks then these blocks are divided into smaller blocks. Over the past 10 years there has been a tremendous demand of marble in Namibia due to the expansion of the construction industry.

2.2 Marble uses

2.2.1 Sculpture

Marble has been known for its use in sculptures since classical times. This preference has to do with the softness and relative isotropy and homogeneity, and a relative resistance to shattering. Also, the low index of refraction of calcite allows light to penetrate several millimeters into the stone before being scattered out, resulting in the characteristic "waxy" look which gives "life" to marble sculptures of the human body. Marble is utilized in monuments, buildings, sculptures, paving and other projects.

2.2.2 Industrial use

Blocks of cut marble are a very pure source of calcium carbonate, which is used in a wide variety of industries.

Ground calcium carbonate can be made from limestone, chalk, and marble; about three-quarters of the ground calcium carbonate worldwide is made from marble. Ground calcium carbonate is used as a coating pigment for paper because of its high brightness and as a paper filler because it strengthens the sheet and imparts high brightness. Ground calcium carbonate is also used in consumer products such as a food additive, in toothpaste, and as inert filler in pills. However, the growth in demand for ground calcium carbonate in the last decade has mostly been for a coating pigment in paper.

2.2.3 Construction Marble

Crushed stone is used as an aggregate in highways, railroad beds, constructing foundations, and different kinds of construction. Marble makes a perfect construction material due to its higher density which ranges from 2.5 to 2.65 Kg/m^3. Construction marble is also composed of calcite, dolomite or serpentine which is capable of taking a polish. Moreover, Calcium carbonate can be reduced under high heat to calcium oxide (also known as "lime"), which has many applications including being a primary component of many forms of cement.

2.2.4 Pharmaceutical industry

Since marble's formula is Calcium carbonate, it will react with acids, thereby neutralizing them. Marble is one of the most effective acid neutralizing agents. The marble powder is used in pharmaceutical industry as antacid. Antacid medicines contain $CaCO_3$ of powdered marble used to reduce acid reflux in patients.

3 Summary of applicable legislation

3.1 Overview

All mineral rights in Namibia are regulated by the Ministry of Mines and Energy (MME) whereas environmental regulations are regulated by the Ministry of Environment, Forestry and Tourism (MEFT). The legislation/acts that affect the implementation, operation and management of exploration activities in Namibia are shown below.

Constitution of the Republic of Namibia, 1990

The Constitution is the supreme law in Namibia, providing for the establishment of the main organs of state as well as guaranteeing various fundamental rights and freedoms. Provisions relating to the environment are contained in Chapter 11, article 95, which is entitled "promotion of the Welfare of the People". This article states that the Republic of Namibia 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 living natural resources on a sustainable basis for all Namibians, both present and future.

3.1.1 Environmental Management Act of 2007

Line Ministry: Ministry of Environment, Forestry 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.

3.1.2 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.

3.1.3 Water Resources Management Act of 2013

Line Ministry: Ministry of Agriculture, Water and Land Reform

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.

3.1.4 Nature conservation ordinance, ordinance No. 4 of 1975

Line Ministry: Ministry of Environment, Forestry 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 conservation 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.

3.1.5 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.

3.1.6 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".

3.1.7 Forest Act, No. 12 of 2001

Line Ministry/Body: Ministry of Agriculture, Water and Land Reform

The act regulates the cutting down of trees and reads as follows "To provide for the 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*".

3.1.8 Atmospheric Pollution Prevention Ordinance 11 of 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.

3.1.9 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.

3.1.10 Namibian Water Corporation (Act 12 of 1997)

Line Ministry/Body: Namibian Water Corporation
The act caters for water rehabilitation of prospecting and mining areas, environmental impact assessments and for minimizing or preventing pollution.

3.1.11 Public and Environmental Health Act, 2015

Line Ministry/Body: Ministry of Health and Social Services provide a framework for a structured uniform public and environmental health system in Namibia; and to provide for incidental matters.

3.1.12 Agricultural (Commercial) Land Reform Act 6 of 1995

Line Ministry/Body: Ministry of Lands and Resettlement
To provide for the acquisition of agricultural land by the State for the purposes of land reform and for the allocation of such land to Namibian citizens who do not own or otherwise have the use of any or of adequate agricultural land, and foremost to those Namibian citizens who have been socially, economically or educationally disadvantaged by past discriminatory laws or practices; to vest in the State a preferment right to purchase agricultural land for the purposes of the Act; to provide for the compulsory acquisition of certain agricultural land by the State for the purposes of the Act; to regulate the acquisition of agricultural land by foreign nationals; to establish a Lands Tribunal and determine its jurisdiction; and to provide for matters connected therewith.

3.2 Recommendations on regulatory framework

The proponent is required to obtain the following permits as may be applicable prior to the commencement of the proposed mining project. Furthermore, compliance and timely renewal of theses permits is mandatory:

- Mining Licenses (ML) from the Ministry of Mines and Energy.
- Environmental Clearance Certificate (ECC) from the Department of Environmental Affairs inthe Ministry of Environment, Forestry and Tourism (MEFT).
- Groundwater abstraction permits and Waste Water Disposal permits from the Departmentof Water

Affairs in the Ministry of Agriculture, Water and Land Reform, and.

- All other permits as may be become applicable before mining and ongoing exploration.

4. Description of proposed mining project

4.1 Description of the project area

ML 218 area falls within Erongo Region, Karibib in the central western part of Namibia within the Damara Orogen. The study area is characterized by hills and local ridges of marble, forming conspicuous topographic elevated surface expressions. Karibib is well known for vast occurrences of marble units of the Karibib formation and Swakop group as well as other metal commodities. Marble is by far the most common dimension stones produced, mainly in the Karibib-Usakos area in central Namibia. The proposed project area has within a radius of 10 km existing quarries such as Omusati granite, Ludi Namibia plus other quarries that are still in development stage, one of them being location 600 m from the targeted area (Fig. 6) on farm Mourepos 58. A non-invasive geological survey was done in November 2016, which including lithological mapping, geological profile survey. Lithological mapping and geological profile survey were undertaken to delineate surface extent of the potential lithology. The marble unit was previously opened up to assess the type and quality of marble as shown in Fig. 7 & 8. Marble within the project area is compact and massive as can be seen in Fig. 8.

Fig. 6. Targeted marble outcrops, in the background is an existing quarry belonging to another company some 600m the east.

Fig. 7. One of the targeted areas that were excavated in past exposing white fresh marble.

Fig. 8. Exposed white marble in the targeted area.

4.2 Mining method to be implemented

Mining will be executed by means of quarrying with a diamond wire saws and stone cutting machines for cutting off rectangular blocks. Quarrying is similar to open-pit mining except the term is commonly applied to the extraction of dimension stone and aggregates. Fewer benches are required in quarrying than in open-pit metal mining in quarrying, most of the material extracted is marketable. Blocks will be cut using a diamond wire and removed by the front end loader for stockpiling and further processing. In choosing a mining method, important considerations are the kind of material to be mined, the shape and size of the geologic formation, the thickness of the overburden, the topography, the production level, the locality of the quarry and imposed restrictions by the government. For homogeneous units, the quarrying method will be by a regular bench design with the aid of diamond-based cutting technologies. Diamond-based cutting technologies are the best methods to use these days. The following operations will be carried out:

- Undercutting by using a diamond-wire saw.
- Vertical cuts with diamond wire
- Block shaping cuts with diamond wire or drill and shear techniques.

Basically, quarrying involves cutting channels on all sides of large, rectangular sections of quarry blocks. These blocks usually have an open face, and once the ends and backs of the doorstep-like ledges are channeled loose, horizontal lift holes are drilled along the bottom of the open face. These long quarry blocks are being freed from the surrounding mass, with diamond wire sawing. Diamond saw basically consists of an engine pulling wire cable through a system of pulley sand return wheels. The wire is a steel cable on which diamond grit-impregnated beads are held in place by plastic spacers. The wire saw strand is threaded through intersecting vertical and horizontal holes; the wire is jointed together making a large loop which simultaneously cuts the top, bottom, and one end of the marble mass. Water is fed continuously through the narrow cuts to cool the wire. If a ledge has two open sides, the wire saw can cut the entire block free. However, the attached side must still be channeled by way of drilling or light blasting. This entire block will

now be moved over with a water bag jacking plant. The big block is then cut with dressing diamond wire saws into smaller blocks of 10 – 35 tons.

4.3 List of key equipments

The following is the summary of the key equipment to be used for the proposed marble mining and processing operations to be developed in the ML 218:

- 2 Loaders;
- 3-5 Excavators;
- 4 Generators;
- 2 Air Compressors;
- 8 Wire Saws;
- 8 Stone Cutting Machine;
- Water Tanks;
- 12m Containers.

4.4 Quarry design

Mining will proceed by means of a series of work faces, benches and vertical slopes (fig. 9).The following is the summary of the key design aspects that has been considered and will continue to be evaluated during the mining operations:

- Expected maximum pit depth of up to 20 m;
- Bench height may be 7 m, however, the marble deposit character and geology, production strategy, slope stability and equipment set may play an important role in determining the exact height
- Bench slope dependent on the geotechnical conditions;
- Bench width based on the space required for the operation of the equipment on it;
- Haul access width and gradient linked to the operating parameters of the trucks and other hauling equipment used in the mine. It shall be wider than the bench width, and;
- Bench length linked to the production rate.

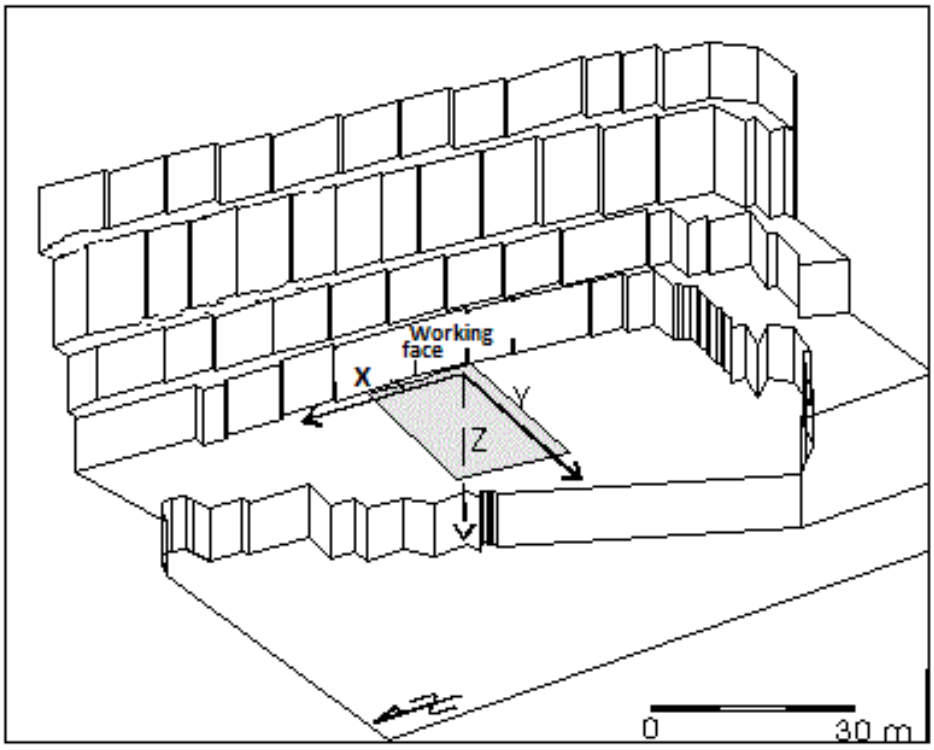

Fig 9: A graphic illustration of the quarrying method displaying working face, benches and vertical slopes.

4.5 Marble processing

The smaller marble blocks will then be moved to the dressing yard. The yard is in very close proximity to the mining activities itself. While most dimension stone mine merely "rough-dress" the cut block by jack hammer trimming, the produced at this mining area will mostly be diamond wire dressed. A derrick boom is slowly raised, tightening the hooks in their holes and the block is lifted from the quarry to be placed on a waiting truck for transporting to the dressing yard. After final dressing and quality control these dimensioned saw blocks are removed by mobile crane onto trucks and shipped to monument plants for processing.

4.6 Transporting of marble blocks

Once the marble is removed from the quarry, the blocks will be examined for quality. All the marble of a particular colour and quality are to be placed together. The marble blocks will then be transported by truck to Karibib for processing or transported to Walvis Bay for shipping overseas

4.7 Quarry Residue and rehabilitation

The only noticeable mine residue will be the "waste" material not usable. This material can be used for rehabilitation purposes during decommissioning. The overburden removed during the quarrying operation will be used to fill the excavations during rehabilitation with the result that on completion of mining no waste dumps will remain.

4.8 Labour requirements

The proponent intends to employ more than 50 personnel, including 6 management staff for the first phase of the project. The employees will be sourced from the local community. 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.

5. Description of the receiving environment

5.1. 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 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 northwest 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 Erongo regions. The region is home to the Skeleton Coast Park and many conservancies. Erongo is one of the central regions in Namibia with a size of 105,185 square kilometers, with vegetation ranging from open savanna around Karibib, to lush vegetation and massive bright red sandstone cliffs. There is generally an absence of fences in most parts of the Erongo Region. This makes livestock farming easier which means that both wild and domestic animals can move widely in many places, migrating from areas of poor grazing to other places with more abundant pastures.

5.2 Current Land Uses

The general land use of the proposed ML area is mainly dominated by agriculture (cattle and small stock framing) and dimension stone (marble and granite) exploration and mining. The game farms offers visitors the opportunity to be close to nature with a variety of tailor made tourism products such game viewing, trails and hunting activities. The game farms are also important conservation areas for endemic and protected flora and are sanctuaries for endangered faunal species. The summary of other land uses activities found in the general areas includes: Karibib town lands, tourism, conservation, prospecting and small-scale and large-scale mining and quarry operations

5.3. Climatic Conditions

5.3.1. Temperature

The project is located in an arid to semi-arid region. Approximately half of the Karibib district where project is situated is covered by dry land grasses and the other half by dry land scrub. The coldest temperatures are typically encountered between June and August, ranging from 7 – 10°C. The highest temperatures are reported between late October and early February. During this time, peak average temperatures reach up to 32°C (generally in mid-November).

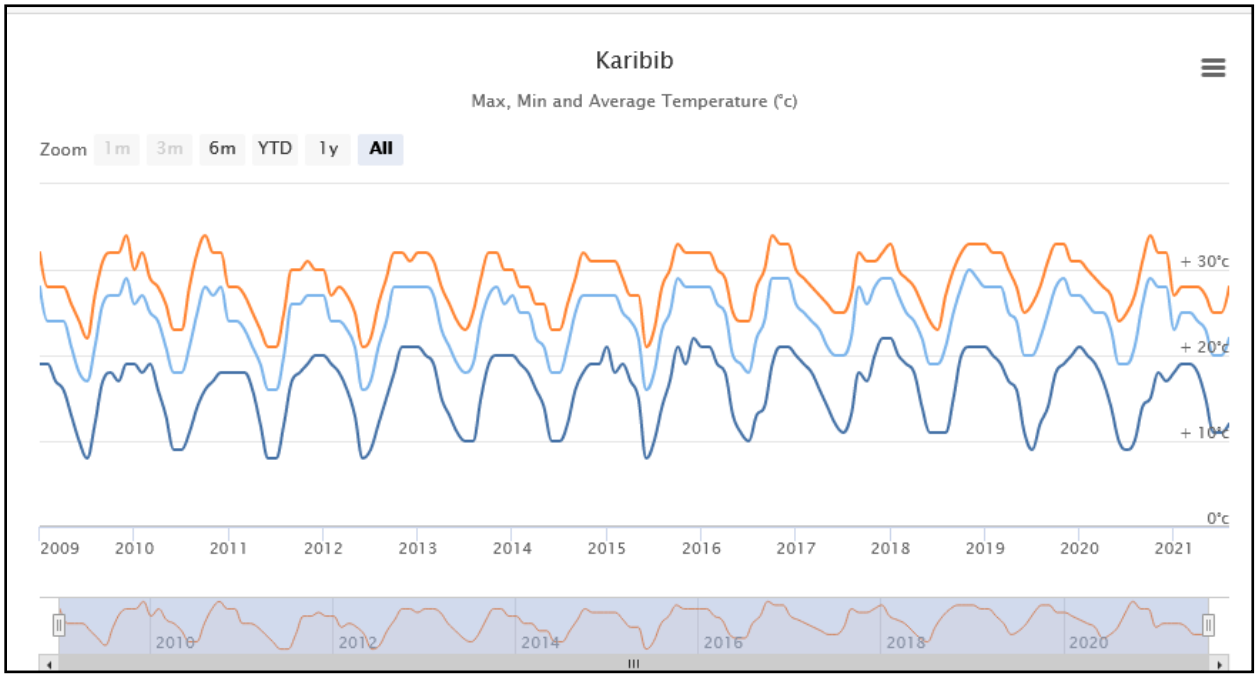

Fig.10: Temperature graph for Karibib (worldweatheronline, 2021).

5.3.2. Precipitation

The highest precipitation in the area occurs between January to March, with a maximum precipitation of 150 mm occurring in the month of February. In January months, rainfall may reach about 150 mm with average rainfall days. The graph below shows the rainfall patterns in the proposed project area. The area experiences semi-arid climatic conditions with an average rainfall of 211 mm per annum. Annual average potential evaporation rate far exceeds average annual rainfall and net water deficit conditions prevail.

Fig. 11: Rainfall graph for Karibib (worldweatheronline, 2021).

5.3.3. Wind

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

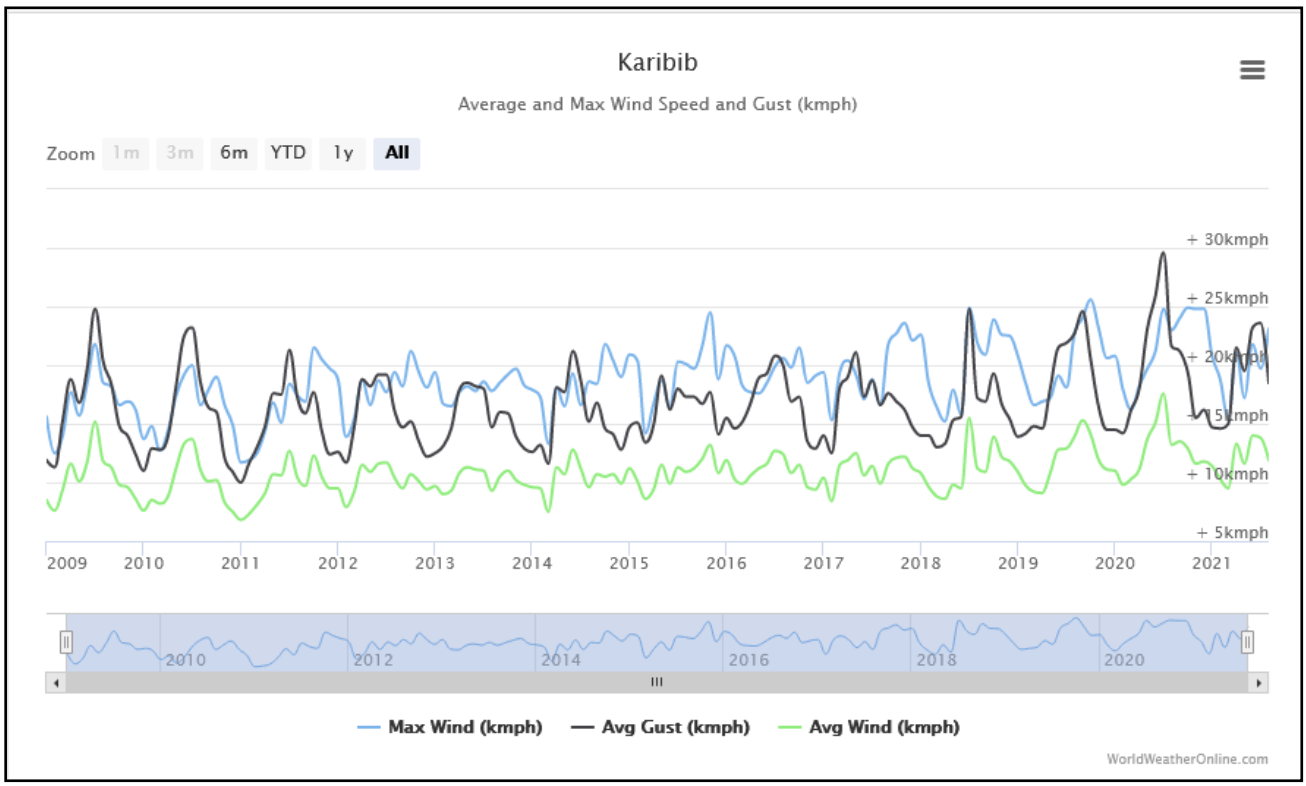

Fig.12: Wind graph for Karibib showing maximum, average gust and average wind (worldweatheronline, 2021).

5.3.4 Humidity

The relative humidity during the least humid months of the year, i.e. October and September, is around 20 % and the most humid month is February with 45% 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.

5.3.5 Air Quality

Data from accuweather.com shows that the air quality in the area is generally excellent with an air quality index of 16 AQI. The ground-level ozone (O3) is about 16 µg/m³ which is excellent. The fine particle matter levels (PM 2.5) are about 6 µg/m³. The particle matter (PM10) is about 4 µg/m³. The nitrogen dioxide (NO2), carbon monoxide (CO), and Sulphur dioxide (SO2) levels in the area are recorded to be 0 µg/m³.Probable sources of air pollution in the area are emissions and dust from vehicles travelling on gravel roads, dust generated by cattle grazing and wind erosion from the exposed areas.

5.4 Geology

5.4.1 Regional geology

The project area is within the Damara belt which forms part of the Pan-African collisional belts in southern Africa representing the formation of the Gondwana supercontinent (Miller, 2008). The Damara Orogen is a Neoproterozoic orogen consisting of three arms, the NNW-trending coastal arm (the Kaoko Belt) extending into Angola, the NE-trending arm (the Damara Belt) which extends through central Namibia, across Botswana to the Zambezi belt (Miller, 2008), and the Gariep Belt to the south extending into north-western South Africa. The Kaoko, Damara and Gariep Belts evolved through phases of intracontinental rifting, spreading, subduction and continental collision lasting from approximately 800 or 900 Ma to ~460 Ma. In the Damara Belt, the Kalahari Craton was subducted beneath the Congo/Angola Craton and continental collision is dated at ~542 Ma (Miller, 2008).

The project area is in the NE-trending, Damara orogenic belt which has been divided into several different zones on the basis of stratigraphy, metamorphic grade, structure, geochronology, plutonic rocks and aeromagnetic expression (Miller, 1983, 1998). The zones are separated by tectonic lineaments and these are, from north to south: the Northern Platform (NP), Northern Margin Zone (NMZ), Northern Zone (NZ), Central Zone (CZ), Southern Zone (SZ), Southern Margin Zone (SMZ) and the Southern Foreland (Fig.12). The Central Zone is divided into northern (nCZ) and southern (sCZ) zones. The Okahandja Lineament zone (OLZ) is routinely regarded as part of the SZ (Miller, 2008). ML218 is located in the sCZ, approximately 9 km south of Navachab gold mine (Fig. 12).

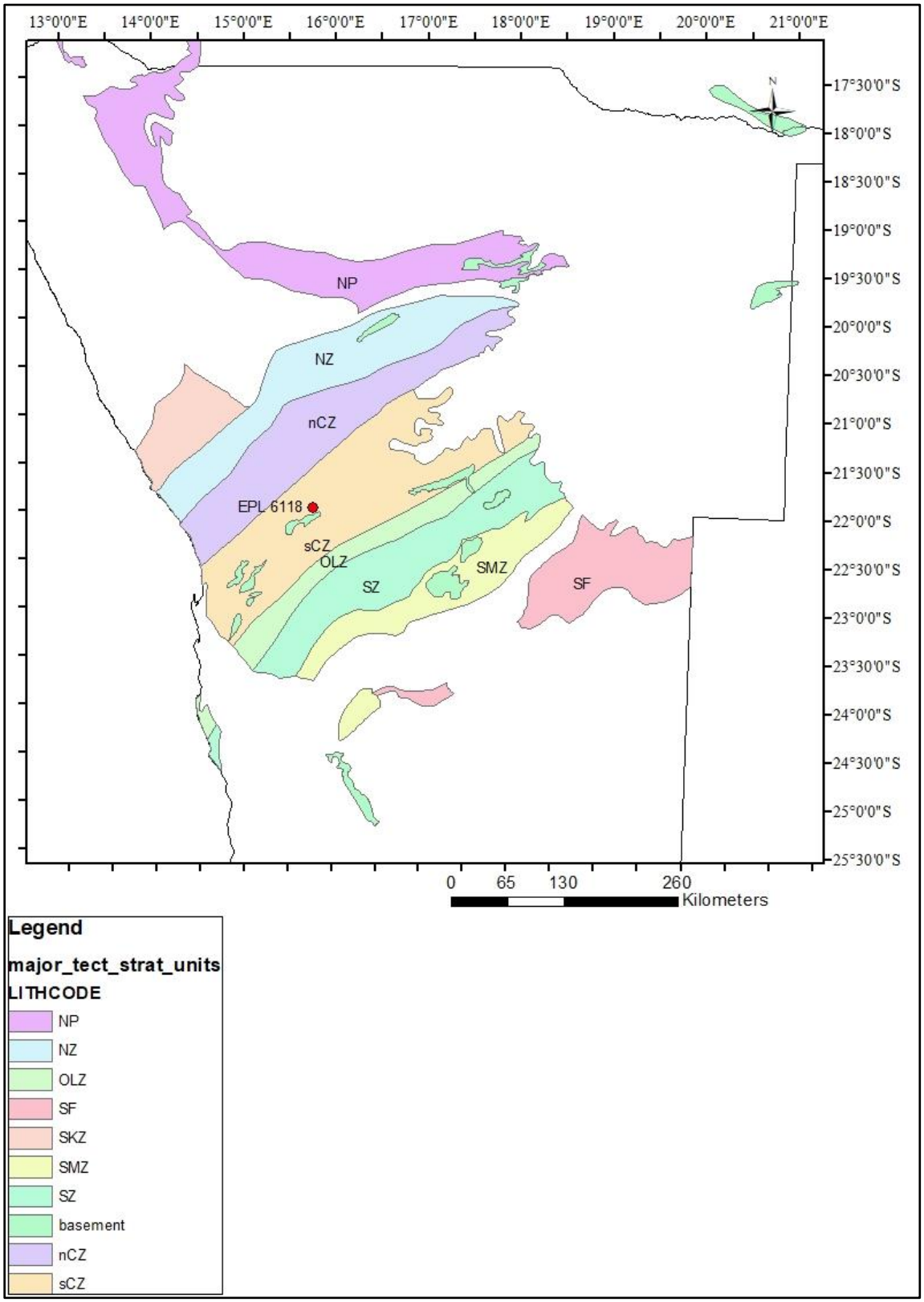

Fig. 13. Tectonic zones of the Damara orogenic belt. (Shape files are from the Geological Survey of Namibia). EPL 6118 and ML 218 is located roughly 9 km south of Navachab Gold Mine.

The regional geology of the central zone of the Damara belt, where the prospect is located, is characterised by mainly marble, schist and quartzite of the Swakop and Nosib groups of the Damara Supergroup (Fig. 13).

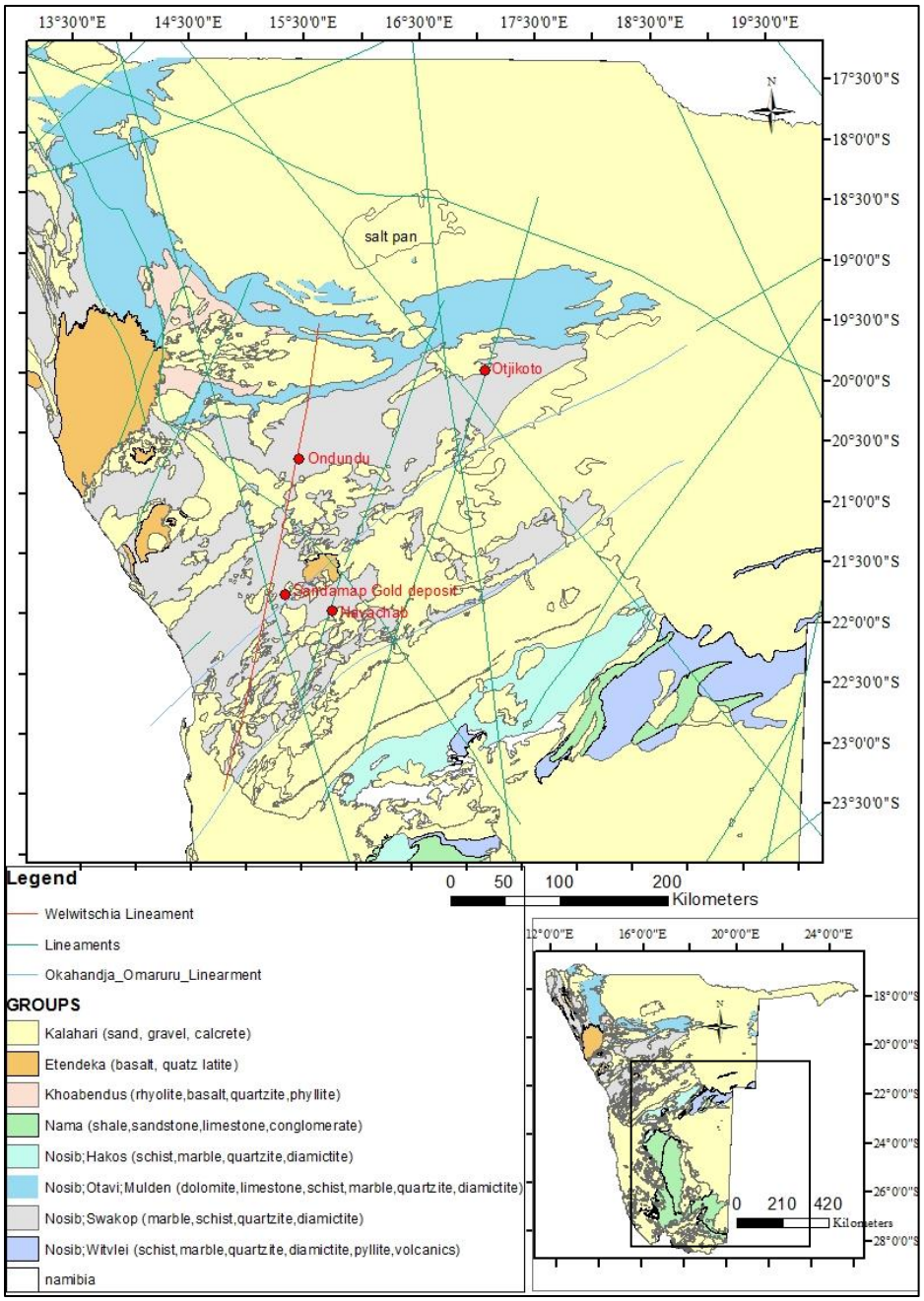

Fig. 14: Regional geology of the Damara Orogenic belt (Shape files are from the Geological Survey of Namibia). EPL 6118 is located roughly 9 km south of Navachab Gold Mine.

The central zone of the Damara Belt is a high-temperature, low-pressure zone with metamorphic grade increasing from middle amphibolite facies in its eastern parts to lower granulite facies in its western parts (Miller, 2008). The northern (nCZ) and southern central (sCZ) zones are separated by the Omaruru lineament to the west and the Waterberg fault in the east. In terms of lithology, the central zone is characterized by mainly schist, marble and quartzite of the Swakop and Nosib groups of the Damara sequence with numerous syn- to post-tectonic granitic plutons (Fig. 14). The zone is also typified by major magnetic lineaments (Welwitschia and Erongo) and minor magnetic lineaments (Abbabis and Otjikoto). Peak regional metamorphism in the central zone (CZ) is syn-D_2 and occurred at ~520 Ma (Haack *et al.*, 1980; Miller, 1983). On the other hand Miller (2008) places the peak of post-tectonic M_2 regional metamorphism throughout the Damara belt at 535 Ma.

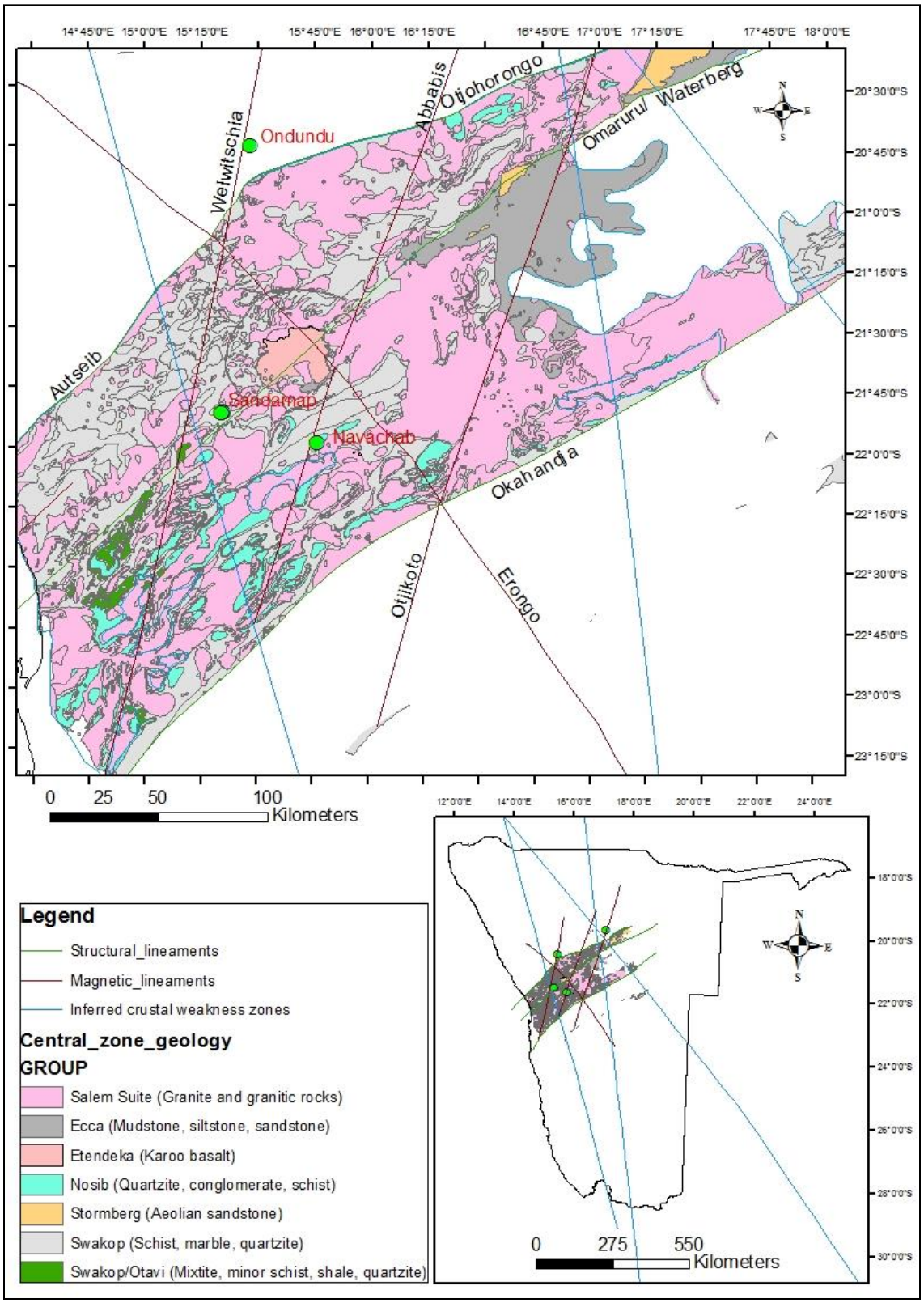

Fig.15: Geology and structural lineaments of the central zone of the Damara orogenic belt.EPL 6118 is located roughly 9 km south of Navachab Gold Mine.

5.4.2 Stratigraphy

The EPL area falls within the Central Zone of the Damara Sequence (Fig. 15). The oldest rocks within the Central Zone are the pre-Damaran basement (Nosib Group) was deposited or laid down in marginal to intracontinental rifts, consists of gneiss, quartzite, arkose, conglomerate, phyllite, calc-silicate, subordinate, limestone and evaporitic rocks. The sequence was deposited during successive phases of rifting, spreading, subduction and continental collision (Miller, 2008). Much of the basal succession is Nosib Group, the Karibib formation which hosts the targeted marble overlies the Arandis Formation and underlies the Kuiseb Formation (Table 1). The partial stratigraphy of the Central zone as in Miller (2008) as given is given in Table 1.

Table 1: Partial Lithostratigraphy of the Damara Sequence in Central Namibia (after Miller, 2008).

Group	Subgroup	Formation	Lithology
Swakop	Navachab	Kuiseb	Mica schist, marble, quartzite, minor amphibolites schist, biotite schist
		Karibib	Marble, schist, calc-silicate, dolostone, limestone, quartzite
	Usakos	Arandis	Schist, calc-silicates
		Chuos	Diamictite, schist, minor quatzite
	Ugab	Rossing	Marble, biotite schist, quartzite, gneis
Nosib		Khan	Gneiss, quartzite, conglomerate, schist, minor marble, amphibole, calc-silicate

		Etusis	Quartzite, gneiss, biotite schist, conglomerate

5.4.3 Local Geology

The targeted marble of the project forms part of the marble member of the Karibib Formation. The Karibib Formation which belongs to the Navachab Subgroup of the Swakop Group is represented mainly by marble, dolostone and limestone. The Swakop Group belongs to the Damaran Supergroup.

The central portion of the EPL is traversed by the Abbabis metamorphic complex (Abbabis MC) along the east-west direction. The Abbabis MC which is the oldest unit in the area (about 1.8 billion old) is comprised of mainly augen gneiss, granite gneiss and biotite sillimanite gneiss(Fig. 15). The marble unit of the Karibib Formation borders the Abbabis MC on northern contact and this unit is composed of mainly marble, dolostone and limestone (Fig. 15). The marble unit appears as a narrow half-circular strip which also traverses across the EPL, striking east-west direction (Fig. 15). Further north wards, diorite and diorite gneiss shares a contact with the marble unit. The northwestern and southern portions of EPL are covered by sediments (sand, gravel & calcrete) of the quaternary age.

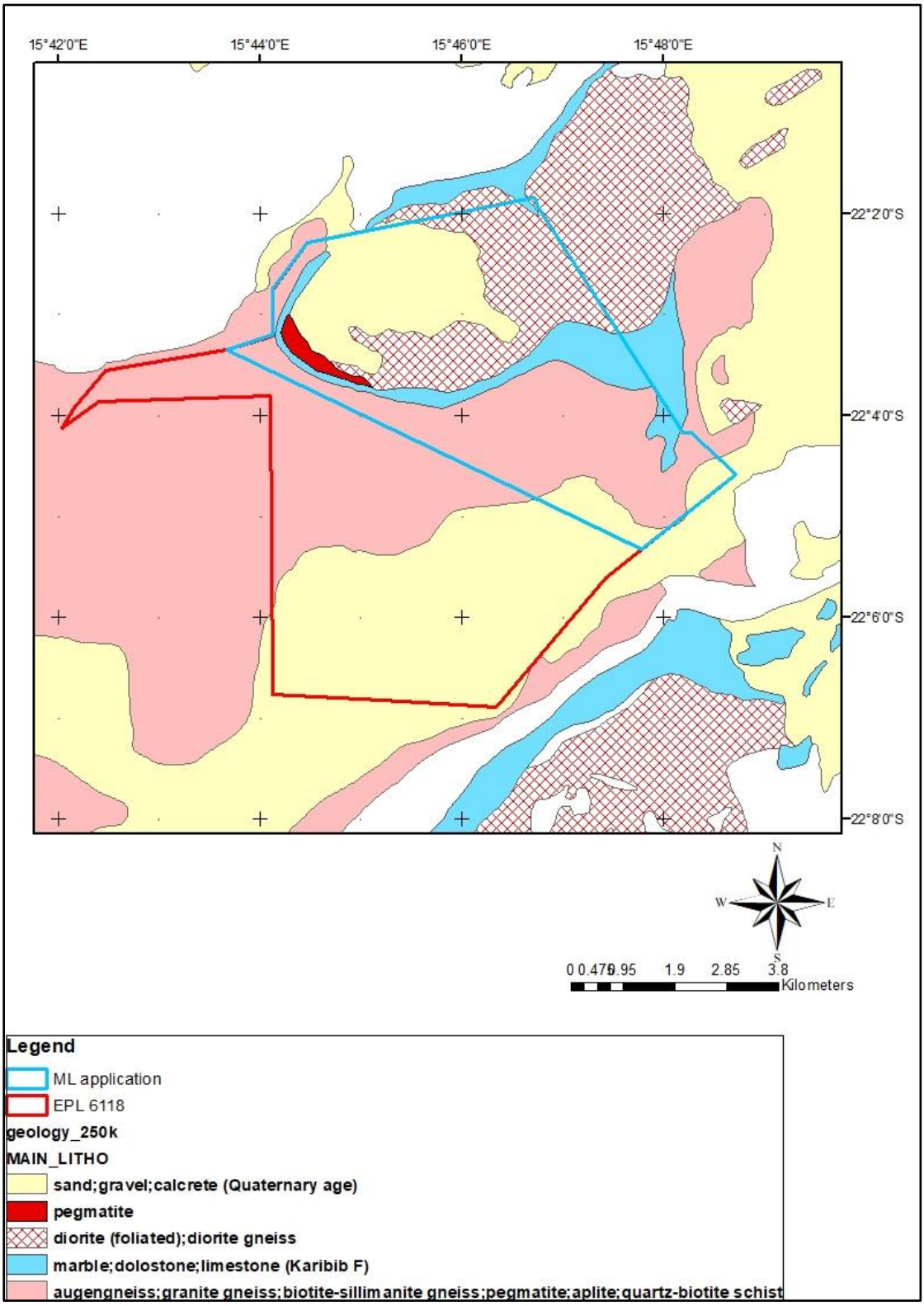

Fig. 16: Detailed local geology of the ML area.

5.5. Hydrogeology and hydrology

The project area is located in the Omaruru-Swakop River basin, which stretches over the Khomas, Erongo and Otjozondjupa Regions. Moreover, the area is underlain by a moderately productive but variable (porous or fractured) aquifer (Fig. 17). There are no river systems passing through the project area. Permission for borehole drilling, groundwater abstraction will be obtained from the Ministry of Agriculture, Water and Land Reform (MAWLR) shall the need for groundwater uses arise. Groundwater in the area is associated with the good secondary hydraulic properties of the limited surficial covers and extensive carbonate deposits. The area is overlain by an unconfined aquifer system which is vulnerable to pollution in case of spillage of the surface. Therefore, the proponent intents to drill at least two monitoring borehole in order to carry out quarterly groundwater quality analysis.

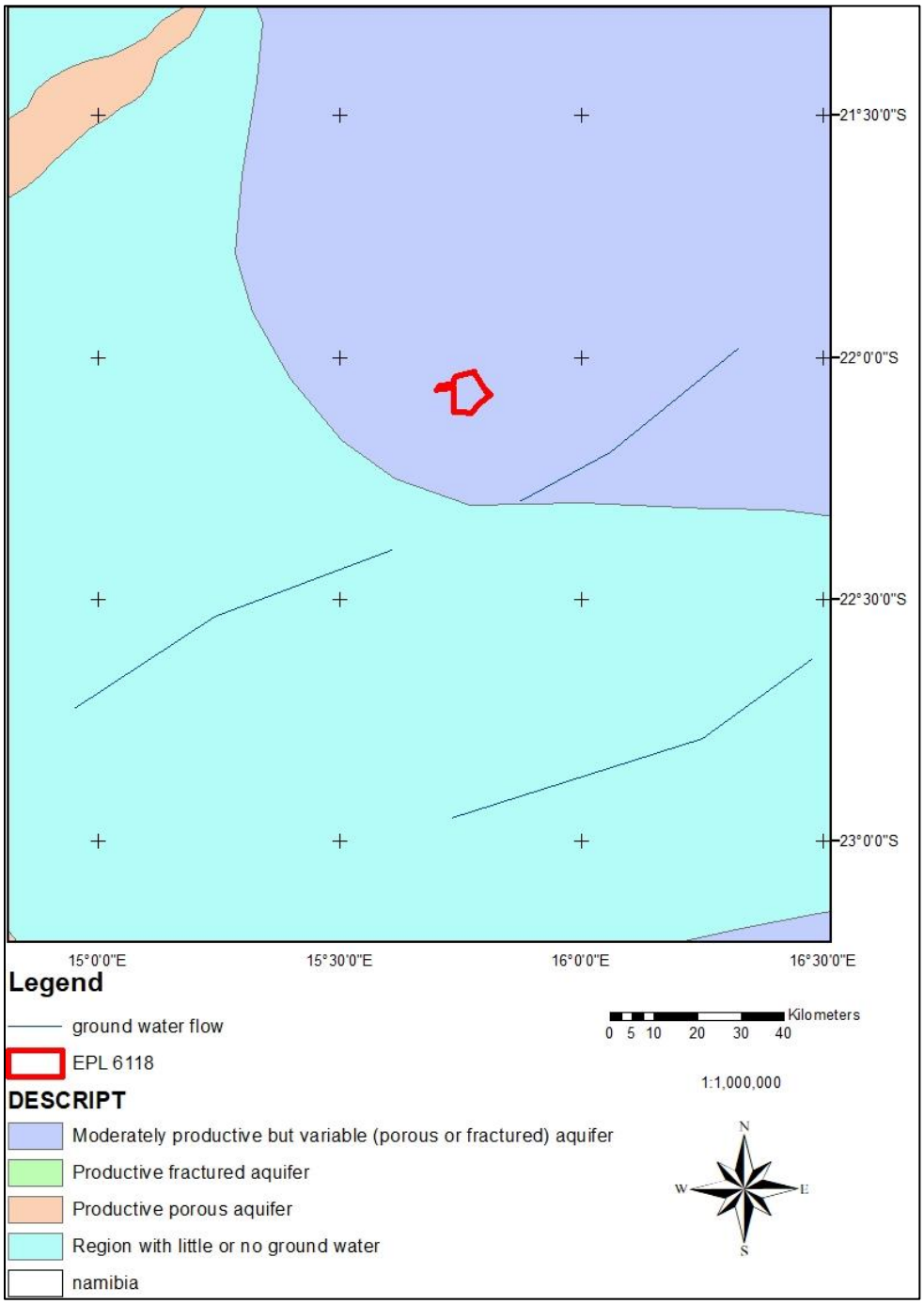

Fig.17: Hydrogeological Map of the project area showing the project area underlain by a moderately productive aquifer.

6.0 Identification and description of environmental aspects and associated potential impacts

6.1. Assessment of Impacts

Environmental aspects and potential impacts were identified during the screening and scoping phases, in consultation with authorities, IAPs and the environmental team. Given the nature and size of the proposed project and taking the existing environment into consideration. Potential impacts were also qualitatively assessed by the Environmental Practitioner. With reference to preceding of this report the various environmental aspects and potential impacts associated with the marble quarrying and ongoing exploration activities were identified and described. It was found that the impact on the environment would be yielding low significance; however the following issues will be qualitatively assessed in this section:

- Air quality (dust and fumes)
- Biodiversity (fauna and flora)
- Socio-economic
- Land-use
- Noise
- Surface water
- Groundwater
- Waste management

6.1.1 Fauna and flora impact assessment

Introduction

The impact of the proposed marble quarry on fauna and flora was carried out during the site visits conducted in September 2021. A thorough assessment was carried out within the Mining Licence area (ML 218) by means of field observations, recording and data collecting. Some of the information is based on a detailed literature review. The purpose of the Fauna literature review is

to identify all potential amphibians, reptiles, mammals and plants expected on the project area and the surrounding farms in the vicinity of the ML area. The proposed 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, implementation of the proposed exploration program in the area will not have a negative impact on any of the species in the project area. Further flora assessment was enhanced with the use of species lists of plants occurring within the quarter degree squares which was extracted from the database, Botanical Research and Herbarium Management System which is found at the National Botanical Research Institute in Windhoek.

6.1.1.1 Flora

The ML 218 area falls within the Semi-desert and Savanna Transition Zone vegetation type. In form, vegetation is generally sparse, with few trees and a thin variety of grass (Fig.18). Plant cover varies in relation to rainfall and so the eastern parts of Erongo have more grass and trees than the Western, coastal areas (Christian, 2005). Rainfall in the Erongo Region is usually both low and extremely variable which means that years of abundant rain often followed by extreme dry conditions (Mendelsohn, et al., 2002). Karibib area is viewed as an area of importance for local endemic plant species nd high botanical diversity. Erongo Mountains has between 26-35 endemic species (Mendelsohn *et al.* 2002). The overall plant production is classified as medium to low in the general Karibib area. Bush thickening /encroachment is viewed as problematic between Karibib and Omaruru with *Acacia reficiens* being the problem species. The density of vegetation in the vicinity of the exploration site is sparse.

Fig. 18. Sparse vegetation around the marble outcrops.

Based on the literature review, all the vegetation that are found within the vicinity of the area are of "medium" to "high" sensitivity against external conditions 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 exploration site. A vegetation expert will be consulted throughout the lifecycle of the exploration program. The protected plant species in the project area are shown in the table below.

Table 2: lists the different plant species which are most likely to occur within the project area. Plant species highlighted in orange are protected under the Forestry Act.

Scientific name	**Local name**	**Status in Namibia**
Acacia erioloba	Camel thorn	Protected
Acacia mellifera	Black thorn	Secure
Acacia reficiens	False umbrella thorn	Secure
Acacia haematoxylon Grey	Grey camel thorn	Protected
Acacia erubescens	Blue thorn	Secure
Acacia karroo	Sweet thorn	Secure
Acacia tortolis	Umbrella thorn	Secure

Acacia hereroensis	False hook-thorn	Secure
Commiphora tenuipetiolata	White-stem corkwood	Secure
Aloe littoralis		Protected
Ozoroacrassinervia	Namibian resin tree Near	endemic, protected
Boscia albitrunca	Shepherd's tree	Protected
Albizia anthelmintica	Worm-bark false-thorn	Protected
Ziziphus mucronata	Buffalo-thorn	Protected
Catophractesalexandri	Trumpet thorn	Secure
Combretum apiculatum	Red bush willow	Secure
Commiphora dinteri		Endemic
Commiphora glandulosa	Tall common corkwood	Secure
Commiphora glaucescens	Blue-leaved corkwood	Nearendemic
Croton gratissimus	Lavender fever-berry	Secure
Cyphostemma bainesii		Endemic, protected
Dichrostachys cinerea	Sickle bush	Secure
Diospyros lycioides	Blue bush	Secure
Dombeya rotundifolia	Common wild pear	Endemic
Ehretia alba		Secure
Elephantorrhiza suffruticosa		Secure
Eucleab pseudebenus	Ebony tree	Protected
Euclea undulata	Common guarri	Secure
Euphorbia guerichiana	Western woody milk bush	Secure
Euphorbia virosa		Secure
Ficus cordata	Namaqua fig	Protected
Ficus ilicina	Laurel fig	Secure
Ficus scomorus	Common cluster fig	Protected
Grewia bicolor	White raisin	Secure

Grewia flava	Velvet raisin	Secure
Grewia flavescens	Sand paper raisin	Secure
Gymnosporiasenegalensis	Red spike-thorn	Secure
Ipomoea adenioides		Secure
Lycium bosciifolium		Secure
Lycium cinereum		Secure
Lycium eenii		Secure
Lycium hirsutum		Secure
Lycium villosum		Secure
Maerua juncea		Secure
Maerua schinzii	Ringwood tree	Protected
Manuleopsis dinteri		Endemic
Melianthus comosus		Secure
Obetia carruthersiana		Near endemic
Pechuel-Loeschealeubnitziae		Secure
Ozoroa crassinervia	Namibian resin tree	Protected
Sterculia africana	African star-chestnut	Protected
Tarchonanthus camiphoratus		Secure
Tetragonia schenckii		Secure
Vernonia cinerascens		Secure
Searsia (Rhus) ciliata		Secure
Searsia (Rhus) lancea	Karree	Protected
Searsia (Rhus) marlothii		Secure

6.1.1.2 Alien Plants

The alien plants were taken into consideration during the botanical assessment. It was found that there are no alien plants in the proposed area and its immediate surrounding area.

6.1.2 Fauna

6.1.2.1 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 exploration area, the mammal fauna will not be affected by the 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 3: Mammal species which are likely to occur within the project area.

Scientific name	**Common name**
Acinonyx jubatus	Cheetah
Antidorcas marsupialis	Springbok
Atelerix frontalis angolae	Southern African Hedgehog
Canis mesomelas	Black-backed Jackal
Caracal caracal	Caracal
Crocuta crocuta	Spotted Hyena
Cynictis penicillata	Yellow Mongoose
Equus zebra hartmannae	Hartmann's Mountain Zebra
Felis nigripes	Black-footed Cat
Felis silvestris/lybica	African Wild Cat

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

6.1.2.2 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 4: Protected reptile species in the project area

Scientific name	Common name	Status
Psammobates Oculiferus	Kalahari Tent Tortoise	Protected
Geochelone Pardalis	Leopard Tortoise	Protected
Python Natalis	Southern African Python	Protected
Varanus Albigularis	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 exploration activities do affect reptile habitat, the project will not have any significant impact on

the reptile species within the proposed 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 exploration area.

6.1.2.3 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 658species 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 that14 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 includes:

Table 5: Bird species which are likely to occur within the site area.

Scientific name	**Common name**
Tockus monteiri	Monteiro's Hornbill
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 Hornbill

6.1.2.4 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 6: A list of amphibian species which may occur in the project area.

Scientific name	**Common name**	**Status**	**Occurrence**
Sand frogs, Bull frogs, Ridged frogs, Cacos, Puddle frogs			
Cacosternum boettgeri	Common caco	Secure	Abundant
Hildebrandtia ornata	Ornate frog	Secure	Uncommon
Phrynobatrachus mababiensis	Mababe puddle frog	Secure	Uncommon
Phrynobatrachus natalensis	Snoring puddle frog	Secure	Uncommon
Pyxicephalus adspersus	Giant bullfrog	Secure	Abundant
Tomopterna krugerensis	Knocking sand frog	Secure	Rare
Tomopterna tandyi	Tandy's sand frog	Secure	Abundant
Fossorial Frogs			
Phrynomantis affinis	Spotted rubber frog	Ambiguous	Rare
Phrynomantis bifasciatus	Banded rubber frog	Secure	Abundant

Toads			
Brevicepsadspersus	Bushveld rain frog	Secure	Abundant
Bufo dombensis	Dombe dwarf toad	Endemic	Abundant
Bufo poweri	Mottled toad	Secure	Abundant
Platannas			
Xenopus laevis	Common Platanna	Secure	Abundant
TREE FROGS, REED FROGS & KASSINAS			
Kassina senegalensis	Bubbling Kassina	Secure	Abundant

6.1.3 Archaeology and Heritage Sites

There are no declared heritage sites by the National Heritage Council of Namibia on ML218 and EPL6118. Accidental find procedure at the subject site may be required. A separate heritage impact assessment is annexed to this report. 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.

7. Assessment of Impacts

Introduction

The impact assessment methodology used to determine the significance of impacts prior and after mitigation is presented below. The assessment process was describe how the significance, probability, and duration of the afore said identified impacts that were identified through the consultation process, desktop studies of dimension stone mining in the Erongo Region by reviewing previous EIA's and EMP's. The phases covered by this assessment are: construction, operational and closure/decommissioning phase. The environmental assessment section of the scoping report and the consequent EMP shall also be compartmentalized into these phases. This assessment methodology enables the assessment of cumulative impacts, the significance of impacts, the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring and the degree to which the impacts can be mitigated. The methodology for conducting the qualitative impact assessment can be found in Table 7.

Table 7: Impact assessment criteria

PART A: DEFINITION AND CRITERIA		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of severity, spatial extent and duration**
Criteria for ranking of the SEVERITY of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action. Irreplaceable loss of resources.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints. Noticeable loss of resources.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints. Limited loss of resources.

	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favorable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	**L**	Localized - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national

PART B: DETERMINING CONSEQUENCE					
SEVERITY = L					
DURATION	Long term	**H**	**Medium**	**Medium**	**Medium**
	Medium term	**M**	**Low**	**Low**	**Medium**
	Short term	**L**	**Low**	**Low**	**Medium**

SEVERITY = M					
DURATION	Long term	**H**	**Medium**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	High
	Short term	**L**	**Low**	**Medium**	Medium

SEVERITY = H

DURATION	Long term	**H**	**High**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	**High**
	Short term	**L**	**Medium**	**Medium**	**High**
			L	**M**	**H**
			Localized Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional/ national
			SPATIAL SCALE		

PART C: DETERMINING SIGNIFICANCE				
Definite/ Continuous	**H**	**Medium**	**Medium**	**High**
Possible/ frequent	**M**	**Medium**	**High**	**High**
Unlikely/ seldom	**L**	**Low**	**Low**	**Medium**
		L	**M**	**H**
		CONSEQUENCE		

PART C: DETERMINING SIGNIFICANCE					
PROBABILITY (of exposure to impacts)	Definite/ Continuous	**H**	**Medium**	**Medium**	**High**
	Possible/ frequent	**M**	**Medium**	**Medium**	High
	Unlikely/ seldom	**L**	**Low**	**Low**	Medium
			L	**M**	**H**
			CONSEQUENCE		

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
High	It would influence the decision regardless of any possible mitigation.
Medium	It should have an influence on the decision unless it is mitigated.
Low	It will not have an influence on the decision.

H+ = High positive; H= High; L+ = Low positive; L = Low; M = Medium

7.1 Identified impacts on bio-physical environment

The following potential effects on the environment during the construction, operation and decommissioning phase of the quarrying project have been identified:

7.1.1 Air quality

The proposed quarrying activities are the potential of fugitive sources for the dust particles as they are easily dispersed and carried away by the winds. During the operation phase dust will be generated onsite by earth moving equipment and also on the gravel road by trucks and vehicles. Continuous movements of people, vehicles and earth moving vehicles on site can thus loosen and re-suspend the deposited material again into the air. Dust in marble quarries is produced during excavation and haulage of stone materials. As part of the operation routine, marble blocks will be cut into smaller blocks in order to give them the desired smooth shape. During the cutting process about a quota of the original marble mass is lost in the form of dust. The bank of marble is currently cut from the rock face (primary cut) using diamond-wire saws. Because a continuous water flow is required for cooling, the fine dust generated in the surrounding area during rock sawing is negligible. Cooling water abates the dust that settles at the base of the primary and, especially, of the secondary cuts (slices from the bench). When dry, the dust forms part of the bed of rubble set in place for attenuating the impact of the slice tip-over. A minor amount of dust is also generated during borehole drilling for diamond-wire insertion.

As mentioned above, blasting is only performed sporadically for overburden removal and quarry development. However, even in this case, the emission of dust into the environment is effectively contained by means of damping. The quarrying operation that potentially raises the greatest amount of dust forming the bed of rubble, from the base of the bench into the atmosphere, is obviously when the slice topples from the quarry face. Moreover, this operation is performed mainly in the summer and is only likely to occur if precautions are not taken to dampen the rubble bed. In any case, block toppling is done at the most once every two or three days in each quarry, and thus not very frequently.

Another cause of moving and raising dust, during loading and hauling quarry blocks or crushed stone (the latter is sent to waste dumps), is the earth-moving (shovels, excavators) and haulage (trucks and dumpers) vehicles transiting along the quarry floors, ramps and near to quarry accesses. Typically, the amount of dust created by the movement of these vehicles is relatively low for normal production, 3–5 gang saw blocks (7–10 m^3) per day and depends on the limited frequency of material handling and the conditions of road surfaces.

Dust may be generated during this phase and might be aggravated during the winter months when strong winds occur. 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. Dust generated and air pollutants suspended in the air could be inhaled by the workers leading to respiratory diseases.

The second source of pollution is the exhaust fumes produced by the diesel engines of the quarry vehicles and generators. Moreover, vehicle exhausts contain a number of pollutants including carbon dioxide (CO_2), carbon monoxide (CO), hydrocarbons, oxides of nitrogen (NO_x), Sulphur and PM10. Tiny amounts of poisonous trace elements such as lead, cadmium and nickel are also present. The quantity of each pollutant emitted depends upon the type and quantity of fuel used, engine size, speed of the vehicle and abatement equipment fitted. Once emitted, the pollutants are diluted and dispersed in the ambient air. Lastly, concerning diesel generators and compressors, the newer models are fitted with suitable exhaust filters. In any case the diesel-powered machines could be replaced by electric engines, which are non-polluting and are more efficient.

7.1.2 Noise pollution

Noise pollution can be defined as any disturbing or unwanted noise that interferes or harms human or wildlife. Noise will most likely be generated during overburden removal, drilling, excavation, loading, unloading, crushing, vehicular traffic and the use of generators. During quarrying, the

main sources of noise are: compressed air equipment (especially drilling machines), carbide chain-saws and diamond-wire saws, air compressors and diesel generators, the transit of vehicles for hauling the stone. It is recommended that operation activities be limited to normal daytime hours (7am -5pm). Noise pollution has negative impact on wildlife species by reducing habitat quality, increase stress level land masking other sounds. Continual exposure to loud noise can cause hearing loss, stress, anxiety, depression and high blood pressure to workers.

7.1.3 Health, safety and security

Mining operations are associated with serious health and safety risks to workers on site. Occupational exposures are normally related to the dermal contact with fuels and inhalation of fuel vapors during handling of such products. 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.

7.1.4 Visual

The proposed quarrying area is situated more than 10 km from any main road. As such, any visual impact that might be caused by the team are minimal. In some parts of the area, the topography of the quarrying site is slightly elevated.

Fig 19: Typical visual impacts from one of the quarries in Karibib.

7.1.5 Solid Waste

Waste can be generated from contractors, staff members and other visitors to the area. Proper solid waste management will involve full commitment by all the employees and contractors of the site. Solid waste which will be generated from this project if not managed will have an effect on the environment. The types of waste that could be generated during operation include hazardous waste, general industrial waste (e.g. wires, drill bits, scrap material, etc), and domestic waste. Hazardous waste includes waste oil, waste solvents and other waste with hazardous nature such as flammability, explosiveness, causticity and toxicity these waste will be collected and sent for treatment before disposal.

Domestic waste will be temporarily handled and stored onsite before being removed for final disposal at permitted waste disposal facilities. A registered Waste Management Company would be contracted to remove all hazardous waste from the site. Furthermore, ablution facilities will use chemical toilets and/or sealed septic tanks and the sewerage taken to the Karibib periodically. No waste will be discharged on site.

7.1.6 Biodiversity

Quarrying carries the potential of destroying habitats and the species they support. Even if the habitats are not directly removed by excavation, they can be indirectly affected and damaged by environmental impacts. The transformation of land for any purpose results in the destruction of the site-specific biodiversity, the fragmentation of habitats, reduces its intrinsic functionality and reduces the linkage role that undeveloped land fulfils between different areas of biodiversity importance. The alteration will occur through physical disturbance and continued human presence and use. Construction and operation activities which are expected to cause destruction of biodiversity and habitats include the movement of vehicles and machinery. Biodiversity impacts resulting from construction and operation activities are likely to include mortality (by earthmoving equipment, vehicles and machinery and due to illegal hunting). Nevertheless, with careful planning and management, it is possible to minimize the effect on biodiversity and in fact, quarries can also provide a good opportunity to create new habitats or to restore existing ones.

7.1.6.1 Fauna

Quarrying 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.

7.1.6.2 Avifauna

If care is not taken, possible disturbance of birds or nest on sites by employees is expected. Should the employees observe any bird nesting sites for endangered avifauna such as vultures, they should notify Ministry of Environment, Forestry and Tourism.

7.1.6.3 Vegetation

The major environmental hazard from the quarry is the effect of dust and this will be dependent on:

- The concentration of the dust particles in the ambient air and its rate of deposition.
- The type of vegetation.
- The leaf surface type of the vegetation.
- Degree of penetration of the dust particles into the vegetation.
- The size distribution of dust particles
- Chemistry of the dust.

Most of the effects of dust particles on plants include the potential to block and damage the stomata such that photosynthesis and respiration are affected. Pollutants such as dust, gaseous emissions and air- borne particulates will be produced and get deposited on the plants. This will no doubt affect the physiological activities of the plants most especially those around the quarry site such as in photosynthesis and respiration. The implication of these is that some of the plants may have retarded growth while others may be eliminated

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 quarrying 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, Forestry and Tourism. Such locations will then be demarcated and completely avoided.

7.1.6.4 Alien invasive plants

Alien invasive plants are prevalent in areas affected by land transformation and anthropogenic disturbance. It is a well-known fact that disturbance to the natural environment often encourages the establishment of alien invasive weed species. Surface mines are a major disturbance, and thus may promote the establishment and expansion of invasive plant communities. Seed or plant material may be imported to site from building materials if the source is contaminated. It is also possible that, plant or seed material may adhere to car tyres or animals. In some cases seeds of alien invasive plants may blow from debris removed at sites.

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*
- *Harissia martini*

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

7.1.7 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.

7.1.8. Fire and explosion hazard

Hydrocarbons are volatile under certain conditions and their vapors 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 sufficient water is available for firefighting purposes. In addition to this, all personnel must be sensitized 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 quarrying area. Regular inspections should be carried out to inspect and test firefighting equipment and pollution control materials at the drilling site.

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 recognize 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.

7.1.9 Groundwater contamination

Groundwater pollution is imminent during mining due to increased anthropogenic activities. However, from previous studies dimension stone mining is associated with low potential of groundwater contamination. Sources of pollution can be categorized into two major types: point source pollution and non-point source pollution. Point source pollution (e.g. leaking sewage lines, leaking mobile toilets and fuel, oil, chemical spillage) is a single identify localized source while non-point source pollution (diffuse sources such as petrochemical pollution) is characterized by multiple discharge point. Groundwater quality is an important variable as poor-quality water can be unsuitable for use.

Project activities during construction and operation have the potential to cause contamination through spillages of hydrocarbons, chemicals, hazardous materials, refueling and maintenance of construction vehicles, sewage as well as through poor management of grey water. Heavy vehicles operating at the mining site should be regularly monitored for leaking hydrocarbon fuels (petrol or diesel) and must be fitted with drip trays while they are parked to avoid contamination of surface and groundwater. Fuel on site will be stored tank mounted on stilts so that any leaks are easily detectable, however if underground fuel storage is to be used it should be lined with heavy duty geo-membranes such as polyvinyl chloride (PVC) or high density polyethylene (HDPE) to prevent groundwater contamination. The total volume of these hazardous materials and chemicals on site is never likely to be substantial and thus the overall risks during construction are not likely to be high.

On account of low annual rainfall, the study area holds no known surface water resources and has minimum potential to hold surface water resources. Due to the crystalline and metamorphic nature of the targeted lithology (marble) as well as the envisaged depth of the drill holes, the proposed mining activities on ML 218 are unlikely to pose any negative impacts on the underground water system. However, groundwater is an important resource and must be protected. The proponent has set out various measures to ensure the protection of groundwater quality.

7.1.10 Liquid waste: oil spillage and wastewater

Potential contamination by hydrocarbon spillages/leaks from vehicles, machinery, fuel storage tanks, potential spillage of effluent from portable toilets and the release of untreated/poorly treated effluent from the wastewater plants. The possible presence of these liquid contaminants at the project has the potential of reaching both groundwater and surface water if there are crevices. Moreover, spillage is a concern although the likelihood of this risk occurrence is low; the impact if it happens is significant, for this reason, the risk is highlighted as a going concern of high priority and therefore mitigation measures to be taken are presented below:

7.1.11 Storage and Utilization of Hazardous Substances

Hazardous substances are regarded by the Hazardous Substance Ordinance (No. 14 of 1974) as those substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure thereby in certain circumstances. It covers manufacture, sale, use, disposal and dumping as well as import and export. During the mining operations, the use; storage and disposal of these types of hazardous substances, such as explosives, shutter oil, curing compounds, types of solvents, primers and adhesives and diesel, on-site could have negative impacts on the surrounding environment, if these substances spill and enter the environment therefore these should be put in a lockable bonded store room.

7.1.12 Municipal Service Impacts

Dimension stone mining activities will result in additional people on-site, who will require provision of the following services:

- ❖ Potable water for domestic purposes.
- ❖ Temporary toilets during the mining operations.
- ❖ Solid waste management (domestic waste).

Workers will be housed on an identified land parcel for the mining camp to be allocated by the farm owner so as to build temporary houses and provide the necessary amenities for the employees including a renewable source of energy in the form of solar panels to ensure a reasonable standard of living.

7.2 General socio-economic concerns

- As the movement of staff and contractors to and from the area increases, the risk of spread of HIV/AIDS and other STDs increases;
- Increased influx of jobseekers to the area as people come in search of job opportunities during the operational phase of the quarrying project. This could lead to potential increase

in the unemployed people in the area and the establishment/growth in informal settlements which could exacerbate security issues due to increased crime rates.

- Impacts on the size and structure of the population. Increased informal settlement and associated problems;
- Negative impact on the health and safety of the surrounding community and workers.

7.3 Qualitative impact assessment

Table 8: The following is a qualitative impact assessment on the impacts associated with the quarrying and ongoing exploration activities.

Impact	Mitigation	Severity	Duration	Spatial scale	Consequence	Probability of occurrence	Significance
Noise	Unmitigated	M	L	L	L	M	M
	Mitigated	L	L	L	L	L	L
Biodiversity	Unmitigated	M	L	L	M	M	L
	Mitigated	L	L	L	L	L	L
Socio-Economic	Unmitigated	M	L	M	M	M	M
	Mitigated	M	L	M	M	L	L
Land-use	Unmitigated	M	H-M	L	M	M	M
	Mitigated	L	L	L	L	L	L
Air quality: Dust and fumes emission	Unmitigated	M	M	L	H	M	M
	Mitigated	L	L	L	L	L	L
Surface water pollution	Unmitigated	M	M	L	M	L	L
	Mitigated	L	L	L	L	L	L
Groundwater pollution	Unmitigated	M	M	H	H	M	L
	Mitigated	L	L	L	L	L	L

Wastewater management	Unmitigated	L	M	L	M	L	L
	Mitigated	L	L	L	L	L	L
Health, safety and security	Unmitigated	M	L	L	L	M	L
	Mitigated	L	L	L	L	L	L
Heritage Impacts	Unmitigated	M	H	L	M	L	M
	Mitigated	L	L	L	L	L	L

Mitigation measures

Where negative impacts are identified, mitigation objectives have been set, and practical, attainable mitigation measures must be recommended that will minimize or eliminate the impacts. Where mitigation is not feasible, this has been stated and reasons given. In the case of positive impacts, enhancement measures are recommended for optimizing the benefit to be derived.

Monitoring

Monitoring requirements with quantifiable standards to assess the effectiveness of mitigation actions have been recommended where appropriate. These must indicate what actions are required, by whom, and the timing and frequency thereof. If further investigations must be undertaken and monitoring programmes implemented before, during and after operations.

8. Environmental Management Plan (EMP)

8.1 Overview

8.1.1. Purpose of this Environmental Management Plan (EMP)

Environmental management plan (EMP) serves as a risk strategy that contains logical framework, monitoring programs, mitigation measures and management control. The aim of an Environmental Management plan (EMP) is to develop procedures to implement project's mitigation measures and monitoring requirements. An EMP ensures the community that the environmental management of the project is acceptable. As well as stipulating the roles and responsibilities of persons involved in the project. It further ensures that legal and policy requirements are well known and understood by the proponent, its employees and contractors and will be strictly enforced by its management team. Issues and concerns identified in the EIA will form a set of environmental specifications that will be implemented on site.

The control measures described in this EMP have been developed following consideration of the findings of the Environmental Impact Study (EIS), which concluded that a number of environmental values would be impacted by the proposed exploration activities. The intent of the proposed control measures is to ensure that project related activities will not negatively affect the environment or the health, welfare and amenity of people and land uses by meeting or exceeding statutory requirements.

Furthermore, overall objectives of this EMP are:

- To develop measures that will mitigate the adverse impacts of the proposed project
- Ensuring compliance with regulatory authority stipulations and guidelines
- To formulate measures to enhance the value of environmental components where possible.

- To formulate measures to protect environmental resources as well enhance the value of environmental components where possible.
- Responding to unforeseen events and providing feedback for continual improvement in environmental performance.

8.1.2. Summary of the proposed activities

The proponent has applied for a mining licence (ML218) on exclusive prospecting licence (EPL 6118) in order to develop a marble quarry. Marble quarrying and ongoing exploration activities have potential impacts on the following:

- Potential land or soil disturbances,
- Soil and water resources contamination,
- Biodiversity (fauna and flora),
- Air quality/dust,
- Noise,
- Health and safety,
- Vehicular traffic safety,
- Archaeological impact.

8.1.3. Project Phases Covered in the EMP

The following phases are addressed in this EMP:

- **Construction phase:** The initial phase which entails construction of main and supporting mining infrastructures (Mine Development).
- **Operation and maintenance phase:** the phase during which the quarrying activities are carried out and maintenance of the site, related infrastructure, equipment and machinery is done.
- **The decommissioning phase** is the time during which the targeted dimension is depleted or of no longer economic value, leading to the cessation of the mining activities. During

the operational phase and before decommissioning, the Proponent will need to put site rehabilitation measures in place. The decommissioning phase is followed by mine closure and aftercare

8.1.4 Legal Implications and obligations under the EMP

The EMP will be sent to the Directorate of Environmental Affairs (DEA) of the Ministry of Environment, Forestry and Tourism (MEFT) for approval. Once the DEA is satisfied with the contents of the EMP, they will issue an Environmental Clearance Certificate (ECC) to the Proponent to commence with the establishment of the quarry for marble and granite in the proposed area. The ECC is linked with the recommendations of the Environmental Management Plan. Once the ECC is issued, the EMP becomes a legally binding document and each role-player including contractors and sub-contractors are made responsible to implement the relevant sections of the EMP and is required to abide by the conditions stipulated in this document

8.1.5 Environmental Management Principles

The proponent will ensure that all parties involved in the project uphold the following broad aims:

1. All persons will be required to conduct all their activities in a manner that is environmentally and socially responsible. This includes all consultants, contractors, and sub-contractors, transport drivers, guests and anyone entering the quarrying areas in connection with the quarrying project.

2. Health, Safety and Social Well Being

- Safeguard the health and safety of project personnel and the public against potential impacts of the project. This includes issues of road safety, precautions against natural dangers on site, and radiation hazards; and,
- Promote good relationships with the local authorities and their staff.

3. Biophysical Environment

- Wise use and conservation of environmental resources, giving due consideration to the use of resources by present and future generations;
- Prevent or minimize environmental impacts;
- Prevent air, water, and soil pollution, Biodiversity conservation and Due respect for the purpose and sanctity of the area.

To achieve these aims, the following principles need to be upheld.

Commitment and Accountability:

The proponent's senior executives and line managers will be held responsible and accountable for: Health and safety of site personnel while on duty, including while travelling to and from site in company vehicles and environmental impacts caused by quarrying activities or by personnel engaged in the quarrying activities, including any recreational activities carried out by personnel in the area

Competence

The proponent will ensure a competent work force through appropriate selection, training, and awareness in all safety, health and environmental matters.

Risk Assessment, Prevention and Control

Identify, assess and prioritize potential environmental risks. Prevent or minimize priority risks through careful planning and design, allocation of financial resources, management and workplace procedures. Intervene promptly in the event of adverse impacts arising.

Performance and Evaluation

Set appropriate objectives and performance indicators. Comply with all laws, regulations, policies and the environmental specifications. Implement regular monitoring and reporting of compliance with these requirements.

Stakeholder Consultation

Create and maintain opportunities for constructive consultations with employees, authorities, other interested or affected parties. Seek to achieve open exchange of information and mutual understanding in matters of common concern.

Continual Improvement

Through continual evaluation, feedbacks, and innovation, seek to improve performance regarding social health and well-being and environmental management throughout the lifespan of the quarrying project.

Financial Provisions for Quarrying

In line with Namibia's environmental rehabilitation policy, the proponent will make the necessary financial provision for compliance with the EMP.

8.2. Identified impacts, monitoring and proposed mitigation measures

8.2.1. Positive social-economic impacts

8.2.1.1. Job Creation

Local recruitment will be encouraged by the proponent with a target of at least 65% locals. This operation thus contributes to the alleviation of unemployment which is severe in the country. The establishment and operation of the quarry will create both direct and indirect jobs for at least minimum50 people .Employment on the new project will be attractive to the local workforce by virtue of the comparatively high wages offered, this will result in the local growth in the economy of Karibib constituency and surrounding areas.

Enhancement measures

- The proponent will introduce training programs (bursary schemes, on the job training etc) in order to boost the supply of local skills
- It is proposed that local people community members from Karibib Constituency should be considered first for employed. Especially where no specific skills are required.
- The Karibib Town Councilor could be requested to assist with the recruitment of workers.
- Gender equality considerations during recruitment process.
- Employment preference will be afforded to previously disadvantaged Namibians.

8.2.1.2. Support to local retailers shop

Mining is the highest foreign currency earner and GDP contributor to the Namibian economy, therefore the presence of mining activities near local authorities stand to benefit the local economies from project-related purchases, for example, the retail, accommodation and recreation sectors. The proponent and his employees are encouraged to purchase or support local retailers in Karibib town unless the intended material/product to purchase is not available.

8.2.1.4. Export taxes and VAT payments

Export taxes and VAT payments contribute significantly to the national economic contribution. Thus, without these payments our government will not be able to roll out the project on infrastructure, being it water, road or electricity and also sanitation facilities nationwide. The proponent and his employees are encouraged to make these payments when applicable to support the economic growth of the country.

8.2.1.5. Supply of raw materials

Supply of raw materials and processed materials to downstream industry for economic growth. In addition to construction, dimension stone is also needed for monumental, as the raw material for

sculpture and tombstones. This industry will also add local value addition for the processing of blocks (waste) that cannot be sold as complete blocks.

8.2.2. Impacts on bio-physical environment

8.2.2.1. Liquid waste: oil spillage and wastewater

Mitigation Measures to be enforced:

- Ensure adequate storage and handling of liquid waste, fuel, waste water as well as regular maintenance of plant equipment.
- Avail a spill response action plan in case of accident.
- Accessibility to spill prevention and response equipment, such equipment should be visible and accessible to all employees at any given time.
- Spills will be cleaned up immediately to the satisfaction of the Regional Manager by removing the spillage together with the polluted soil and by disposing of them at a recognized facility.
- Designated waste collection tanks should be available on-site and away from waterways, and such isolation should be maintained at all times.
- Storage of the hazardous substances in a bounded area,
- Refuel vehicles at a designated area that has a protective surface covering/geo-membrane lining and utilize drip trays for stationary plant.

8.2.2.2 Impacts on surface water

Mitigation Measures to be enforced:

- No dumping of waste products of any kind in or in close proximity to surface water bodies.
- Heavy mining vehicles should be kept out of any surface water bodies and the movement of vehicles should be limited where possible to the existing roads and tracks.

- Ensure that oil/ fuel spillages from vehicles transporting the stones and machinery are minimized and that where these occur, that they are appropriately dealt with.
- Drip trays must be placed underneath vehicles when not in use to contain all oil that might be leaking from these vehicles.
- In all areas where there is storage of hazardous substances (i.e. hydrocarbons), there will be containment of spillages on impermeable floors and bund walls that can contain 110%ofthevolume of the hazardous substances.
- All refueling and any maintenance of vehicles will take place on impermeable surfaces.
- Pollution will be prevented through basic infrastructure design and through maintenance of equipment.
- Spill kits will be readily available on site. Employees and/or contractors will be trained to use the spill kits to enable containment and remediation of pollution incidents.
- Environmental awareness for contractor and employees to be included during inductions
- Any spills will be contained and cleaned up immediately
- Non-toxic and biodegradable drilling lubricant will be used

8.2.2.3. Solid waste

Solid waste is a challenge during the ongoing exploration and operational phases. It can be generated from contractors, staff members and other visitors to the area. Proper solid waste management will involve full commitment by all the employees and contractors on site. Solid waste which will be generated from this project if not managed will have an effect on the environment.

Mitigation Measures to be enforced:

- Sufficient waste disposal sites should be established on-site were generated waste should be kept during ongoing exploration and operation period.
- The collected solid waste should be disposed of at Karibib Town Council solid waste disposal sites.

- For human waste, during the construction phase, the mobile toilet should be made available on-site for workers and once these facilities are full, the collected human waste should be disposed at the Town Council human waste disposal site.
- It is recommended that waste from the temporary toilets be pumped out and disposed of at the designated waste treatment site in Karibib.
- Mandatory waste segregated right at the source of waste generation. The collection of segregated waste would be made from the quarrying site and amenity areas.
- Reusable and recyclable waste will be disposed of by selling to scrap dealers and private contractors for resale.
- Non-degradable waste will be transferred to the municipal solid waste management system.
- Waste generated will be handled in accordance with the contract signed with the landowner. This shall include: waste should be separated and recycled / re-used where possible.
- Where waste management procedures do not exist, a procedure should be developed.
- Employees and contractors will be shown the importance of correct waste disposal as well as waste minimization and recycling.

8.2.2.4. Land and soil disturbance

Dimensions stone mining process involve cutting out prismatic blocks from in situ granite and marble outcrops and therefore disturbing the landform and the soil cover in the immediate surroundings of the mining site. This undertaking has the potential of disturbing the structural composition and biological productivity of topsoil and If not taken care of this can lead to land degradation.

Mitigation Measures to be enforced:

- The access road to the mining site must be established in consultation with the landowner and usage of existing roads shall be enforced.

- The design, construction, and location of access to main roads will be in accordance with the requirements laid down by the controlling authority.
- Land markings, vehicle tracks, trenches and excavations shall be restored to the original landform and, visual state as much as possible.
- In the case of dual or multiple uses of access roads by other users, arrangements for multiple responsibilities must be made with the other users. If not, the maintenance of access roads will be the responsibility of the holder of the mining licence (ML).

8.2.2.5. Biodiversity (fauna and flora)

Mining can be destructive process, changing abiotic and biotic conditions and in some cases singlehandedly causing local decline in rare and threatened species and ecosystems. Some of the activities of the proposed project i.e. vehicles, human movements, excavating pose a risk to the integrity of baseline biodiversity as well as the biological productivity of the site and the immediate proximity. Movement of vehicles in and out of the site and noise produced by moving earth-moving equipment are the major threats to fauna .The following mitigations are to be undertaken to minimize further impact on the existing biodiversity:

Mitigation Measures to be enforced: **flora**

- The footprint of the area to be disturbed will be minimized as far as is practically possible.
- Remove unique fauna and sensitive fauna before commencing with the development activities and relocate to a less sensitive/disturbed site if possible.
- Recommend the planting of local indigenous species of flora as part of the landscaping as these species would require less maintenance than exotic species and have important ecological functions in terms of carbon sequestration from decomposing materials at the site.
- Disturbance of marginal vegetation in the mountains should be limited.

- Where it is clear that certain large species will be destroyed consideration should be given to offering to rescue the individuals involved and relocate them to nearby gardens.
- Transplant removed trees where possible, or plant new trees in lieu of those that have been removed.
- Prevent the destruction of protected tree species.
- No open fires will be permitted on site.

Mitigation Measures to be enforced: **fauna**

- Barriers/barricades confining driving trucks must be erected to avoid stray driving and trampling on habitat. Proper demarcation of the mining and exploration area.
- Honor agreements set out in the site-access contracts, specifically relating to the areas utilized for professional hunting.
- Avoid disturbance on invertebrate on-site and along the gravel road stretch.
- Avoid the creation of multiples roads strips, which could result in the disturbance of breeding sites for various mammals.
- No workers will be allowed to collect any plant or snare, hunt or otherwise capture any wild animal.
- No domestic animals will be permitted on the quarry sites by means of erecting a perimeter fence, small stock should graze at designated areas.
- A fauna survey will be conducted to determine the effect of fragmented habitat on game species should the need arise.
- No foodstuff will be left lying around as these will attract animals which might result in human-animal conflict.
- Care will be taken to ensure that no litter is lying around as these may end up being ingested by wild animals

Methods for monitoring:

- Regular monitoring of any unusual signs of animal habitat.

- There should be limited movement of heavy duty machinery and mining equipment in the area to avoid interference.
- Birds or Nest sites will not be disturbed by any employee, visitor or contractor.
- If possible encountered bird kills and nest removal should be registered in a biodiversity data-base and information should be made available to the general public

8.2.2.6. Impacts of Alien invasive Plants

Alien invasive plants are prevalent in areas affected by land transformation and anthropogenic disturbance. It is a well-known fact that disturbance to the natural environment often encourages the establishment of alien invasive weed species. Surface mines are a major disturbance, and thus may promote the establishment and expansion of invasive plant communities. Seed or plant material may be imported to site from building materials if the source is contaminated. It is also possible that, plant or seed material may adhere to car tyres or animals, in some cases seeds of alien invasive plants may blow from debris removed at sites.

Mitigation Measures to be enforced:

- The site manager will ensure that debris is properly disposed of.

- Vehicle tyres inspections can be carried out although this may not be a practical mitigation measure.

- The proponent should implement an alien plants awareness campaign to educate and sensitize the employees and the local community on the menace of planting alien vegetation in the area.
- Eradicating alien plants by using an Area Management Plan

Methods for monitoring:

- Regular monitoring of any unusual signs of alien species.
- The proponent and local community should establish an alien plant task force to ensure that there is no planting of alien plants species in the area.

- The proponent should adopt and support the implementation of an annual alien plants clearing campaign.

8.2.2.7. Air quality

The proposed quarrying activities are the potential of fugitive sources for the dust particles as they are easily dispersed and carried away by the winds. During the operation phase dust will be generated onsite by earth moving equipment and also on the gravel road by trucks and vehicles. Continuous movements of people, vehicles and earth moving vehicles on site can thus loosen and re-suspend the deposited material again into the air

Mitigation Measures to be enforced

- Dust suppressants shall be applied to all the mining activities as well as all the unpaved/gravel roads.
- The speed of haul trucks and other vehicles must be strictly controlled to excessive dust or excessive deterioration of the road being used.
- All gravel roads in the project area should have a speed limit of 60km/h for light vehicles and 30km/h for heavy vehicles in order to minimize the amount of dust generated by vehicles.
- Transportation of raw materials required for construction will be carried out during non-peak hours.
- Covering scaffolding and cleaning of vehicles that can reduce dust and vapor emissions will be used.
- Cover any stockpiles with plastic to minimise windblown dust.
- During high wind conditions the proponent must make the decision to cease works until the wind has calmed down.
- Use of personal protective equipment for proper dust control for respiratory protection and other necessary PPE (gloves, work suits, sun hats etc.).

Monitoring

- Daily inspection by the ENC of the gravel roads and quarry site on possible dust creation that requires attention.
- Daily inspection on site by the ENC to ensure that all workers are wearing their protective clothes at all time during the mining process and the dry skin contact with gloves is prevented.

8.2.2.8. Impacts on Archaeological Sites

Potential damage to archaeologal sites may be impacted through unintentional destruction or damages are a result of vehicle tracks, footprints and actions of contractors, employees and visitors of the quarry site. Currently, there is no information provided about known heritage or site of cultural values within the project site. Therefore, this impact can be rated medium to low, if there are no mitigation measures in place. At the sites, there are no known heritage areas or artifacts deemed to be impacted by the ongoing exploration and quarrying activities. However, there might be unknown archaeological remains within the Mining Licence area hence the Proponent is required to follow the chance find procedures and consult the Heritage Council immediately. The Proponent should consider having a qualified and experience archaeologist on standby during entire operational phase. This action will be to assist on the possibility of uncovering sub-surface graves or other cultural/heritage objects and advice the Proponent accordingly. Identified graves or any archaeological significant objects on the site should not be disturbed, but are to be reported to the project Environmental officer or National Heritage Council offices.

Mitigation Measures to be enforced

- Buffer zones will be created around the operation site
- Adhere to practical guidelines provided by an archeologist on site to reduce archaeological impacts of quarrying activities.
- All archeological sites to be identified and protected before construction commences.
- Notices/ information boards information will be placed on site.

- Training employees regarding the protection of these sites.
- Obtain appropriate clearance or approval from the competent authority.
- In the event of such finds, mining must stop and the project management or contractors should notify the National Heritage Council of Namibia immediately.

Monitoring

- An archaeologist will inspect any identified archaeological sites before commencing with the quarrying activities.

8.2.2.9. Noise

Noise emissions on site are mainly generated by earthmoving equipments, drilling rigs, wire saw, people and vehicles. The main noise sources are associated with drilling, breaking, crushing and transport of equipment or materials to or from the quarry site. Exposure to loud noises at work can cause irreversible hearing damage, workplace accidents and be a contributing factor to other health problems.

Mitigation Measures to be enforced

Continuous monitoring of noise levels should be conducted to make sure the noise levels at the mining site does not exceed acceptable limits.

- Reduction of noise from drilling rigs by using down hole drilling or hydraulic drilling;
- Installation of proper sound barriers and (or) noise containments, with enclosures and curtains at or near the source equipment.
- Use of rubber-lined or soundproof surfaces on processing equipment (e.g. screens, chutes, transfer points, and buckets);
- Use of rubber-belt transport and conveyors;
- Installation of natural barriers at facility boundaries (e.g. Vegetation curtains or soil berms).

- Optimization of internal-traffic routing, particularly to minimize vehicle-reversing needs (reducing noise from reversing alarms) and to maximize distances to the closest sensitive receptors.
- No activity having a potential noise impact should be allowed after 18:00 hours if possible.
- In the event that activities continue outside the stipulated hours the contractor will communicate such occurrences to potentially affected communities prior to commencing such activities.
- Workers working near high noise mining machinery will be provided with ear muffs/ earplugs.

8.2.2.10 Storm water and erosion Control

Mitigation Measures to be enforced

- Regular preventative maintenance should be carried out on the quarry infrastructure.
- Earth embankments to prevent erosion will be established where appropriate.
- The surface water accumulated in the open trenches must be channelled along the natural tributaries of area.
- It is recommended that granite mining takes place outside of the rainy season in order to limit flooding on site and surface water pollution.
- Storm water Management Plans should be developed for each quarry/claim site and should include the management of storm water during excavation, as well as the installation of storm water and erosion control infrastructure and management thereof after completion of mining.
- Storm water management systems will be installed to prevent storm water from entering or exiting the quarry, which could result in silt laden surface water from draining into any ephemeral river systems that may be in proximity to the mining claim site.
- Quarry slopes should be profiled to ensure that they are not subjected to excessive erosion but capable of drainage run-off with minimum risk of scour (maximum 1:3 gradient).
- If necessary, diversion channels should be constructed ahead of the open cuts as well as above emplacement areas and stockpiles to intercept clean run-off and divert it around disturbed areas into the natural drainage system downstream of the quarry.

- All mined areas (where works will take place) will be rehabilitated to control erosion and sedimentation.
- Existing vegetation must be retained as far as possible to minimize erosion problems.
- Rehabilitation of quarries shall be planned and completed on a continuous basis in such a way that the run-off water (if any) will not cause erosion.
- Visual inspections shall be done on a regular basis with regard to the stability of water control structures, erosion and siltation (if required).

8.2.2.11 Topsoil disturbance

Topsoil shall be removed from all areas where physical disturbance of the surface will occur, prior to the disturbance occurring. Topsoil refers to that layer of soil covering the earth and which provides a suitable environment for the germination of seeds, allows the penetration of water, and is a source of micro-organisms, plant nutrients and in some cases seed.

Mitigation Measures to be enforced

- Topsoil shall be stored so that it can be placed on the exposed subsoil as soon as the mining of the excavation or the relevant section of it has been completed and its slopes have been finished off to the acceptable gradient as part of the rehabilitation process.
- Topsoil shall be stockpiled only in the areas dedicated for only that purpose, even if the topsoil is only partially cleared.
- The topsoil removed, shall be stored in a bund wall on the high ground side of the quarry and in such a way that it will not cause damming up of water or wash ways, or wash / blow away itself. Stockpiles will not exceed a height of **two** meters.
- Stockpiles shall be managed so as to maintain the re-growth potential of the topsoil. Should the stockpiles stand for too long (greater than 12 months) it can be considered barren from a seed bank point of view. In this case reseeding may be required. Stockpiles should ideally be stored for no longer than six months.
- The overburden, i.e., that layer of soil immediately beneath the topsoil, will be removed and stored separately from the topsoil.

- No chemical pollution shall be allowed to contaminate the soils; any plant equipment found to be attributing to this shall be removed from the site and repaired.

8.2.2.12 Visual negative impacts

Mitigation Measures to be enforced

- Negative visual effects can further be prevented through mitigations (i.e. keep existing trees, introduce tall indigenous trees).
- Quarries should be levelled mining activities cease so as to restore the visual sense of place of the area to its natural state.
- The remains of all structures that may have been erected at the quarry shall be demolished and removed on completion of the project.
- Care must be taken to ensure that all rehabilitated areas are similar to the immediate environment in terms of visual character, vegetation cover and topography and any negative visual impacts will be rectified to the satisfaction of the environmental consultant.
- Overburden will be placed back into excavation as part of the rehabilitation programme

8.2.2.13 Fire and Explosion Hazard

Mitigation Measures to be enforced

- Sufficient fire extinguishers will be installed at selected locations such as mine office, garage. Sufficient water hydrants with sufficient water hydrants with sufficient length of hosepipes will be made available on the surface for fire protection.
- Mine personnel will be trained on how to use fire extinguishers.

8.2.2.14 Health, safety and security

There are number of hazards associated with the movement of equipments and impact on dangerous parts of the equipment. The risk of an accident will be high if the dangerous parts are exposed and operators are poorly trained or supervised. 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.

Mitigation Measures to be enforced:

- All vehicular equipment operators must have valid licence for that particular vehicle class.
- Personnel should not overnight at the mining site, except the security personnel.
- Ensure that all mining personnel are properly trained depending on the nature of their work.
- Provide for a first aid kit and a properly trained person to apply first aid when necessary.
- A wellness program should be initiated to raise awareness on health issues, especially the impact of sexually transmitted diseases as described above.
- Encourage HIV counseling and testing and facilitate access to Antiretroviral (ARV) medication
- Restrict unauthorized access to the mining claim site and implement access control measures.
- Clearly demarcate the mining claim site boundaries along with signage of "no unauthorized access".
- Clearly demarcate dangerous areas and no go areas on site.
- Staff and visitors to the mining claim site must be fully aware of all health and safety measures and emergency procedures.
- The contractor must comply with all applicable occupational health and safety requirements.
- The workforce should be provided with all necessary Personal Protective Equipment where appropriate.
- Emergency medical treatment should be available on site.

8.2.3. Negative Impacts on Socio-Economic

The **nature of impact** is outlined below:

- Impact from loss of grazing for domestic livestock in "exclusive use zone"
- Impacts on cultural and spiritual values.
- Demographic factors: Attraction of additional population that cannot benefit from the project.
- Perception of Health and Safety risks associated with quarrying.

Mitigation Measures to be enforced:

- The population change can be mitigated by employing people from the local community and encouraging the contractors to employ local individuals.
- The perception of risks will be mitigated by putting up safety signs wherever possible and ensuring that all employees and visitors to the site undergo a safety induction course.

Methods for monitoring:

- Public meetings will be held by the proponent whenever necessary.

Environmental Management Plan, Organization and Implementation

The environmental aspects which may be affected by the proposed project have been categorized into negative and positive impacts as an extension of the preceding sections. This section summarizes the objectives, indicators to be observed, schedules be adhered to and roles and responsibilities of various stakeholders to the EMP. The following tables gives the mitigation measures to be undertaken during construction, operation, closure and decommissioning phases with the agency responsible for implementation. The following abbreviations are used to indicate who is responsible for what impact mitigation objective:

- Site Foreman SF
- Site/mine Manager SM/MM
- Project manager PM
- Project Proponent PP
- Project Geologist PG

- Environmental Coordinator ENC
- Contractor C
- Geological Technician GT
- Project staff PS

Table 9 : Implementing of the negative impacts. All the mentioned impacts in the below table are scheduled for all the phases of the proposed project.

Objectives	**Indicators**	**Responsibility**
To avoid any form of hydrocarbon spills on and around the mining site	No hydrocarbon spillage or/and remnants of hydrocarbon spillage shall be visible around the project site	SF,PS, ENC
To avoid any form of liter be it paper, metal, plastic and human waste on and around the mining site	No litter or/and remnants of liter shall be visible around the project site	SF,PS , ENC
To minimize land and soil disturbance	Driving tracks and excavation shall be restricted and only be visible within the project site.	SM, SF , ENC
To protect and conserve fauna and flora within the project area	Minimum levels of habitat disturbance	SM,SF, ENC
To minimize dust generation on site and atmospheric pollution	Emissions/generation particulate content of the dust around the site and gravel roads shall not exceed maximum allowable concentration that may affect human being and animals	SM,SF, ENC
To ensure compliance with statutory requirements	Assurance measures shall be put in place and Periodic inspections aimed at corrective action undertaken, recorded and documented	EC, PP , ENC

Table 10: Summary of Environmental Management Plan during construction, operation and decommissioning phases

Construction phase			
Environmental impacts	**Proposed mitigation measures**	**Responsibility**	**Monitoring plan**
Air pollution	• Regular maintenance of vehicles and equipments. • Sensitize workers and contractors. • Control speed and operation of construction vehicles. • Regular maintenance of vehicles, construction equipments and heavy machineries. • Sensitize workers and contractors. • Provide workers with dust masks.	C SM PM ENC	• Amount of dust produced. • Level of landscaping executed.
Noise pollution	• All noise sources should be removed from site or kept within reasonable level. • Work should only be carried out during day time (7 am to 5 pm) • Regular maintenance of vehicles, equipments and heavy machinery. • Workers should be provided with personal hearing protection if working in a noisy environment.	C GT SM ENC	• Amount of noise produced
Solid waste	• Littering should be discouraged. • Any debris/litter should be collected by a waste collection company. • The site should have receptacles with bulk storage facilities at convenient points to prevent littering.	PM SM ENC	• Presence of dust bins/waste collection points.
Oil leaks and spills	• Contactor should have a sealed designated area where maintenance is carried out to prevent percolation of contaminants. • Oil products should be handled carefully. • Vehicles and equipments should be well maintained to prevent oil leaks.	C ENC SM	• Absence of oil spills and leaks on site.
First aid	• A well-stocked first aid kit shall be maintained by a qualified personnel.	PM	• Contents of the first aid kits.
Visual	• Environmental considerations will always be adhered to before clearing roads, trenching and excavation.	PM GT	• Employees to be trained on hoe to minimize visual impacts.

Archaeological sites	• Buffer zones will be created around the sites. • Adhere to practical guidelines provided by the responsible archaeologist to reduce archaeological impacts of quarrying activities. • All archaeological sites to be identified and protected before development commences.	PM ENC PP SM	• Register of all archaeological sites identified.
Occupational health and safety	• Provide personal protective equipments, train workers on personal safety, and how to handle equipments and machines. • A well-stocked first shall be maintained by qualified personnel. • Report any accidents/ incidences and treat and compensate affected workers. • Provide sufficient and suitable sanitary conveniences which should be kept clean.	C PM PP	• Workers using personal protective equipments. • Availability of a well-stocked first aid box. • Clean sanitary facilities.
Fauna	• Some habitat areas such as the river and tunnel outcrops will be avoided wherever possible. • A fauna survey will be conducted to determine the effect of fragmented habitat to game species should the need arise. • No animals shall be killed, capture or harmed in any way. • No food stuff shall be left lying around as this will attract animals which may result in human-animal conflict.	PM ENC PP SM	• Regular monitoring of any unusual signs of animal habitat.
Alien invasive plants	• Ensure vehicles and equipment are clean of invasive plants and seeds. • Eradicating alien plants using area management plan. • Contain neighboring infestations and restrict movement of invasive plants from adjacent lands • Educating everyone on site on types of invasive plants.	PM ENC PP SM	• Regular monitoring of any signs of alien plants.

Loss of vegetation	• Environmental considerations will be adhered to at all times before clearing roads, trenching and excavating. • The movement of vehicles in riverbeds, rocky outcrops and vegetation sensitive area will be avoided. • The movement of vehicles will be restricted to certain tracks only.	PM ENC PP SM	• Warning signs on site • Restored vegetation

Operational Phase			
Environmental /Social Impact	**Proposed mitigation measures**	**Respon sibility**	**Monitoring plan**
Noise pollution	• All noise sources should be removed from site or kept within reasonable level. • Regular maintenance of vehicles, equipments, heavy machinery on regular basis. • Work should only be carried out only during day time (7am to 5pm). • Workers should be provided with personal hearing protection if working in noisy environment.	PM ENC PP SM MM C	• Amount of noise produced
Visual	• Environmental considerations will be adhered to at all times before clearing roads and excavations	PM, ENC GT	• Employees to be trained on how to minimize visual impacts
Fauna	• Some habitat areas will be avoided where possible. • A fauna survey will be conducted to determine the effects of fragmented habitat game species should the need arise. • No animal shall be kept, captured, killed or harmed in any way. • No food stuff will be left lying around as these will attract animals which may result in human-animal conflict.	PM ENC PP MM C	• Regular monitoring of unusual signs of animal habitat.
Alien invasive plants	• Ensure debris is properly disposed of. • Ensure vehicles and equipment are clean of invasive plants and seeds. • Contain neighboring infestations and restrict movement of invasive plants from adjacent lands	PM ENC PP MM C	• Regular monitoring of any signs of alien invasive plants

	• Educating everyone on site on types of invasive plants. Eradicating alien invasive plants by using an area management plan.		
Loss of vegetation	• Environmental considerations will be adhered to at all times before clearing roads, trenching and excavations. • Paths and roads will be aligned to avoid root zones. • Permeable materials will be used where ever possible. • Movement of vehicles in riverbeds, rocky outcrops and vegetation sensitive areas will be avoided and restricted to certain tracks only.	PM ENC PP MM C	• Restored vegetation
Solid waste	• Minimize solid waste generated on site. • Debris should be collected by waste collection company. • Excavation waste should be reduced or backfilled.	PM C	• Amount of waste on site. • Availability of dust bins, waste collection point.

Oil leaks and spills	• Machinery should be well maintained to prevent oil leaks. • Contractors should have a designated area where maintenance is carried out and should be underlain by impermeable layer.	PM ENC PP MM C	• No observed/detected oil spills and leaks on site
Archaeological sites	• Buffer zones will be created around the sites. • Adhere to practical guidelines provided by an archaeologist to reduce archaeological impact of quarrying activities. • All archaeological sites to be identified and protected before further quarrying commences.	PM	• Up to date register of all archaeological sites identified in the vicinity.
First aid	• A well-stocked first aid kit shall be maintained by qualified personnel.	PM	• Contents of the first aid kit.

Fire preparedness	• Firefighting emergency response plan. • Ensure all firefighting equipments are always available regularly maintained, serviced and inspected. • Fire hazard signs and directions to emergency exit, route to follow and assembly point in case of any fire incidence.	PM	• Fire signs put up in strategic places. • Availability of well-maintained firefighting equipments.
Environmental health and safety	• Train workers on personal safety and disaster preparedness. • Provide sufficient and suitable sanitary conveniences which should be kept clean. • Conduct annual health and safety audits. • Report any accidents/incidences, treat and compensate affected workers. • A well-stocked first aid kit shall be maintained by qualified personnel.	PM	• Provide sanitary facilities. • Copies of annual audit.

Decommissioning phase			
Impacts	**Proposed mitigation measures**	**Responsibility**	**Monitoring plan/Indicator**
Noise and air pollution	• Personal hearing protection must be worn by workers in noisy section. • Regular maintenance of vehicles, equipments, heavy machinery on regular basis. • Workers should be provided with dust mask to wear at all times. • Decommissioning work can only be carried out during the day.	C PM	• Amount of noise and dust generated

Disturbed physical environment	• Undertake a complete a complete environmental restoration programme and introducing appropriate vegetation for ground stabilization.	PM	
Solid waste	• Solid waste should be collected by contracted waste collection company. • Excavation waste should be used or backfilled	C PM	• Amount of waste on site. • Presence of well-maintained receptacles and central collection point.
Occupational health and safety	• Train workers on personal safety and how to handle equipments and machines. • Provide personal protective equipments (PEE). • A well-stocked first aid kits shall be maintained by qualified personnel. • Demarcate area under decommissioning.	C PM	• Workers using protective equipments. • Availability of a first aid box.

8.3 Monitoring, reporting and corrective action

8.3.1 Monitoring of EMP

Monitoring of the EMP performance for the proposed project by the Contractor emphasizes early detection, reporting, and corrective action. It is divided into three parts, namely:

• Monitoring of project activities and actions to be undertaken by the Environmental Coordinator (ENC) appointed by the Contractor.

• The Environmental Coordinator (ENC) shall report all incidents and situations which have the potential of jeopardizing compliance of statutory provisions as well as provisions of this EMP to the Project Proponent.

• The Environmental Coordinator (ENC) shall take corrective prompt measures, adequate and long-lasting in addressing non-compliance activities or behavior.

To ensure compliance of the Contractor ENC to the implementation of the EMP, it is

highly recommended that an External Environmental Expert is appointed by the proponent to ensure the implementation of the EMP.

8.3.2 Inspections and Audits

During the life of the project, performance against the EMP commitments will need to be monitored and corrective action taken where necessary, in order to ensure compliance with the EMP and relevant environ-legal requirements.

8.3.2.1 Internal Inspections/Audits

The following internal compliance monitoring programme will be implemented:

1. Project kick-off and close-out audits will be conducted on all contractors. This applies to all phases, including drilling contract work during operations:
    - Before a contractor begin any work, an audit will be conducted by the applicable phase site manager to ensure that the EMP commitments are included in Contractors' standard operating procedures (SOPs) and method statements.
    - Following completion of a Contractors work, a final close-out audit of the contractor's performance against the EMP commitments will be conducted by the applicable phase site manager.
2. Monthly internal EMP performance audits will be conducted during the construction/initial and decommissioning phases.
3. Ad hoc internal inspections can be implemented by the applicable manager at his/her discretion, or in follow-up to recommendations from previous inspection/audit findings.

8.3.2.2 External Audits

- At the end of each project phase, and annually during the operational phase, an independently conducted audit of EMP performance will be conducted.
- Specialist monitoring/auditing may be required where specialist expertise are required or in order to respond to grievances or authorities directives.

- Officials from the DEA may at any time conduct a compliance and/or performance inspection of quarrying operations. The proponent will be provided with a written report of the findings of the inspection. These audits assist with the continual improvement of the quarrying project and the proponent will use such feedback to help improve its overall operations.

8.3.3 Documentation

Records of all inspections/audits and monitoring reports will be kept in line with legislation. Actions will be issued on inspection/audit findings. These will be tracked and closed out.

8.3.4 Reporting

Environmental compliance reports will be submitted to the Ministry of Environment, Forestry on a bi-annual basis.

8.3.5 Environmental management system framework

Environmental Management System (EMS) will be established and implemented by the proponent and their Contractors. This subchapter establishes the framework for the compilationofaprojectEMS.Theapplicablemanagerwillmaintainapaperbasedand/orelectronic system of all environmental management documentation. These will be divided into policy and performance standards &Enviro legal documentation.

Policy and Performance Standards

A draft environmental policy and associated objective, goals and commitments has been included in the EMP. The project proponent may adapt these as necessary.

Enviro-Legal Documentation

A copy of the approved environmental assessment and EMP documentation will always be available by the proponent. Copies of the Environment Clearance Certificate and all other associated authorizations and permits will also be kept with the quarrying team. In addition, a register of the legislation and regulations applicable to the project will be maintained and updated as necessary.

Impact aspect register

A register of all project aspects that could impact the environment, including an assessment of these impacts and relevant measures is to be maintained. This Draft EMP identifies the foreseeable project aspects and related potential impacts of the proposed project, and such forms the basis for the aspect Impact Register with the project activities. It should however be noted that during the life of the project additional project aspects and related impacts may arise which would need to be captured in the Aspect-Impact Register.

8.3.6 Procedures and Method Statements

In order to affect the commitments contained in this EMP, procedures and method statements will be drafted by the relevant responsible quarrying staff and Contractors. These include, but may not be limited:

- Standard operating procedures for environmental action plan and management programme execution.
- Incident and emergency response procedures.
- Auditing, monitoring and reporting procedures, and
- Method statements for EMP compliance for ad hoc activities not directly addressed in the EMP action plans.

All procedures are to be version controlled and signed off by the applicable manager. In addition, knowledge of procedures by relevant staff responsible for the execution thereof must be demonstrable and training records maintained.

Register of roles and responsibilities

During project planning and risk assessments, relevant roles and responsibilities will be determined. These must be documented in a register of all environmental commitment roles and responsibilities. The register is to include relevant contact details and must be updated as required.

Site Map

An up to date map of the quarrying site indicating all project activities is to be maintained. In addition to the project layout, the following detail must be depicted:

- Materials handling and storage;
- Waste management areas (collection, storage, transfer, etc.);
- Sensitive areas;
- Incident and emergency equipment locations; and Location of responsible parties.

Environmental management schedule

A schedule of environmental management actions is to be maintained by the applicable phase site managers and/or relevant Contractors. A master schedule of all such activities is to be kept up to date by the manager. Scheduled environmental actions can include, but are not limited to:

- Environmental risk assessment;
- Environmental management meetings;
- Soil handling, management and rehabilitation;
- Waste collection;
- Incident and emergency response equipment evaluations and maintenance
- Environmental training;
- Stakeholder engagement;
- Environmental inspections and
- Auditing , monitoring and reporting

8.3.7 Change Management

The environmental management schedule must have a procedure in place for change management. In this regard, updating and revision of environmental documentation, of procedures and method statements, actions plants etc. will be conducted as necessary in order to account for the following scenarios:

- Changes to standard operating procedures (SOPs);
- Changes in scope;
- Ad hoc actions;
- Changes in project phase; and
- Changes in responsibilities or roles

All documentation will be version controlled and require sign off by the applicable phase site managers.

8.4 Environmental code of conduct

The Code of Conduct outlined in this section of the EMP applies to, subcontractors, visitors, permanent and temporal workers. Therefore, anybody within the boundaries of the project site must adhere to the Environmental Code of Conduct as outlined in this section of the EMP.
The Environmental Coordinator ENC will implement on-site environmental guidelines and has the authority to issue warnings as well as discipline any person who transgresses environmental rules and procedures. Persistent transgression of environmental rules will result in a disciplinary hearing and thereafter continued noncompliance behavior will result in permanent removal from the construction sites.

8.5 Site closure and rehabilitation

Introduction

The closure period will commence once the last planned blocks of dimension stone has been extracted from the quarry, at the end of the active mining period. The scope of the proponent site rehabilitation emphasizes the backfilling of excavated quarries and sampling holes with previously removed top soil and overburden rocks. Mine rehabilitation is the process of repairing

the damage done by mining activities. Rehabilitation has been planned with a main aim of returning disturbed environment close to its pre mining state. It is also planned to cater for the access road, vehicle tracks around the site, removal, and restoration of areas covered by stockpile and rock piles. The closure vision for the proposed project is to establish a safe, stable and non-polluting post-prospecting landscape that can facilitate integrated, self-sustaining and value generating opportunities, thereby leave a lasting positive legacy.

8.5.1 Site closure and rehabilitation

All waste (such as hazardous and domestic) waste will be transported offsite for disposal in licensed landfills in Karibib town. Disturbed or/and contaminated areas will be cleaned up, treated where necessary and restored to its pristine state.

- No roads are anticipated to be constructed to access the site; existing roads will be used as far as possible. Where access tracks have been developed in cases where there are no roads, these will be rehabilitated and closed as l part of normal closure actions.
- Rehabilitated area will be re-vegetated with the objective of creating a sustainable ecosystem. Vegetationestablishmentwillbeinlinewithaprojectarea'sindigenousvegetation.
- The recovered topsoil and subsoil should be utilized to reconstruct the original soil profile.
- All rehabilitated areas shall be considered no go areas and the environmental coordinator shall ensure that none of the staff members enters the area after rehabilitation.
- A site inspection will be held after completion of the mining process to determine the nature and scope of the rehabilitation work to be undertaken. The rehabilitation will be done to the satisfaction of both the proponent and METF.

8.5.2 Alternatives Considered

Considering that this is a uniform mining project with no chemical processing involved, the proposed project is not complex, and the risks associated with prospecting are understood and can be mitigated at closure. Alternative options for closure are limited. There are only two options that have been considered as activity alternatives for the closure plan:

- **Preferred Alternative:** Closure or backfill of quarries and trenches with overburden removed during mining.

- **Alternative 2:** To leave trenches, quarries open, in-order to allow for groundwater recharge by surface run-off.

Preferred Alternative: Rehabilitation/ Backfill of boreholes

Rehabilitation is the restoration of a disturbed area that has been degraded as a result of activities such as mining, road construction or waste disposal, to a land use in conformity with the original land use before the activity started. This also includes aesthetical considerations, so that a disturbed area will not be visibly different to the natural environment. This also involves maintaining physical, chemical and biological ecosystem processes in degraded environments, hence the preferred option of backfilling the boreholes with the overburden removed during development and cover with growth medium to establish vegetation. This option has several advantages as discussed below:

Advantages:

- The site will be aesthetically acceptable;
- The site will blend in with the environment;
- The site will be a suitable habitat for fauna and flora again.
- The site will be safe and pollution free;
- Re-vegetating the site will ensure that the site in non-erodible.

Opting for alternative 1, which is to leave trenches without backfilling poses a risk in that, these boreholes may fill in with water, which may become attractive to wildlife and communities leading to drowning and the risk of being trapped in the declines. To mitigate these risks, it is necessary to backfill. Treatment technologies should be used to prevent decanting.

8.5.3 Closure Assumptions

This closure plan has been developed based on limited available information including environmental data. Some of the information currently available may need to be supplemented

during the operational period. Therefore, several assumptions were made about general conditions, and closure and rehabilitation of the facilities at the site to develop the proposed closure actions. As additional information is collected during operations, these assumptions will be reviewed and revised as appropriate.

The assumptions used to prepare this plan include the following:

- The closure period will commence once the last planned weight of minerals has been extracted from the site.
- The proposed mining sites will be adhered to minimize the potential impacts.
- Vegetation establishment will be in line with a project area's indigenous vegetation.
- Water management infrastructure developed for the operational phase will be retained for closure /end of the life of the project as necessary.
- There are limited opportunities for any infrastructure to be built on site and if any infrastructure is built, it will be of limited benefit to the community. Therefore, all buildings will be demolished.
- All hazardous and domestic waste will be transported offsite for disposal in licensed landfills.
- No roads are anticipated to be constructed to access the site; existing roads will be used as far as possible. Where access tracks have been developed in cases where there are no roads, these will be rehabilitated and closed as part of normal closure actions.

8.5.4 Closure and Rehabilitation Activities

The rehabilitation actions intended to be undertaken at the end of the life of the proposed mining activities are described below.

8.5.4.1 Infrastructure

All infrastructures will be decommissioned, and the footprints rehabilitated for the establishment of vegetation. Material inventories will be managed near the end of mining activities to minimize any surplus materials at closure. Where practicable, equipment and materials with value not needed for post-closure operations will be sold and or removed from the site. Equipment with scrap or salvage value will be removed from the site and sold to recyclers.

A soil contamination investigation will be conducted on completion of demolition activities. The purpose of this is to identify areas of possible contamination and design and implement appropriate remedial measures to ensure that the soil contaminants are removed. Closure actions will include:

- All power and water services to be disconnected and certified as safe prior to commencement of any decommissioning works;
- All remaining inert equipment and decommissioning waste will be disposed to the nearest licensed general waste disposal facility;
- Salvageable equipment will be removed and transported offsite prior and during decommissioning;
- All tanks, pipes and sumps containing hydrocarbons to be flushed or emptied prior to removal to ensure no hydrocarbon/chemical residue remains;

8.5.4.2 Roads

Existing roads will be used as far as possible. Closure actions concerning roads and parking areas will include:

- Removal of all signage, fencing, and shade structures, traffic barriers, etc.
- All ‘hard top’ surfaces to be ripped along with any concrete structures.
- All potentially contaminated soils are to be identified and demarcated for later remediation; and
- All haul routes that have been treated with saline dust suppression water need to be treated, with the upper surface ripped and removed to designated contaminant disposal areas.

8.6 Remediation of Contaminated Areas

All soil, contaminated with hydrocarbons, will be identified, excavated, if possible, to at least 200 mm below the contaminated zone and then treated.

- All tanks, pipes and sumps containing hydrocarbons will be flushed or emptied.
- Removed soils will be managed as determined by the nature and extent of the contamination.
- Liquid storage tanks will be emptied, the structure removed/demolished and sub-surface holes filled; and
- All equipment in which chemicals have been stored or transported will be cleaned and disposed of in a suitable disposal facility.

8.6.1 Vegetation

Successful re-vegetation will help control erosion of soil resources, maintain soil productivity and reduce sediment loading in streams utilizing non-invasive plants that fit the criteria of the habitat (e.g. soils, water availability, slope and other appropriate environmental factors). Invasive species will be avoided, and the area will be managed to control the spread of these species. To counter the effects of erosion, naturally occurring grassland species will be planted on slopes. These species will provide soil holding capacity and reduce runoff velocity. The flatter areas will be re-vegetated with the objective of creating a sustainable ecosystem. The occurrence of protected plant species will need to be determined before vegetation is removed and the required permits will be obtained for either destruction or relocation.

8.6.2 Waste Management

Waste management activities will include:

- Hazardous waste will be managed handled, classified and disposed.
- Non hazardous substances will be disposed in the nearby landfill sites.
- Scrap and waste steel will be sold to recyclers
- It may be necessary to fence temporary salvage yards for security reasons, particularly where these are located close to public roads.

9. Public Participation Process

The public participation process commenced with a total of 5 newspaper advertisements in two widely distributed newspapers (Windhoek Observer and confidante newspaper) for two consecutive weeks as shown in Appendix A. Known interested and affected parties were notified directly via mail and fax. Posters were placed at the office of the Karibib Constituency office, around Karibib town and on farm fences as well. Registered mail letters were also sent to the farm owners. Interested and affected parties that were notified directly include farmers, government departments, regional council, Namwater, Chamber of Mines and individuals that may be affected by the quarrying activities. No negative concerns were received so far, however should any interested and affected parties raise any concerns during the ongoing project phase, the Ministry of Environment, Forestry and Tourism will be immediately notified.

10. Conclusion and recommendations

The above Environmental Management Plan, if properly implemented, will help to minimize adverse impacts on the environment. Where impacts occur, immediate action must be taken to reduce the escalation of effects associated with these impacts. The Environmental Management Plan should be used as an on-site reference document during all phases of the proposed project, and auditing should take place in order to determine compliance with the EMP for the proposed site. Parties responsible for transgression of the EMP should be held responsible for any remediation that may need to be undertaken. The EMP Consultants are confident that the potential negative impacts associated with the exploration activities on site can continue to be mitigated by effectively implementing the recommended management action measures and their monitoring.

This report covers the environmental assessment for the construction, operation, operation, ongoing monitoring and rehabilitation and decommissioning, closure and aftercare of the marble quarry and supporting infrastructure. It should be viewed as a framework for integrating mitigation measures and applicable legal tools to ensure both compliance and sustainability. It is therefore very important that the proponent provides adequate support for human and financial resources,

for the implementation of the proposed mitigations and effective environmental management during the planned exploration activities. The proponent must implement and adhere to all the provisions of the EMP report and environmental monitoring shall be implemented.

It is hereby recommended that proposed marble mining and exploration operations as well as the supporting infrastructure be granted an Environmental Clearance Certificate, provided that: All mitigations provided in this EMP should are implemented as stipulated and where required and emphasized, improvement should be effectively put in place. The proponent shall prepare address all the impacts identified as medium and high rated impacts. The Proponent and all their workers comply with the legal requirements governing this type of project and its associated activities. The proponent shall negotiate further Lease Agreements with the owners of any farms falling within the ML area.

11. References

Ashmole, I., &Motloung, M. (2008). Dimension stone: the latest trends in exploration and production technology. In *Proceedings of the International Conference on Surface Mining* (Vol. 5, No. 8).

Angotzi, G., Bramanti, L., Tavarini, D., Gragnani, M., Cassiodoro, L., Moriconi, L., & Bovenzi, M. (2005). World at work: Marble quarrying in Tuscany. *Occupational and environmental medicine*, *62*(6), 417-421

Careddu, N., Di Capua, G., &Siotto, G. (2019). Dimension stone industry should meet the fundamental values of geoethics. *Resources Policy*, *63*, 101468.

Careddu, N., & Siotto, G. (2011). Promoting ecological sustainable planning for natural stone quarrying. The case of the Orosei Marble Producing Area in Eastern Sardinia. *Resources Policy*, *36*(4), 304-314.

Bakhtavar, E. (2011). Parallel holes spacing for the extraction of dimension stones using expansive mortars. *Archives of Mining Sciences*, *56*(4), 621-628.

Barnard, P., 1998. *Biological diversity in Namibia - a country study*, Windhoek: Namibian National Biodiversity Task Force.

Brown, C. & Lawson, J., 1989. *Birds and electricity transmission lines in South WestAfrica/Namibia,* Windhoek: Madoqua.

Burke, A., 2003. *Floristic relationship between inselbergs and mountain habitats inthe Central Namib.*, s.l.: Dinteria.

Calcutt, V., 2001. *Introduction to Copper: Mining & Extraction*, s.l.: Copper Development Association.

Christian, C., 2005. *Spitzkoppe Lodge Proposal Final Report*, Windhoek: Eco Plan (Pty) Ltd.

Griffin, E., 1998. *Species richness and biogeography of non-acarine arachnids inNamibia,* Windhoek: Biodiversity and Conservation.

Kisters, A., 2008. *Introduction to the Damara Orogen,* Windhoek: Isotope Geology ofNamibia.Levinson, O., 1983. *Diamonds in the Desert.* Cape Town: Tafelberg.

Marshall, T. & Baxter-Brown, R., 1995. Basic principles of alluvial diamond exploration. *Journal of Geochemical Exploration,* pp. 278-293.

Mendelsohn, J., Jarvis, A., Roberts, C. & Robertson, T., 2002. *Atlas of Namibia: aportrait of the land and its people,* Cape Town: David Philip.

Miller, R.M. 1983. The Pan-African Damara Orogen of S.W.A./Namibia. *Special Publication of the Geological Society of South Africa*, 11, 431-515.

Miller, R.M., 2008. Neoproterozoic and early Palaeozoic rocks of the Damara Orogen. In: Miller, R.M. (Ed.). The Geology of Namibia. Geological Survey of Namibia, Windhoek vol. 2, pp. 13-1–13-410.References.

Schneider, G. & Seeger, K., 1992. Copper. In: s.l.:The Mineral Resources ofNamibia, pp. 2.3, 1-172.

Appendix E: Registered IAP's

Name	Organization	Tel	Email
B. Korhs	Earth life Namibia	061-2022041	earthl@iway.na
C. Sisamu	Nampower	061-2052350	Calvin.Sisamu@nampower.com.na
C. Tubalike	MURD	061-2975062	ctubalike@murd.gov.na
Coleen Mannheimer	061-2022021	manfam@iafrica.com.na	
E de Paauw	Roads Authority - Specialised road Legislation, Advise & Compliance	061-2847027	dePaauwe@ra.org.na
E Muremi	Ministry of Health and Social Services Director Khomas Region	061-2035001	Elizabeth.Muremi@mhss.gov.na
E. Shivolo	Min. of M&E - Mining Commissioner	061-2848111	Erasmus.Shivolo@mme.gov.na
Esmerialda Strauss	CHIEF FORESTER National Botanical Research Institute (NBRI)	061-2022017	Esmerialda.Strauss@mawf.gov.na
F Kreitz	Namibian Environment and Wildlife Society - Media, website and newsletter	061-306450	Information@NEWS-Namibia.org;
F. Sikabongo	MET - Deputy Director of Directorate ofEnvironmental Affairs	061-2842701	frederick.Sikabongo@meft.gov.na
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MrNoroab	Karibib Town Council	067-331057	