



**Environmental Assessment (EA) For Exclusive Prospecting License  
(EPL) No. 6031 and 6917 near Rehoboth Town in the Hardap Region,  
Namibia**

**FINAL REPORT**

**EDS Project Number: PNEA2019-37**

|  |  |
|--|--|
| Author(s): <b>Ms. Althea Brandt &amp; Mr. Silas David</b>                  | Client: <b>Southwest Mining Investment (Pty) Ltd</b> |
| Reviewer: <b>Mr. Nerson Tjelos</b>   | Contact person: <b>Mr Wu Feng</b>                    |
| Company: <b>Excel Dynamic Solutions (Pty) Ltd</b>                          | Cell phone: <b>+264 (0) 81 691 8305</b>              |
| Telephone: <b>+264 (0) 61 259 530</b>                                      | Email: <b>li_zuxioa@126.com</b>                      |
| Fax2email: <b>+264 (0) 886 560 836</b>                                     |  |
| Email: <b><a href="mailto:info@edsnamibia.com">info@edsnamibia.com</a></b> |  |

**December 2019**

## **EXECUTIVE SUMMARY**

Southwest Mining Investment (Pty) Ltd (The Proponent), a holder of two exclusive prospecting licenses (EPL 6031 and 6917) granted by the Ministry of Mines and Energy (MME) intends to acquire an Environmental Clearance Certificate (ECC) to be able to conduct prospecting and exploration activities on the EPLs. At present EPL 6917 is in its first 3 three (3) years period and due to expire on April 25, 2021. EPL 6031 is in its first 2-year extension and due to expire on December 17, 2021. The earth data available on the MME mining cadastral portal indicated that the Proponent applied for four groups of commodities. However, Base metals are target commodities for which detailed prospecting and exploration activities will be conducted. The four commodity groups covered by each licence are:

- Base and rare metals
- Precious metals
- Industrial minerals
- Dimension stones

The licences are situated near Klein Aub settlement in the Hardap Region, with a combined area of 55605.3127 Ha. Excel Dynamic Solutions (Pty) Ltd (EDS) have been appointed to conduct the Environmental Assessment (EA) to apply for the Environmental Clearance in relations to Environmental Management Act (7 of 2007). Furthermore, this Scoping Report has been compiled to attain the environmental assessment requirements.

## **Project Description**

The Proponent's plan is to advance the project from its current early-stage of prospecting and identify targets offering significant resource potential. Historically, the region experienced intensive exploration work including detailed mapping, soil geochemistry and geophysics undertaken between June 1971 and January 1972. In the same years, Anglo America prospecting services undertook stream sediment sampling, regional mapping and detailed soil sampling of selected areas. In 1975 they followed up with geophysical survey and drilled a few pilot holes to test their targets. The prospecting and exploration activities on EPL 6031 and 6917 entail the following four mineral commodity groups: (i) Base and rare metals, (ii) Precious metals, (iii) Industrial minerals and (iv) Dimension stones. Base and precious metals are the main target for the planned exploration work. The selection of the potential mineralization model and exploration targets has been specially selected based on the regional and likely local geology as well as the results of the past exploration activities. The objective of the planned prospecting and exploration is to delineate the mineral deposits and determine whether the deposits are economically viable for mining. The scoping process will identify sensitive environmental features that might be affected by the proposed prospecting and exploration activities. The level and magnitude of planned exploration work is not clear at this stage. However, both invasive and non-invasive exploration activities are expected to take place upon issuance of an environmental clearance certificate. Non-invasive activities include geological field mapping, geophysical survey work, airborne and ground-based surveys. Invasive activities involve soil and rock sampling, trenching and drilling. The Proponent plans to conduct a staged exploration approach as follows:

### **Prospecting and Exploration (Construction/Initiation Phase)**

The prospecting and exploration phase include reviewing existing reports and composite stratigraphic, lithological-geochemical maps of the targeted areas to identify prospective lithostratigraphic packages. In addition to literature review, field work (lithological (soil/rock) mapping and sampling) will be conducted to verify desktop work. Up to this point no physical disturbance is required.

During the advanced exploration phase the Proponent will assess the licence areas through detailed geological mapping, geophysical and geochemical surveys, supported where necessary by geophysical surveys, with a view to defining targets for drilling testing.

### **Exploration drilling, Sampling and Analysis (Operational and Maintenance Phase)**

During this advanced exploration phase the Proponent will assess the licence areas through detailed geological mapping, geophysical and geochemical surveys, supported where necessary by geophysical surveys, with a view to defining targets for drilling testing. Therefore, the target areas within EPL 6031 and 6917 boundaries; which have been acknowledged during the initial prospecting and exploration phase will go through exploration drilling. Reverse circulation (RC) is the preferred drilling technique for the exploration program. RC uses a down the hole hammer, Tricone bit or Three-Wings bit which drives a rotating tungsten-steel bit. This technique produces an uncontaminated large volume sample which is comprised of rock chips. The penetration rate of this technique is fast, quick for installation and cheaper compared to other drilling techniques. Diamond drilling will be considered to test a number of targets. Larger amount of sample materials may be required for analysis in the advanced stage of exploration activities on the EPLs, to perform processing trails. Furthermore, pits may be dug for sampling. Depending on the nature of mineralization observed from drilling, the size of the samples size may be adjusted. No explosives will be used during the exploration phase. Other aspects of the exploration include:

#### **Access**

The EPLs are situated in central Namibia approximately 140 km from the capital city of Windhoek. The nearest town to the tenements is Rehoboth which is approximately 80 km from the capital city. The tenements can be reached from Rehoboth by a secondary gravel road designated C24 and about 5 km northeast of Klein Aub village. In terms of accessibility from other parts of the world, Namibia is serviced by an international Airport located at Windhoek with daily flights to Europe and South Africa. Regionally, the paved all weather Trans-Caprivi Highway road links Walvis Bay to the countries of Botswana, Zambia and Zimbabwe, as well as the Democratic Republic of Congo. In addition, the Trans-Kalahari Highway links Walvis Bay with South Africa's Gauteng industrial heartland via Botswana. A harbour (Nairport) is found in Walvis Bay that gives a platform for samples and mined materials to be offloaded or loaded onto transnational shipping lines.

#### **Resources**

The required input for exploration program in terms of vehicles and equipment include; SUV (4X4) vehicles, heavy equipment like bowzers, compressors, drilling machines, a grab, Tow Truck and pickup truck. The neighbouring village of Klein Aub has a resident population of +-3000. Rehoboth and Kein Aub village are good sources for semi-skilled and unskilled workers, many of whom have previous exploration

and mining experience. The exploration work will require about eight (8) people to be at site, which include a site manager, a guide, a driver, three consultants (i.e. geologists) and three sampling workers. Equipment and vehicles will be stored at a designated area near the accommodation site or at a storage site established within the EPLs area.

### **Services infrastructure**

**Water:** Water required for exploration activities will be obtained from existing boreholes, or from approved water sources, through water abstraction permits. It is established that drilling activities will require about 200 litres of water per month. Water would need to be trucked to the site for the purpose of drilling and for consumption.

**Power supply:** No power supply is required for the exploration work on the tenements. Instead, a diesel power generator will be used during exploration phase.

### **Accommodation**

Exploration staff will be accommodated in Klein Aub Settlement or any neighboring farms on the EPLs. A campsite will be set up for the exploration crew. If the accommodation camp is to be set up on a farm, necessary arrangements will be done with the farm owner. Furthermore, exploration activities will take place during the day time only and the exploration team will be commuting to the work site from their accommodation place.

### **Timeframe**

The planned ground geophysical surveys may last several weeks and will be done in stages on different parts of the property (EPL 6031 and 6917). The geological mapping will be done in two (2) months. A reverse circulation drilling program of about 1500 m is anticipated to last for 2-4 months. The timeframe for exploration is estimated to be between 12 to 36 months.

### **Waste Management**

The site will be equipped with secured waste bins for each waste type (i.e. domestic, hazardous etc.). Depending on the amount generated, waste will be sorted and collected on a weekly basis or monthly and taken to the Rehoboth or Klein Aub landfill site. Ablution facilities will use chemical toilets and/or sealed septic tanks and the sewerage taken to the Rehoboth storage periodically.

## Security

Temporary storage areas for drilling materials, machines and other project materials and equipment will be necessary at the camp. Security will be supplied on a 24-hour basis at the storage and/or camp site and exploration camp. A temporal support fence surrounding the storage/camp site will be constructed to ensure people and domestic animals are not put at risk.

## Decommissioning Phase

Earlier intensive exploration work in the region ended in the 1970s and 1980s primarily due to low metal prices. Therefore, a similar economic situation or unconvincing exploration results may force the Proponent to eventually cease with the exploration program. However, During the operational phase and before decommissioning, the Proponent will need to put site rehabilitation measures in place. Where necessary, stockpiling of top soil for rehabilitation at a later stage will be undertaken. Necessary landscaping of exploration areas will be undertaken upon completion of each phase of exploration (drilling, sampling etc.).

## Project Alternatives

The conclusions weighed and considered above are summarized below:

- **No-go alternative:** The “No-Go” alternative is the preference of not continuing with the activity, which characteristically implies a furtherance of the existing state of affairs. Therefore, should the proposed works of the prospecting and exploration plan be discontinued, none of the possible impacts (positive and negative) identified would occur. Furthermore, local people to be hired for exploration work will be left jobless and the Proponent would not be able discover and define the targeted resource for possible mining and to contribute to the country’s economy through revenue and license royalty payments. If the proposed project is to be discontinued, the current land use for the proposed site will remain unchanged. In considering the proposed project, the ‘no-go’ option is not considered the preferred alternative.

- **Prospecting location:** The prospecting location is dependent on the mineral deposits and the local geology of the area. Therefore, finding an alternative location for the planned exploration activities is not possible. In other words, the target base metals (i.e. copper) mineralization is area specific, which means exploration targets are primarily determined by the geology (host rocks) and the tectonic environment of the site (ore forming mechanism). The tenements have sufficient surface rights that should an economic mineral deposit be defined there is adequate area for potential tailings storage areas, waste disposal, heap leach pads if required and processing facilities.
- **Exploration Methods:** Both invasive and non-invasive exploration activities are expected to take place. If an economically viable discovery is made, the project will proceed to mining phase. A separate full environmental assessment will be undertaken for the mining phase.

## Impact Identification

The potential positive and negative impacts that have been identified for the proposed establishment activities are as follows:

### Positive impacts:

- Creation of jobs to the locals
- Helps boost local economic growth.
- Open up other investment opportunities.
- Contribution to regional economic development.

### Negative impacts:

- Loss of biodiversity
- Generation of dust
- Waste generation
- Groundwater contamination
- Visual impact (scars) on landscape
- Potential health and safety risks
- Surrounding soils disturbance
- Archaeological impact
- Noise pollution

## Impacts Assessment and Mitigations

The key potential impacts associated with prospecting, drilling and sampling and decommissioning phases of the project were identified and assessed. In order to avoid and minimise (where impacts cannot be avoided) the identified project impacts, mitigation measures were recommended. The significant identified impacts for the project phases are summarized below. These impacts can be reduced or curtailed by implementing the mitigation measures given under the impact assessment chapter and also management actions plan provided in the Draft EMP.

- **Loss of Biodiversity:** Land degradation will be created due to drilling activities and earthworks done to uncover the mineralized rock units. The destruction or drastic modification of the area can have a catastrophic impact on the biodiversity of the area. This can lead to a massive habitat loss for a diversity of flora and fauna ranging from microorganisms to large animals. Endemic species are most severely affected since even the slightest disruptions in their habitat can result in extinction or put them at high risk of being wiped out. It is therefore important to identify what species are present, understand them and try to minimise the impact upon them with operational management guidelines. EDS advises the Proponent to avoid unnecessary removal of vegetation, in order to promote a balance between biodiversity and their operations. Under the current status, the impact can be considered to be of a medium significance rating. With the implementation of appropriate mitigation measures, the rating will significantly be reduced to low.
- **Generation of Dust:** Emissions of dust can create a substantial environmental impact and compromise the air quality in the area. Dust will emanate from exploration activities which include transporting exploration equipment; people and water supply to and from the site; and during site clearing for sampling and drilling. Vehicular movements create dust even though it is not always so severe. The hot and dry environment, loose and in some areas, sandy nature of the substrate and low vegetation cover causes ambient fugitive dust levels. The medium significance of this impact can be reduced by properly implementing mitigation measures.

- **Waste Generation:** During the prospecting and exploration phase, there will be generation of waste of all kinds (domestic and general). Therefore, land and water pollution can occur on the site or around the site if these generated wastes are not disposed in a responsible way. Industrial waste is a given by-product of any exploration operation. Non-biodegradable and biodegradable refuse should be stored in a container and collected on a regular basis and disposed of at a recognized disposal facility. Precautions should be taken to prevent any refuse spreading. The container should be covered with mesh to prevent access from animals. Without any mitigation measure, the impact has a medium significance. The impact will be of low significance from medium, upon implementing the mitigation measures
- **Visual Impact (Scars) on Landscape:** Exploration activities leave scars on the landscape. Thus, causing a visual impact. If the exploration site is situated near tourists' routes, these scars may contrast the surrounding landscape and this can potentially cause visual nuisance to tourists. However, it is vital to note that throughout exploration phase, assured measures will need to be taken into concern regarding the visual aspect. Currently, the visual impact can be rated as medium to low significance, but upon effectively implementing the measures.
- **Potential Health and Safety Risks:** Inappropriate handling of exploration materials and equipment may cause health and safety risks such as injuries to workers. The impact is probable and has a medium significance rating. However, with adequate mitigation measures, the impact rating will be reduced to low.
- **Surrounding Soils:** Planned exploration activities will potentially disturb the soil structure on the site, which will leave the already exposed site soils vulnerable to erosion resulting into creation of gullies. This impact is likely because the proposed site has little vegetation cover. The impact can be rated as medium, if no mitigation measures are implemented. However, with the implementation of mitigation measures, the impact will reduce to low.
- **Archaeological Impact:** Historical resources may be impacted through unintentional destruction or damage, during exploration activities. Furthermore, there was no information provided about known heritage or site of cultural values within the site or in the vicinity of the project site area. Therefore, this impact can be rated medium to low, if there are no mitigation measures in place. Upon implementation of the necessary measures, the impact will be low.

**Noise:** Noise pollution is most likely to be created by drilling machines during the exploration activities. This has a negative impact on the neighbours as the drilling machines can produce excessive noise and therefore a nuisance to neighbours. Furthermore, extreme noise pollution can cause hearing problems thus health risks to workers on the site. Without any mitigations, the impact is rated as of medium significance. In order to change the impact significance from the pre-mitigation significance to low rating, the mitigation measures should be implemented.

## Conclusions

The potential positive and negative impacts stemming from the proposed prospecting and exploration activities on the EPL 6031 & 6917 were identified, assessed and mitigation measures made thereof. The mitigation measures and recommendations provided in this EIA report and the management action plans provided in the draft EMP, can be deemed sufficient to avoid and/or reduce (where impact avoidance is impossible) the risks to acceptable levels. EDS is therefore confident that these measures are sufficient and thus recommends that the Proponent be issued with the Environmental Clearance Certificate (ECC) to enable the exploration of base metals on the tenements, EPL 6031 and 6917. However, the ECC should be issued on a condition that the provided management measures and action plans are effectively implemented on site and monitored. Most importantly, monitoring of the environmental components described in the impact assessment chapter should be conducted by the Proponent and applicable Competent Authority. This is to ensure that all potential impacts identified in this study and other impacts that might arise during the exploration program implementation are properly identified in time and addressed. Lastly, should the ECC be issued, the Proponent will be expected to be compliant with the ECC conditions as well as legal requirements governing the mineral exploration and related activities.

## Limitations

EDS warrants that the findings and conclusions contained herein were accomplished in accordance with the methodologies set forth in the Scope of Work and EMA, 2007. These methodologies are described as representing good customary practice for conducting an Environmental Impact Assessment of a property for the purpose of identifying recognized environmental conditions. There is a possibility that even with the proper application of these methodologies there may exist on the subject property conditions that

could not be identified within the scope of the assessment or which were not reasonably identifiable from the available information. EDS believes that the information obtained from the record review and during the public consultation process concerning the subject property is reliable. However, EDS cannot and does not warrant or guarantee that the information provided by these other sources is accurate or complete. The conclusions and findings set forth in this report are strictly limited in time and scope to the date of the evaluations. No other warranties are implied or expressed.

Some of the information provided in this report is based upon personal interviews, community meetings and research of available documents, records, and maps held by the appropriate government and private agencies. This report is subject to the limitations of historical documentation, availability, and accuracy of pertinent records and the personal recollections of those persons contacted.

## TABLE OF CONTENTS

|  |           |
|--|-----------|
| <b>EXECUTIVE SUMMARY</b> .....                                       | i         |
| <b>LIST OF FIGURES</b> .....   | xii       |
| <b>LIST OF TABLES</b> .....  | xiii      |
| <b>LIST OF APPENDICES</b> .....                                      | xiv       |
| <b>LIST OF ABBREVIATIONS</b> .....                                   | xv        |
| <b>1 INTRODUCTION</b> .....  | <b>1</b>  |
| 1.1 Project Background .....   | 1         |
| 1.2 Terms of Reference and Scope of Works .....                      | 1         |
| 1.3 Appointed Environmental Assessment Practitioner .....            | 3         |
| 1.4 Details of the Project Proponent .....                           | 3         |
| 1.5 The Need for the Proposed Project .....                          | 4         |
| <b>2 PROJECT DESCRIPTION: PROPOSED EXPLORATION ACTIVITIES</b> .....  | <b>5</b>  |
| 2.1 Prospecting .....  | 5         |
| 2.2 Exploration Drilling, Sampling and Analysis .....                | 6         |
| 2.3 Decommissioning Phase .....                                      | 8         |
| <b>3 PROJECT ALTERNATIVES</b> .....                                  | <b>9</b>  |
| 3.1 Types of Alternatives Considered .....                           | 9         |
| 3.2 Conclusion on Alternatives .....                                 | 10        |
| <b>4 LEGAL FRAMEWORK: LEGISLATION, POLICIES AND GUIDELINES</b> ..... | <b>11</b> |
| 4.1 The Environmental Management Act (No. 7 of 2007) .....           | 11        |
| <b>5 ENVIRONMENTAL BASELINE</b> .....                                | <b>17</b> |
| 5.1 Climate .....  | 17        |
| 5.2 Topography and Drainage .....                                    | 19        |
| 5.3 Soils .....  | 20        |
| 5.4 Geology .....  | 21        |
| 5.5 Water Resources .....  | 22        |
| 5.6 Fauna .....  | 23        |
| 5.7 Flora .....  | 23        |
| 5.8 Population of Hardap Region .....                                | 25        |
| 5.9 Tourism .....  | 25        |
| 5.10 Surrounding Land Uses .....                                     | 25        |

5.11 Economic Development ..... 27

5.12 Services Infrastructure ..... 27

6 PUBLIC CONSULTATION PROCESS..... 29

6.1 Pre-identified and Registered Interested and Affected Parties (I&APs)..... 29

6.2 Communication with I&APs ..... 30

6.3 Second Public Meeting: 3 December 2019 ..... 32

6.4 Third Public Meeting: 14 December 2019 ..... 33

6.5 First Round Public Feedback ..... 35

7 IMPACT IDENTIFICATION, ASSESSMENT AND MITIGATION MEASURES..... 36

7.1 Impact Identification..... 36

7.2 Impact Assessment Methodology..... 36

7.3 Assessment of Potential Negative Impacts: Surveys, Drilling, Sampling (Operational Phases)  
41

7.4 Assessment of Potential Negative Impacts: Decommissioning Phase..... 48

8 RECOMMENDATIONS AND CONCLUSIONS..... 50

8.1 Recommendations ..... 50

8.2 Conclusions ..... 51

9 REFERENCES ..... 52

**LIST OF FIGURES**

Figure 1: Location of the EPL no. 6031 and 6917 near Rehoboth settlement, in the Hardap Region..... 2

Figure 2: Diagram of the Life Cycle of a Mine (after Superfund Research Project, 2019). The phase covered by this study is highlighted with a red box ..... 5

Figure 3: A graph showing rainfall patterns for one year (October 2018 – October 2019) in Rehoboth, Hardap Region..... 17

Figure 4: A graph showing temperature patterns for one year (September 2018 – September 2019) in Rehoboth in Hardap Region..... 18

Figure 5: A graph showing Wind patterns for one year (October 2018 – October 2019) in Rehoboth in Hardap Region..... 19

Figure 6: Hydrology Map of EPL 6031 & 6917 ..... 19

Figure 7: Typical sand soils on the proposed exploration site(s)..... 20

Figure 8: Map displaying geology of the project area. .... 22

Figure 9: Map showing vegetation structure and plant diversity found on the EPLs and the surrounding ..... 24

Figure 10: Typical flora found on the EPLs..... 24

Figure 11: Map of farms within the EPLs, 6031 and 6917 ..... 26  
 Figure 12: Public notices placed in Rehoboth..... 30  
 Figure 13: First Public meeting scheduled on 07 November 2019 ..... 31  
 Figure 14: Second Public Meeting on 3rd December 2019 ..... 32  
 Figure 15: Third Public Meeting on 14th December 2019..... 34

**LIST OF TABLES**

Table 1: Proponent contact details and purpose of the required ECC ..... 3  
 Table 2: Applicable local, national and international standards, policies and guidelines governing the proposed development..... 11  
 Table 3: Percentage of distribution of households by main source of water for cooking/drinking and area ..... 22  
 Table 4: Summary of Interested and Affected Parties (I&APs)..... 29  
 Table 5: Summary of main issues and comments received during the first public site engagement through emails correspondence ..... 31  
 Table 6: Summary of main issues and comments received during the first public site engagement through emails correspondence ..... 33  
 Table 7: Summary of main issues and comments received during the first public site engagement through emails correspondence ..... 34  
 Table 8: Extent or spatial impact rating ..... 38  
 Table 9: Duration impact rating ..... 38  
 Table 10: Intensity, magnitude or severity impact rating..... 38  
 Table 11: Probability of occurrence impact rating..... 39  
 Table 12: Significance rating scale ..... 40  
 Table 13: Assessment of the impacts of exploration on biodiversity..... 42  
 Table 14: Assessment of the impacts of exploration on air quality..... 43  
 Table 15: Assessment of waste generation impact ..... 44  
 Table 16: Assessment of the exploration on visual ..... 45  
 Table 17: Assessment of the impacts of exploration on health and safety ..... 45  
 Table 18: Assessment of the impacts of exploration on soils..... 46  
 Table 19: Assessment of the impacts of exploration on archaeological sites ..... 47  
 Table 20: Assessment of the impacts of noise from exploration ..... 47  
 Table 21: Assessment of the impacts of exploration activities closure on employment ..... 48

## LIST OF APPENDICES

- Appendix A:** ECC Application Form plus Revenue Stamps
- Appendix B:** Environmental Management Plan (EMP)
- Appendix C:** Curricula Vitae (CV) for the Environmental Assessment Practitioner (EAP)
- Appendix D:** List of Interested and Affected Parties (I&APs)
- Appendix E:** Background Information Document (BID)
- Appendix F:** EIA Notification in the newspapers (*New Era* and the *Namibian*)
- Appendix G:** Public Meeting Minutes
- Appendix H:** Raised Issues via Email
- Appendix I:** Copy of Mineral Licenses Certificates from MME
- Appendix J:** Access Letter by Proponent

**LIST OF ABBREVIATIONS**

| <b>Abbreviation</b> | <b>Meaning</b>                        |
|---------------------|---------------------------------------|
| AMSL                | Above Mean Sea Level                  |
| BID                 | Background Information Document       |
| CV                  | Curriculum Vitae                      |
| DEA                 | Department of Environmental Affairs   |
| EA                  | Environmental Assessment              |
| EAP                 | Environmental Assessment Practitioner |
| ECC                 | Environmental Clearance Certificate   |
| EDS                 | Excel Dynamic Solutions               |
| EIA                 | Environmental Impact Assessment       |
| EMA                 | Environmental Management Act          |
| EMP                 | Environmental Management Plan         |
| EPL                 | Exclusive Prospecting License         |
| GG                  | Government Gazette                    |
| GN                  | Government Notice                     |
| I&APs               | Interested and Affected Parties       |
| MET                 | Ministry of Environment and Tourism   |
| MME                 | Ministry of Mines and Energy          |
| Reg                 | Regulation                            |
| S                   | Section                               |
| TOR                 | Terms of Reference                    |

## Key Terms

**Alternative** - A possible course of action, in place of another that would meet the same purpose and need of the proposal.

**Baseline** - Work done to collect and interpret information on the condition/trends of the existing environment.

**Biophysical** - That part of the environment that does not originate with human activities (e.g. biological, physical and chemical processes).

**Cumulative Impacts/effects assessment** - in relation to an activity, means the impact of an activity that in it may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

**Decision-maker** - The person(s) entrusted with the responsibility for allocating resources or granting approval to a proposal.

**Ecological processes** - Processes which play an essential part in maintaining ecosystem integrity. Four fundamental ecological processes are the cycling of water, the cycling of nutrients, the flow of energy and biological diversity (as an expression of evolution)

**Environment** - As defined in Environmental Management Act - the complex of natural and anthropogenic factors and elements that are mutually interrelated and affect the ecological equilibrium and the quality of life, including – (a) the natural environment that is land, water and air; all organic and inorganic matter and living organisms and (b) the human environment that is the landscape and natural, cultural, historical, aesthetic, economic and social heritage and values.

**Environmental Management Plan** – as defined in the EIA Regulations (Section 8(j)), a plan that describes how activities that may have significant environments effects are to be mitigated, controlled and monitored.

**Interested and Affected Party (I&AP)** - in relation to the assessment of a listed activity includes - (a) any person, group of persons or organization interested in or affected by an activity; and (b) any organ of state that may have jurisdiction over any aspect of the activity. Mitigate - practical measures to reduce adverse impacts. Proponent – as defined in the Environmental Management Act, a person who proposes to undertake a listed activity. Significant impact - means an impact that by its magnitude, duration,

intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

**Fauna** - All of the animals found in a given area

**Flora** - All of the plants found in a given area

**Mitigation** - The purposeful implementation of decisions or activities that are designed to reduce the undesirable impacts of a proposed action on the affected environment

**Monitoring** - Activity involving repeated observation, according to a pre-determined schedule, of one or more elements of the environment to detect their characteristics (status and trends)

**Proponent** – Organization (private or public sector) or individual intending to implement a development proposal

**Public consultation/involvement** - A range of techniques that can be used to inform, consult or interact with stakeholders affected by the proposed activities

**Scoping** - An early and open activity to identify the impacts that are most likely to be significant and require specialized investigation during the EIA work. Can, also be used to identify alternative project designs/sites to be assessed, obtain local knowledge of site and surroundings and prepare a plan for public involvement. The results of scoping are frequently used to prepare a Terms of Reference for the specialized input into full EIA

**Terms of Reference (ToR)** - Written requirements governing full EIA input and implementation, consultations to be held, data to be produced and form/contents of the EIA report. Often produced as an output from scoping

## 1 INTRODUCTION

### 1.1 Project Background

Southwest Mining Investment (Pty) Ltd (The Proponent), a holder of two exclusive prospecting licenses (EPL 6031 and 6917) granted by the Ministry of Mines and Energy (MME) intends to acquire an Environmental Clearance Certificate (ECC) to be able to conduct prospecting and exploration activities on the EPLs. The company focuses on acquisition, exploration and development of precious and base metal projects, including EPL 6031 and 6917. The locality map of the licences where exploration work will be undertaken is shown in **Figure 1**.

In terms of Section 27 of the Environmental Management Act (EMA), No.7 of 2007 and its 2012 Environmental Impact Assessment (EIA), some activities as listed may not be carried out without an Environmental Impact Assessment (EIA) being undertaken and Environmental Clearance Certificate (ECC) being obtained. The relevant listed activities as per EIA regulations are:

- *3.1 The construction of facilities for any process or activities which requires a license, right of other forms of authorization, and the renewal of a license, right or other form of authorization, in terms of the Minerals (Prospecting and Mining Act, 1992).*
- *3.2 other forms of mining or extraction of any natural resources whether regulated by law or not.*
- *3.3 Resource extraction, manipulation, conservation and related activities.*

Subsequently, the Proponent appointed Excel Dynamic Solutions (Pty) Ltd, an independent team of Environmental Consultants to conduct the required EA process and submit the ECC application to the Ministry of Environment and Tourism and Ministry of Mines and Energy on their behalf.

### 1.2 Terms of Reference and Scope of Works

Individuals or organizations may not carry out exploration activities listed among those, without an EIA undertaken and an ECC awarded. EDS was appointed by the Proponent to undertake an environmental assessment for the purpose of applying for an ECC for exploration work on EPL 6031 & 6917. There were no formal Terms of Reference (ToR) to EDS provided by the Proponent. The consultant, instead, relied on the requirements of the Environmental Management Act (No. 7 of 2007) (EMA) and its Environmental Impact Assessment (EIA) Regulations (GN. No. 30 of 2012) to conduct the study.

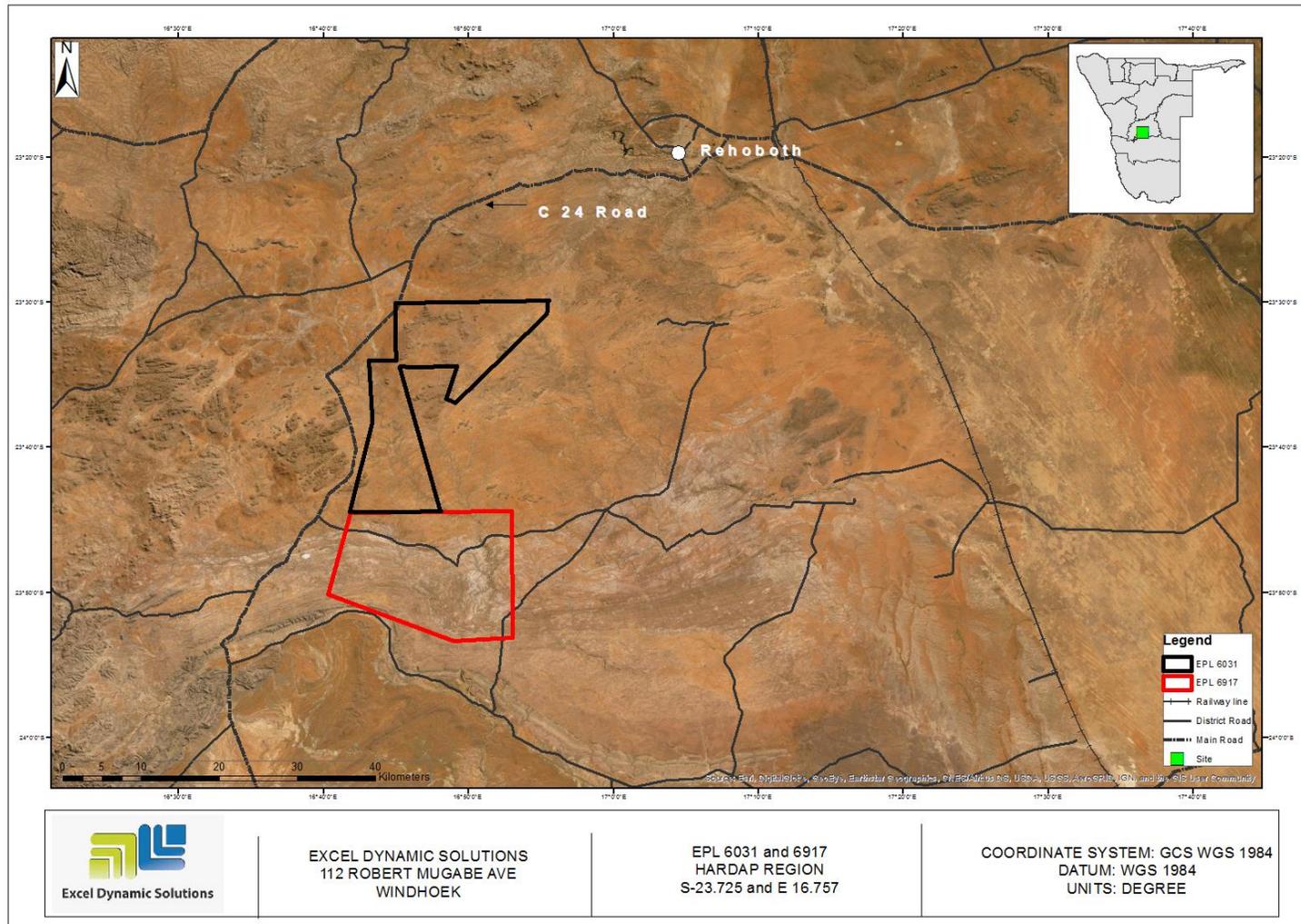


Figure 1: Location of the EPL no. 6031 and 6917 near Rehoboth settlement, in the Hardap Region

### 1.3 Appointed Environmental Assessment Practitioner

In order to satisfy the requirements of the EMA and its 2012 EIA Regulations, Southwest Mining Investment (Pty) Ltd appointed Excel Dynamic Solutions Pty Ltd (EDS or the Environmental Assessment Practitioner hereafter), an independent consulting company to conduct the required EIA process on their (Proponent's) behalf. The findings of the EIA process are incorporated into this report and the draft Environmental Management Plan (EMP) (**Appendix B**) will be submitted as part of an application for an ECC to the Environmental Commissioner at the Department of Environmental Affairs (DEA), Ministry of Environment and Tourism (MET).

The EIA project is headed by Mr. Nerson Tjelos, a qualified and experienced Geoscientist and experienced EAP. The consultation process and reporting are done by Ms. Althea Brandt support from Mr. Silas David. Mr. Nerson Tjelos contributed to report writing and review. The CV for Mr. Tjelos is presented in **Appendix C**.

### 1.4 Details of the Project Proponent

The details of the Proponent are presented in **Table 1** below.

**Table 1: Proponent contact details and purpose of the required ECC**

| Full name of Proponent                | Contact number             | Postal Address                                  | ECC Application for:   |
|---------------------------------------|----------------------------|---|--|
| Southwest Mining Investment (Pty) Ltd | Cellphone: +264 81 6918305 | P.O Box 1730,<br>Olympia<br>Windhoek<br>Namibia | Exclusive Prospecting License (EPL)<br>No. 6031 and 6917 near Rehoboth Town and Klein Aub Settlement in the Hardap Region, Namibia |

## 1.5 The Need for the Proposed Project

Exploration and Mining activities contribute to 25% of the country's income, thus regarded as one of the largest contributors to the Namibian economy. Namibia has various natural resources including diamonds, uranium, copper, gold, lead, tin, lithium, cadmium, zinc, salt and vanadium. Participation of local communities in prospecting, exploration and mining sector does not only create employment and increase revenue, but also contribute to the Gross Domestic Product (GDP) of the country, which can help achieve a balance between the creation and distribution of wealth. Moreover, mining forms the core of some of Namibia's development plans, namely: National Development Plan 5 (NDP5) and Harambee Prosperity Plan (HPP). In addition, mining does not only form the core of the national development plans, but the Vision 2030 too. A discovery of an economic deposit on any of the two or on both EPLs will contribute positively, as a solution, to the ever-increasing demand for base metals for the world's growing population and for prosperity. Copper is one of the metals on which a technological society is based. In addition, its (Copper) behaviour as an electrical and thermal conductor appears to ensure a long-term future for the metal in spite of threats of substitution by fiber optics and ceramic superconductors. Moreover, because of the large number of producers in the world, the metal is not as susceptible as other commodities to large price swings as a result of speculation or cartel sales.

Given the fact that this activity creates employment to the local community and contributes to the country's GDP, this justifies the need for exploration work on EPL 6031 and 6917 to enable future mining works, if found to be economically feasible.

## 2 PROJECT DESCRIPTION: PROPOSED EXPLORATION ACTIVITIES

The descriptions of exploration activities to be undertaken are presented below (section 2.1, 2.2 and 2.3).

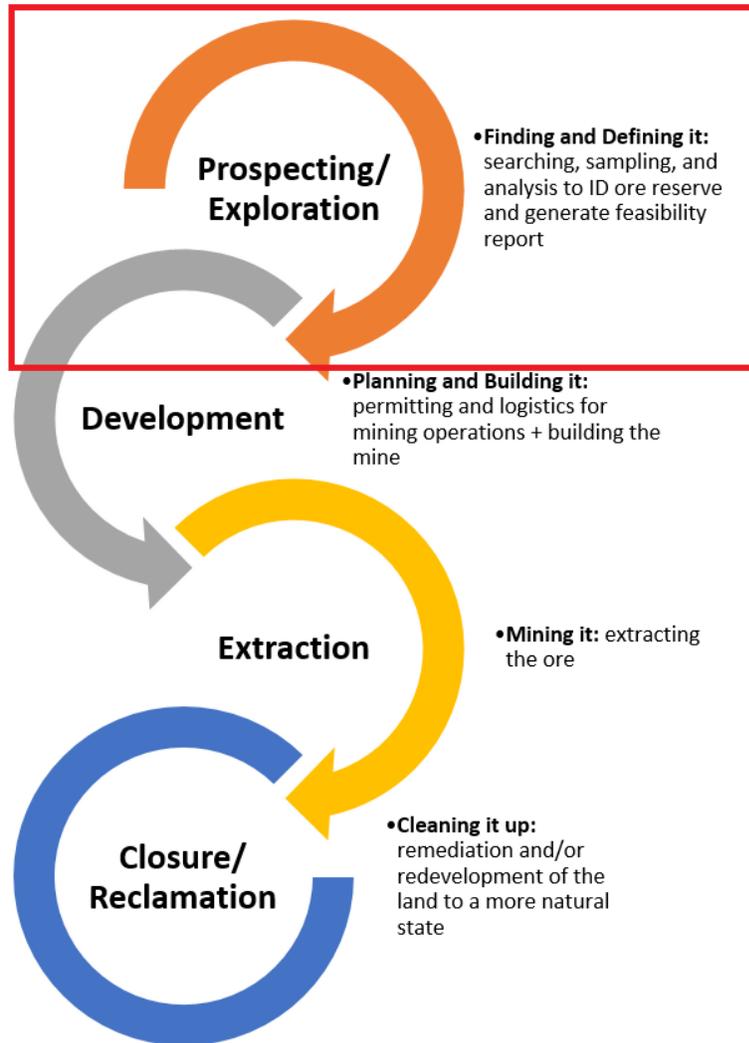


Figure 2: Diagram of the Life Cycle of a Mine (after Superfund Research Project, 2019). The phase covered by this study is highlighted with a red box

### 2.1 Prospecting

The prospecting and exploration phase include reviewing existing reports and composite stratigraphic, lithological-geochemical maps of the targeted areas to identify prospective lithostratigraphic packages. In addition to literature review, field work (lithological (soil/rock) mapping and sampling) will be conducted to verify desktop work. Up to this point no physical disturbance is required.

## 2.2 Exploration Drilling, Sampling and Analysis

During this advanced exploration phase the Proponent will assess the licence areas through detailed geological mapping, geophysical and geochemical surveys, supported where necessary by geophysical surveys, with a view to defining targets for drilling testing. Therefore, the target areas within EPL 6031 and 6917 boundaries; which have been acknowledged during the initial prospecting and exploration phase will go through exploration drilling. Reverse circulation (RC) is the preferred drilling technique for the exploration program. RC uses a down the hole hammer, Tricone bit or Three-Wings bit which drives a rotating tungsten-steel bit. This technique produces an uncontaminated large volume sample which is comprised of rock chips. The penetration rate of this technique is fast, quick for installation and cheaper compared to other drilling techniques. Diamond drilling will be considered to test a number of targets. Larger amount of sample materials may be required for analysis in the advanced stage of exploration activities on the EPLs, to perform processing trails. Furthermore, pits may be dug for sampling. Depending on the nature of mineralization observed from drilling, the size of the samples size may be adjusted. No explosives will be used during the exploration phase. Other aspects of the exploration include:

### 2.2.1 Access

The EPLs are situated in central Namibia approximately 140 km from the capital city of Windhoek. The nearest town to the tenements is Rehoboth which is approximately 80 km from the capital city. The tenements can be reached from Rehoboth by a secondary gravel road designated C24 and about 5 km northeast of Klein Aub village. In terms of accessibility from other parts of the world, Namibia is serviced by an international Airport located at Windhoek with daily flights to Europe and South Africa. Regionally, the paved all weather Trans-Caprivi Highway road links Walvis Bay to the countries of Botswana, Zambia and Zimbabwe, as well as the Democratic Republic of Congo. In addition, the Trans-Kalahari Highway links Walvis Bay with South Africa's Gauteng industrial heartland via Botswana. A harbour (Namport) is found in Walvis Bay that gives a platform for samples and mined materials to be offloaded or loaded onto transnational shipping lines.

### 2.2.2 Resources

The required input for exploration program in terms of vehicles and equipment include; SUV (4X4) vehicles, heavy equipment like bowsers, compressors, drilling machines, a grab, Tow Truck and pickup truck. The neighbouring village of Klein Aub has a resident population of ~3000. Rehoboth and Kein Aub village are good sources for semi-skilled and unskilled workers, many of whom have previous exploration and mining experience. The exploration work will require about eight (8) people to be at site, which

include a site manager, a guide, a driver, three consultants (i.e. geologists) and three sampling workers. Equipment and vehicles will be stored at a designated area near the accommodation site or at a storage site established within the EPLs area.

### **2.2.3 Services**

**Water:** Water required for exploration activities will be obtained from existing boreholes, or from approved water sources, through water abstraction permits. It is established that drilling activities will require about 200 litres of water per month. Water would need to be trucked to the site for the purpose of drilling and for consumption.

**Power supply:** No power supply is required for the exploration work on the tenements. Instead, a diesel power generator will be used during the exploration phase.

### **2.2.4 Accommodation**

Exploration crew will be accommodated in Klein Aub Settlement or any neighboring farms on the EPLs. A campsite will be set up for the exploration crew. If the accommodation camp is to be set up on a farm, necessary arrangements will be done with the farm owner. Furthermore, exploration activities will take place during the day time only and the exploration team will be commuting to the work site from their accommodation place.

### **2.2.5 Timeframe**

The planned ground geophysical surveys may last several weeks and will be done in stages on different parts of the property (EPL 6031 and 6917). The geological mapping will take two (2) months or more. A reverse circulation drilling program of about 1500 m is anticipated to last for 2-4 months. The timeframe for the exploration program on the EPLs is estimated to be between 12 to 36 months.

### **2.2.6 Waste Management**

The site will be equipped with secured waste bins for each waste type (i.e. domestic, hazardous etc.). Depending on the amount generated, waste will be sorted and collected on a weekly basis or monthly and taken to the Rehoboth or Klein Aub landfill site. Ablution facilities will use chemical toilets and/or sealed septic tanks and the sewerage taken to the Rehoboth storage periodically.

### **2.2.7 Security**

Temporary storage areas for drilling materials, machines and other project materials and equipment will be necessary at the camp. Security will be supplied on a 24-hour basis at the storage and/or camp site and

exploration camp. A temporal support fence surrounding the storage/camp site will be constructed to ensure people and domestic animals are not put at risk.

### **2.3 Decommissioning Phase**

Earlier intensive exploration work in the region ended in the 1970s and 1980s primarily due to low metal prices. Therefore, a similar economic situation or unconvincing exploration results may force the Proponent to eventually cease with the exploration program to an end. However, during the operational phase and before decommissioning, the Proponent will need to put site rehabilitation measures in place. Where necessary, stockpiling of top soil for rehabilitation at a later stage will be undertaken. Necessary landscaping of exploration areas will be undertaken upon completion of each phase of exploration (drilling, sampling etc.).

### 3 PROJECT ALTERNATIVES

Alternatives are defined as: “*different means of meeting the general purpose and requirements of the activity*” (Environmental Management Act (2007) of Namibia (and its regulations (2012))). This chapter will highlight the different ways in which the project can be undertaken and to identify the alternative that will be the most practical but least damaging to the environment.

Once the alternatives have been established, these are examined by asking the following three questions:

- What alternatives are technically and economically feasible?
- What are the environmental effects associated with the feasible alternatives?
- What is the rationale for selecting the preferred alternative?

The alternatives considered for the proposed development are discussed in the following subchapters.

#### 3.1 Types of Alternatives Considered

##### 3.1.1 The "No-go" Alternative

The “No-Go” alternative is the preference of not continuing with the activity, which characteristically implies a furtherance of the existing state of affairs. Therefore, should the proposed works of the prospecting and exploration plan be discontinued, none of the possible impacts (positive and negative) identified would occur. Furthermore, local people to be hired for exploration work will be left jobless and the Proponent would not be able to discover and define the targeted resource for possible mining and to contribute to the country’s economy through revenue and license royalty payments. If the proposed project is to be discontinued, the current land use for the proposed site will remain unchanged. In considering the proposed project, the ‘no-go’ option is not considered the preferred alternative.

##### 3.1.2 Prospecting Location

The prospecting location is dependent on the mineral deposits and the local geology of the area. Therefore, finding an alternative location for the planned exploration activities is not possible. In other words, the target base metals (i.e. copper) mineralization is area specific, which means exploration targets are primarily determined by the geology (host rocks) and the tectonic environment of the site (ore forming mechanism). The tenements have sufficient surface rights that should an economic mineral deposit be defined there is adequate area for potential tailings storage areas, waste disposal, heap leach pads if required and processing facilities.

### 3.1.3 Exploration Methods

Both invasive and non-invasive exploration activities are expected to take place upon issuance of an environmental clearance certificate. Furthermore, the project will continue to a mining phase when economically viable discovery is made. Minerals can be mined from the earth by two main techniques, namely surface (open cast) and underground mining.

## 3.2 Conclusion on Alternatives

The conclusions weighed and considered above are summarized below:

- **No-go alternative:** Should the proposed prospecting and exploration works on the EPLs (EPL 6031 & 6917) be discontinued, none of the potential impacts (positive and negative) identified would occur. Moreover, the local people to be hired by the project will be left without employment and Proponent would not be able discover and define the targeted minerals for possible future mining activities to generate an income and contribute to the country's GDP through revenue and license royalty payments. In considering the proposed project, the 'no-go' option is not considered the preferred alternative.
- **Prospecting location:** Finding an alternative location for the planned exploration activities is not possible (refer to section 3.1.2)

The exploration activities have certain legal implications and these applicable legal standards are presented in the following chapter.

## 4 LEGAL FRAMEWORK: LEGISLATION, POLICIES AND GUIDELINES

A review of applicable and relevant Namibian legislation, policies and guidelines to the proposed development are given in this chapter. This review serves to inform the project Proponent, Interested and Affected Parties and the decision makers at the DEA of the requirements and expectations, as laid out in terms of these instruments, to be fulfilled in order to establish the proposed prospecting and exploration activities.

### 4.1 The Environmental Management Act (No. 7 of 2007)

This EIA was carried out according to the Environmental Management Act (EMA) and its Environmental Impact Assessment (EIA) Regulations (GG No. 4878 GN No. 30).

The EMA has stipulated requirements to complete the required documentation in order to obtain an Environmental Clearance Certificate (ECC) for permission to undertake certain listed activities. These activities are listed under the following Regulations:

- *3.1 The construction of facilities for any process or activities which requires a license, right of other forms of authorization, and the renewal of a license, right or other form of authorization, in terms of the Minerals (Prospecting and Mining Act, 1992).*
- *3.2 other forms of mining or extraction of any natural resources whether regulated by law or not.*
- *3.3 Resource extraction, manipulation, conservation and related activities.*

The legal obligations that are relevant to the proposed cemetery and related activities are presented in **Table 2**.

**Table 2: Applicable local, national and international standards, policies and guidelines governing the proposed development**

| Legislation/Policy/<br>Guideline                                     | Relevant Provisions  | Implications for this project  |
|--|--|--|
| Environmental Management Act EMA (No 7 of 2007)                      | Requires that projects with significant environmental impacts are subject to an environmental assessment process (Section 27).<br><br>Details principles which are to guide all EAs. | The EMA and its regulations should inform and guide this EA process. |
| Environmental Impact Assessment (EIA) Regulations GN 28-30 (GG 4878) | Details requirements for public consultation within a given environmental assessment process (GN 30 S21).  |  |

| Legislation/Policy/<br>Guideline                                    | Relevant Provisions  | Implications for this project   |
|---|--|---|
|   | <p>Details the requirements for what should be included in a Scoping Report (GN 30 S8) and an Assessment Report (GN 30 S15).</p>   |   |
| <p>The Constitution of the Republic of Namibia, 1990 as amended</p> | <p>The Constitution of the Republic of Namibia (1990 as amended) addresses matters relating to environmental protection and sustainable development. Article 91(c) defines the functions of the Ombudsman to include:</p> <p><i>“...the duty to investigate complaints concerning the over-utilisation of living natural resources, the irrational exploitation of non-renewable resources, the degradation and destruction of ecosystems and failure to protect the beauty and character of Namibia...”</i></p> <p><i>Article 95(l) commits the state to actively promoting and maintaining the welfare of the people by adopting policies aimed at the:</i></p> <p><i>“...Natural resources situated in the soil and on the subsoil, the internal waters, in the sea, in the continental shelf, and in the exclusive economic zone are property of the State.”</i></p> | <p>By implementing the environmental management plan, the establishment will be in conformant to the constitution in terms of environmental management and sustainability.</p> <p>Ecological sustainability will be main priority for the proposed development.</p> |
| <p>The Regional Councils Act (No. 22 of 1992)</p>                   | <p>This Act sets out the conditions under which Regional Councils must be elected and administer each delineated region. From a land use and project planning point of view, their duties include, as described in section 28 “to undertake the planning of the development of the region for which it has been established with a view to physical, social and economic characteristics, urbanisation patterns, natural resources, economic development potential, infrastructure, land utilisation pattern and sensitivity of the natural environment.</p> <p>The main objective of this Act is to initiate, supervise, manage and evaluate development.</p>   | <p>The relevant Regional Councils are considered to be I&amp;APs and must be consulted during the Environmental Assessment (EA) process. The project site falls under the Hardap Regional Council, therefore they should be consulted.</p>                          |

| Legislation/Policy/<br>Guideline               | Relevant Provisions   | Implications for this project  |
|--|---|--|
| Local Authorities Act No. 23 of 1992           | To provide for the determination, for purposes of local government, of local authority councils; the establishment of such local authority councils; and to define the powers, duties and functions of local authority councils; and to provide for incidental matters.   | The Rehoboth Town Council is the responsible Local Authority of the area therefore they should be consulted. |
| Water Act 54 of 1956                           | <p>The Water Resources Management Act 11 of 2013 is presently without regulations; therefore, the Water Act No. 54 of 1956 is still in force:</p> <ul style="list-style-type: none"> <li>• Prohibits the pollution of water and implements the principle that a person disposing of effluent or waste has a duty of care to prevent pollution (S3 (k)).</li> <li>• Provides for control and protection of groundwater (S66 (1), (d (ii)).</li> </ul> <p>Liability of clean-up costs after closure/abandonment of an activity (S3 (l)).</p>  | The protection (both quality and quantity/abstraction) of water resources should be a priority.              |
| Water Resources Management Act (No 11 of 2013) | <p>The Act provides for the management, protection, development, use and conservation of water resources; and provides for the regulation and monitoring of water services and to provide for incidental matters. The objects of this Act are to:</p> <p>Ensure that the water resources of Namibia are managed, developed, used, conserved and protected in a manner consistent with, or conducive to, the fundamental principles set out in Section 66 - protection of aquifers, Subsection 1 (d) (iii) provide for preventing the contamination of the aquifer and water pollution control (Section 68).</p> |  |

| Legislation/Policy/<br>Guideline                            | Relevant Provisions  | Implications for this project  |
|---|--|--|
| <p>Minerals (Prospecting and Mining Act) No. 33 of 1992</p> | <p>The Prospecting and Mining Act aims to provide for the reconnaissance, prospecting and mining for, and disposal of, and the exercise of control over, minerals in Namibia; and to provide for matters incidental thereto.</p> <p>Section 52 requires mineral license holders to enter into a written agreement with affected landowners before exercising rights conferred upon the license holder.</p> | <p>The Proponent should enter into a written agreement with landowners before carrying out exploration on their land as per the Section 52 of the Minerals (Prospecting and Mining) Act No. 33 of 1992 and Section 2.2.3 of the Draft Minerals Policy of Namibia:</p> <p><i>. Section 52 (1) The holder of mineral licence shall not exercise any rights conferred upon such holder by this Act or under any terms and conditions of such mineral licence –</i></p> <p><i>(a) In, on or under any and until such time as such holder has entered into an agreement in writing with the owner of such land containing terms and conditions relating to the payment of compensation, or the owner of such land has in writing waked any right to such compensation and has submitted a copy of such agreement or waiver to the Commissioner.</i></p> <p><i>Section 2.2.3 of the Draft Minerals Policy of Namibia states that the Licence Holder and/or mineral explorers currently have to negotiate a contract with landowners to gain access for or mining purposes.</i></p> |

| Legislation/Policy/<br>Guideline                    | Relevant Provisions  | Implications for this project  |
|---|--|--|
| National Heritage Act No. 27 of 2004                | To provide 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.   | The Proponent should ensure compliance with this Acts' requirements. The necessary management measures and related permitting requirements must be taken. This done by consulting with the National Heritage Council of Namibia. |
| The National Monuments Act (No. 28 of 1969)         | The Act enables the proclamation of national monuments and protects archaeological sites.  |  |
| Soil Conservation Act (No 76 of 1969)               | The Act makes provision for the prevention and control of soil erosion and the protection, improvement and conservation of soil, vegetation and water supply sources and resources, through directives declared by the Minister.   | Duty of care must be applied to soil conservation and management measures must be included in the EMP.   |
| Public Health Act (No. 36 of 1919)                  | Section 119 states that “no person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health.”  | The Proponent and all its employees should ensure compliance with the provisions of these legal instruments.   |
| Health and Safety Regulations GN 156/1997 (GG 1617) | Details various requirements regarding health and safety of labourers.   |  |
| Road Traffic and Transport Act, No. 22 of 1999      | The Act provides for the establishment of the Transportation Commission of Namibia; for the control of traffic on public roads, the licensing of drivers, the registration and licensing of vehicles, the control and regulation of road transport across Namibia's borders; and for matters incidental thereto. Should the Proponent wish to undertake activities involving road transportation or access onto existing roads, the relevant permits will be required. | Mitigation measures should be provided for, if the roads and traffic impact cannot be avoided.<br><br>The relevant permits must therefore be applied for.  |

| Legislation/Policy/<br>Guideline | Relevant Provisions  | Implications for this project  |
|----------------------------------|--|--|
| Labour Act (No. 6 of 1992)       | Ministry of Labour (MOL) is aimed at ensuring harmonious labour relations through promoting social justice, occupational health and safety and enhanced labour market services for the benefit of all Namibians. This ministry insures effective implementation of the Labour Act no. 6 of 1992. | The Proponent should ensure that the prospecting and exploration activities do not compromise the safety and welfare of workers. |

The following chapter is a presentation of the pre-prospecting baseline (environmental baseline).

## 5 ENVIRONMENTAL BASELINE

The proposed prospecting and exploration programme will be undertaken in specific environmental and social conditions. The pre-project conditions of the environment will aid in laying down background "information" of what was before and what would be after project. This also helps the EAP in identifying the sensitive environmental features that may need to be protected through the recommendation and effective implementation of mitigation measures. The summary of selected biophysical and social baseline information pertaining to the prospecting area is given below. The baseline information presented below has been sourced from different sources including similar studies conducted in the region.

### 5.1 Climate

Climate data for Rehoboth are used in this report.

#### 5.1.1 Rainfall

Hardap Region, like the rest of Namibia, is an arid to semi-arid area. Therefore, there is virtually no rainfall throughout year. The driest time is between June and August with 0 mm of rainfall. With an average of 71 mm, the most precipitation falls in February. Various rivers in the area flow only after heavy rains, necessitating some curtailment of exploration activities during this time of year (<https://en.climate-data.org>).

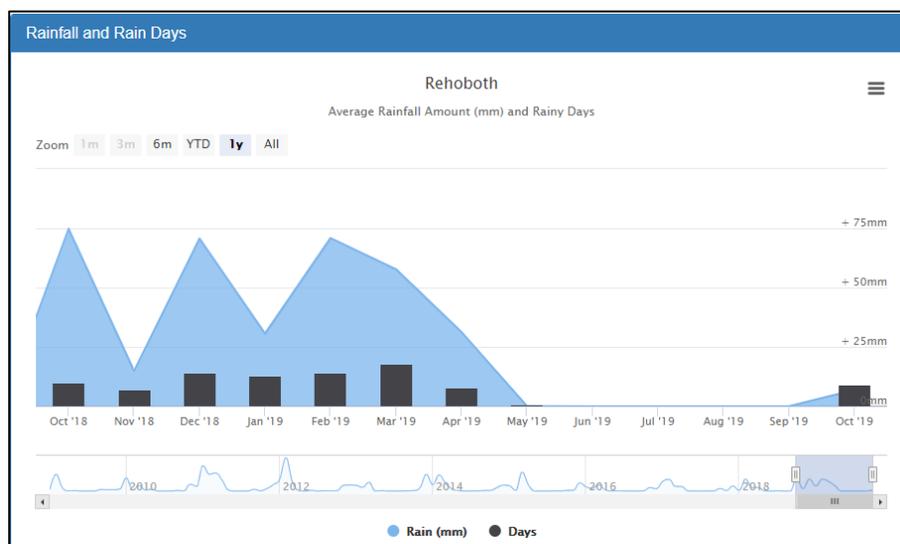
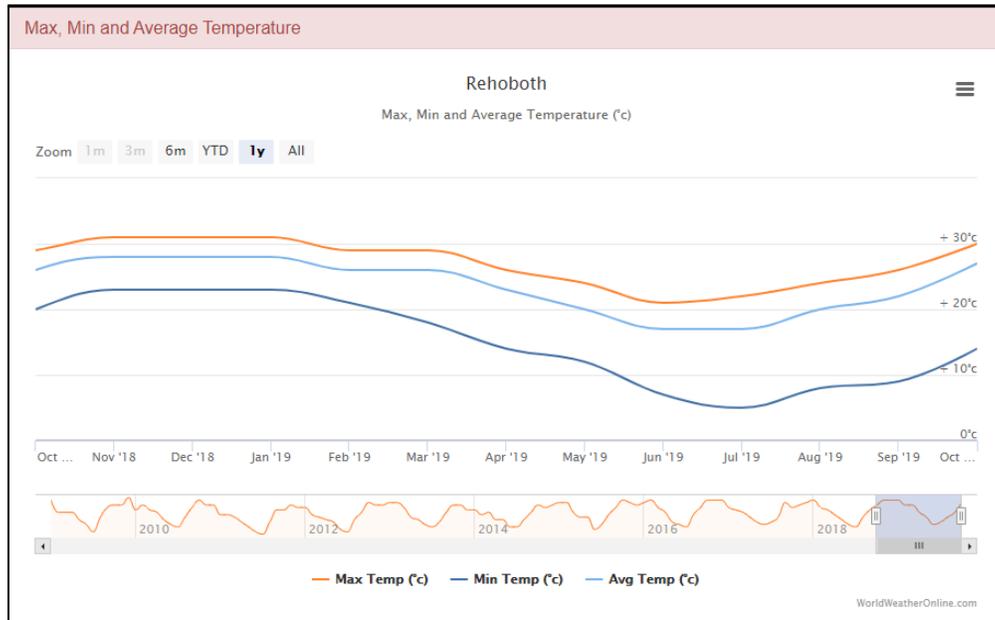


Figure 3: A graph showing rainfall patterns for one year (October 2018 – October 2019) in Rehoboth, Hardap Region

**5.1.2 Temperature**

The daytime temperatures range between 35° to 45° C from October to March, the hottest months, and can drop below freezing between June and August. July has the lowest average temperature of the year (<https://en.climate-data.org>).



**Figure 4: A graph showing temperature patterns for one year (September 2018 – September 2019) in Rehoboth in Hardap Region**

**5.1.3 Wind**

Rehoboth has predominantly easterly wind. Southerly, easterly and northerly airflow is common. The highest wind speeds are attained in September as shown in **figure 5**.



Figure 5: A graph showing Wind patterns for one year (October 2018 – October 2019) in Rehoboth in Hardap Region

### 5.2 Topography and Drainage

The morphology of the EPLs area are characterized by flat alluvial plains that are interrupted by rugged ridges and peaks with elevations that ranges from 1 375 to 1 543 m above mean sea level (mamsl). Vegetation consists of grasses, low shrub and small trees. See below the hydrology (streams) map in figure

6.

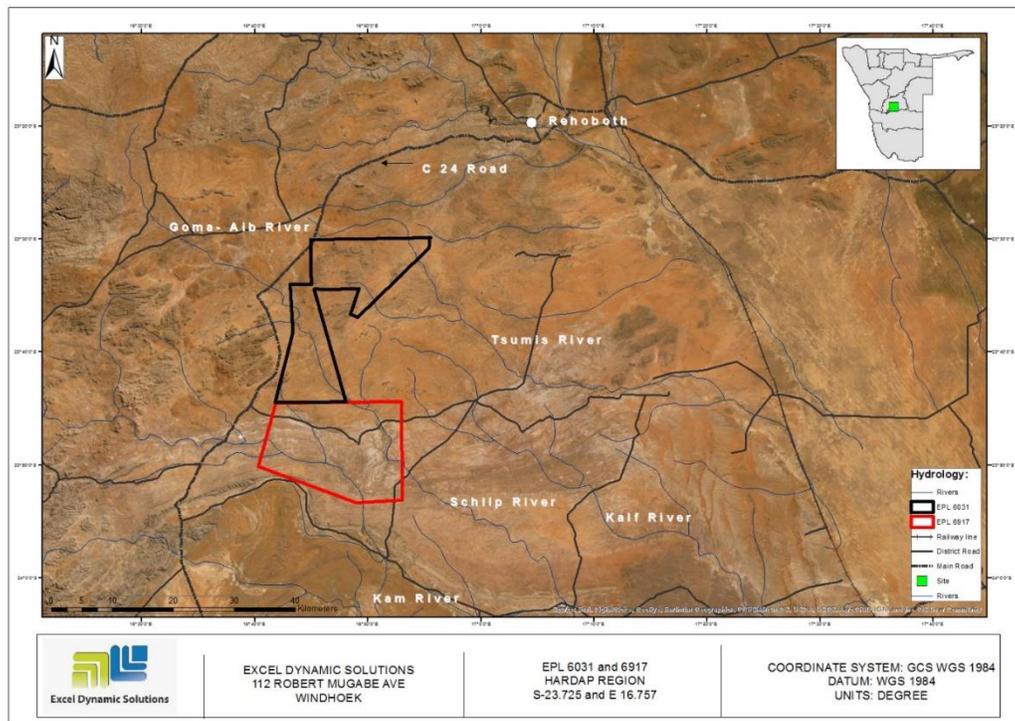


Figure 6: Hydrology Map of EPL 6031 & 6917

### 5.3 Soils

The soils in the region can be classified into three groups: Aeolian sands, Calcareous soils; and Lithosols. Aeolian sands are fine to medium, non-plastic and uniformly graded materials present in many sandy sites, mainly in desert areas. Lithosols are mainly group of shallow soils that lack well defined horizons, especially an entisol consisting of partially weathered rock fragments, usually on steep slopes. Moreover, the Calcareous soils have a presence of significant quantities of free excess lime (calcium or magnesium carbonate). The lime dissolves in neutral to acid pH soil, but does not readily dissolve in alkaline soil and instead, serves as a sink for surface absorbed calcium phosphate precipitation (Taalab, 2018).



Figure 7: Typical sand soils on the proposed exploration site(s)

## 5.4 Geology

The geology of the region is dominated by Neoproterozoic (1300Ma –900Ma) basins of the Sinclair Sequence and their equivalents which occur as relatively narrow, discontinuous, fault-bounded troughs which trend from southern, central and eastern Namibia. In the project area the Sinclair Sequence is distinguished into four formations that can be divided into three stages. The four formations are from top to bottom: Klein Aub Formation, Doornpoort Formation, Grauwater Formation and the Nuckopf Formation. It is unconformably overlain by the Damara Sequence of the Kamtsas Formation. The two EPLs are situated in the Kalahari Copperbelt stretching from Central Namibia to Northern Botswana. In central Namibia, copper mineralization, hosted by slate and phyllite, is intermittently developed over more than 60 km of strike of the Kagas Member of the Klein Aub Formation. The structural associations (e.g., the relation to a late reverse fault at Klein Aub) and detailed textural features (e.g., copper in veins, brittle fractures, cleavage-parallel lenticles and tectonic breccia zones) indicate that copper mineralization was emplaced into structurally controlled sites, late in the deformation history of the region. The conclusion of the present review is that economically viable copper accumulations resulted predominantly from one or more regionally extensive but locally structurally controlled hydrothermal events, mostly subsequent to formation of the dominant cleavage. As a result, modern exploration should focus primarily on favourable structures, particularly potential dilatant sites in tectonically complex zones. Within the region, there are numerous occurrences of sediment-hosted copper mineralization. Other significant copper deposits within the Kalahari Copperbelt occur to the northeast in the Rehoboth, Dordabis and Witvlei areas and are held by other parties. Below in **figure 8**, the map illustrates the specific rock types found at the site.

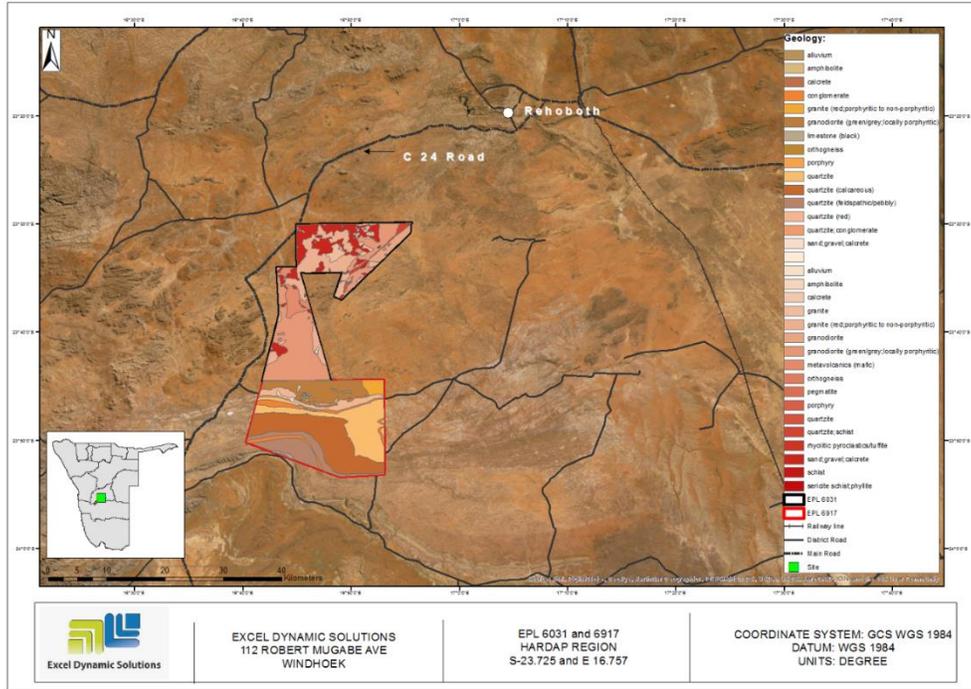


Figure 8: Map displaying geology of the project area.

### 5.5 Water Resources

Hardap region households have about 93.4% access to safe water and about 96 % in urban areas have access to safe water, which more than the rural areas in Hardap region (90.5%). In connection to inconsumable water about 45% of people in the region in rural areas relies on unprotected wells, boreholes with tanks, rivers and/or dams as their sources of water for consumption (Franzius, 2004). The Department of Infrastructure, Water & Technical Services at Rehoboth Town Council is responsible for the supply, distribution and quality of potable water. Water is supplied to the town by NamWater, which is then distributed to the residents and businesses by the Town Council. Water sources in Klein Aub which is located in the Rehoboth Rural Constituency are presented in **Table 3**. In 1999, Klein Aub won the battle to have water contaminated by the mine to be purified (Rehoboth Basters, 2019).

Table 3: Percentage of distribution of households by main source of water for cooking/drinking and area

| Area            | Households | Piped Water Inside | Piped Water Outside | Borehole    |                   |           | Well Protected | Safe water | Borehole       |     | Other unprotected source | Others |
|-----------------|------------|--------------------|---------------------|-------------|-------------------|-----------|----------------|------------|----------------|-----|--------------------------|--------|
|                 |            |                    |                     | Public Pipe | with Tank Covered | Open Tank |                |            | with Open Tank |     |                          |        |
| Hardap          | 19 307     | 39.0               | 18.7                | 16.9        | 18.4              | 0.3       | 93.4           | 2.0        |                | 2.2 | 4.6                      |        |
| Urban           | 11 021     | 55.1               | 18.5                | 20.1        | 1.4               | 0.5       | 95.6           | 0.6        |                | 3.2 | 4.0                      |        |
| Rural           | 8 286      | 17.6               | 18.9                | 12.7        | 41.1              | 0.1       | 90.5           | 3.7        |                | 0.8 | 5.4                      |        |
| Gibeon          | 2 805      | 25.1               | 25.7                | 10.2        | 31.5              | 0.1       | 92.6           | 1.4        |                | 1.1 | 2.6                      |        |
| Mariental Rural | 3 883      | 15.2               | 15.2                | 28.1        | 37.6              | 0.0       | 96.1           | 2.4        |                | 0.7 | 3.1                      |        |
| Mariental Urban | 3 585      | 40.6               | 21.4                | 30.6        | 3.8               | 0.3       | 96.7           | 0.8        |                | 0.4 | 2.9                      |        |
| Rehoboth Rural  | 2 174      | 16.2               | 17.8                | 9.3         | 40.2              | 0.4       | 83.9           | 7.6        |                | 0.6 | 8.4                      |        |
| Rehoboth East   | 4 147      | 50.1               | 23.8                | 13.7        | 3.2               | 0.9       | 91.7           | 0.2        |                | 7.7 | 8.1                      |        |
| Rehoboth West   | 2 713      | 86.8               | 5.9                 | 0.6         | 2.7               | 0.3       | 96.4           | 1.7        |                | 0.7 | 2.4                      |        |

## 5.6 Fauna

Common animals found in the region are Kudu, Oryx, Springbok, Steenbok, Hartmann's mountain Zebra, red hartebeest and ostrich. Furthermore, there is small pollution of black rhino in the area. There are about 300 bird species such as yellow-billed stork, osprey, African fish eagle, Goliath heron, Bradfield's swift and stark's lark. The presence of people spending their days and camping in the veld is likely to result in disturbance to animals such as birds, especially raptors. A number of these species, such as white-backed vulture and tawny eagle, are Red Data species. There is also likely to be greater levels of poaching. Although no mammal species in the EPL areas are likely to be affected by poaching, animal such as steenbok, warthog, kudu are of high conservation priority or significantly threatened by this activity, this will lead to loss of wildlife that many farmers are trying to build up for hunting and/or ecotourism purposes. Other species, such as tortoises and leguaans, are conservation priorities

## 5.7 Flora

Hardap region has scarce vegetation consisting of isolated trees, shrubs and grass. Some parts have typical savannah or steppe vegetation, which provide forage for some small stock, while in the area with the red-Kalahari sandy soil and water springs crop production is carried out. About 70% of Namibia is savannah. In Central Namibia, thorn bush-savannah is dominant with extensive grasslands and acacia bush. Sporadically you see trees, mainly camel-thorn trees and other kinds of acacia which often grow near dry riverbeds (Namibia Travel Guide, 2010). Furthermore, the EPLs are covered by sparse scrubland and approximately 80% of the EPLs are covered by medium plant diversity and the approximately 20% are covered by low medium plant diversity. Moreover, about 5.81 km from the EPLs there is an important species called Harpagophytum procumbens (Devil's claw) traditionally used for musculoskeletal disorders, osteoarthritis and pain; this important plant species will not be affected by exploration activities due to the fact that, it is far from the EPLs. A mix of vegetation strata provides habitats for a great variety of wildlife, including invertebrates, browsers, grazers, scavengers and predators such as the endangered cheetah. **Figure 9** shows vegetation structure and plant diversity the project area. **Figure 10** shows the typical vegetation type in Rehoboth.

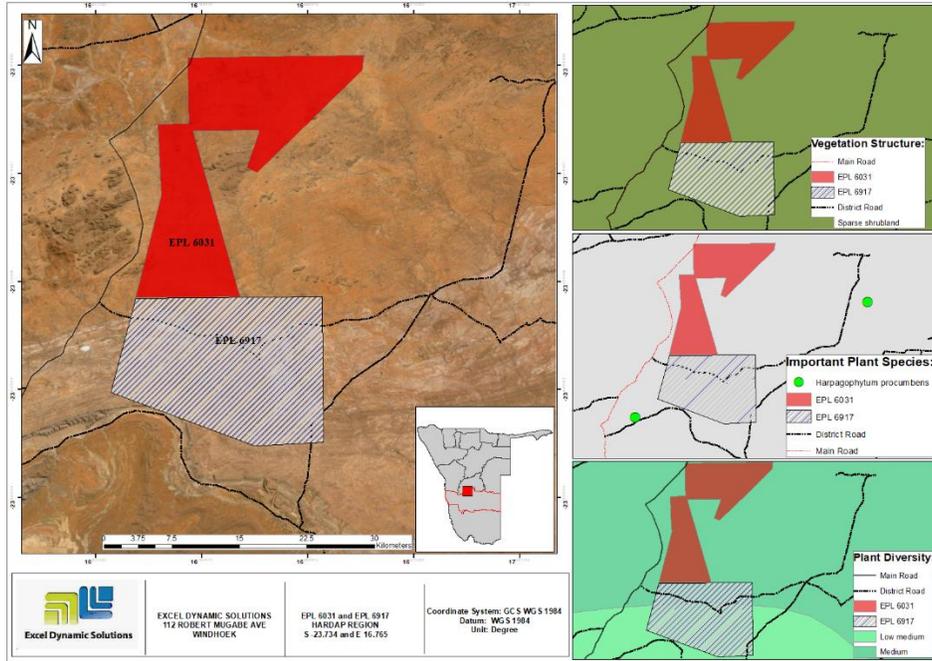


Figure 9: Map showing vegetation structure and plant diversity found on the EPLs and the surrounding



Figure 10: Typical flora found on the EPLs

## 5.8 Population of Hardap Region

The Hardap region is the third largest region in Namibia with the total area of 109 659 Km<sup>2</sup>, occupying 13.3 percent of the country's total land surface, with the low population density of 0.6 persons per square kilometre. The total population of Hardap Region was 79 000 (Namibia Statistics Agency, 2011). On the question of land ownership, 75% of the entire region form part of commercial farms; 10% communal farmland and national parks claiming the 15% of the remaining area.

## 5.9 Tourism

Tourism is one of the main contributions to the Gross Domestic Product (GDP), in 2018 tourism contributed 10.9% to the Namibian economy. Furthermore, Hardap region has several tourists' attractions such as the world's oldest desert called the Namib Desert with the Kuiseb valley and river where some oldest rocks are found, part of the Namib Naukluft Park and the world famous Sossuvlei and Sesreim. Hardap Dam found in the region is one the most tourism attraction in the region.

Rehoboth is known for its few tourism attractions such as the Oando dam which is found about 7 kilometres from Rehoboth. Rehoboth museum, spa recreation resort, the Ginsberg Nature reserve and the Oanob Lake and game reserve are one of the tourism activities that can be found Rehoboth (Hardap Regional Development Profile, 2015). Klein Aub village attracts tourists who have interest in abandoned mining sites.

## 5.10 Surrounding Land Uses

The main activity in the area is ranching with herds of cattle, goats and sheep grazing for local consumption and for export. Klein Aub and Rehoboth town have permanent clinics, special education schools, a post and telecommunication offices, a couple of general dealers, churches, police stations and various dwelling structures for the local inhabitants. The EPLs falls within 100% of farmland (**Figure 11**). The Proponent is required to secure a signed agreement from the affected land owners to be able to gain access to go undertake prospecting and exploration investigations as per the Section 52 of the Minerals (Prospecting and Mining) Act No. 33 of 1992 and Section 2.2.3 of the Draft Minerals Policy of Namibia:

1. *Section 52 (1) The holder of mineral licence shall not exercise any rights conferred upon such holder by this Act or under any terms and conditions of such mineral licence –*
  - (b) *In, on or under any and until such time as such holder has entered into an agreement in writing with the owner of such land containing terms and conditions relating to the payment of compensation, or the owner of such land has in writing waked any right to such compensation and has submitted a copy of such agreement or waiver to the Commissioner.*

2. Section 2.2.3 of the Draft Minerals Policy of Namibia states that the Licence Holder and/or mineral explorers currently have to negotiate a contract with landowners to gain access for or mining purposes.

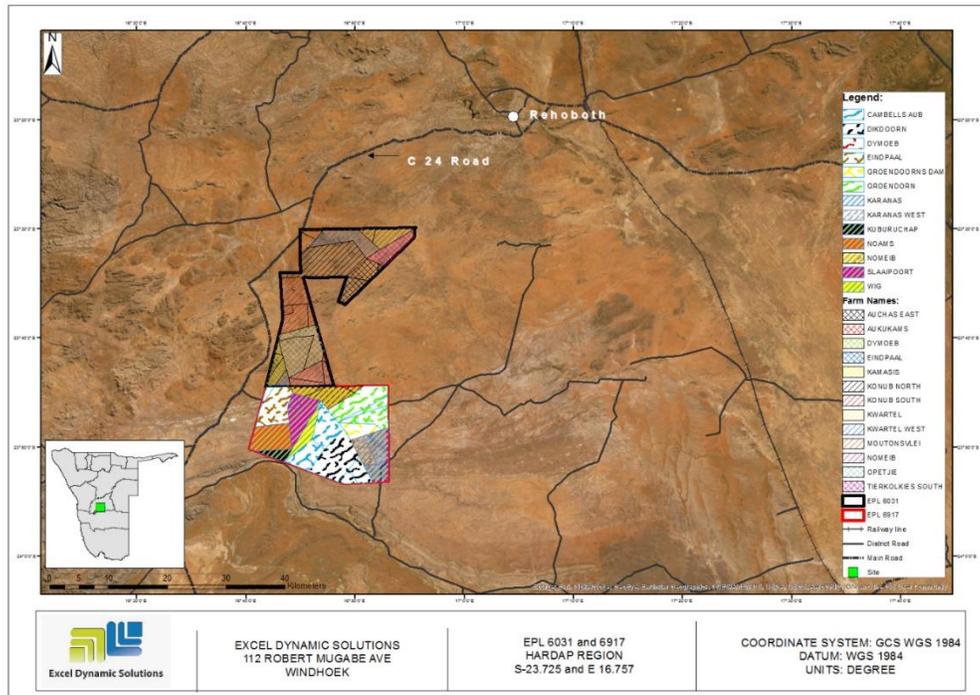


Figure 11: Map of farms within the EPLs, 6031 and 6917

## Heritage and Archaeology

The Hardap Region has several heritage and archaeological sites such as monuments at Kub, cemetery at Nomtsas, Sam Khubis, Hoachanas, Kai//ganaxab, Lutheran Paulus Church, Drierivier archaeological sites and the famous Namib Naukluft Park. The Monument at Kub is located at Farm Voigtskub in Hardap region where it is a permanent proclamation. This monument is erected to commemorate the battle at Kub that was between the Germans and the Nama people in 1904. The cemetery at Nomtsas is a historical cemetery which contains pioneers who are associated with colonial endeavors. The Sam Khubis is a war memorial for Rehoboth baster community in Namibia. Its name was derived from the shape of the rocks that were found at the fountain. Currently the area is identified by a white structure that resembles a pulpit where the plaque with the names placed during the commemorations where the community identifies it as a heritage site. Kai//ganaxab is of significance in Namibia’s liberation struggle as it represents tangible evidence of the cruelty and pain that is often associated with the liberation struggle.

Moreover, the main features identified at Kai//ganaxab is the old prison which has both movable and immovable heritage properties. The Lutheran Paulus Church is the earliest building in Rehoboth in Hardap region, this church is built on top of a spring and therefore the aesthetics of the building itself and the spring make the church and its premises an important heritage resource. The Drierivier archaeological site which located along in the Aonob River folds plains. This site is important for producing burials under cairns that are evidence of the pre-colonial occupation of the area by the Khoekhoe. Furthermore, one of the graves found on the site is opened and preserved for scientific and educational purposes for visitors. Therefore, the grave is declared a national heritage property by National Heritage Council of Namibia (NHC, 2019). No archaeological assessment within the EPLs was conducted during this scoping study.

### **5.11 Economic Development**

The region has a well-known and prosperous agricultural industry comprised mainly of cattle, goat and sheep farming. About 75% of the region is covered by commercial farming and the rest of the region is covered by 10% communal and 15% national park as their source of income in the region Hardap Dam plays a major role as it is the agro-economic developed of the region. Furthermore, the region has a special focus on infrastructure rehabilitation, restoring service provision in health, education, security and justice sectors. Furthermore, Rehoboth is well-known for supply of labourers with construction skills. Construction is one of the catalysts of economic development in Namibia. This makes a significant contribution to infrastructural developed, one of the pillars of the Harambee Prosperity Plan (HPP) (Hardap Regional Development Profile, 2015).

### **5.12 Services Infrastructure**

#### **5.12.1 Roads and Transport modes**

The EPLs are situated near Rehoboth which is connected to the capital city Windhoek by two lanes tarred road. Namibia is serviced by an international Airport located at Windhoek with daily flights to Europe and South Africa. Regionally, the paved all weather Trans-Caprivi Highway road links Walvis Bay to the countries of Botswana, Zambia and Zimbabwe, as well as the Democratic Republic of Congo. In addition, the Trans-Kalahari Highway links Walvis Bay with South Africa's Gauteng industrial heartland via Botswana. A harbour (Namport) is found in Walvis Bay that gives a platform for samples and mined materials to be offloaded or loaded onto transnational shipping lines.

### **5.12.2 Power Supply**

Rehoboth and Klein Aub settlement are connected to the main electricity network as part of rural electrification programme (Hardap Regional Council, 2019). No electrical power supply for the exploration work is planned For. Instead, a diesel power generator will be used during exploration phase.

### **5.12.3 Water Supply**

Water required for exploration activities will be obtained from existing boreholes, or from approved water sources, through water abstraction permits. It is established that drilling activities will require about 200 litres of water per month. Water would need to trucked to the site for the purpose of drilling and for consumption.

## 6 PUBLIC CONSULTATION PROCESS

Public consultation forms an important component of an Environmental Assessment (EA) process. Public consultation provides potential Interested and Affected Parties (I&APs) with an opportunity to comment on and raise any issues relevant to the project for consideration as part of the assessment process. Public consultation has been done in accordance with both the EMA and its EIA Regulations.

The public consultation process assists the Environmental Assessment Practitioner (EAP) in identifying all potential impacts and to what extent further investigations are needed. Public consultation can also aid in the process of identifying possible mitigation measures.

### 6.1 Pre-identified and Registered Interested and Affected Parties (I&APs)

EDS identified relevant and applicable national, regional and local authorities, church leaders, farm owners and other interested members of the public. The (pre-identified) I&APs were contacted directly and some were registered as I&APs upon their request (those that were registered after the EA notification in the newspapers). Newspaper adverts of the proposed exploration activities were placed in two widely-read national newspapers in the region (*The Namibian* and *New Era* newspapers). The project advertisement / announcement ran for two consecutive weeks inviting members of the public to register as I&APs and submit their comments. The summary of pre-identified and registered I&APs is listed in **Table 4** below and the complete list of I&APs is provided in **Appendix D**.

**Table 4: Summary of Interested and Affected Parties (I&APs)**

| National (Ministries and State-Owned Enterprises)                     |
|---|
| Ministry of Environment and Tourism                                   |
| Ministry of Urban and Rural Development                               |
| Ministry of Labour, Industrial Relations and Employment Creation      |
| Ministry of Health and Social Services                                |
| Ministry of Agriculture, Water and Forestry                           |
| Ministry of Mines and Energy  |
| Roads Authority   |
| Regional & Local  |
| Hardap Regional Council   |
| Rehoboth Town Council   |
| Rehoboth Rural Constituency (Klein Aub Settlement Advisory Committee) |
| General Public  |

Interested members of the public & Farm Owners

## 6.2 Communication with I&APs

Regulation 21 of the EIA Regulations details steps to be taken during a public consultation process and these have been used in guiding this process. Communication with I&APs about the proposed development was facilitated through the following means and in this order:

- A Background Information Document (BID) containing brief information about the proposed facility was compiled (**Appendix E**) and sent out to all pre-identified affected parties and upon request to all new registered Interested and Affected parties (I&APs);
- Project Environmental Assessment notices were placed in *The Namibian and New Era* newspapers (**Appendix F**) dated **22 October 2019** and **29 October 2019**, briefly explaining the activity and its locality, inviting members of the public to register as I&APs and submit comment;
- Public notices were placed at frequented places (**Figure 13**) in Rehoboth to inform members of the public of the EIA process and register as I&APs as well as submit comments; and
- A public meeting was scheduled and held on **07 November 2019** in Rehoboth.



Figure 12: Public notices placed in Rehoboth

The meeting was held in Rehoboth (Hermanus van Wyk Gedenksaal) at 11h00. The meeting was not attended by the members of the public as well as the local authorities from Rehoboth.



Figure 13: First Public meeting scheduled on 07 November 2019

However, issues were raised by affected and interested parties through email and these issues have been recorded and incorporated in the environmental report and EMP. The summarized issues raised in the emails are presented in **Table 5** below. The issues raised and responses by EDS are attached under **Appendix G and H**.

Table 5: Summary of main issues and comments received during the first public site engagement through emails correspondence

| Issue  | Concern  |
|--------|--|
| Water  | 200 Litres of water per day seems to be inadequate for the number of people mentioned. Please indicate how and where water for the operation, especially during drilling operations, will be acquired.<br><br>Depletion of underground water is a concern. |
| Access | How will access be gained, especially during drilling operations?  |

| Issue           | Concern   |
|-----------------|---|
| Camping & Theft | Will the team need to set up camp at any time? There are concerns with regards to the safety of cattle roaming freely.  |
| Communications  | Should any issues or disputes arise at any time, how will it be recorded and handled? Can we perhaps establish a clear policy of communication and perhaps have a liaison officer appointed for this purpose? |
| Boreholes       | Should any of the boreholes yield significant amount of water, will there be opportunity to discuss ownership/use of it?  |
| Disturbance     | Damage to grazing routine for animals and for farmers as well   |
| Rehabilitation  | Rehabilitation measures should be properly put in place   |

Due to the fact that no one attended the first meeting on the 7<sup>th</sup> of November 2019, the EAP together with the Rehoboth Farmer’s Association had to reschedule a second meeting on the 3<sup>rd</sup> of December 2019 (**Figure 14**) and then again, the third time on the 14<sup>th</sup> December 2019 (**Figure 15**).

### 6.3 Second Public Meeting: 3 December 2019

A second meeting was held in Rehoboth, Oschenwagen at 15h00. This time the meeting was well-attended by some of the farmers - please refer to **Figure 15** below. The meeting minutes were taken, compiled and shared with the meeting attendees for review and comments. These meeting minutes are attached as **Appendix G**.



Figure 14: Second Public Meeting on 3rd December 2019

The issues that were raised have been recorded; responses provided and are fully presented in the meeting minutes in **Appendix G** and incorporated in the environmental report and EMP. The summarized issues raised in the meeting are presented in **Table 6** below. The issues raised and responses by EDS are attached under **Appendix G**.

**Table 6: Summary of main issues and comments received during the first public site engagement through emails correspondence**

| Issue           | Concern   |
|-----------------|---|
| Water usage     | 200 Litres of water per day seems to be inadequate for the number of people mentioned and activities.<br><br>Depletion of underground water is a concern.   |
| Access          | Proponent has already entered farms and did site reconnaissance work without the ECC  |
| EPL application | Farmers do apply for licences on top of their farms and they are never granted rights   |
| Communications  | Proponent did not follow the right approach when the first contact with farmers was made. Letters requesting for access were send to some farmers but not all.<br><br>The EIA process was poorly communicated. One affected party indicated that he learnt about the project through social media |
| Contamination   | Previous mining activities at Klein Aub have left water heavily polluted and rehabilitation measures were not taken. Farmers are also concerned about the amount of water that will be used for the exploration activities.   |
| Ownership       | Farmers’ Association wants to own shares in the project and not just be beneficiaries of the social corporate responsibility activities   |
|                 | Farmers’ Association want to own shares in the project and not just be beneficiaries of the social corporate responsibility activities  |

:

**6.4 Third Public Meeting: 14 December 2019**

A third meeting was held together with the Consultant (EDS) and the Proponent on Saturday; 14 December 2019 at 09H30 in Rehoboth (at Rehoboth Farmers’ Association chairperson’s residence). The meeting was set to take place in the Rehoboth Town Hall, but due to late delivery of the hall keys, the farmers decided to use their chairperson’s residence (**Figure 15**).



Figure 15: Third Public Meeting on 14th December 2019

The meeting minutes are attached as **Appendix G** and incorporated in the environmental report and EMP. The summarized issues raised in the meeting are the **Table 7** below.

Table 7: Summary of main issues and comments received during the first public site engagement through emails correspondence

| Issue           | Concern   |
|-----------------|---|
| Water usage     | Water resource in the area is very low. Where will the Proponent get water for exploration activities?<br><br>Water abstraction may affect other farmers  |
| Access          | Proponent has already entered farms and did site reconnaissance work without the ECC  |
| EPL application | Farmers do apply for licences on top of their farms and they are never prioritised to be granted mineral rights as landowners   |
| Communications  | Proponent did not follow the right approach when the first contact with farmers was made. Letters requesting for access were send to some farmers but not all.<br><br>The Consultant was supposed to advertise the EIA in the local (Rehoboth based) newspapers |

| Issue                 | Concern   |
|-----------------------|---|
|                       | The EIA process was poorly communicated. Some farmers received letters from the Proponent via their post boxes and others only learnt about the project from fellow farmers.  |
| Conflict of Interest  | Consultant is paid by the Proponent which according to the farmers could jeopardise the assessment process  |
| Contamination         | Past experience showed that mining companies do not take enough care of the environment in which they operate, thus not abiding to the environmental regulations. Klein Aub is a good example where water is heavily polluted |
| Ownership             | Farmers must be compensated and have ownership in the project. A contractual partnership is preferred, not just a signed access agreement. Farmers will consult on the subject  |
| Legal advice          | Farmers would like to seek legal advice on how best the partnership can be structured before they make any suggestion   |
| Food security concern | Farmers produce meat for local consumption and for export. Exploration and mining activities may have a negative impact on farming.   |

### 6.5 First Round Public Feedback

Comments were received by EDS via email and other mode of communication after the EIA advertisement in the newspapers and upon placing public notices in Rehoboth.

The Draft EIA report together with all its appendices will be circulated to all I&APs for review for a period not less than 7 days. Should there be any comments, these will be documented in a Comments and Response Trail Document and incorporated into the Final Report that will be then submitted to the Department of Environmental Affairs (DEA) for evaluation and consideration of an ECC.

## 7 IMPACT IDENTIFICATION, ASSESSMENT AND MITIGATION MEASURES

### 7.1 Impact Identification

Proposed developments/activities are usually associated with different potential impacts, be it positive or negative, be it positive or negative. For an environmental assessment, the focus is primarily placed on the negative impacts. This is done to ensure that these impacts are addressed by providing adequate mitigation measures such that an impact's implication is brought under control, while maximizing the positive impacts of the development. The potential positive and negative impacts that have been identified from the prospecting and exploration activities are listed as follow:

#### **Positive impacts:**

- Creation of jobs to the locals
- Helps boost local economic growth.
- Open up other investment opportunities.
- Contribution to regional economic development.

#### **Negative impacts:**

- Loss of biodiversity
- Generation of dust
- Groundwater contamination
- Waste generation
- Visual impact (scars) on landscape
- Potential health and safety risks
- Surrounding soils impacted
- Archaeological impact
- Noise pollution

### 7.2 Impact Assessment Methodology

The impact assessment method used for this project was adopted from previous environmental reports that were compiled by the author and as well as published reports online through research on the suitable project assessment methodology.

The identified impacts were assessed in terms of probability (likelihood of occurring), scale/extent (spatial scale), magnitude (severity) and duration (temporal scale) as presented in **Table 8, Table 9, Table 10** and **Table 11**.

In order to enable a scientific approach to the determination of the environmental significance, a numerical value is linked to each rating scale. This methodology ensures uniformity and that potential impacts can be addressed in a standard manner so that a wide range of impacts are comparable. It is assumed that an assessment of the significance of a potential impact is a good indicator of the risks associated with such an impact. The following process will be applied to each potential impact:

- Provision of a brief explanation of the impact;
- Assessment of the pre-mitigation significance of the impact; and
- Description of recommended mitigation measures.

The recommended mitigation measures prescribed for each of the potential impacts contribute towards the attainment of environmentally sustainable operational conditions of the project for various features of the biophysical and social environment. The following criteria were applied in this impact assessment:

7.2.1 Extent (spatial scale)

Extent is an indication of the physical and spatial scale of the impact. **Table 8** shows rating of impact in terms of extent of spatial scale.

Table 8: Extent or spatial impact rating

| Low (1)   | Low/Medium (2)                            | Medium (3)   | Medium/High (4)                                      | High (5)  |
|---|---|--|--|---|
| Impact is localised within the site boundary: Site only | Impact is beyond the site boundary: Local | Impacts felt within adjacent biophysical and social environments: Regional | Impact widespread far beyond site boundary: Regional | Impact extend National or over international boundaries |

7.2.2 Duration

Duration refers to the timeframe over which the impact is expected to occur, measured in relation to the lifetime of the project. **Table 9** shows the rating of impact in terms of duration.

Table 9: Duration impact rating

| Low (1)   | Low/Medium (2)   | Medium (3)                                     | Medium/High (4)     | High (5)   |
|---|--|--|---------------------|--|
| Immediate mitigating measures, immediate progress | Impact is quickly reversible, short term impacts (0-5 years) | Reversible over time; medium term (5-15 years) | Impact is long-term | Long term; beyond closure; permanent; irreplaceable or irretrievable commitment of resources |

7.2.3 Intensity, Magnitude / severity

Intensity refers to the degree or magnitude to which the impact alters the functioning of an element of the environment. The magnitude of alteration can either be positive or negative. These were also taken into consideration during the assessment of severity. **Table 10** shows the rating of impact in terms of intensity, magnitude or severity.

Table 10: Intensity, magnitude or severity impact rating

| Type of criteria | Negative   |  |   |   |  |
|------------------|--|--|---|---|--|
|                  | H-<br>(10)   | M/H-<br>(8)  | M-<br>(6)   | M/L-<br>(4)   | L-<br>(2)  |
| Qualitative      | Very high deterioration, high quantity of deaths, injury of illness / total loss | Substantial deterioration, death, illness or injury, loss of habitat / diversity | Moderate deterioration, discomfort, partial loss of habitat / biodiversity or | Low deterioration, slight noticeable alteration in habitat and biodiversity. Little | Minor deterioration, nuisance or irritation, minor change in species / |

| Type of criteria | Negative   |  |                               |                         |   |
|------------------|--|--|-------------------------------|-------------------------|---|
|                  | H-<br>(10)   | M/H-<br>(8)  | M-<br>(6)                     | M/L-<br>(4)             | L-<br>(2)   |
|                  | of habitat, total alteration of ecological processes, extinction of rare species | or resource, severe alteration or disturbance of important processes | resource, moderate alteration | loss in species numbers | habitat / diversity or resource, no or very little quality deterioration. |

#### 7.2.4 Probability of occurrence

Probability describes the likelihood of the impacts actually occurring. This determination is based on previous experience with similar projects and/or based on professional judgment. See **Table 11** for impact rating in terms of probability of occurrence.

**Table 11: Probability of occurrence impact rating**

| Low (1)   | Medium/Low (2)   | Medium (3)   | Medium/High (4)  | High (5)   |
|---|--|--|--|--|
| Improbable; low likelihood; seldom. No known risk or vulnerability to natural or induced hazards. | Likely to occur from time to time. Low risk or vulnerability to natural or induced hazards | Possible, distinct possibility, frequent. Low to medium risk or vulnerability to natural or induced hazards. | Probable if mitigating measures are not implemented. Medium risk of vulnerability to natural or induced hazards. | Definite (regardless of preventative measures), highly likely, continuous. High risk or vulnerability to natural or induced hazards. |

#### 7.2.5 Significance

Impact significance is determined through a synthesis of the above impact characteristics. The significance of the impact “without mitigation” is the main determinant of the nature and degree of mitigation required. As stated in the introduction to this chapter, for this assessment, the significance of the impact without prescribed mitigation actions was measured.

Once the above factors (**Table 8**, **Table 9**, **Table 10** and **Table 11**) have been ranked for each potential impact, the impact significance of each is assessed using the following formula:

$$SP = (\text{magnitude} + \text{duration} + \text{scale}) \times \text{probability}$$

The maximum value per potential impact is 100 significance points (SP). Potential impacts were rated as high, moderate or low significance, based on the following significance rating scale (**Table 12**).

Table 12: Significance rating scale

| <i>Significance</i> | <i>Environmental Significance Points</i> | <i>Colour Code</i> |
|---------------------|--|--------------------|
| High (positive)     | >60                                      | H                  |
| Medium (positive)   | 30 to 60                                 | M                  |
| Low (positive)      | <30                                      | L                  |
| Neutral             | 0  | N                  |
| Low (negative)      | >-30                                     | L                  |
| Medium (negative)   | -30 to -60                               | M                  |
| High (negative)     | >-60                                     | H                  |

For an impact with a significance rating of high, mitigation measures are recommended to reduce the impact to a low or medium significance rating, provided that the impact with a medium significance rating can be sufficiently controlled with the recommended mitigation measures. To maintain a low or medium significance rating, monitoring is recommended for a period of time to enable the confirmation of the significance of the impact as low or medium and under control.

The assessment of the exploration phases is done for both pre-mitigation (before implementing any mitigation) and post-mitigation (after mitigations are implemented).

The risk/impact assessment is driven by three factors and these are:

- **Source:** *The cause or source of the contamination.*
- **Pathway:** *The route taken by the source to reach a given receptor*
- **Receptor:** *A person, animal, plant, eco-system, property or a controlled water source. If contamination is to cause harm or impact, it must reach a receptor.*

According to Booth (2011), a pollutant linkage occurs when a source, pathway and receptor exist together. The objective with the mitigation measures is to firstly avoid the risk and if the risk cannot be avoided, mitigation measures to minimize the impact are recommended. Once the mitigation measures have been applied, the identified risk will be of low significance.

The impact assessment for this EIA focuses on the three project phases namely; prospecting/exploration, advanced exploration drilling, sampling (and possible analysis) and decommissioning. The potential negative impacts stemming from the proposed activities are described, assessed and mitigation measures provided thereof. Further mitigation measures in a form of management action plans will be provided in the Draft Environmental Management Plan.

### 7.3 Assessment of Potential Negative Impacts: Surveys, Drilling, Sampling (Operational Phases)

The main potential negative impacts associated with construction and operational (and maintenance phases) identified are; soil disturbance, dust (air pollution), visual impact, loss of biodiversity (fauna and flora), health and safety, archaeological impact, waste generation and noise pollution. Potential impacts identified to be associated with the exploration discontinuation are loss of employment opportunities and loss of economic growth for the country.

- *Loss of biodiversity* - possible destruction of faunal habitats that may be encountered within the site soils.
- *Generation of dust (air quality)* - generation of dust from the unpaved site access roads during construction and possible gaseous emissions into the air by un-serviced vehicles and machinery
- *Waste generation* - potential environmental pollution through uncontrolled waste disposal.
- Visual impact
- *Potential health and safety risk* - potential health and safety risks associated with mishandling of project equipment.
- *Surrounding soils impacted* - disturbance of site soils by exploration, project vehicles and machinery.
- *Archaeological impact* - potential uncovering of unknown archeological objects during construction works or operational phase.
- *Noise* – noise due to drilling during exploration

### 7.3.1 Loss of Biodiversity (Fauna and Flora)

Land degradation will be created due to drilling activities and earthworks done to uncover the mineralized rock units. The destruction or drastic modification of the area can have a catastrophic impact on the biodiversity of the area. This can lead to a massive habitat loss for a diversity of flora and fauna ranging from microorganisms to large animals. Endemic species are most severely affected since even the slightest disruptions in their habitat can result in extinction or put them at high risk of being wiped out. It is therefore important to identify what species are present, understand them and try to minimise the impact upon them with operational management guidelines. EDS advises the Proponent to avoid unnecessary removal of vegetation, in order to promote a balance between biodiversity and their operations. Under the current status, the impact can be considered to be of a medium significance rating. With the implementation of appropriate mitigation measures, the rating will significantly be reduced to low. The impact is assessed in **Table 13** below.

**Table 13: Assessment of the impacts of exploration on biodiversity**

| Mitigation Status | Extent  | Duration | Intensity | Probability | Significance |
|-------------------|---------|----------|-----------|-------------|--------------|
| Pre mitigation    | M - 3   | M - 3    | M - 6     | M - 3       | M - 36       |
| Post mitigation   | L/M - 2 | L/M - 2  | L/M - 4   | L/M - 2     | L - 16       |

#### ***Mitigations and recommendation to minimize the loss of biodiversity***

- Vegetation found on the site, but not in the targeted exploration areas should not be removed, but left to preserve biodiversity on the site.
- Even if a certain shrub or tree is found along drilling or sampling spots on sites, this does not mean that it should be removed. Therefore, care should be taken when extracting mineral resources without destroying the vegetation.
- Workers should refrain from killing or snaring animals' species (big or small) that may be found on the site.
- Environmental awareness on the importance of biodiversity preservation should be provided to the workers.

### 7.3.2 Generation of Dust

During the prospecting and exploration phase, there will be generation of waste of all kinds (domestic and general). Therefore, land and water pollution can occur on the site or around the site if these generated wastes are not disposed in a responsible way. Industrial waste is a given by-product of any exploration operation. Non-biodegradable and biodegradable refuse should be stored in a container and collected on a regular basis and disposed of at a recognized disposal facility. Precautions should be taken to prevent any refuse spreading. The container should be covered with mesh to prevent access from animals. Without any mitigation measure, the impact has a medium significance. The impact will be of low significance from medium, upon implementing the mitigation measures. The impact is assessed in **Table 14** below.

**Table 14: Assessment of the impacts of exploration on air quality**

| Mitigation Status | Extent  | Duration | Intensity | Probability | Significance |
|-------------------|---------|----------|-----------|-------------|--------------|
| Pre mitigation    | L/M - 2 | L/M - 2  | L/M- 4    | L/M - 2     | M – 16       |
| Post mitigation   | L - 1   | L - 1    | L- 2      | L - 1       | L - 4        |

#### ***Mitigations and recommendation to minimize dust***

- The Proponent should ensure that the exploration schedule is limited to the given number of days of the week, but not every day. This will keep the vehicle-related dust level minimal in the area.
- Since the project site is in an area where soils are exposed due to little vegetation cover, it is highly probable that more dust will be generated from exploration works. It is therefore advised that in extremely windy days, a reasonable amount of water should be used to suppress the dust that may be emanating from certain exploration areas on the EPLs.

### 7.3.3 Waste Generation

During the prospecting and exploration phase, there will be generation of waste of all kinds (domestic and general). Therefore, land and water pollution can occur on the site or around the site if these generated wastes are not disposed in a responsible way. Industrial waste is a given by-product of any exploration operation. Non-biodegradable and biodegradable refuse should be stored in a container and collected on a regular basis and disposed of at a recognized disposal facility. Precautions should be taken to prevent any refuse spreading. The container should be covered with mesh to prevent access from animals. Without any mitigation measure, the impact has a medium significance. The impact will be of low significance from medium, upon implementing the mitigation measures. The assessment of this impact is given in **Table 15**.

**Table 15: Assessment of waste generation impact**

| Mitigation Status | Extent | Duration | Intensity | Probability | Significance |
|-------------------|--------|----------|-----------|-------------|--------------|
| Pre mitigation    | M - 3  | M/H - 4  | M - 6     | M - 3       | M - 39       |
| Post mitigation   | L - 1  | L - 1    | L - 2     | L/M - 2     | L - 8        |

#### ***Mitigations and recommendation to waste management***

- Workers should be sensitized to dispose of waste in a responsible manner and not to litter.
- After each daily works, the Proponent should ensure that there are no wastes left on site.
- All domestic and general operational waste produced on a daily basis should be contained until such that time it will be transported to designated waste sites.
- No waste may be buried or burned on site or anywhere else.
- The exploration site(s) should be equipped with separate waste bins for hazardous and general waste/domestic.
- A penalty system for irresponsible disposal of waste on site and anywhere in the area should implemented.

### 7.3.4 Visual Impact (Scars) on Landscape

Exploration activities leave scars on the landscape thus, causing a visual impact. If the exploration site is situated near tourists' routes, these scars may contrast the surrounding landscape and this can potentially cause visual nuisance to tourists. However, it is vital to note that throughout exploration phase, assured measures will need to be taken into concern regarding the visual aspect. Currently, the visual impact can be rated as medium to low significance, but upon effectively implementing the measures. The assessment of this impact is presented in **Table 16**.

**Table 16: Assessment of the exploration on visual**

|                 | Extent  | Duration | Intensity | Probability | Significance |
|-----------------|---------|----------|-----------|-------------|--------------|
| Pre mitigation  | M - 3   | M - 3    | M - 6     | M - 3       | M - 36       |
| Post mitigation | L/M - 2 | L/M - 2  | L/M - 4   | L/M - 2     | L - 16       |

#### ***Mitigations and recommendation to minimize visual impact***

- The Proponent should consider the implementation of continuous rehabilitation programme, by using overburden waste rocks.

### 7.3.5 Potential Health and Safety Risks

Inappropriate handling of exploration materials and equipment may cause health and safety risks such as injuries to workers. The impact is probable and has a medium significance rating. However, with adequate mitigation measures, the impact rating will be reduced to low. This impact is assessed in **Table 17** below and mitigation measures provided.

**Table 17: Assessment of the impacts of exploration on health and safety**

| Mitigation Status | Extent  | Duration | Intensity | Probability | Significance |
|-------------------|---------|----------|-----------|-------------|--------------|
| Pre mitigation    | M - 3   | L/M - 2  | M - 6     | M/H - 4     | M - 44       |
| Post mitigation   | L/M - 2 | L/M - 2  | L - 2     | L/M - 2     | L - 12       |

#### ***Mitigations and recommendation to minimize health and safety issues***

- As part of their induction, the workers should be provided with an awareness training of the risks of mishandling equipment and materials on site.

- When working on site, employees should be properly equipped with personal protective equipment (PPE) such as coveralls, gloves, safety boots, earplugs, safety glasses, etc.
- No employee should be allowed to drink alcohol prior to and during working hours as this may lead to mishandling of equipment which results into injuries and other health and safety risks.
- Employees should not be allowed on site if under the influence of alcohol.

7.3.6 Surrounding Soils Impacted

The planned exploration activities will potentially disturb the soil structure on the site, which will leave the already exposed site soils vulnerable to erosion resulting into creation of gullies. This impact is likely because the proposed site has little vegetation cover. The impact can be rated as medium, if no mitigation measures are implemented. However, with the implementation of mitigation measures, the impact will reduce to low. The impact is assessed in **Table 18** below and mitigation measures are provided below.

Table 18: Assessment of the impacts of exploration on soils

| Mitigation Status | Extent  | Duration | Intensity | Probability | Significance |
|-------------------|---------|----------|-----------|-------------|--------------|
| Pre mitigation    | L/M - 2 | L/M - 2  | M - 6     | M - 3       | M - 30       |
| Post mitigation   | L - 1   | L/M - 2  | L - 2     | L/M - 2     | L - 10       |

**Mitigations and recommendation to minimize impact on soil**

- Overburden material (if any) should be handled more efficiently during exploration operations to avoid erosion when subjected erosional processes.
- Prevent the creation of huge piles of waste rocks by performing sequential backfilling.

7.3.7 Archaeological Impact

Historical resources may be impacted through unintentional destruction or damage, during exploration activities. Furthermore, there was no information provided about known heritage or site of cultural values within the site or in the vicinity of the project site area. Therefore, this impact can be rated medium to low, if there are no mitigation measures in place. Upon implementation of the necessary measures, the impact will be low. The impact is assessed **Table 19**.

Table 19: Assessment of the impacts of exploration on archaeological sites

| Mitigation Status | Extent  | Duration | Intensity | Probability | Significance |
|-------------------|---------|----------|-----------|-------------|--------------|
| Pre mitigation    | M - 3   | M - 3    | M - 6     | M - 3       | M - 36       |
| Post mitigation   | L/M - 2 | L/M - 2  | L/M - 4   | L/M - 2     | L - 16       |

#### ***Mitigations and recommendation to minimize impact on archaeological sites***

- The Proponent should consider having a qualified and experience archaeologist on standby during exploration work and sampling phase and as required during the 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.

#### **7.3.8 Noise**

Noise pollution is most likely to be created by drilling machines during the exploration activities. This has a negative impact on the neighbours as the drilling machines can produce excessive noise and therefore a nuisance to neighbours. Furthermore, extreme noise pollution can cause hearing problems thus health risks to workers on the site. Without any mitigations, the impact is rated as of medium significance. In order to change the impact significance from the pre-mitigation significance to low rating, the mitigation measures should be implemented. This impact is assessed in **Table 20** below.

Table 20: Assessment of the impacts of noise from exploration

| Mitigation Status | Extent  | Duration | Intensity | Probability | Significance |
|-------------------|---------|----------|-----------|-------------|--------------|
| Pre mitigation    | L/M - 2 | L/M - 2  | M - 6     | M - 3       | M - 30       |
| Post mitigation   | L - 1   | L/M - 2  | L - 2     | L/M - 2     | L - 10       |

#### ***Mitigations and recommendation to noise***

- Noise from operations vehicles and equipment on site should be reduced to acceptable levels.
- The exploration operational times should be set such that, no exploration activity is carried out during the night or very early in the mornings.

- Exploration hours should be restricted to between 08h00 and 17h00 to avoid noise generated by exploration equipment and the movement of vehicles before or after hours.
- When operating the drilling machinery onsite, workers should be equipped with personal protective equipment (PPE) such as earplugs to reduce noise exposure.

**7.4 Assessment of Potential Negative Impacts: Decommissioning Phase**

Impacts pertaining to the closure of the exploration program have been identified. The impacts are; loss of employment by workers at the exploration site and contribution to the national economy (revenue and royalties’ payments). Another concern that stems from exploration program closure is the rehabilitation of the sites.

**7.4.1 Impact on Employment Opportunities and Economic Contribution**

Should the exploration program come to an end, workers that are employed by the exploration company will lose their jobs and source of income. This will also mean that there will be no more revenue and royalties paid to the government. This impact can be rated as of medium significance and given that the program has defined timeframe, only so much can be done by the Proponent to assist the workers in this regard. Regarding the national revenue and royalties’ payment, there will be unfortunately nothing that the Proponent would do to mitigate this. The impact significance of unemployment can be reduced from medium to low, by implementing mitigation measures. The impact assessed in **Table 21** below is that of employment loss only.

**Table 21: Assessment of the impacts of exploration activities closure on employment**

| Mitigation Status | Extent  | Duration | Intensity | Probability | Significance |
|-------------------|---------|----------|-----------|-------------|--------------|
| Pre mitigation    | M - 3   | L/M - 2  | M - 6     | M/H - 4     | M – 44       |
| Post mitigation   | L/M - 2 | L/M - 2  | L/M - 4   | L/M - 2     | L - 16       |

**Mitigations and recommendation to minimize joblessness**

- The Proponent should inform the employees on time, of its intentions to cease the exploration works and the expected date of such closure. This will provide the employees with enough time to search for work elsewhere.
- The Proponent should raise awareness of the possibilities for work in industrial sectors.

To conclude this chapter, it is found that most of the identified potential negative impacts are rated as medium significant. Therefore, in order to reduce the significance from medium to low, it is recommended that the Proponent effectively implement mitigation measures. Furthermore, in order to maintain low significance, the implementation of measures will need to be continuously monitored.

## 8 RECOMMENDATIONS AND CONCLUSIONS

### 8.1 Recommendations

The key potential impacts associated with the proposed exploration program and its associated activities were identified and assessed. In order to avoid and minimise (where impacts cannot be avoided) the identified project impacts, mitigation measures were recommended. The significant identified impacts for the project phases on the environmental features are summarized below. These impacts can be reduced or minimised by implementing the mitigation measures and given under the impact assessment chapter and also management actions plan provided in the Draft EMP.

- **Loss of Biodiversity:** EDS consultant has advised the Proponent (in section 7.3.1) to avoid unnecessary removal of vegetation, in order to promote a balance between biodiversity and their operations. Under the current status, the impact can be considered to be of a medium significance rating. With the implementation of appropriate mitigation measures (provided in the EMP, **Appendix B**), the rating will significantly be reduced to low.
- **Generation of Dust:** The generation of dust by exploration operations is considered minimal, and therefore of medium significance without any mitigation measures. The medium significance of this impact can be reduced by properly implementing mitigation measures (provided in the EMP, **Appendix B**).
- **Waste Generation:** Without any mitigation measure, the impact has a medium significance. The impact will be of low significance from medium, upon implementing the mitigation measures (provided in the EMP, **Appendix B**).
- **Visual Impact (Scars) on Landscape:** Currently, the visual impact can be rated as slightly medium to low significance, but upon effectively implementing the measures (provided in the EMP, **Appendix B**).
- **Potential Health and Safety Risks:** Improper handling of mining materials and equipment may cause health and safety risks such as injuries to workers. The impact is probable and has a medium significance rating. However, with adequate mitigation measures, the impact rating will be reduced to low (provided in the EMP, **Appendix B**).

- **Surrounding Soils Impacted:** The impact can be rated as medium, if no mitigation measures are implemented. However, with the implementation of mitigation measures, the impact significance will reduce to low (provided in the EMP, **Appendix B**).
- **Archaeological impact:** There is no information provided and/or established about the known heritage or site of cultural values within the EPLs or in the vicinity of the project site area. Therefore, this impact can be rated medium to low, if there are no mitigation measures in place. Upon implementation of the necessary measures, the impact significance will be low (provided in the EMP, **Appendix B**).
- **Noise:** Without any mitigation, the impact is rated as of medium significance. In order to change the impact significance from the pre-mitigation significance to low rating, the mitigation measures should be implemented (provided in the EMP, **Appendix B**).

## 8.2 Conclusions

The potential positive and negative impacts stemming from the proposed prospecting and exploration activities on the EPL 6031 & 6917 were identified, assessed and mitigation measures made thereof. The mitigation measures and recommendations provided in this EIA report and the management action plans provided in the draft EMP can be deemed sufficient to avoid and/or reduce (where impact avoidance is impossible) the risks to acceptable levels. EDS is therefore confident that these measures are sufficient and thus recommends that the Proponent be issued with the Environmental Clearance Certificate (ECC) to enable the exploration of base metals on the tenements, EPL 6031 and 6917. However, the ECC should be issued on a condition that the provided management measures and action plans are effectively implemented on site and monitored. Most importantly, monitoring of the environmental components described in the impact assessment chapter should be conducted by the Proponent and applicable Competent Authority. This is to ensure that all potential impacts identified in this study and other impacts that might arise during the exploration program implementation are properly identified in time and addressed. Lastly, should the ECC be issued, the Proponent will be expected to be compliant with the ECC conditions as well as legal requirements governing the mineral exploration and related activities.

## 9 REFERENCES

- Ansaah, L. H. (2008). *Kwame Nkrumah University of Science & Technology*. Retrieved from Theses: Rehabilitation of Small Scale Mined Out Areas: <http://ir.knust.edu.gh/xmlui/handle/123456789/1520>
- Booth, P. (2011). *Environmental Conceptual Site Model Exercise: Source – pathway – receptor*. WSP Global: Semantic Scholar.
- Cermak, J. . (2012). *Low clouds and fog along the South-Western African coast—Satellite-based retrieval and spatial patterns*. *Atmospheric Research*, 116, 15–21.
- Christelis, G. and Struckmeier, F. (editors). (2001). *Groundwater in Namibia: An Explanation to the Hydrogeological Map*. Windhoek: Ministry of Agriculture, Water and Forestry.
- Christelis, G. and Struckmeier, W. (eds). (2001). *Groundwater in Namibia: An Explanation to the Hydrogeological Map*. Windhoek: Ministry of Agriculture, Water and Forestry.
- Hardap Regional Council. (2019). Retrieved 2 December, 2019 from: <http://www.hardaprc.gov.na/about-us>
- Heath, R. G. M. (2006). *Small-Scale Mines, Their Cumulative Environmental Impacts and Developing Countries Best Practice Guidelines for Water Management*. Auckland Park: Pulles Howard & de Lange.
- Minerals Council of Australia. (1998). *Mine Rehabilitation: Handbook*. Dickson, Canberra: Minerals Council of Australia.
- Mweemba, M. S. (2014). Small-Scale Mining in Namibia: An Overview. *Theme: “Earth Sciences and Climate Change: Challenges to Development in Africa”: 7th conference of the African Association of Women in Geosciences, Sub theme: Earth sciences and the community* (p. 4). Windhoek: Ministry of Mines and Energy.
- Rehoboth Basters. (2019). Retrieved from: <http://rehobothbasters.org/news/89-water-on-tap-for-klein-aub?id=89>
- Seely, M. K., Klintonberg, P., & Henschel, J. R. (2008). Learning from the desert 19. *Journal of Arid Land Studie*, 1–3.