Vibrant Upstream Services (Pty) Ltd

Final Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) Report to Support the Application for Renewal, Amendment and Transfer of Environmental Clearance Certificate (ECC) for 2.63 Ha Leased Land on Farm 38 from the Walvis Bay Municipality for Warehousing and Storage Facilities for Oil and Gas Exploration and Production Support Services by Vibrant Upstream Services (Pty) Ltd

Walvis Bay Municipality, Erongo Region

August 2023

Vibrant Upstream Services (Pty) Ltd
8612 Hosea Kutako
Drive, Southport Building, 1st Floor,
Unit 6A & B, Southern Industrial,
Windhoek, Namibia

PROPONENT, LISTED ACTIVITIES AND RELATED INFORMATION SUMMARY

Proponent
Vibrant Upstream Services (Pty) Ltd

Type of Authorisation Requiring
Environmental Clearance Certificate (ECC)
2.63 Ha Leased Land on Farm 38 from the Walvis Bay Municipality for
Warehousing and Storage Facilities for
Oil and Gas Exploration and Production Support Services

Ministry of Environment, Forestry and Tourism (MEFT)
ECC Reference Application No.
APP-230829002063

Competent Authority
Ministry of Mines and Energy (MME)

Project Title / Subject on the ECC
Environmental Clearance Certificate (ECC) for 2.63 Ha Leased Land on Farm 38
from the Walvis Bay Municipality for Warehousing and Storage Facilities for
Oil and Gas Exploration and Production Support Services,
Walvis Bay Municipality Erongo Region

Location of the Project Area
Walvis Bay Municipality, Erongo Region
(Latitude: -23.004508, Longitude: 14.612569)

Environmental Regulator and National Regulatory Framework
Ministry of Environment, Forestry and Tourism (MEFT),
Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007) and
Environmental Impact Assessment (EIA) Regulations No. 30 of 2012

Address of the Proponent and Contact Person
8612 Hosea Kutako
Drive, Southport Building, 1st Floor,
Unit 6A & B, Southern Industrial,
WINDHOEK, NAMIBIA

Permitting / De-Risking Advisors / Environmental Consultants
Risk-Based Solutions (RBS) CC
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P. O. Box 1839, **WINDHOEK, NAMIBIA**
Tel: +264-61-306058 / 224780 / 236598, **Fax:** +264-61-245001
Email: smwiya@rbs.com.na, **Global Office** / **URL:** www.rbs.com.na

Environmental Assessment Practitioner (EAP)
Environmental Assessment Practitioner (EAP)
Dr Sindila Mwiya
(*PhD, PG Cert, MPhil, BEng (Hons), Pr Eng*)

Content List

List of Figures

List of Tables

NON-TECHNICAL SUMMARY

Vibrant Upstream Services (Pty) Ltd (the Proponent) had applied to the Walvis Bay Municipality to lease 2.63 Ha portion of land which form part of Farm 38. The Walvis Bay Municipality has approved the land lease application by the Proponent subject to the fulfilment of certain conditions, including obtaining Environmental Clearance Certificate (ECC) with respect to the proposed activities. The leased land falls within Farm 38, situated in the Walvis Bay Municipality town boundary in the Erongo Region. The leased land has existing infrastructure and supporting services with limited additional infrastructure likely to be added within the demarcated portion of Farm 38. The Proponent intends to use the leased land for warehousing and storage with respect to the oil and gas exploration and production services. The Proponent is involved in storage and warehousing, permitting and licensing for oilfield service companies, marine services, logistics and custom clearance, tubular services, fabrication, engineering works, manpower supply, training, and development.

The activities to be undertaken on the leased land are listed in the Environmental Management Act, 2007, (Act No. 7 of 2007) and cannot be undertaken without an Environmental Clearance Certificate (ECC). The leased land by the Proponent form part of the 2769.5 Ha portion of Farm 38 land on which and an ECC dated 24th July 2012 was obtained by Mr. J. Gurirab of Erongo Quarry and Civil Work with respect to the warehousing, storage and quarrying activities. This Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) Report prepared by the Risk-Based Solutions (RBS) CC on behalf of the Proponent to support the application for the renewal, amendment and transfer of the ECC over the leased land on Farm 38.

This EIA and EMP Report covers the impact assessment and management of the activities associated with the proposed operation of the warehouse and storage facility on the leased land covering the following project developmental stages:

(i) Permitting and preconstruction activities may be required.

(ii) Construction of the warehousing and storage infrastructure.

(iii) Operation, ongoing monitoring and rehabilitation of the warehousing and storage and.

(iv) Decommissioning, closure and aftercare of the site.

Walvis Bay municipal area which is home to the country's biggest Port, covers 1124 km² which includes 60 km of coastline. It is situated on the edge of the Namib Desert, which is the world's oldest desert. Relative humidity is approximately 80% and rainfall is less than 20 mm per annum. Walvis Bay has an estimated pollution of 67 201 people with the industrial base dominated by the operations of the Port of Walvis Bay, fisheries, tourism, mining, and trading.

It is estimated that at least 54 reptile, 7 amphibian, 42 mammal and 182 bird species (breeding residents) are known to or expected to occur in the general area of which a large proportion are endemics species. Endemics species include at least 50% of the reptiles, 43% of the amphibians, 29% of the mammals and 4% (7 of the 14 Namibian endemics species) of all the breeding and/or resident birds known and/or expected to occur in the general area. Between 26 and 39 species of larger trees and shrubs are known and/or expected to occur in the general area of which 6 species are classified as endemic (i.e., 15.4%) while up to 48 grasses – 6 to 37 species – occur in the general area around.

The construction of warehousing and storage facilities on the portion of land falling on Farm 38 within the Walvis Bay municipal area will have insignificant impacts on the local receiving environment with extremely unlikely probability of occurrence without mitigations. Overall significant impacts will be negligible except for the socioeconomic components which will be low positive. The leased land is already disturbed with existing infrastructure and the surrounding areas are also not pristine. Based on the findings of EIA, it is hereby recommended that the leased land to be used for warehousing and storage facilities be issued with an ECC with key conditions of adhering to all the provisions of the EMP and requirements and conditions of the Lease Agreement and all applicable by-laws and national regulations. Mitigation measures shall be implemented as detailed in Section 6 (EMP) of this report.

1. BACKGROUND

1.1 Introduction

Vibrant Upstream Services (Pty) Ltd (the Proponent) holds approval to lease 2.63 Ha portion of land which form part of Farm 38 from the Walvis Bay Municipality. The Walvis Bay Municipality has approved the land lease application subject to the fulfilment of certain conditions, including obtaining Environmental Clearance Certificate (ECC) with respect to the proposed activities.

Vibrant Upstream Services (Pty) Ltd is a wholly owned Namibian energy, oilfield services and infrastructure development company set up to provide support services to the upstream Oil and Gas industry. Vibrant is committed to enhancing local content and developing the capacity of Namibian individuals and businesses throughout our operations. In partnership with international market leaders in oil and gas services, we aim to fill the gaps identified in the local industry and ensure our clients get world class services while simultaneously developing the local competency of Namibia and the rest of Africa.

The Proponent is involved in storage and warehousing, permitting and licensing for oilfield service companies, marine services, logistics and custom clearance, tubular services, fabrication, engineering works, manpower supply, training, and development. The Proponent has the financial capacity to make use of the leased land, put up the required temporary structures and pay the lease fees. The financial backing of the Proponent is from the combination of own capital contribution and investor equity.

1.2 Regulatory Requirements

The activities to be undertaken by the Proponent on the leased land covering warehousing and storage support services to the oil and gas, and energy companies, are listed in the Environmental Management Act, 2007, (Act No. 7 of 2007) and cannot be undertaken without an Environmental Clearance Certificate (ECC).

The leased land area by the Proponent form part of the 2769.5 Ha portion of Farm 38 land on which an ECC dated 24th July 2012 was granted by the Environmental Commissioner in the Ministry of Environment, Forestry, and Tourism (MEFT) (Fig. 1.1). The ECC was granted to Mr. J. Gurirab of Erongo Quarry and Civil Work with respect to warehousing, storage and quarrying activities (Fig. 1.1).

This Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) Report has been prepared by the Risk-Based Solutions (RBS) CC on behalf of the Proponent to support the application for the renewal, amendment and transfer of the current ECC over the leased land on Farm 38.

1.3 Location, Land Use and Supporting Infrastructure

1.3.1 Location

The leased land by the Proponent falls within Farm 38, situated in the Walvis Bay Municipality town boundary in the Erongo Region. The leased land has existing infrastructure and supporting services with limited additional infrastructure likely to be added within the demarcated land.

The regional terrain around the leased land is flat and sandy with no major drainage or Ephemeral streams. The local sandy terrain form part of the surrounding Namib Desert sand dune area.

REPUBLIC OF NAMIBIA

MINISTRY OF ENVIRONMENT AND TOURISM

Tel: (061) 284 2701
Fax: (061) 240 339
Enquiry: Ms. Saima Angula

Capital Centre, 6th Floor
Private Bag 13306
Windhoek

OFFICE OF THE ENVIRONMENTAL COMMISSIONER

J. Gurirab
P.O. Box 1256
Walvisbay
Namibia

Dear Sir

SUBJECT: ENVIRONMENTAL CLEARANCE FOR THE PROPOSED QUARRYING ACTIVITIES NEAR WALVISBAY, ERONGO REGION

The Environmental Impact Assessment (EIA) submitted is sufficient as it made an adequate provision of the environmental management concerning the proposed activities. From this perspective regular environmental monitoring and evaluations on environmental performance should be conducted. Targets for improvements should be established and monitored throughout this process.

In view of the fact that your project is located in an environmentally sensitive area, this Ministry reserves the right to attach further legislative and regulatory conditions during the operational phase of the project. From this perspective, we issue this clearance with the following condition: all key stakeholders, particularly the regional authority, must be properly consulted and written consent obtained prior to any development activities.

On the basis of the above, this letter serves as an environmental clearance for the project to proceed. However, this clearance letter does not in anyway hold the Ministry of Environment and Tourism accountable of any wrong doing, for insufficient information, nor any adverse effects that may arise from this project activity. Instead, full accountability rests with the proponent and his/ her consultants.

Yours sincerely,

MINISTRY OF ENVIRONMENT & TOURISM
P/Bag 13306
Windhoek. Namibia
24-07-2012
Office of the Environmental Commissioner

Teofilus Nghitila
ENVIRONMENTAL COMMISSIONER

Figure 1.1: Copy of the ECC granted to Mr. J. Gurirab of Erongo Quarry and Civil Work (Pty) Ltd on the 24th July 2012. This current ECC need to be renewed, amended and transferred to the current Proponent with respect to the current leased land portion of Farm 38.

1.3.2 Current Land Uses

The leased land area is not pristine and is dominated by a number of old excavations, waste rock and litter linked to the historical activities and other associated current land uses.

The proposed activities will to some extent address some of the current poor state of the local environment that has not been rehabilitated over many years of historical operations linking to the surrounding mining / quarrying operations.

The land use around the leased land area is dominated by gravel and dimension stone quarrying operations, telecommunication services towers and Namibia Defence Force shotting range.

1.3.3 Supporting Infrastructure

The leased land area is accessible via the C14 Road from Walvis Bay (Figs. 1.2-1.7). A number of minor gravel roads linked to the C14 provide good access to Farm 38 and the leased land area (Figs. 1.3-1.7).

The warehousing and storage facilities will not require major water and energy supplies. Water requirements for the warehousing and storage facilities will be transported from Walvis Bay and stored onsite in tanks.

Electricity needs will be supplied by generator and later connect to the Erongo Red network, the regional electricity distributor. Diesel and petrol will be obtained from the main sources of fuels and readily available Walvis Bay.

Likely limited liquid and solid wastes will be management as follows:

(i) Management of wastewater will utilise a French Drain or Septic Tanks systems. Once the onsite storage is full, it will be emptied and waste water will be disposed off at the Walvis Bay Sewage Works, and.

(ii) Generated solid waste will be stored in separated containers marked hazardous and non-hazardous waste and occasional taken for recycling or disposed off at the general or hazardous waste as may be applicable and in line with the Walvis Bay Municipality wate management by laws.

Figure 1.2: Regional location leased land portion of Farm 38, Walvis Bay municipal area.

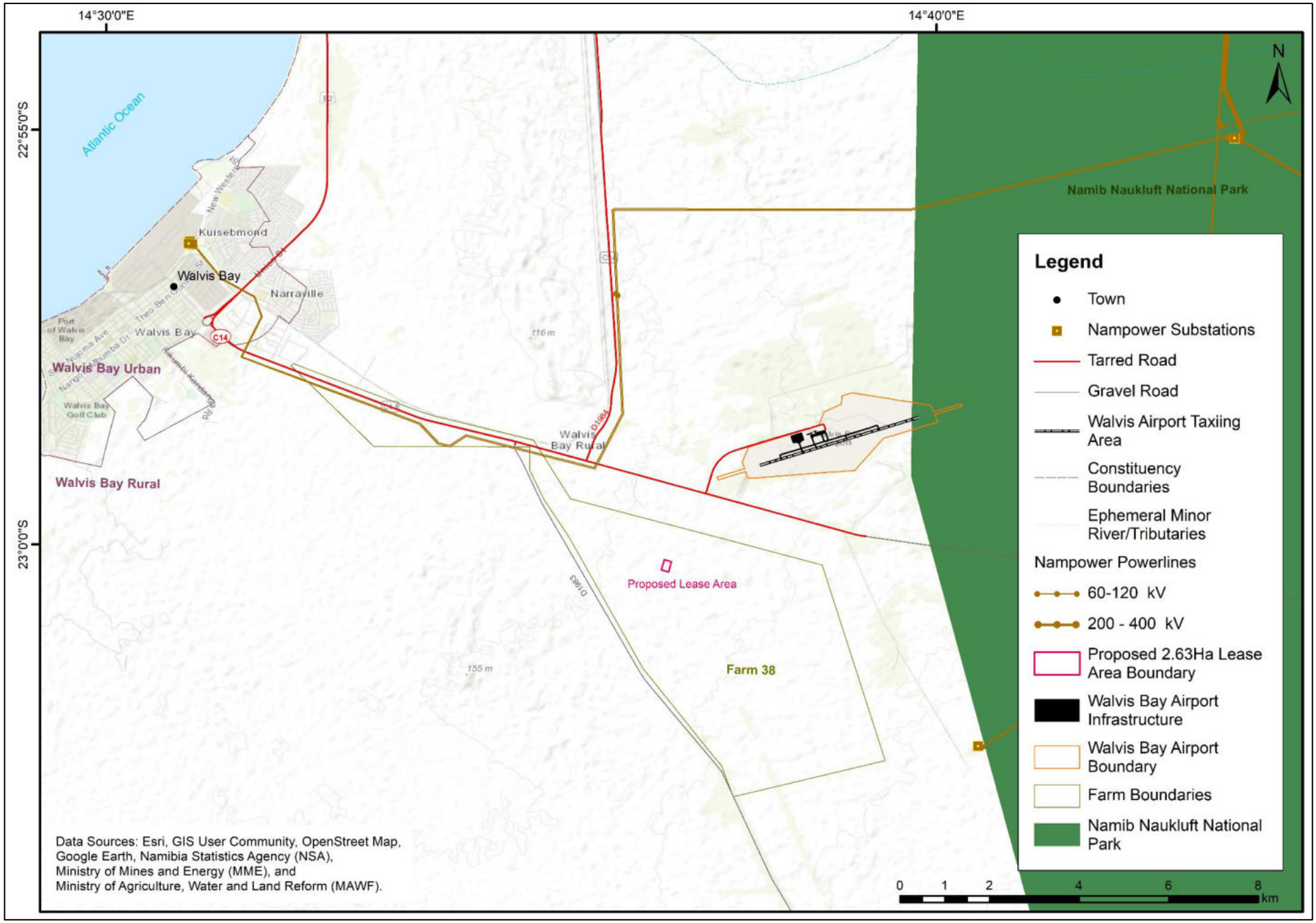

Figure 1.3: Detailed regional location of the leased land portion of Farm 38, Walvis Bay municipal area.

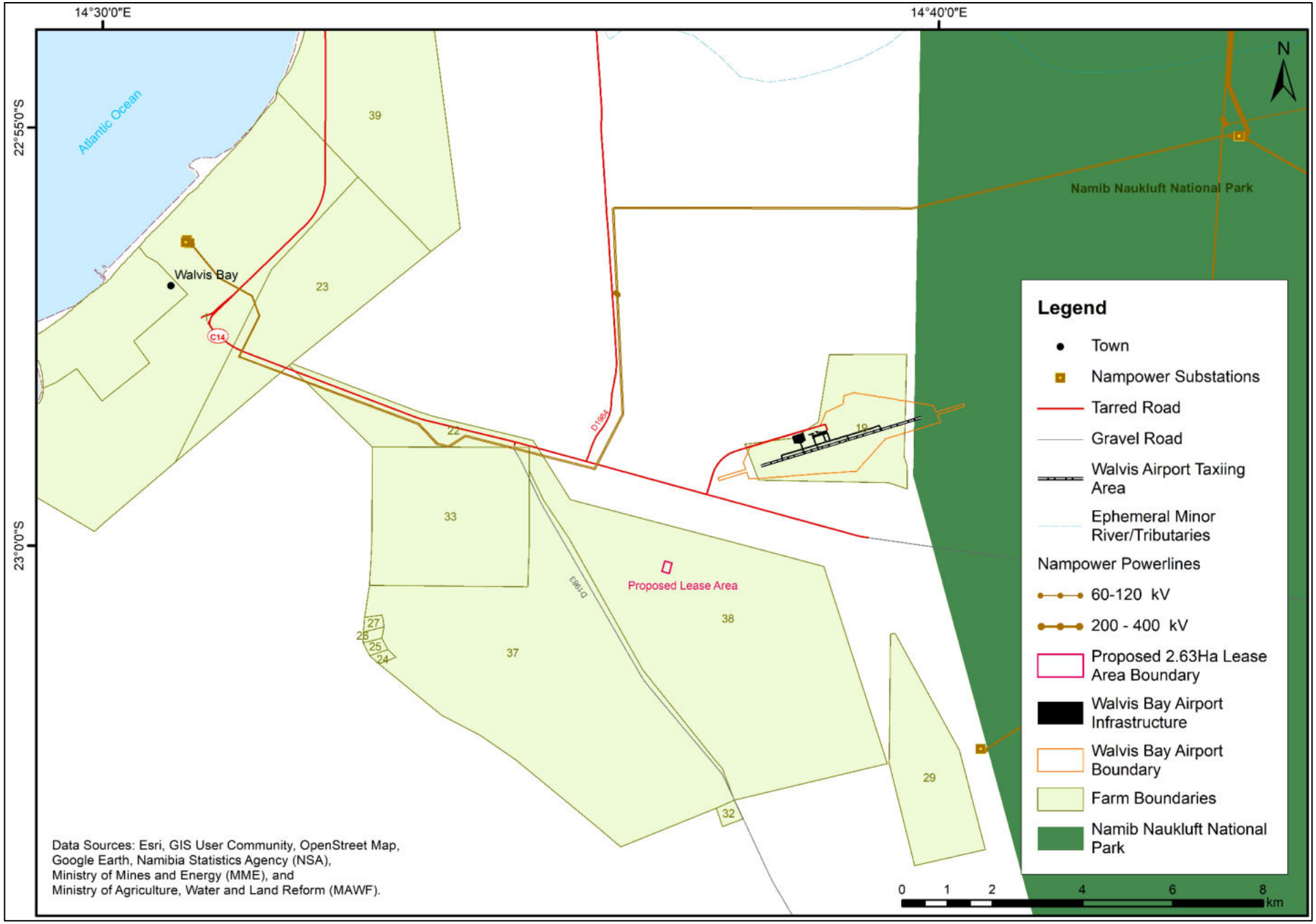

Figure 1.4: Detailed location of the leased land portion of Farm 38, Walvis Bay municipal area.

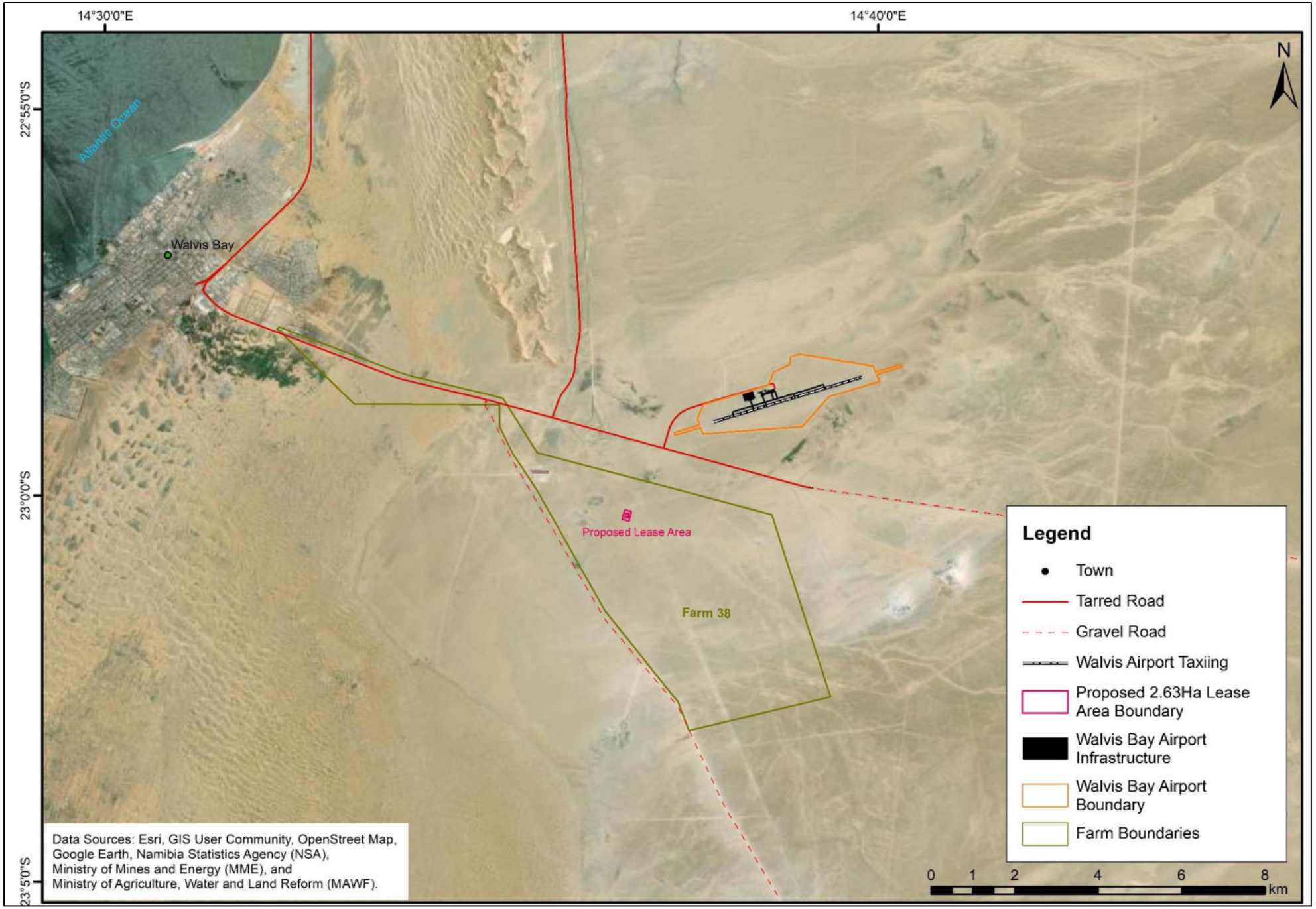

Figure 1.5: Detailed regional satellite image location of the leased land portion of Farm 38, Walvis Bay municipal area.

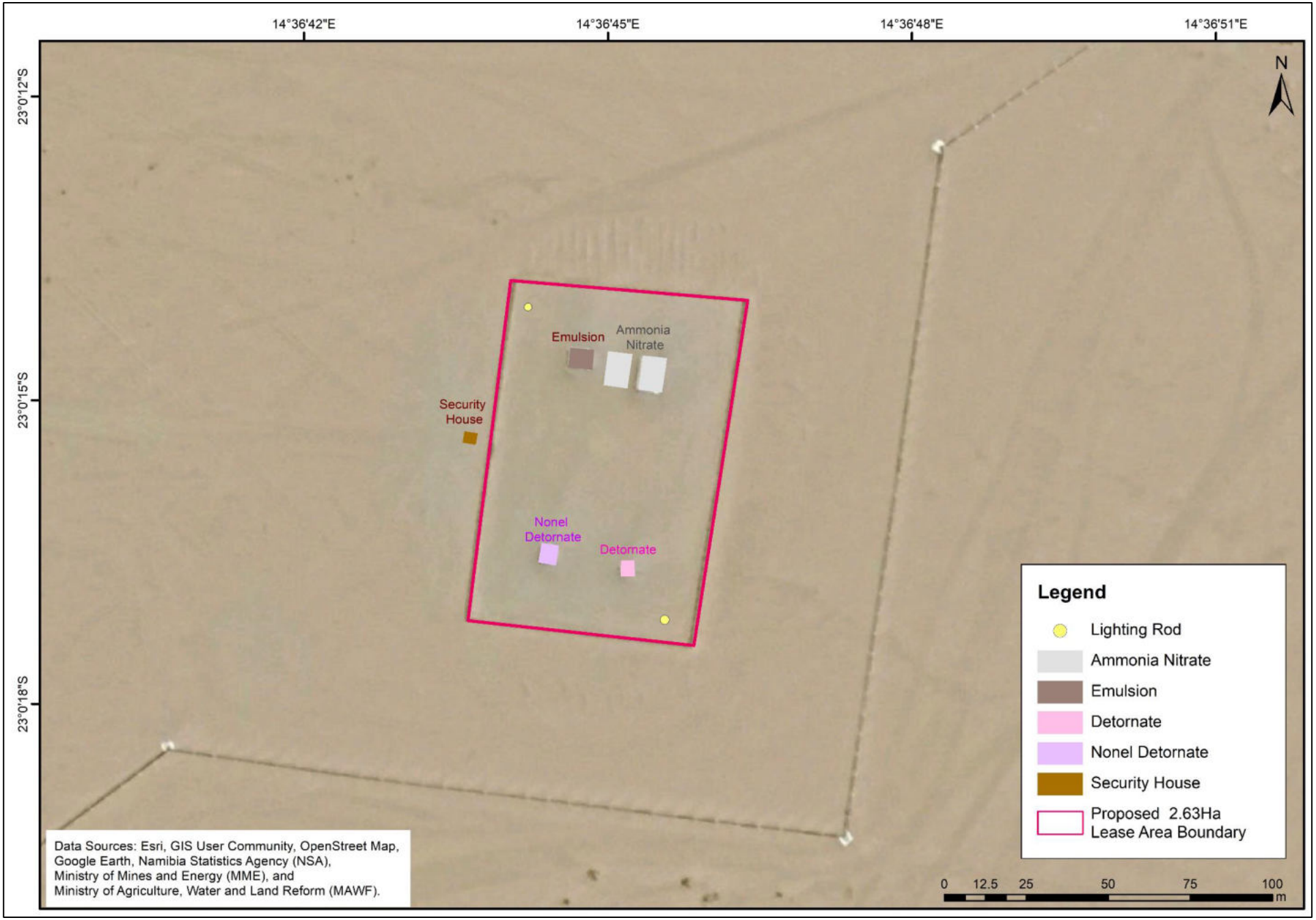

Figure 1.6: Detailed satellite image location of the leased land portion of Farm 38, Walvis Bay municipal area.

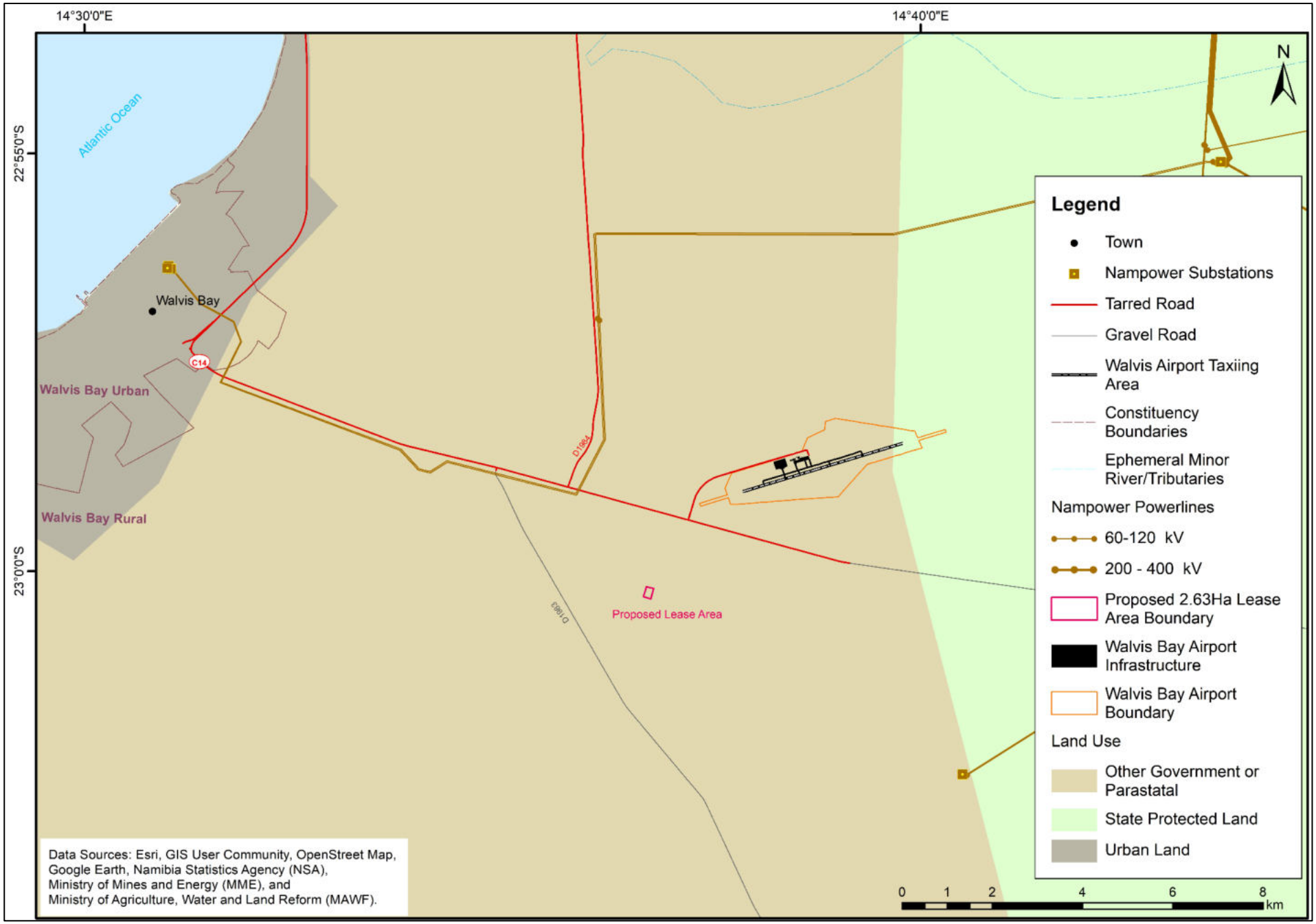

Figure 1.7: Detailed regional land uses around the leased land portion of Farm 38, Walvis Bay municipal area.

2. PROPOSED PROJECT AND ASSESSMENT METHODOLOGY

2.1 Summary of the Proposed Project Activities

Vibrant Upstream Services (Pty) Ltd (the Proponent) holds approval to lease 2.63 Ha portion of land which form part of Farm 38 from the Walvis Bay Municipality as shown in Fig. 2.1. The leased land will be used for warehousing and storage support services to the oil and gas, and energy companies. Temporary structures for warehousing and storage of oil and gas related consumables and tools such as explosives and radioactive sources.

All the storage facilities for explosives and radioactive sources oil and gas tools, will be bult in accordance with the international required standards and national regulatory building codes as shown in Figs. 2.2 and 2.3.

The following is the summary of the land lease and proposed activities:

- Type of proposed activities to be undertaken on the leased land: Warehousing and storage support services to the oil and gas, and energy companies.
- Current land owner: Walvis Bay Municipality.
- Proponent: Vibrant Upstream Services (Pty) Ltd
- Size of the leased land: 2.63 Ha portion of Farm 38, Walvis Bay municipal area, and.
- Environmental Clearance Certificate Status: Required for the proposed project and current ECC was granted on the 24th July 2012 to Mr. J. Gurirab of Erongo Quarry and Civil Work. The current ECC need to be renewed, amended and transferred to Vibrant Upstream Services (Pty) Ltd.

This EIA and EMP Report covers the impact assessment and management of the activities associated with the proposed development of the warehouse and storage facility on the leased land covering the following project developmental stages:

(i) Permitting and preconstruction activities may be required.

(ii) Construction of the warehousing and storage infrastructure.

(iii) Operation, ongoing monitoring and rehabilitation of the warehousing and storage and.

(iv) Decommissioning, closure and aftercare of the site.

2.2 Project Motivation (Needs and Desirability)

The lease of land to the Proponent will help create much needed employment opportunities, and value to the town of Walvis Bay.

It is estimated that about nine (9) employment opportunities will be created. The operation of the warehousing and storage facilities will be enhanced creation of new skills and services from the oil and gas, mining, and energy sectors.

As part of corporate social commitments in giving back to the community of Walvis Bay in addition to the job opportunities being created, the Proponent is prepared to invest up to 5% of profits in any institutional endeavour of any recognised Vocational Training Centre in the Walvis Bay area.

Figure 2.1: Overview of the leased land to be used for warehousing and storage support services to the oil and gas, and energy companies.

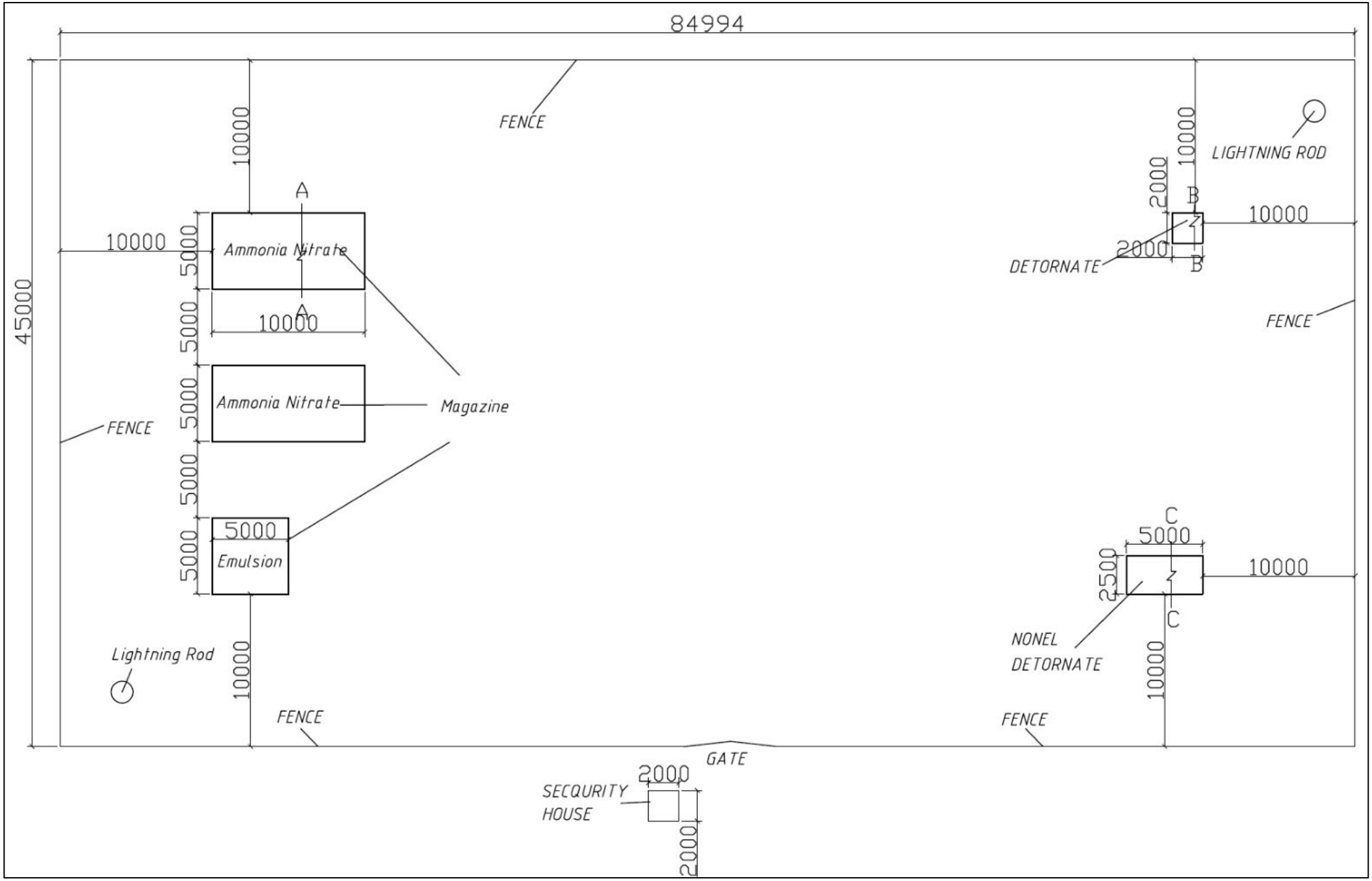

Figure 2.2: Detailed layout of the leased land to be used for warehousing and storage support services to the oil and gas, and energy companies.

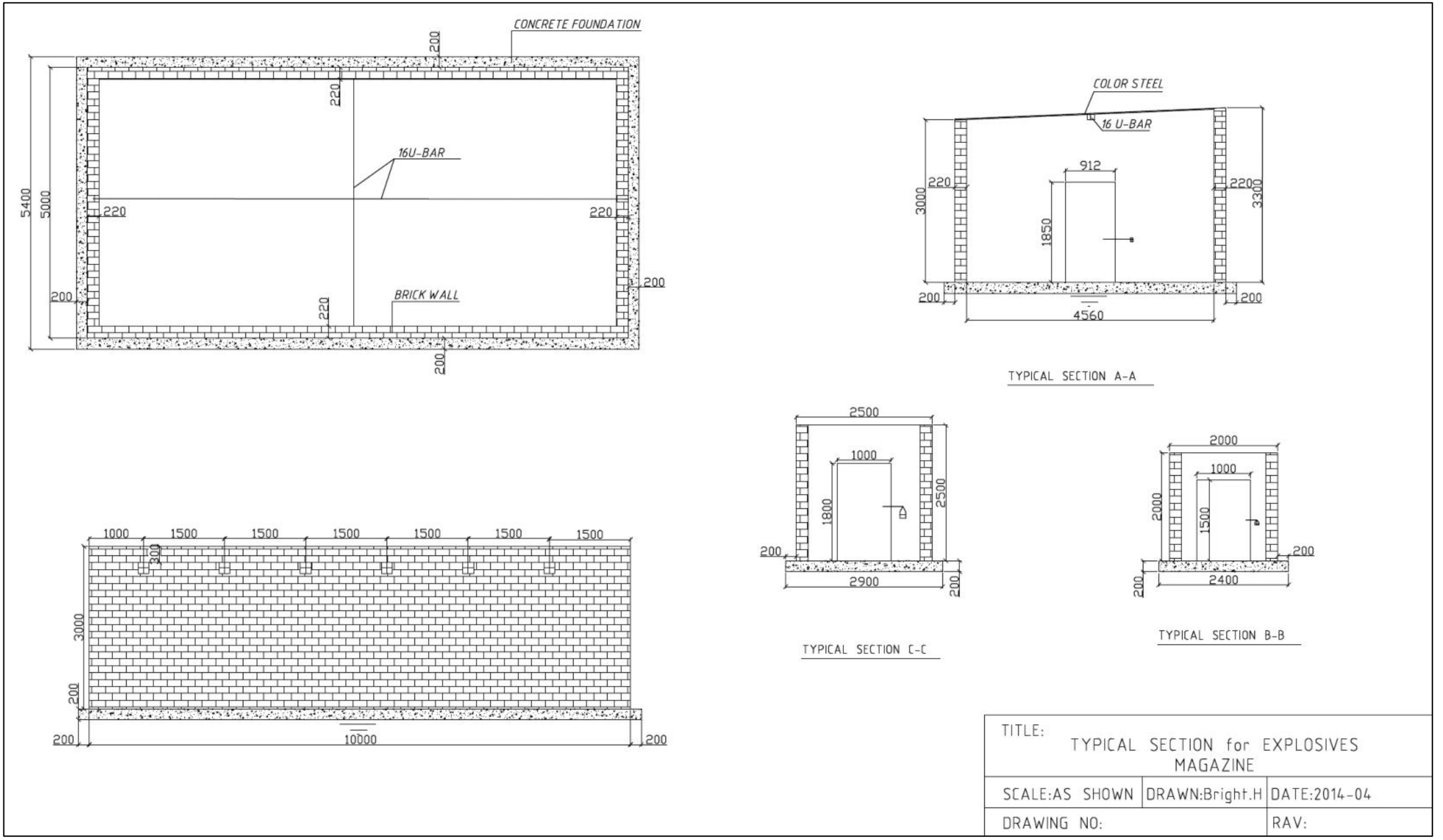

Figure 2.3: Example of the detailed design of an oil and gas explosives magazine tools banker to be bult on the leased land in accordance with the international required standards and national regulatory building codes.

2.3 Approach, Alternatives, Key Issues and Methodology

2.3.1 Terms of Reference (ToR) and Approach

Risk-Based Solutions (RBS) was appointed by the Proponent to prepare this EIA and EMP based on the approved screening by the Environmental Commissioner in order to support the application for renewal, amendment and transfer of the part thereof of the Environmental Clearance Certificate (ECC) for Farm 38 with respect to the warehousing and storage facilities activities to be built on portion to be leased by the Proponent.

The environmental assessment and management process reviewed the key components of the previous EIA and EMP Report, receiving environmental settings (physical, biological, socioeconomic and ecosystem services, function, use values and non-use) with respect to the proposed activities, identified and assessed the likely impacts (positive and negative) on the receiving environment (Table 2.1).

The key deliverable comprises this EIA and EMP Report as per the provisions of the confirmation of screening notice send to the Proponent by the Environmental Commissioner through email in terms of the assessment procedures (Section 35 (1)(a)(b) of the Environmental Management Act, No 7 of 2007).

The EIA and EMP Report and the completed applications for the renewal, amendment and transfer of the current Environmental Clearance Certificate (ECC) will be submitted to the client (Proponent) and the Office of the Environmental Commissioner, Department of Environmental Affairs and Forestry (DEAF), Ministry of Environment, Forestry and Tourism (MEFT) through the Mining Commissioner in Ministry of Mines and Energy (the Competent Authority on oil and gas exploration and production) for review and issue of the Record of Decision (RD).

The environmental assessment processes has been performed with reasonable skill, care and diligence in accordance with professional standards and practices existing at the date of performance of the assessment and that the guidelines, methods and techniques that have been applied are all in conformity to the national regulatory requirements, process and specifications in Namibia as required by Ministry of Mines and Energy (MME), Ministry of Environment, Forestry and Tourism (MEFT) and the client (Proponent). This Scoping and EMP Report has been prepared in line with the January 2015 MEFT Environmental Assessment Reporting Guideline.

Table 2.1: Summary of the proposed / ongoing activities, alternatives and key issues considered during the Environmental Assessment (EA) process covering Scoping, EIA and EMP Processes.

<table>
<tr><th>PROPOSED / ONGOING PROJECT ACTIVITIES</th><th>ALTERNATIVES TO BE CONSIDERED</th><th colspan="2">KEY ISSUES EVALUATED AND ASSESSED WITH ENVIRONMENTAL MANAGEMENT PLAN (EMP) / MITIGATION MEASURES DEVELOPED</th></tr>
<tr><td rowspan="8">(i) Permitting and preconstruction activities may be required.
(ii) Construction of the warehousing and storage infrastructure.
(iii) Operation, ongoing monitoring and rehabilitation of the warehousing and storage and.
(iv) Decommissioning, closure and aftercare of the site.</td><td rowspan="8">(i) Location of the leased land.
(ii) Other Alternative land uses
(iii) Ecosystem Function (What the Ecosystem Does.
(iv) Ecosystem Services.
(v) Use Values.
(vi) Non-Use, or Passive Use.
(vii) The No-Action Alternative</td><td colspan="2">Potential land use conflicts / opportunities for coexistence between proposed activities and other existing land uses such as conservation, tourism and other industrial activities</td></tr>
<tr><td rowspan="3">Impacts on the Physical Environment</td><td>Natural Environment such as air, noise, water, dust etc.</td></tr>
<tr><td>Built Environment such as existing houses, roads, transport systems, Buildings, energy and water and other supporting infrastructure</td></tr>
<tr><td>Socioeconomic, archaeological and Cultural impacts on the local societies and communities</td></tr>
<tr><td rowspan="4">Impacts on the Biological Environment</td><td>Flora</td></tr>
<tr><td>Fauna</td></tr>
<tr><td>Habitat</td></tr>
<tr><td>Ecosystem functions, services, use values and non-Use or passive use</td></tr>
</table>

2.3.2 Environmental Assessment Process and Steps

The environmental assessment process adopted for this project took into considerations the provisions of the Environmental Impact Assessment (EIA) Regulations, 2012 and the Environmental Management Act (EMA), 2007, (Act No. 7 of 2007) as outlined in Fig. 2.4.

2.3.3 Assumptions and Limitations

The following assumptions and limitations underpin the approach adopted, overall outcomes and recommendations for this study:

- The proposed activities as well as all the plans, maps, leased land boundary / coordinates and appropriate data sets received from the Proponent, project partners, regulators, Walvis Municipality, Competent Authorities and specialist assessments are assumed to be current and valid at the time of conducting the studies and compilation of this environmental report.

- The impact assessment outcomes, mitigation measures and recommendations provided in this report are valid for the entire duration of the proposed project activities.

- A precautionary approach has been adopted in instances where baseline information was insufficient or unavailable or site-specific information on the proposed project activities are not yet available, and.

- Mandatory timeframes as provided for in the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 and the Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007) have been observed and will apply to the review and decision of this report by the Competent Authority and the Environmental Commissioner.

2.4 Structure of the Report

The following is the summary structure outline of this EIA and EMP Report prepared based on the confirmation of the screening notice send to the Proponent by the Environmental Commissioner through email in terms of the assessment procedures (Section 35 (1)(a)(b) of the Environmental Management Act, No 7 of 2007):

- **Section 1: Background** covering the proposed project location with available infrastructure and services.

- **Section 2: Project Description** covering the summary of the proposed project activities.

- **Section 3: Regulatory Framework** covering the proposed activities with respect to relevant legislation, regulations and permitting requirements.

- **Section 4: Receiving Environment** covering physical, biological and socioeconomic environments of the proposed project area.

- **Section 5: Impact Assessment** covering the likely positive and negative impacts the proposed project activities are likely to have on the receiving environment.

- **Section 6: Environmental Management Plan (EMP)** describing the detailed mitigation measures with respect to the identified likely impacts.

- **Section 7: Conclusions and Recommendations**- Summary of the findings and way forward.

- **SECTION 8: Annexes**

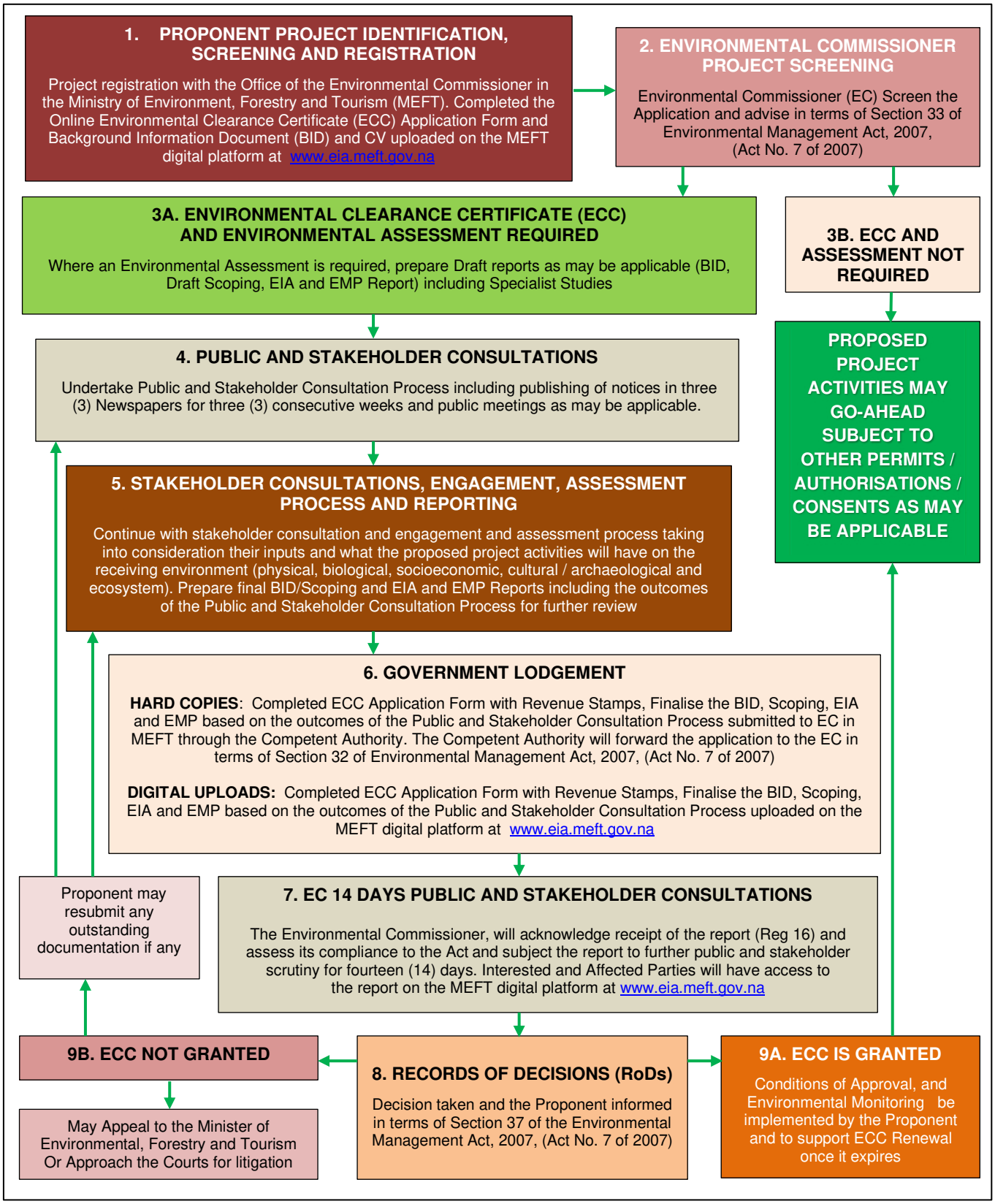

Figure 2.4: RBS Schematic presentation of Namibia's Environmental Assessment Procedure.

3. LEGISLATIVE FRAMEWORK

3.1 Overview

The constitution is the supreme law of Namibia. All other laws must be in line with it. The most important legislative instruments and associated permits\licenses\authorisations\concerts\ compliances applicable to the proposed activities include: Environmental management, land rights, water, atmospheric pollution prevention and labour as well as other indirect laws linked to the accessory services and infrastructure to be developed on the leased land.

3.2 Key Applicable Legislation

3.2.1 Environmental Management Legislation

The Environmental Assessment (EA) process in Namibia is governed by the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 gazetted under the Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007) in the Ministry of Environment, Forestry and Tourism (MEFT). The objectives of the Act and the Regulations are, among others, to promote the sustainable management of the environment and the use of natural resources to provide for a process of assessment and control of activities which may have significant effects on the environment. The Minister of Environment, Forestry and Tourism (is authorised to list activities which may only be undertaken if an environmental clearance certificate has been issued by the environmental commissioner, which activities include those relating to the proposed project activities. In addition to the requirements for undertaking Environmental Assessment prior to the project implementation, the Environmental Management Act and the EIA Regulations also provide for obligations of a license holder to provide for project rehabilitation and closure plan. In the regulations, the definition of "rehabilitation and closure plan" is a plan which describes the process of rehabilitation of an activity at any stage of that activity up to and including closure stage.

3.2.2 Water Legislation

Water Act 54 of 1956 under the Minister of Agriculture, Water and Land Reform (MAWLR) provides for the control, conservation and use of water for domestic, agricultural, urban and industrial purposes. In terms of Section 6, there is no right of ownership in public water and its control and use is regulated and provided for in the Act. In accordance with the Act, the Proponent shall ensure that water protection and management mechanisms are implemented to prevent water pollution. Certain permits will also be required to abstract groundwater as well as for "water works". The broad definition of water works will include the reservoir on site (as this is greater than 20,000m^3), water treatment facilities and pipelines. Due to the water scarcity of the area, all water will be recycled (including domestic wastewater). The Act requires the license holder to have a wastewater discharge permit for discharge of effluent. The Water Act 54 of 1956 is due to be replaced by the Water Resources Management Act 24 of 2004 which is currently being revised. The Water Resource Management Act 2004 *provides for the management, development, protection, conservation and use of water resources.*

3.2.3 Forest Regulations and Permit Requirements

All forms of trees and wood harvesting anywhere in Namibia, is governed by the Forest Act, 2001, (Act No. 12 of 2001). and its Regulations, 2015. The Act also governs activities which take place in classified forests, namely State Forests, Forestry Management Areas and Community Forests as well as non-classified forest areas. This Act is administered by the Directorate of Forestry (DoF) in the Ministry of Environment, Forestry and Tourism (MEFT).

3.2.4 Atmospheric Pollution Prevention Legislation

The Atmospheric Pollution Prevention Ordinance, 11 of 1976 falling under the Ministry of Health and Social Services (MHSS) provide for the prevention of the pollution of the atmosphere, and for matters incidental thereto. Part III of the Act sets out regulations pertaining to atmospheric pollution by smoke.

While preventative measures for dust atmospheric pollution are outlined in Part IV and Part V outlines provisions for Atmospheric pollution by gases emitted by vehicles.

3.2.5 Labour, Health and Safety Legislations

The Labour Act, 1992, Act No. 6 of 1992 as amended in the Labour Act, 2007 (Act No. 11 of 2007), falling under the Ministry of Labour, Industrial Relations and Employment Creation (MLIREC) refers to severance allowances for employees on termination of a contract of employment in certain circumstances and health, safety, and welfare of employees. In terms of the Health Safety and Environment (HSE), the Labour Act, 2007 protects employees and every employer shall, among other things: provide a working environment that is safe, without risk to the health of employees, and that has adequate facilities and arrangements for the welfare of employees, provide and maintain plant, machinery and systems of work, and work processes, that are safe and without risk to the health of employees, and ensure that the use, handling, storage or transportation of hazardous materials or substances is safe and without risk to the health of employees. All hazardous substances shall have clear exposure limits and the employer shall provide medical surveillance, first-aid and emergency arrangements as fit for the operation.

3.2.6 Other Applicable National Legislations

Other Important legislative instruments applicable to the permitting, construction, operation and closure of the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area include the following (Table 3.1):

- Explosives Act 26 of 1956 (as amended in SA to April 1978) – Ministry of Home Affairs, Immigration, Safety and Security (MHAISS).
- Atomic Energy and Radiation Protection Act (Act No. 5 of 2005) - Ministry of Health and Social Services.
- National Heritage Act 27 of 2004 – Ministry of Education, Arts and Culture (MEAC).
- Petroleum Products and Energy Act 13 of 1990 – Ministry of Mines and Energy (MME).
- Nature Conservation Ordinance, No. 4 of 1975 – Ministry of Environment, Forestry and Tourism (MEFT).
- Forest Act 12 of 2001 – Ministry of Environment, Forestry and Tourism (MEFT).
- Hazardous Substances Ordinance 14 of 1974 – Ministry of Health and Social Services (MHSS), and.
- Public Health Act 36 of 1919 – Ministry of Health and Social Services (MHSS).

3.3 International and Regional Treaties and Protocols

Article 144 of the Namibian Constitution provides for the enabling mechanism to ensure that all international treaties and protocols are ratified. All ratified treaties and protocols are enforceable within Namibia by the Namibian courts and these include the following:

- The Paris Agreement, 2016.
- Convention on Biological Diversity, 1992.
- Vienna Convention for the Protection of the Ozone Layer, 1985.
- Montreal Protocol on Substances that Deplete the Ozone Layer, 1987.
- United Nations Framework Convention on Climate Change, 1992.

- ❖ Kyoto Protocol on the Framework Convention on Climate Change, 1998.
- ❖ Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and Their Disposal, 1989.
- ❖ World Heritage Convention, 1972.
- ❖ Convention to Combat Desertification, 1994. and
- ❖ Stockholm Convention of Persistent Organic Pollutants, 2001.
- ❖ Southern Africa Development Community (SADC) Protocol on Mining, and.
- ❖ Southern Africa Development Community (SADC) Protocol on Energy.

3.4 Standards and Guidelines

Industrial effluent likely to be generated by the proposed activities must comply with provisions of the Government Gazette No 217 dated 5 April 1962 (Table 3.1) while the drinking water quality comparative guideline values are shown in Table 3.2. The only key missing components to the regulatory frameworks in Namibia are the standards, and guidelines with respect to gaseous, liquid, and solid emissions. However, in the absence of national gaseous, liquid, and solid emission limits for Namibia, the proposed project shall target the Multilateral Investment Guarantee Agency (MIGA) gaseous effluent emission level and liquid effluent emission levels (Table 3.3). Noise abatement measures must target to achieve either the levels shown in Table 3.4 or a maximum increase in background levels of 3 dB (A) at the nearest receptor location off-site (MIGA guidelines).

Table 3.1: R553 Regional Standards for Industrial Effluent, in Government Gazette No 217 dated 5 April 1962.

Colour, odour and taste	The effluent shall contain no substance in concentrations capable of producing colour, odour or taste	
pH	Between 5.5 and 9.5	
Dissolved oxygen	At least 75% saturation	
Typical faecal coli	No typical faecal coli per 100 ml	
Temperature	Not to exceed 35 °C	
Chemical demand oxygen	Not to exceed 75 mg/l after applying a correction for chloride in the method	
Oxygen absorbed	Not to exceed 10 mg/l	
Total dissolved solids (TDS)	The TDS shall not have been increased by more than 500 mg/l above that of the intake water	
Suspended solids	Not to exceed 25 mg/l	
Sodium (Na)	The Na level shall not have been increased by more than 50 mg/l above that of the intake water	
Soap, oil and grease	Not to exceed 2.5 mg/l	
Other constituents	Residual chlorine	0,1 mg/l as Cl
	Free and saline ammonia	10 mg/l as N
	Arsenic	0,5 mg/l as As
	Boron	1,0 mg/l as B
	Hexavalent Cr	0,05 mg/l as Cr
	Total chromium	0,5 mg/l as Cr
	Copper	1,0 mg/l as Cu
	Phenolic compounds	0,1 mg/l as phenol
	Lead	1,0 mg/l as Pb
	Cyanide and related compounds	0,5 mg/l as CN
	Sulphides	1,0 mg/l as S
	Fluorine	1,0 mg/l as F
	Zinc	5,0 mg/l as Zn

Table 3.2: Comparison of selected guideline values for drinking water quality (after Department of Water Affairs, 2001).

Parameter and Expression of the results			WHO Guidelines for Drinking-Water Quality 2nd edition 1993		Proposed Council Directive of 28 April 1995 (95/C/13-1/03) EEC	Council Directive of 15 July 1980 relating to the quality intended for human consumption 80/778/EEC		U.S. EPA Drinking water Standards and Health Advisories Table December 1995		Namibia, Department of Water Affairs Guidelines for the evaluation of drinking-water for human consumption with reference to chemical, physical and bacteriological quality July 1991			
			Guideline Value (GV)		Proposed Parameter Value	Guide Level (GL)	Maximum Admissible Concentration (MAC)	Maximum Contaminant Level (MCL)		Group A Excellent Quality	Group B Good Quality	Group C Low Health Risk	Group D Unsuitable
Temperature	t	°C		-	-	12	25		-	-	-	-	-
Hydrogen ion concentration	pH, 25° C	-	R	<8.0	6.5 to 9.5	6.5 to 8.5	10		-	6.0 to 9.0	5.5 to 9.5	4.0 to 11.0	<4.0 to >11.0
Electronic conductivity	EC, 25° C	mS/m		-	280	45	-		-	150	300	400	>400
Total dissolved solids	TDS	mg/l	R	1000	-	-	1500		-	-	-	-	-
Total Hardness	$CaCO_3$	mg/l		-	-	-	-		-	300	650	1300	>1300
Aluminium	Al	µ g/l	R	200	200	50	200	S	50-200	150	500	1000	>1000
Ammonia	NH_4^+	mg/l	R	1.5	0.5	0.05	0.5		-	1.5	2.5	5.0	>5.0
	N	mg/l		1.0		0.04	0.4		-	1.0	2.0	4.0	>4.0
Antimony	Sb	µ g/l	P	5	3	-	10	C	6	50	100	200	>200
Arsenic	As	µ g/l		10	10	-	50	C	50	100	300	600	>600
Barium	Ba	µ g/l	P	700	-	100	-	C	2000	500	1000	2000	>2000
Berylium	Be	µ g/l		-	-	-	-	C	4	2	5	10	>10
Bismuth	Bi	µ g/l		-	-	-	-		-	250	500	1000	>1000
Boron	B	µ g/l		300	300	1000	-		-	500	2000	4000	>4000
Bromate	BrO_3^-	µ g/l		-	10	-	-	P	10	-	-	-	-
Bromine	Br	µ g/l		-	-	-	-		-	1000	3000	6000	>6000
Cadmium	Cd	µ g/l		3	5	-	5	C	5	10	20	40	>40
Calcium	Ca	mg/l		-	-	100	-		-	150	200	400	>400
	$CaCO_3$	mg/l		-	-	250	-		-	375	500	1000	>1000
Cerium	Ce	µ g/l		-	-	-	-		-	1000	2000	4000	>4000
Chloride	Cl^-	mg/l	R	250	-	25	-	S	250	250	600	1200	>1200
Chromium	Cr	µ g/l	P	50	50	-	50	C	100	100	200	400	>400
Cobalt		µ g/l		-	-	-	-		-	250	500	1000	>1000
Copper after 12 hours in pipe	Cu	µ g/l	P	2000	2	100	-	C	TT##	500	1000	2000	>2000
		µ g/l		-	-	3000[1]	-	S	1000	-	-	-	-
Cyanide	CN^-	µ g/l		70	50	-	50	C	200	200	300	600	>600
Fluoride	F^-	mg/l		1.5	1.5	-	at 8 to 12 °C: 1.5	C	4	1.5	2.0	3.0	>3.0
		mg/l		-	-	-	at 25 to 30 °C: 0.7	P,S	2	-	-	-	-
Gold	Au	µ g/l		-	-	-	-		-	2	5	10	>10
Hydrogen sulphide	H_2S	µ g/l	R	50	-	-	undetectable		-	100	300	600	>600
Iodine	I	µ g/l		-	-	-	-		-	500	1000	2000	>2000
Iron	Fe	µ g/l	R	300	200	50	200	S	300	100	1000	2000	>2000
Lead	Pb	µ g/l		10	10	-	50	C	TT#	50	100	200	>200
Lithium	Li	µ g/l		-	-	-	-		-	2500	5000	10000	>10000
Magnesium	Mg	mg/l		-	-	30	50		-	70	100	200	>200
	$CaCO_3$	mg/l		-	-	7	12		-	290	420	840	>840
Manganese	Mn	µ g/l	P	500	50	20	50	S	50	50	1000	2000	>2000
Mercury	Hg	µ g/l		1	1	-	1	C	2	5	10	20	>20
Molybdenum	Mo	µ g/l		70	-	-	-		-	50	100	200	>200
Nickel	Ni	µ g/l		20	20	-	50		-	250	500	1000	>1000
Nitrate*	NO_3^-	mg/l	P	50	50	25	50		45	45	90	180	>180
	N	mg/l		-	-	5	11	C	10	10	20	40	>40
Nitrite*	NO_2^-	mg/l		3	0.1	-	0.1		3	-	-	-	-
	N	mg/l		-	-	-		C	1	-	-	-	-
Oxygen, dissolved	O_2	% sat.		-	50	-	-		-	-	-	-	-
Phosphorus	P_2O_5	µ g/l		-	-	400	5000		-	-	-	-	-
	PO_4^{3-}	µ g/l		-	-	300	3350		-	-	-	-	-
Potassium	K	mg/l		-	-	10	12		-	200	400	800	>800
Selenium	Se	µ g/l		10	10	-	10	C	50	20	50	100	>100
Silver	Ag	µ g/l		-	-	-	10	S	100	20	50	100	>100
Sodium	Na	mg/l	R	200	-	20	175		-	100	400	800	>800
Sulphate	SO_4^{2-}	mg/l	R	250	250	25	250	S	250	200	600	1200	>1200
Tellurium	Te	µ g/l		-	-	-	-		-	2	5	10	>10
Thallium	Tl	µ g/l		-	-	-	-	C	2	5	10	20	>20
Tin	Sn	µ g/l		-	-	-	-		-	100	200	400	>400
Titanum	Ti	µ g/l		-	-	-	-		-	100	500	1000	>1000
Tungsten	W	µ g/l		-	-	-	-		-	100	500	1000	>1000
Uranium	U	µ g/l		-	-	-	-	P	20	1000	4000	8000	>8000
Vanadium	V	µ g/l		-	-	-	-		-	250	500	1000	>1000
Zinc after 12 hours in pipe	Zn	µ g/l	R	3000	-	100	-	S	5000	1000	5000	10000	>10000
		µ g/l		-	-	5000	-		-	-	-	-	-

P: Provisional
R: May give reason to complaints from consumers

C: Current. P: Proposed. S: Secondary.
T#: Treatment technique in lieu of numeric MCL.
TT##: treatment technique triggered at action level of 1300 µ g/l

Table 3.3: Liquid effluent emission levels (MIGA /IFC).

Pollutant	**Max. Value**
pH	6-9
Total suspended solids	50 mg/l
Total metals	10 mg/l
Phosphorous (P)	5 mg/l
Fluoride (F)	20 mg/l
Cadmium (Cd)	0.1 mg/l

Table 3.4: Noise emission levels (MIGA /IFC).

	Maximum Allowable Leq (hourly), in dB(A)	
Receptor	Day time (07:00 – 22:00)	Night time (22:00 – 07:00)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

3.5 Recommendations on Permitting Requirements

It is hereby recommended that the Proponent must follow the provisions of all relevant national regulatory throughout the proposed project lifecycle and must obtain the following permits/ authorisations as maybe applicable / required as the proposed project development:

(i) Land lease agreement.

(ii) Valid ECC from the Department of Environmental Affairs and Forestry in the MEFT.

(iii) Permits to import and export, transport, store and usage of explosive and radioactive sources if managed on the leased land, and.

(iv) The Proponent shall apply for all other permits as may be applicable.

4. RECEIVING ENVIRONMENT

4.1 Climatic Settings

The leased land area falls within the pro-Namib Coastal Zone and receives summer rainfall which is brought by northeast winds, generally from October to April (Fig. 4.1) The average annual rainfall varies considerably and ranges between 300 mm and 400 mm (Fig. 4.1). Regional mean annual gross evaporation around the leased land area is about 3200 mm.

The numbers of rainfall events expressed as an annual average in days as determined from the regional data is 10-30 days. The sun shines for an annual average of 10 hours a day. The annual mean temperature for is around 24°C with the mean monthly temperatures ranging between 23°C to 14°C throughout the year (Fig. 4.2). Seasonal variations in the wind fields are presented by the average wind data for January, April, July and October. An increase in the north to north-easterly winds during summer (January) and autumn (April) is likely (Fig. 4.2).

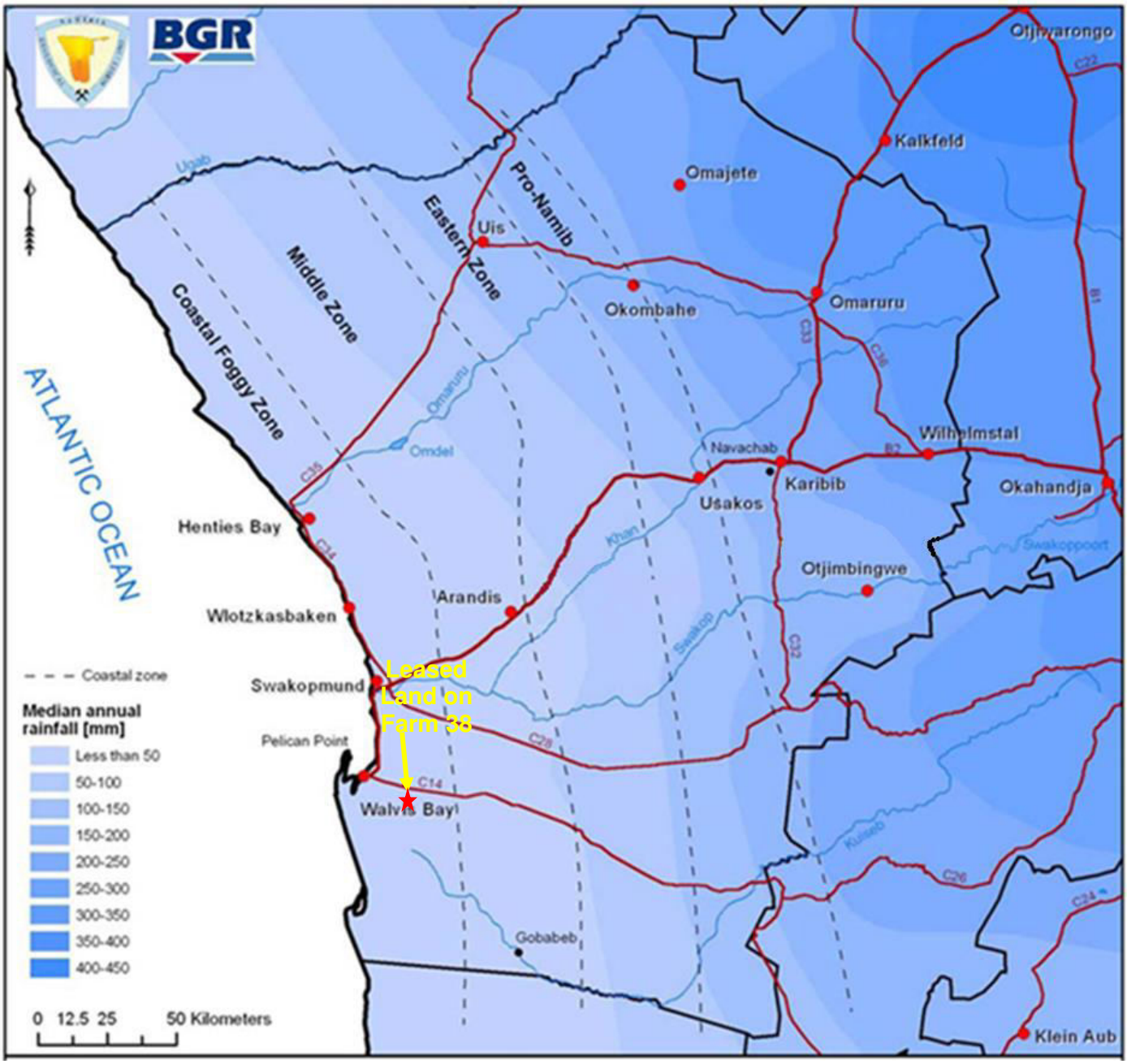

Figure 4.1: Median annual rainfall of central Namib Desert showing the location of the leased land on Farm 38 (Source: Ministry of Mines and Energy (MME), 2010).

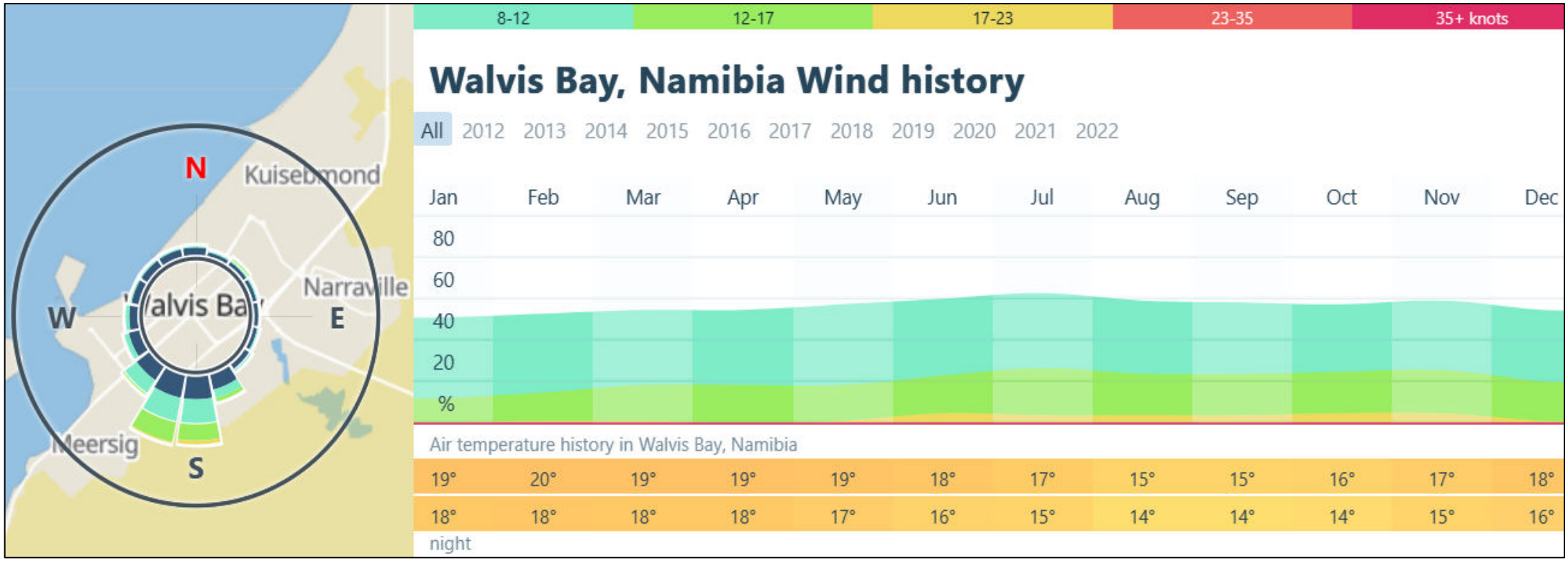

Figure 4.2: Prevailing wind direction, average wind speed and air temperature at Walvis Bay, location of the leased land on Farm 38 (Source: https://windy.app).

4.2 Topography

The leased land area around Farm 38 falls within the topographically low laying areas (Figs. 4.3 and 4.4). The general surrounding topography is dominated Namib Desert sandy and rocky landscape. The proposed development will result in localised negative visual impacts on the physical landscape and resources associated with other landscape uses such as recreation or tourism.

Although the proposed leased land area seems to be hidden from major public road / settlement, potential contributors to likely visual impacts will include disturbed ground profiles, and access roads. Rehabilitation of all disturbed areas shall be undertaken and the reclaimed lands should, to the extent feasible, conform to the visual aspects of the surrounding landscape. The reclamation design and procedures should take into consideration the proximity to public viewpoints and the visual impact within the context of the viewing distance.

4.3 Flora Diveristy

The central coastal region with the exception of the Walvis Bay and Swakopmund town lands has formal conservation surrounding it in the Namib-Naukluft Park and the National West Coast Recreational Area. Important tree and shrub species in the general Walvis Bay area are the endemics (i.e., Adenia pechuelii, Arthraerua leubnitziae, Commiphora dinteri, C. saxicola, C. virgata & Euphorbia damarana) as well as the species protected under the Forestry Ordinance No. 37 of 1952, Forest Act No. 72 of 1968, Nature Conservation Ordinance No. 4 of 1975 and CITES Appendix 2. According to Müller (1984) the endemic grass Eragrostis omahekensis potentially occurs in the general area although the updated Müller (2007) excludes this species suggesting that it probably does not occur in the area.

The flagship plant of the Namib Desert is Welwitschia mirabilis (Endemic and classified as Vulnerable and CITES appendix II) with the core populations falling outside the formal protected areas is an important species in the general Walvis Bay area (Burke 2003).

The lichen fields are difficult to protect as these mainly fall within the National West Coast Recreational Area although some areas have been fenced off for better protection over the last few years. The overall diversity of lichens is poorly known from Namibia, especially the coastal areas and statistics on endemicity is even sparser (Craven 1998). More than 100 species are expected to occur in the Namib Desert with the majority being uniquely related to the coastal fog belt. Lichen diversity is related to air humidity and generally decreases inland form the Namibian coast (Schults & Rambold 2007). Off road driving is the biggest threat to these lichens which are often rare and unique to Namibia. Another importance of the lichens is that the endemic Damara Tern often uses these fields as a breeding ground (Craven & Marais 1986).

To indicate how poorly known lichens are from Namibia, the recent publication by Schultz et al. (2009) indicating that 37 of the 39 lichen species collected during BIOTO surveys in the early/mid 2000's was new to science (i.e., new species), is a case in point.

Acanthosicyos horridus (!Nara) is endemic to the dunes of the Namib Desert and protected under the Forest Ordinance (Burke 2003) and are important as a source of food to the Topnaar community living in the Kuiseb River area. Destruction and/or unscrupulous harvesting thereof would pose a threat to these plants.

All Aloe species are protected in Namibia and thus viewed as important plants (Mendelsohn et al. 2002). Aloe species occurring in the general area may include A. asperifolia, Aloe dichotoma and Aloe namibensis (Burke 2003, Craven & Marais 1986, Rothman 2004).

Often deserts and plants associated with this marginal area look "dead" although are not, and thus not viewed as important. All desert vegetation serves as a source of habitat for desert dwelling fauna – e.g., arthropods and reptiles. It is certain that many other plant species will be viewed as economically important in the future, especially if viewed as medicinally important.

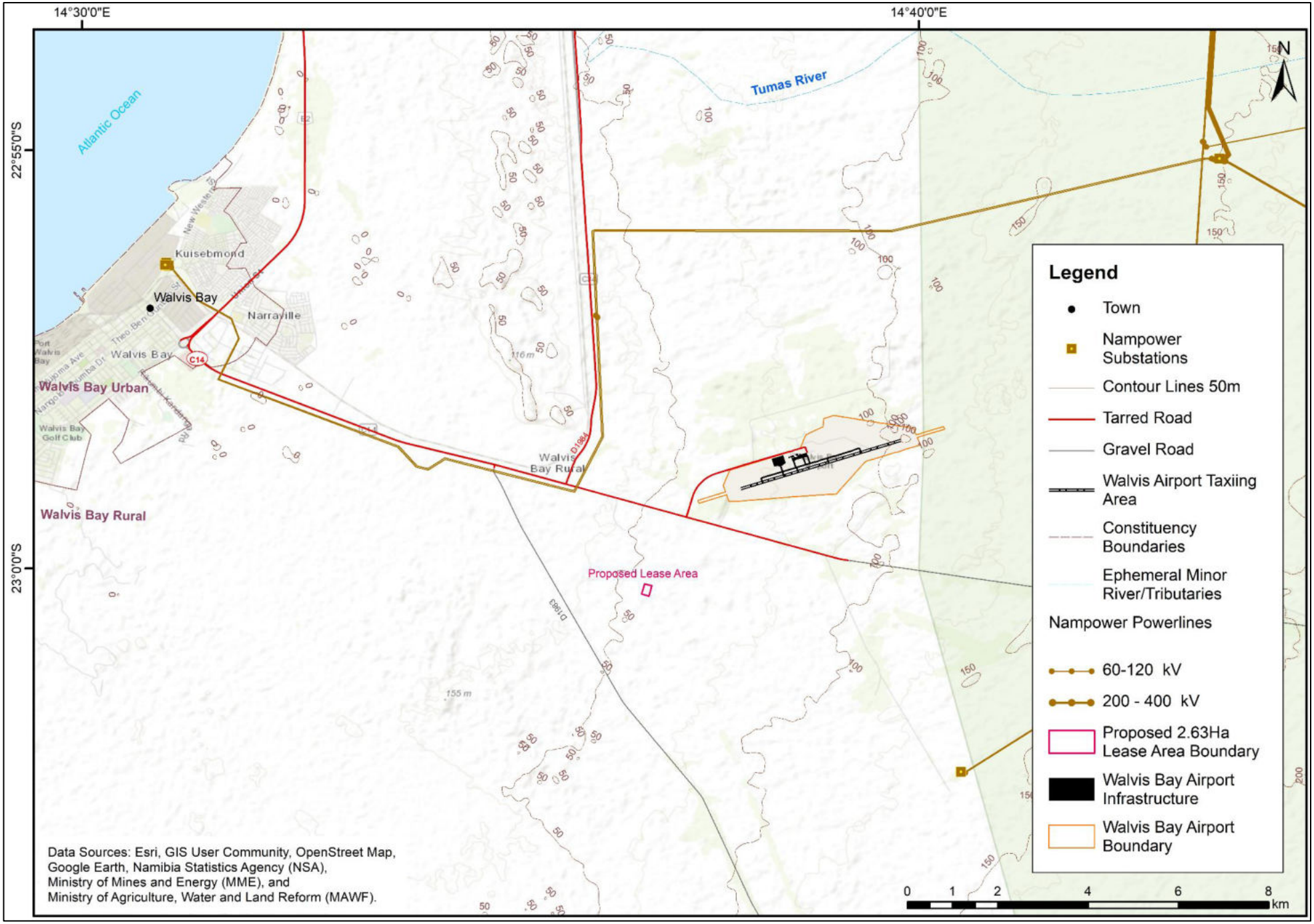

Figure 4.3: Regional topographic settings around the leased land area.

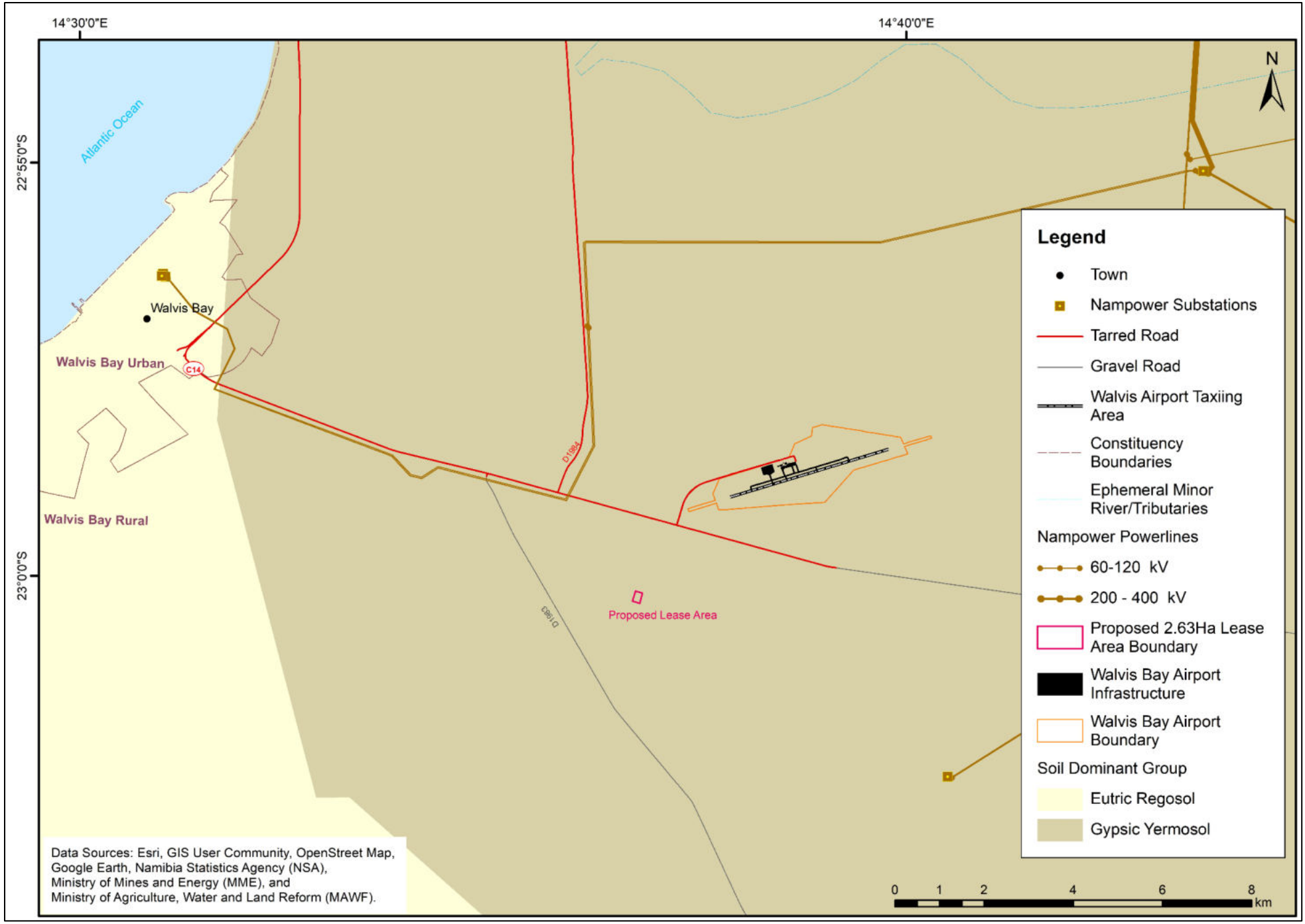

Figure 4.4: Local soils around the leased land area.

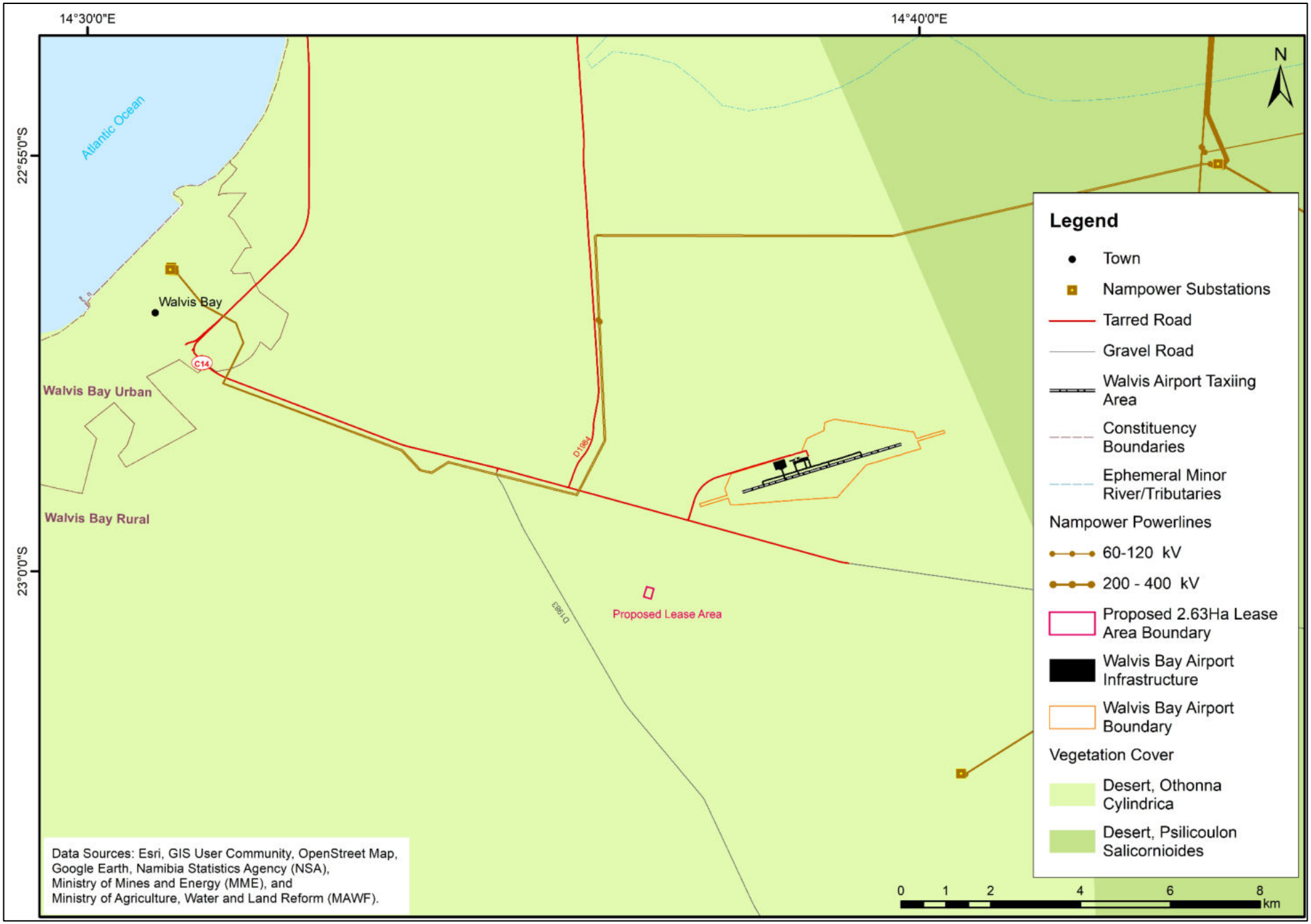

Figure 4.5: Regional vegetation zones around the leased land area.

4.4 Fauna Diversity

4.4.1 Reptiles

The high percentage of endemic reptile species (50%) known and/or expected to occur in the general Walvis Bay area underscores the importance of this area for reptiles. Reptile species of concern are the 2 thread snakes (*Leptotyphlops occidentalis* & *L. labialis*) as well as the sand burrowing/dwelling species such as *Bitis peringueyi* and the various *Meroles* species, especially *Meroles micropholidotus* classiefied as endemic and rare, as well as the high proportion (81%) of endemic gecko (e.g., *Pachydactylus* species) species of which very little is known about their ecological role and actual status in Namibia. The seemingly barren sandy dune and gravel plain areas around Walvis Bay are host to a variety of reptile fauna not often expected and/or acknowledged. Development and recreation often affect these species negatively.

4.4.2 Amphibians

Amphibians are generally not viewed as extremely important in saline coastal areas which are marginal habitat for most amphibians. Although 43% of the amphibians expected to occur in the general area are endemic to Namibia, they are expected to occur further inland – i.e., the Kuiseb River and rocky outcrops with temporary pools associated with these landforms, etc. – and not directly associated with Walvis Bay. The endemic *Phrynomantis annectens* is probably the amphibian of greatest concern in the area.

4.4.3 Mammals

Endemic mammals expected to occur in the general Walvis Bay area make up a relatively large percentage (33%) of the mammals known and/or expected from the area. Endemic mammal species of concern include the mole *Eremitalpa granti* and the two bats *Laephotis namibensis* and *Cistugo seabrai* as well as the Hairy-footed Gerbils (*Gerbillurus* sp.). Both bats are very poorly known with only a few records from the general area making them particularly important. The predator of concern is *Parahyaena* (*Hyaena brunnea*) which is classified locally as Insufficiently Known. Vulnerable and Peripheral with international status of Near Threatened (SARDB 2004) and Endangered (IUCN 2004).

4.4.4 Birds

The high proportion of endemic birds of which 50% (7 of 14 species) are endemic to Namibia and which are known and/or expected to occur in the general Walvis Bay area is important and should be taken into consideration regarding development in the area. Seabirds tend to be more mobile than most other birds with the highest species diversity and abundance along nutrient-rich waters such as the Benguela upwelling system along the Namibian coastline (Hockey et al. 2006).

Species of greatest concern include all the endemics as well as *Spheniscus demersus* (Critically Endangered – IUCN 1996), *Phalacrocorax coronatus* (Endangered – IUCN 1996), *Phoenicopterus minor* (Endangered – IUCN 1996) and *Haematopus moquini* (Vulnerable – IUCN 1996).

The Damara Tern (*Sterna balaenarum*) which breeds in the gravel plain and sandy beach areas in the Walvis Bay area is an endemic species as well as classified as Endangered (IUCN 1996). This species is possibly most threatened by development in the immediate Walvis Bay area. The Palaearctic migrants visiting the Walvis Bay lagoon area – mainly during the summer – are also of great importance with disturbance to the feeding area impacting globally on these birds.

The larger birds which follow local migration patterns such as the 2 Flamingo species (Walvis Bay – Etosha NP – Botswana) and the Great White Pelican (Walvis Bay – Etosha NP – Hardap Dam) would also be of concern. Flamingos have shown a downward trend in southern Africa with the Namibian coast regularly supporting 84% (40 000 to 47 000) of the Greater Flamingos and 85% (34 000 to 40 000) of the Lesser Flamingos, respectively (Simmons 1998c). This indicates the importance of the coastal areas for the species.

4.5 Socioeconomic

4.5.1 Regional Settings

The Erongo Region extending over 63,720 km^2 and the majority of the population lives in urban settlements, principally Swakopmund and Walvis Bay (Fig. 4.6). The surge in uranium exploration and mining operations has seen significant growth in various downstream industries in the coastal towns. The region has the second highest income per capita in the country after Khomas Region, and its relative prosperity is derived from fishing, mining and tourism.

Major mining activities in the region are Rössing Uranium, the Navachab gold mine, Langer Heinrich Uranium, Husab Uranium and the coastal salt operations. Other uranium projects that are also expected to advance further are those of Bannerman, Reptile Uranium and Swakop Uranium, but these do not exhaust the list of potential uranium operations in Erongo Region. The main commodities mined are uranium and gold. Extensive salt mining occurs along the coast at Walvis Bay and smaller companies operate at Cape Cross and Ugab.

Within the Erongo Region, access to economic opportunities and resources in the region is highly variable especially to rural communities. This is usually due to the isolation and underdeveloped infrastructures within these rural communities and is a situation experienced across all regional parts of the country.

The uneven pattern to development, benefits and economic opportunity significantly has results in a regional Gini co-efficient of 0.60, with 19.7% of the population being poor and 7.1% being extremely poor (National Planning Commission, 2006, 2007 and 2012).

The Erongo Regional Council has adopted developed strategies to address poverty reduction and economic development, with primarily focus on rural areas by initiating measures to insure sound management of the region's natural resources (www.erc.com.na). The Region's main focal areas for development include water resources, the environment, and tourism, fishing and marine resources.

4.5.2 Local Settings

Walvis Bay municipal area which is home to the country's biggest Port, and covers 1124 km² which includes 60 km of coastline (Fig. 4.6). It is situated on the edge of the Namib Desert, which is the world's oldest desert. Relative humidity is approximately 80% and rainfall is less than 20 mm per annum. Walvis Bay has an estimated pollution of 67 201 people with the industrial base dominated by the operations of the Port of Walvis Bay, fisheries, tourism, mining, and trading.

The following is summary of the regional and local socioeconomic setting of the region (Erongo Region) and local (Walvis Bay Area):

- There is a shortage of skills which hampers development projects.
- Infrastructure and facilities are available in the region and locally to support the proposed activities, but are not sufficient.
- Educational and health facilities are available but with an influx of people, may not be able to meet the demand.
- A high level of inequality exists, especially in urban areas.
- The main health concerns in the Erongo region are HIV/Aids, tuberculosis (TB), substance abuse, other respiratory system diseases and children in need of care. Mobility and migration increase vulnerability to HIV infection.
- Alcohol use increases with the increase in income and is a contributing factor to the HIV/Aids epidemic.

- ❖ Of all the regions, Erongo Region has the lowest poverty incidence rate of 7.1%, appreciably lower than the national rate of 28.7%. However, rural areas are noticeably more impoverished than urban areas, and.
- ❖ Crime is on the increase and in rural areas poaching and stock theft is a concern and high levels of unemployment, alcohol abuse and population density contributes to higher crime rates.

The development will have mainly positive impacts on the surrounding areas.

Figure 4.6: Map of the Erongo Region showing the location of the leased land area (Source: www.erc.com.na).

4.6 Ground Components

4.6.1 Geology

The leased land area falls within the Central Zone of the Damara Sequence which underlies most of Namibia. The oldest rocks within the Central Zone are the pre-Damaran basement that consists of gneiss and granite lithologies found in different parts of the zone (Fig. 4.7 and Table 4.1). According to Miller, (1983a), the sequence was deposited during successive phases of rifting, spreading, subduction and continental collision.

The basal succession (Nosib Group), laid down in or marginal to intracontinental rifts, consists of quartzite, arkose, conglomerate, phyllite, calc-silicate, subordinate, limestone and evaporitic rocks. Local alkaline ignimbrites with associated subvolcanic intrusions ranging from 840 to 720 million years in age also form part of the regional geology (Miller, 1992).

According to Miller, (1992), widespread carbonate deposition followed and overlapped far beyond early rift shoulders (Kudis, Ugab and basal Khomas Subgroups). interbedded mica and graphitic schist, quartzite (some ferruginous), massflow deposits, iron-formation and local within-plate basic lava point to fairly variable depositional conditions south of a stable platform where only carbonates with very minor clastics occur (Otavi Group). Near the southern margin of the orogen, deep-water fans, facies equivalents of the carbonates were deposited on either side of a Southern Zone Ocean separating Kalahari and Congo Cratons (Auas and Tinkas Formations). Thick schistose metagreywacke and metapelite (Kuiseb Formation) overlie the above rocks.

The lithostratigraphy of the Damara Sequence in the Central Zone (CZ) in which the leased land area falls has been reviewed and significantly revised by Badenhorst (1987), who has also correlated the stratigraphy across the Omaruru Lineament. The stratigraphy of the CZ taken from Steven (1993) as slightly modified after Badenhorst, (1987) and (1988) is given in Table 4.1 and Fig. 4.7).

Table 4.1: Partial Lithostratigraphy of the Damara Sequence in Central Namibia (Karibib-Swakopmund Area) (Source: Venmyn Deloitte, 2014).

GROUP	SUB-GROUP	FORMATION	THICKNESS (m)	LITHOLOGICAL DESCRIPTION
Swakop	Khomas	Kuiseb	3,000	Biotite-rich quartzo-feldspathic schist, biotite-garnet-cordierite schist, minor amphibolite schist, quartzite, calc-silicate rock and marble.
		Karibib	700	Marble, biotite schist, quartz schist and calc-silicate rock.
		Chuos	700	Diamictite, pebble- and boulder-bearing schist and minor quartzite
	Discordance			
	Ugab	Rössing	200	Very variable marble, quartzite, conglomerate, biotite schist, biotite cordierite schist and gneiss, aluminous gneiss, biotite-hornblende schist and calc-silicate schist.
Unconformity or conformable transition				
Nosib		Khan	1,100	Various gneisses, quartzite, schist, conglomerate, minor marble, amphibolite and calc-silicate rock.
		Etusis	3,500	Layered light-red to greyish-brown quartzites with high feldspar content. In-between para-gneisses, biotite schists and conglomerates occur.

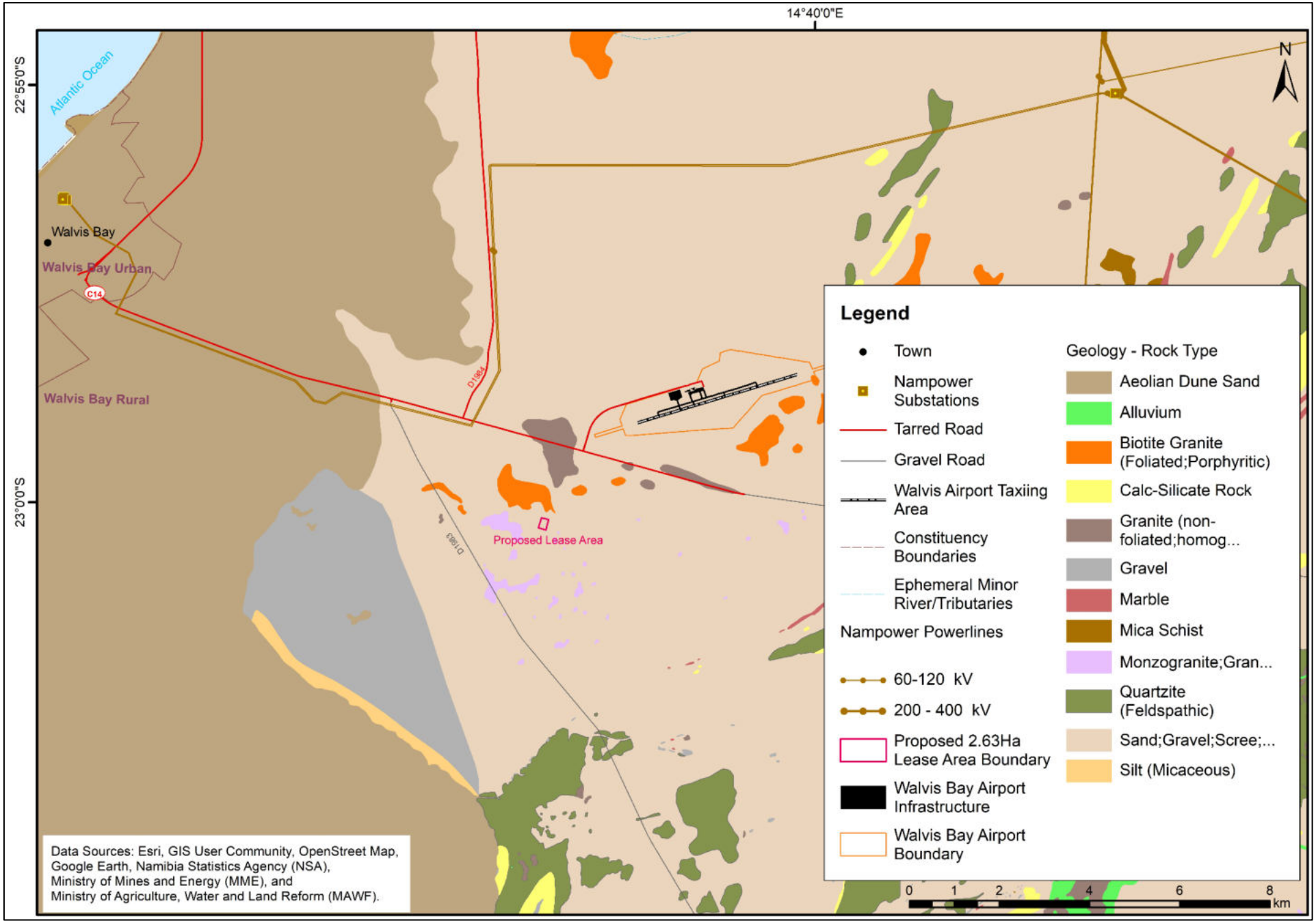

Figure 4.7: Regional geological setting of the leased land area.

4.6.2 Geotechnical Engineering Considerations

Rocks of varying geotechnical characteristics are expected within the pegmatite zones and alternating bands within the banded dolomitic marble and biotite-quartz schist country rock and covered by a variety of sediments in some places. No field and laboratory assessment of rock mass and detailed discontinuities survey were undertaken as part of this study.

Table 4.2 outlines an indicative classification of the various discontinuities that are likely to be found in the area. Both low and high order discontinuities are likely to be found around the leased land area.

It's highly recommended that a field-based geotechnical engineering assessment followed by laboratory assessments must be undertaken before the implementation deep excavation in order to have accurate figures of all the key geotechnical parameters.

Table 4.2: General rock structure scheme (Source: Mwiya, 2004).

GEOMETRY				CHARACTERISTIC				
DISCONTINUITY	LENGTH m	SPACING m	WIDTH m	TRANSMISSIVITY m^2/s	HYDRAULIC CONDUCTIVITY m/s	INFILLING THICKNESS m	EXAMPLE	INFLUENCE INDICATOR
LOW ORDER DISCONTINUITIES. ZONES OUTCROPS								
1^{ST} ORDER	$>10^4$	$>10^3$	$>10^2$	10^{-5} - 10^{-2}	10^{-7}- 10^{-5} AV. [10^{-6}]	10^0	Regional major fault systems	4 V. High
2^{ND} ORDER	10^3 - 10^4	10^2- 10^3	10^1 – 10^2	10^{-7} - 10^{-4}	10^{-8} – 10^{-6} AV. [10^{-7}]	10^{-1}	Local major fault zones	
3^{RD} ORDER	10^2 – 10^3	10^1 – 10^2	10^0 - 10^1	10^{-9} – 10^{-6}	10^{-9} – 10^{-7} AV. [10^{-8}]	$\leq 10^{-2}$	Local minor fault zones	
HIGH ORDER DISCONTINUITIES: INDEPENDENT OUTCROPS								
4^{TH} ORDER	10^1 – 10^2	10^0- 10^1	-	-	10^{-11}-10^{-9} AV.[10^{-10}]	-	Local major joint set or bedding	3 High
5^{TH} ORDER	10^0 - 10^1	10^{-1} - 10^0	-	-	10^{-12}-10^{-10} AV. [10^{-11}]	-	Local minor joints/ fractures	
6^{TH} ORDER	10^{-1} - 10^0	10^{-2} – 10^{-1}	-	-	10^{-13}-10^{-11} AV. [10^{-12}]	-	Local minor fissures / schistosity	2 Low
7^{TH} ORDER	$<10^{-1}$	$<10^{-2}$	-	-	$<10^{-13}$	-	Crystalline voids	1 V. Low

4.6.3 Groundwater Resources

Groundwater as well as surface water (only during the rainy season) from ephemeral river channels is the sources of water supply in the area as well as much of the Erongo Region. According to the Department of Water Affairs, (2001), the Erongo Region and in particular the Walvis Bay around the leased land area generally has a low groundwater potential due to the dominance of the nonporous metamorphic rocks (Figs. 4.7 and 4.8).

Recharge from rainfall is an important parameter determining the groundwater potential, but the degree of metamorphism affects the groundwater potential too. The groundwater potential of rocks decreases, as the degree of metamorphism increases.

Crystalline rocks normally exhibit a very low tendency to store water, typical of the granites, pegmatite zones and the alternating bands within the banded dolomitic marble and biotite-quartz schist found within the project area (Figs. 4.7 and 4.8). The groundwater potential of these rock units is generally low, to locally moderate.

Possible targets for water resources in this area are mainly fractured zones and faults that outcrop on the surface without impermeable infillings. But the success rate and yields for these rock types are generally low. The area along major ephemeral rivers may be more promising due to well developed fractures and faults that give rise to good recharge potential during the rainy season.

4.6.4 Evaluation of Water Vulnerability

Vulnerability assessment of surface water covered possible runoff, the presence of source factors and major flow routes such as major high order discontinuities (Table 4.2), ephemeral river channels, valleys and gullies as pathways and the presence of surface water body as a target (Figs. 4.8 and 4.9).

The groundwater assessments covered hydraulic properties and thickness of the unsaturated and saturated zones derived from geological and hydrogeological data. The assessment of the unsaturated characteristics was based on the ability for source factors to influence the system through known pathway factors such as discontinuities. The combined effects of unsaturated and saturated flow probabilities were used as indicator for groundwater vulnerability.

However, groundwater or surface water will only be vulnerable to contamination if the following three (3) component are all present at the same time and at a site-specific area within the leased land:

(i) Contaminant sources resulting from proposed project.

(ii) Potential pathways for contaminant migration such as major high order discontinuities (Table 4.2), ephemeral river channels, valleys and gullies, and.

(iii) Targets (economic water resources) present within the project area.

Overall, the limited local groundwater resources found in the area form part of the poorly developed metamorphic rocks based confined and unconfined aquifer system that is moderately vulnerable to any sources of pollution (Figs. 4.8 and 4.9).

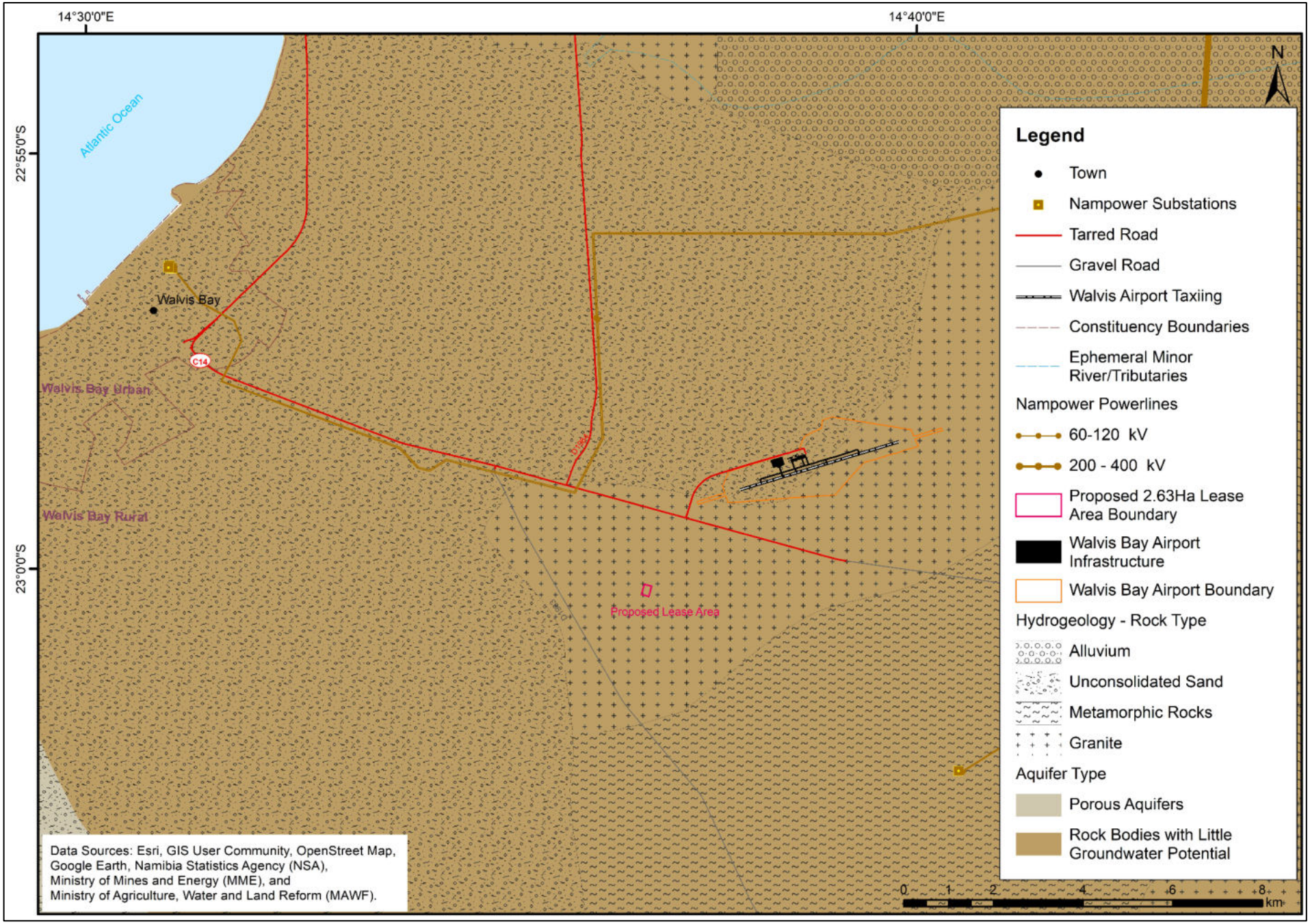

Figure 4.8: Regional hydrogeological settings of the leased land area.

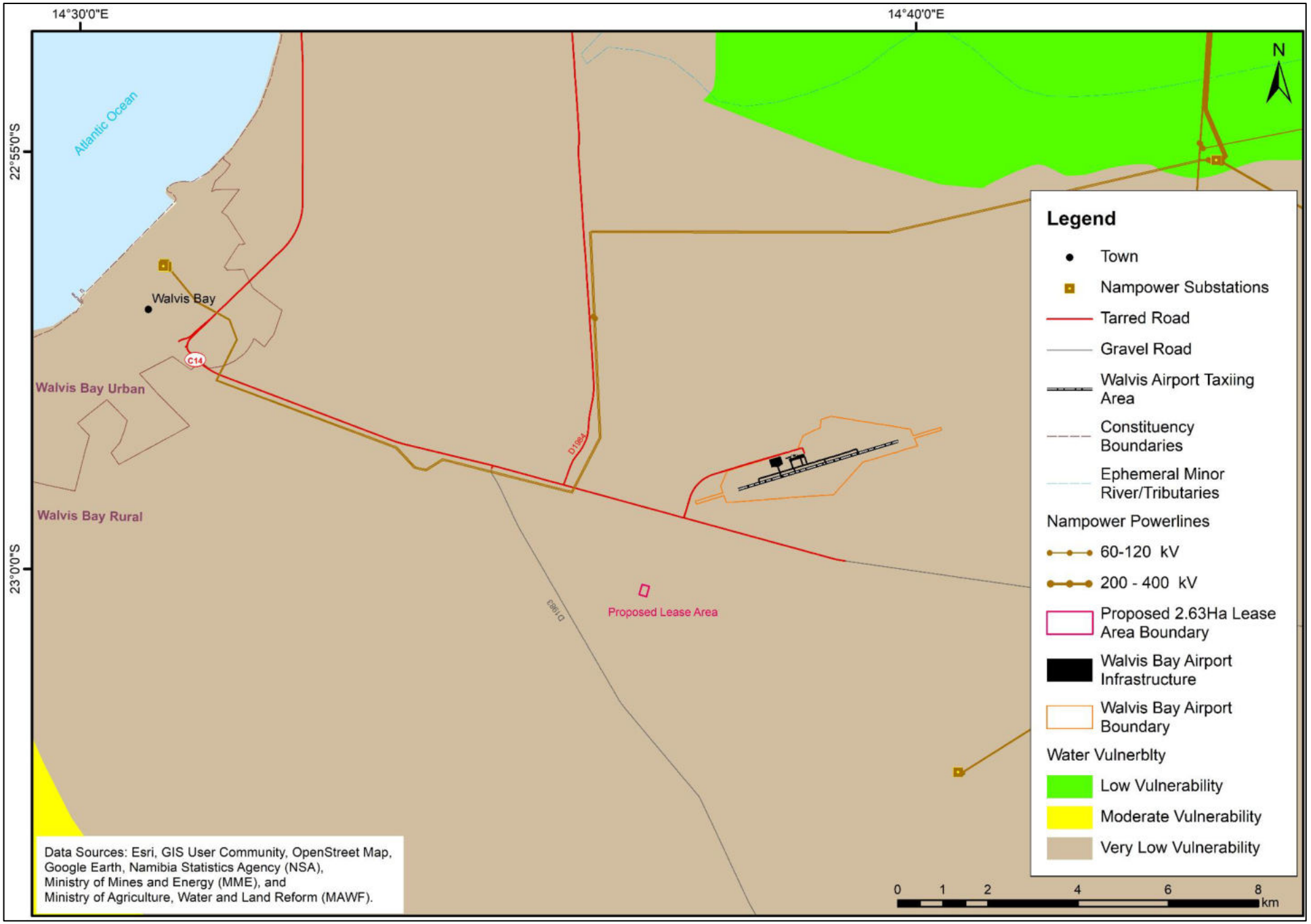

Figure 4.9: Regional groundwater vulnerability around the leased land area.

4.7 Archaeology

4.7.1 Regional Archaeological Setting

Modern humans and their ancestors have lived in Namibia for more than one million years, and there are fossil remains of lineal hominin ancestors as early as the Miocene Epoch (Kinahan, 2017). Namibia has a relatively complete sequence covering the mid-Pleistocene to Recent Holocene period, represented by thousands of archaeological sites mainly concentrated in the central highlands, escarpment and Namib Desert.

According to Kinahan, (2017), the Recent Holocene archaeological sequence in Namibia, i.e., the last 5 000 years, is of particular importance because it provides the background evidence for the development and recent history of the indigenous peoples of Namibia before the advent of written historical records during the colonial era.

Many archaeological sites from this period are of great significance to the understanding of Namibian history, and some are considered to be of global importance.

4.7.2 Local Archaeological Setting

The general area around the leased land area is well known for extensive rock-art sites linked to various granite rock outcrop shelters such as those found along the Kuiseb River and Delta situated south of the leased land. These sites hold significance historical, cultural and spiritual value and all-important heritage area for all Namibians and are protected by the National Heritage Act, 2004 (Act No. 27 of 2004) under the National Heritage Council of Namibia.

It is unlikely that the targeted marble and associated pegmatites will hold significant archaeological rock-art resources because most of these rock arts are associated with the granite which are more resistant to weathering compared to the marbles.

Other potential archaeological resources found in the general area include colonial evidence points to impermanent settlement by groups of probably Khoe pastoralists (Kinahan, 2017). These people formed part of a regional-scale network with links to the Atlantic coast and inland sites where copper was produced.

However, there are a large assemblage of ceramic vessels associated with the general area of and represent an important addition to the regional archaeological picture.

Evidence from the early colonial period relates to mining in the general area and a combination of trade, missionary activity and wagon repair. No local settlements within the leased land area are expected as the area is already disturbed. A number of National Monument sites have been recognised in general area under the National Heritage Act, 2004 (Act No. 27 of 2004).

4.7.3 Archaeological Desk Assessment

Early colonial remains are expected to be relatively abundant in Erongo Region and around Walvis Bay. It is expected that the leased land area will be extensively disturbed and that little might remain of either pre-colonial or early colonial sites.

4.7.4 Archaeological Conclusions and Recommendations

The area of interest for mining operations probably has archaeological potential, although no archaeological sites have been recorded so far from within the area itself. The expectation is therefore:

(i) Very low likelihood of Holocene age archaeological sites, including rock art, associated with outcropping local granite on the leased land area.

(ii) Very low likelihood of late precolonial settlement around the leased land area, and.

(iii) Very low likelihood of early colonial settlement remains relating to the historical occupation of area that may be unknown or not recorded on the leased land area.

The following are the key recommended actions related to archelogy in the leased land area:

(i) Contractors working on the site should be made aware that under the National Heritage Act, 2004 (Act No. 27 of 2004) any items protected under the definition of heritage found in the course of development should be reported to the National Heritage Council.

(ii) The chance finds procedure as outlined in the EMP must be implemented at all times, and.

(iii) Detailed field survey should be carried out if suspected archaeological resources or major natural cavities / shelters have been unearthed during construction.

The Proponent must not disturb major natural cavities that may be unearthed because they could hold some highly significant historical or cultural sites that would require detailed survey and documentation.

5. IMPACT ASSESSMENT AND RESULTS

5.1 Impact Assessment Procedure

The Environmental Assessment process that has been undertaken with respect to the permitting, construction, operation and closure of the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area has been conducted in accordance with the provisions of the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 gazetted under the Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007).

5.2 Alternatives and Ecosystem Assessments

The following alternatives have been considered:

(i) **Location of the Leased land:** The leased land form part of the Farm 38 belonging to the Walvis Bay Municipality. Other alternative sites have been considered. However, existence of supporting infrastructure and

(ii) **The No-Action Alternative** - A comparative assessment of the environmental impacts of the 'no-action' alternative (a future in which the activities do not take place) has been undertake. An assessment of the environmental impacts of a future, in which the proposed activities does not take place, may be good for the receiving environment because there will be no negative environmental impacts due to the permitting, construction, operation and closure of the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area. The environmental benefits will include no current or future negative environmental impacts as a result of the proposed activities. However, it is important to understand that even if the proposed activities do not take place, to which the likely negative environmental impacts are likely negligible, the other current and future land uses such as tourism, quarrying, future urban development will still have some negative impacts on the receiving environment. The likely negative environmental impacts of the other current and future land use that may still happen in the absence of the proposed activities includes: Land degradation due to drought and climate change, poor land management practices, urbanisation, and erosion.

Furthermore, it is important to understand what benefits might be lost if the proposed activities do not take place. Key loses that may never be realised if the proposed project activities do not go-ahead include: Loss of potential added value, socioeconomic benefits derived from current and future business, direct and indirect contracts and employment opportunities, export earnings, foreign direct investments, license rental fees, royalties, and various other taxes payable to the Government with respect to oil and gas exploration related services.

(iii) **Other Alternative Land Uses:** The leased land fall within the well-known industrial area of Walvis Bay with international airport, Namibian Defences Force shotting range and various quarrying operations. Tourism is key vital sector for Walvis Bay and provides socioeconomic opportunity in the general area but not necessary around the leased land area. The leased land area does not have tourism products. Due to the limited scope of the proposed activities and the implementation of the EMP, it is likely that the proposed activities will coexist with the current and potential future land uses within the general area.

(iv) **Potential Land Use Conflicts:** Considering the current land use practices as well as potential other land uses including urbanisation, it is likely that potential economic derivatives from any positive will co-exist with the existing and potential future land use options of the general area.

(v) **Ecosystem Function** (**What the Ecosystem Does**)**:** Ecosystem functions such as wildlife habitats, carbon cycling or the trapping of nutrients and characterised by the physical, chemical, and biological processes or attributes that contribute to the self-maintenance of an ecosystem in this area are vital components of the receiving environment. However, the

proposed activities will not affect the ecosystem function of the general area and its ecosystem due to the limited scope of the proposed activities. The ecosystem of this area is part of the larger local and regional ecosystems which are all interlinked.

(vi) **Ecosystem Services:** Food chain, harvesting of animals or plants, and the provision of clean water or scenic views are some of the local ecosystem services associated with the area. However, the proposed activities will not affect the ecosystem services due to the limited scope and area of coverage of the proposed activities because the ecosystem of the leased land area is part of the larger local and regional ecosystems which are all interlinked.

(vii) **Use Values**: The leased land area has direct values for other land uses such as agriculture, conservation and tourism as well as indirect values which includes: Watching a television show about the general area and its wildlife, food chain linkages that sustains the complex life within this area and bequest value for future generations to enjoy. The proposed activities will not destroy the current use values due to the limited scope of the operations as well as the adherence to the provisions of the EMP as detailed in the EMP report, and.

(viii) **Non-Use or Passive Use**: The leased land area has an existence value that is not linked to the direct use / benefits to current or future generations. The proposed activities will not affect the ecosystem current or future none or passive uses due to the limited scope of the proposed activities that will leave much of the surrounding areas untouched because the ecosystem of the leased land area is part of the larger local and regional ecosystems which are all interlinked.

5.3 Key Issues Considered in the Assessment Process

5.3.1 Sources of Impacts (Proposed Project Activities)

The permitting, construction, operation and closure of the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area activities are the key sources both negative and positive impacts on the receiving environment.

5.3.2 Summary of Receptors Likely to be Negative Impacted

Based on the findings of this report, the following is the summary of the key environmental receptors that are may be negatively impacted by the proposed activities:

- **Physical environment:** Water quality, physical infrastructure and resources, air quality, noise and dust, landscape and topography, soil quality and, Climate change influences.

- **Biological environment:** Habitat, protected areas and resources, flora, fauna, and ecosystem functions, services, use values and non-use or passive use, and.

- **Socioeconomic, cultural and archaeological environment:** Local, regional and national socioeconomic settings, commercial and subsistence agriculture, community protection areas tourism and recreation cultural, biological and archaeological resources.

5.4 Impact Assessment Methodology

5.4.1 Impact Definition

In this report, a natural and/or human environmental impact is defined as: “Change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation’s environmental aspects.” (ISO 14001). All proposed project activities (routine and non-routine) were considered during the Scoping, EIA and EMP Phases in terms of their potential to:

- Interact with the existing environment (physical, biological and social elements), and.

- ❖ Breach relevant national legislation, relevant international legislation, standards and guidelines, and corporate environmental policy and management systems.

Where a project activity and receptor were considered to have the potential to interact, the impact has been defined and ranked according to its significance. Table 5.1 provides the definition of different categories of impacts identified and used in this report. This report has assessed the potential impacts resulting from routine Project activities, assuming that the Project activities that may cause an impact that will occur but the impact itself will be dependent on the likelihood (Probability) (Table 5.1). Correct control measures through the implementation of the EMP and monitoring thereof, often reduce any negative significant impacts on the receiving environment as the results of the project activities. The assessment therefore, has focussed on the measures aimed at preventing the occurrence of an impact as well as mitigation measures that may be employed.

Table 5.1: Definition of impact categories used in this report.

Nature of Impact	Adverse	Considered to represent an adverse change from the baseline, or to introduce a new undesirable factor.
	Beneficial	Considered to represent an improvement to the baseline or to introduce a new desirable factor.
Type of Impact	Direct	Results from a direct interaction between a planned or unplanned Project activity and the receiving environment.
	Indirect	Results from the Project but at a later time or at a removed distance or which may occur as a secondary effect of a direct impact.
	Cumulative	Results from (i) interactions between separate Project-related residual impacts. and (ii) interactions between Project-related residual impacts in combination with impacts from other projects and their associated activities. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.
Duration of Impact	Short-term	Predicted to last only for a limited period but will cease on completion of the activity, or as a result of mitigation/reinstatement measures and natural recovery typically within a year of the project completion.
	Medium-	Predicted to last only for a medium period after the Project finishing, typically one to five years.
	Long-term	Continues over an extended period, typically more than five years after the Project's completion.
	Permanent	Occurs during the development of the Project and causes a permanent change in the affected receptor or resource that endures substantially beyond the Project lifetime.
Scale of Impact	Local	Affects locally important environmental resources or is restricted to a single habitat/biotope, a single community.
	Regional	Affects nationally important environmental resources, or an area that is nationally important/protected or has macro-economic consequences.
	National	Affects nationally important environmental resources, or an area that is nationally important/protected or has macro-economic consequences.
	International	Affects internationally important resources such as areas protected by international Conventions
	Transboundary	Impacts experienced in one country as a result of activities in another.
Probability	Negligible	Possibility negligible
	Improbable	Possibility very low
	Probable	Distinct possibility
	Highly Probable	Most likely
	Definite	Impact will occur regardless of preventive measures

5.4.2 Knowledge-Based Impact Assessment Process

5.4.2.1 Characterisation of the Impact Assessment Inputs Variables

The impact assessment process for the proposed permitting, construction, operation and closure of the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area took into consideration the interactions of the proposed activities with respect to

the Knowledge-Based System Model Methodology (KBSMM) characterised climatic, environmental, and ground model datasets of the receiving environment (physical, biological, socioeconomic and ecosystem services and functions). The influence assessment of the characterised components of the environment has been based on a Knowledge-Based System Model Methodology (KBSMM), a PhD research-based and industry tested / validated Artificial Intelligent (AI) framework developed by Dr Sindila Mwiya. The KBSMM model inputs variables covered characterised climatic, environmental, and ground model datasets. Source-Pathway-Receptor risk assessment approach was used to determine or validate the influence (impact assessment), and ultimate likely harm that may be linked to the various phased activities of each of the various stages of the proposed project implementation process (Fig. 5.1).

5.4.2.2 Climatic Data Sets/Components Inputs

The climatic data sets that have been used in the regional and local site-specific assessment process comprised precipitation, temperature, evapotranspiration and wind data sets. The following is summary explanation of the roles that climatic data sets may have on the proposed project implementation process (Fig. 5.1):

- Temperature: Temperature had a direct influence on the fluids that may influence the operation of the site by supporting evapotranspiration. It also has an influence on the planning, operation and implementation of the various project activities.

- Rainfall: Rainfall is one of the data sets used in the water balance assessments with respect to potential fluid production and flash flood occurrences. The data sets had some influence on mobilisation pollutants that may be associated with the proposed project activities.

- Evapotranspiration: This combined effect of evaporation and transpiration is important in water balance assessments with direct influences on the implementation of the various project activities, and.

- Wind Direction and Speed: The direction and speed of the prevailing winds may be critical to the site operations and determination of the optimum operational requirements. The data had a direct influence on the site operations including dust and noise management.

5.4.2.3 Environmental Data Sets/Components Inputs

The regional or local environmental data sets used in this project comprise:

- Economic activities (Permitting, construction, operation and closure of the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area).

- Types and amounts of waste likely to be generated.

- Likely contaminants from the activities.

- Ecological, habitats and ecosystems including fauna and flora.

- Community considerations such, land ownership, social, health and safety, and.

- Archaeological, cultural and political issues.

The following is summary explanation of the role of the environmental data sets may have on the proposed project implementation process (Fig. 5.1):

- Economic activities and logistic support: The types of economic activities and logistical support services and infrastructure for the proposed activities are a key source of impact component of the environmental data sets in the determination of the likely impacts on the receptors, and.

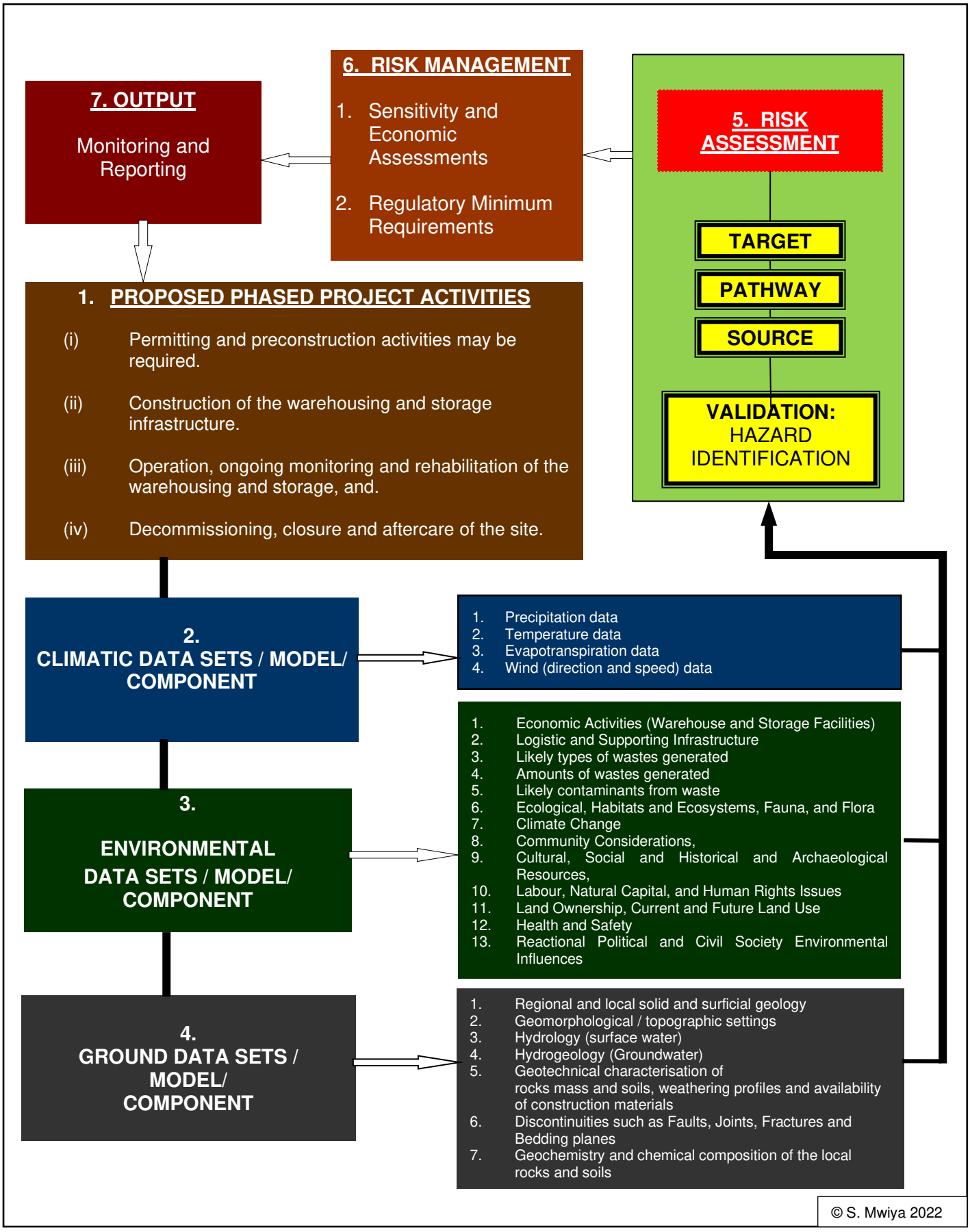

Figure 5.1: Detailed outline of the technical methodology based on a complete looped Knowledge-Based System Model Methodology (KBSMM) used in the impact assessment, risk assessment and determination of the monitoring and reporting strategy. The system model methodology has a built-in looping that allows for the evaluation for phased project implementation lifecycle.

- ❖ The likely Types and amount of waste: Understanding the characteristics of the liquid and solid waste streams be handled is vital in the evaluation of the hazard exposure in terms of the overall risk assessment to the receptors.

- ❖ Likely contaminants: The state (solid, gas, liquid, or vapour) of any likely contaminants that may associated with the proposed phased project activities play a major role in the determination of the likely harm, mitigation, monitoring and reporting strategies.

- ❖ Ecological, habitats, ecosystems, fauna, flora, and local, regional or global climate change influences: At national, regional and local levels, there are a number of unique and protected habitats, ecosystems, fauna and flora and highly vital as they support other sectors of the national economy such as tourism, agriculture, food security and services. Understanding the likely level of sensitivity of the regional or local areas is highly important to the successful determination of the likely impacts and harm, development mitigation measures, monitoring and reporting strategy to be implemented for the proposed phased project implementation process, and.

- ❖ Community considerations: Local community issues and acceptability of the proposed activities by the local community is of vital importance. Other key components of the community considerations include: Land ownership, land use, local social settings, labour, natural capital, human rights, public and workers health and safety, archaeological, cultural, political, and civil society influences.

As part of the data collection, evaluation, influence and risk assessment process of the proposed phased project developmental process, determination of the mitigation measures, monitoring and reporting strategies, specialist assessments conducted as part of the EIA process provided vital recommendations incorporated in this report.

5.4.2.4 Ground Data Sets/Components Inputs

The ground data sets covered regional/local solid and surficial geology, geomorphological / topographic settings, hydrology (surface water), hydrogeology groundwater), geotechnical and geochemical characterisation of rocks and soils, weathering profiles and availability of construction materials, and discontinuities such as faults, joints, fractures, and bedding planes of the drilled sites (Fig. 5.1). The geology (solid and superficial) and water (surface and groundwater resources are all targets that may be influenced (impacted) by the various activities of the proposed phased project implementation process. Other ground components which include the local terrain (geomorphology and topographic features), discontinuities, geotechnical as well as geochemical /mineralogy will aid the influence of sources in causing or minimising the impacts to be controlled through mitigations (Fig. 5.1). Regional/local solid and surficial geology, geomorphological and topographic settings also linked directly to the availability of local construction and operational materials in support of the proposed phased project implementation lifecycle process (Fig. 5.1).

5.4.2.5 Source-Pathway-Receptor Risk Assessment, Harm and Monitoring

To evaluate the level of influence (impact), risk, and harm that the proposed phased project implementation process, the assessment process was focused on the sources, pathways, and targets / receptor chains (Fig. 5.2). It is important to note that in the absence of any of the interlinked three (3) components (sources, pathways, or targets/ receptor) there is no harm or risk to mitigate, monitor or manage (Figs. 5.2 and 5.3).

The risk source/s refers to knowledge - based identified potential hazards that may be present and can cause harm to the exposed target/s / receptors (Fig. 5.3). The risk pathway refers to the route direct or indirect though which the risk source/s may be transferred and exposed to a target/s of concern.

The risk target/s or receptor/s refers to the destination (area point of exposure) at which the source/s may cause harm. The characterisation of source/s, pathway/s and target/s chain has been undertaken for climatic, environmental and ground model data components with respect to the proposed project implementation process.

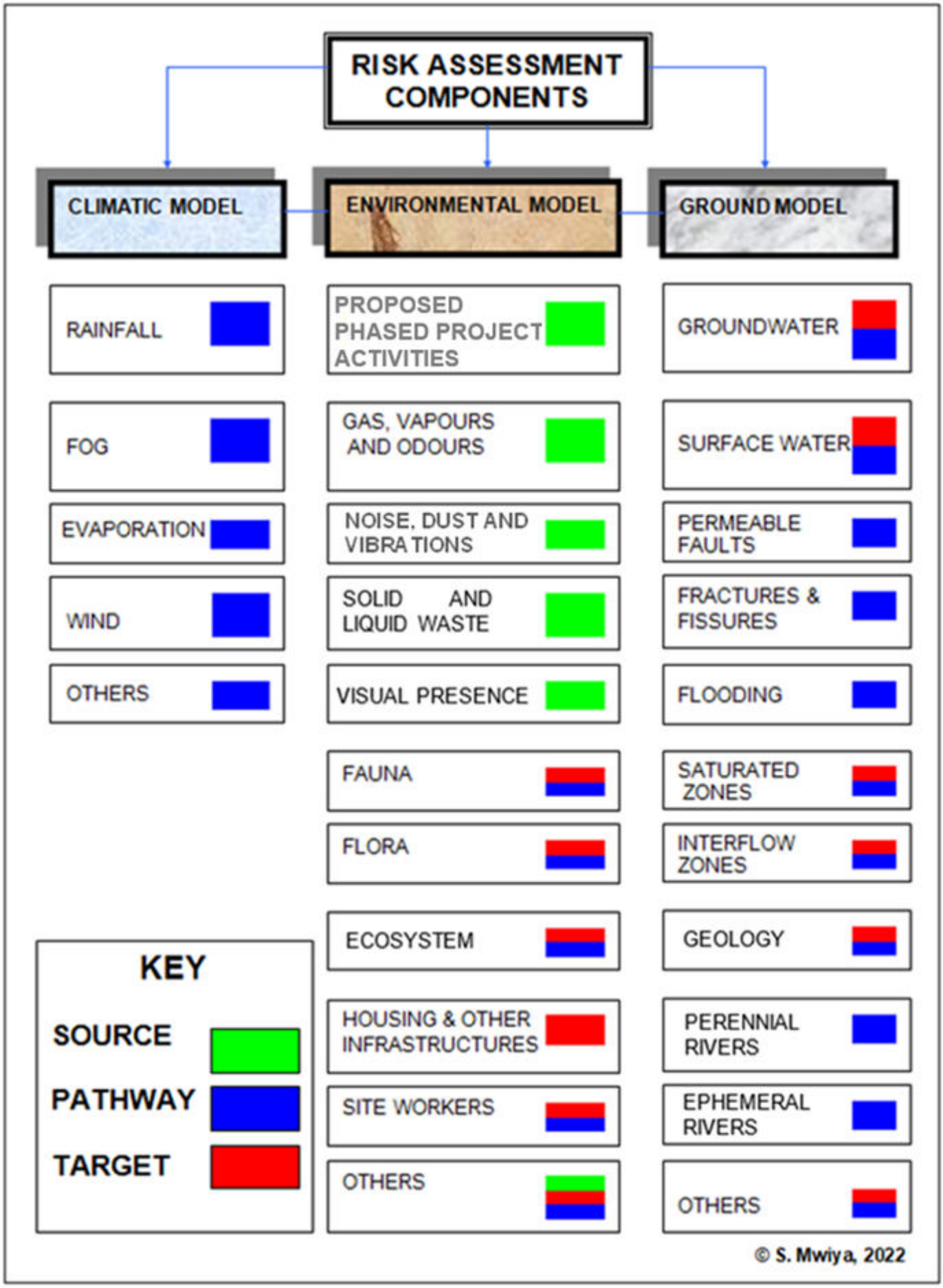

Figure 5.2: A Knowledge-Based System Model Methodology (KBSMM) characterised interactive risk assessment system output field-based and tested / validated Artificial Intelligent (AI) framework windows for phased project implementation lifecycle.

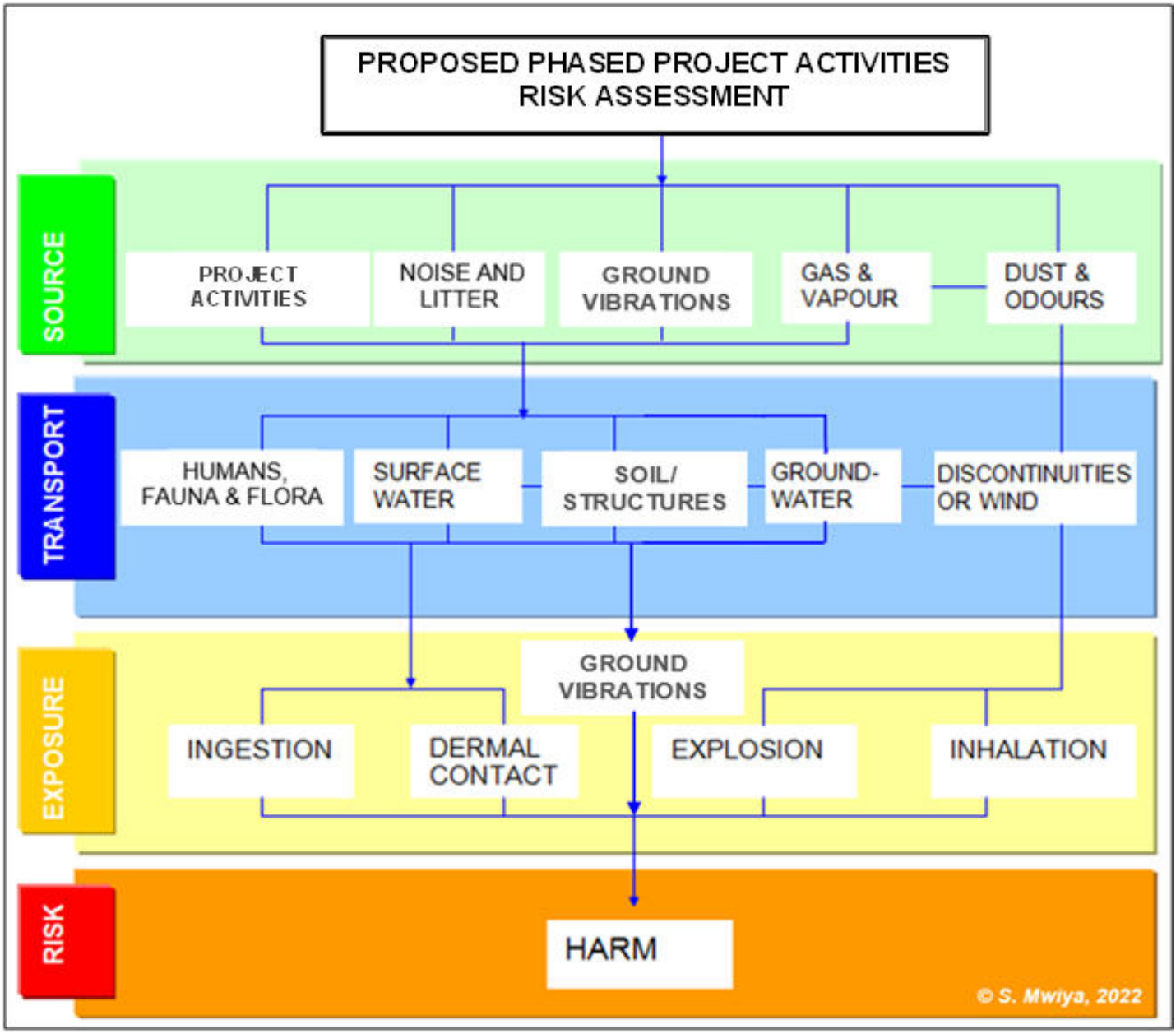

Figure 5.3: A Knowledge-Based System Model Methodology (KBSMM) characterised system output research-based and tested / validated Artificial Intelligent (AI) framework risk consequences (harm) pathways to the receiving target/receptors windows for phased project implementation lifecycle.

5.4.2.6 Individual Components Impact Assessment Criteria

Based on the Terms of Reference and individual components impact assessment outputs of the KBSMM for the proposed phased project implementation process and the lessons learned (created knowledge-base) from the previous phased processes undertaken and tested since 1999 when the KBSMM was developed, all key components of the receiving environment were identified and assessed with respect to the overall proposed activities and likely significant impacts on the receiving environment with the aim of developing appropriate mitigation measures as detailed in the EMP Report.

5.4.3 Overall Component and Significant Impact Assessment

5.4.3.1 Overall Component Impact Assessment

The overall component impact assessment and evaluation process has been undertaken by considering the activities of the proposed phased project implementation process operations as the overall source of impact (Figs. 5.1-5.3). As illustrated in Figs. 5.1-5.3, the receiving environment has

been considered as the receptor / target that may be impacted positively or negatively by the proposed permitting, construction, operation and closure of the warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area.

The characterised components of the receiving environment encompassed the following:

- Physical Conditions / Natural Environment – Air, noise, water, green space, climate change, built environment – houses, roads, transport systems, buildings, infrastructure, etc.
- Biological Conditions: fauna, flora, habitats, and ecosystem - services, function, use values and non-use etc., and.
- Socioeconomic Conditions: Social, economic, labour, gender, human rights, natural and social capital, archaeological, cultural resources, and cultural issues

In evaluating the individual degree of potential negative impacts, the following factors have been taken into consideration:

- Impact Severity: The severity of an impact is a function of a range of consideration, and.
- Likelihood of Occurrence (Probability): How likely is the impact to occur?

In evaluating the severity of potential negative environmental impacts, the following factors have been taken into consideration:

- Receptor/ Resource Characteristics: The nature, importance, and sensitivity to change of the receptors / target or resources that could be affected.
- Impact Magnitude: The magnitude of the change that is induced.
- Impact Duration: The time period over which the impact is expected to last.
- Impact Extent: The geographical extent of the induced change, and.
- Regulations, Standards and Guidelines: The status of the impact in relation to regulations (eg. discharge limits), standards (eg. environmental quality criteria) and guidelines.

The overall impact severity has been categorised using a subjective scale as shown in Table 5.2 for magnitude, Table 5.3 for duration and Table 5.4 for extent.

Table 5.2: Scored on a scale from 0 to 5 for impact magnitude.

SCALE (-) or (+)		DESCRIPTION
0		no observable effect
1		low effect
2		tolerable effect
3		medium high effect
4		high effect
5		very high effect (devastation)

Table 5.3: Scored time over which the impact is expected to last.

SCALE (-) or (+)		DESCRIPTION
T		Temporary
P		Permanent

Table 5.4: Scored geographical extent of the induced change.

SCALE (-) or (+)		DESCRIPTION
L		limited impact on location
O		impact of importance for municipality.
R		impact of regional character
N		impact of national character
M		impact of cross-border character

The likelihood (probability) of the pre-identified events occurring has been ascribed using a qualitative scale of probability categories (in increasing order of likelihood) as shown in Table 5.5. Likelihood of an impact occurring is estimated on the basis of experience (existing knowledge-base) and/ or evidence that such an outcome has previously occurred. Impacts resulting from routine/planned events are classified under category (E).

Table 5.5: Summary of the qualitative scale of probability categories (in increasing order of likelihood).

SCALE (-) or (+)		DESCRIPTION
A		Extremely unlikely (e.g., never heard of in the industry)
B		Unlikely (e.g., heard of in the industry but considered unlikely)
C		Low likelihood (e.g., such incidents/impacts have occurred but are uncommon)
D		Medium likelihood (e.g., such incidents/impacts occur several times per year within the industry)
E		High likelihood (e.g., such incidents/impacts occur several times per year at each location where such works are undertaken)

The overall individual components impact assessment with respect to the impact duration, geographical extent and probability of occurrence have been categorised using a semi quantitative approach as shown in Table 5.6 and the results are presented under Subsection 5.4.4.

5.4.3.2 Overall Significant Impact Assessment

The determination of the significance of the negative impacts / key issues caused by the proposed phased project activities as key sources of such impact has been based on the environmental baseline results such as the intensity and duration of the likely negative impact as assessed under individual components likely to be impacted. The assessment focused on the existence of potential pathways, and the degree to which the proposed project activities are likely to result in unwanted consequences on the receptor, covering the receiving environment (natural, built, socioeconomic, flora, fauna, habitat, and ecosystem).

5.4.4 Proposed Project Activities Summary of Impacts Results

The results of the impacts assessment and evaluation has adopted a matrix assessment framework linked to the KBSMM framework. Assessment results of the magnitude, duration, extent, and probability of the potential impacts due to the proposed project activities interacting with the receiving environment are presented in form of a matrix table as shown in Table 5.6.

Based on sensitivity of the receiving environment, the overall severity of potential environmental impacts of the proposed project activities on the receiving environment will be of low magnitude temporally duration, localised extent and low probability of occurrence due to the limited scope of the proposed activities. The step progressional approach will allow the Proponent to evaluate the results of the successful and the implementation of the next stages of proposed project developmental process. It is important to note that the assessment of the likely impacts as shown in Table 5.6 have been considered without the implementation of mitigation measures as detailed in EMP Report. The need for implementation of the appropriate mitigation measures as presented in the EMP section of this report has been determined based on the results of the impact assessment and the significant impacts as detailed in Tables 5.7 and 5.8.

Table 5.6: Results of the sensitivity assessment of the receptors (Physical, Socioeconomic and Biological environments) with respect to the permitting, construction, operation and closure of the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area. Based on sensitivity of the receiving environment, the overall severity of potential environmental impacts of the proposed project activities on the receiving environment will be of low magnitude temporally duration, localised extent and low probability of occurrence due to the limited scope of the proposed activities.

RECEPTOR SENSITIVITY	PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL, AND ARCHAEOLOGICAL ENVIRONMENT				
	Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional and national socioeconomic settings	Health Safety and Environment (HSE)	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources
(i) Permitting and preconstruction activities may be required	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
(ii) Construction of the warehousing and storage infrastructure	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
(iii) Operation, ongoing monitoring and rehabilitation of the warehousing and storage	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
(iv) Decommissioning, closure and aftercare of the site.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

SENSITIVITY RATING		CRITERIA
1	Negligible	The receptor or resource is resistant to change or is of little environmental value.
2	Low	The receptor or resource is tolerant of change without detriment to its character, is of low environmental or social value, or is of local importance.
3	Medium	The receptor or resource has low capacity to absorb change without fundamentally altering its present character, is of high environmental or social value, or is of national importance
4	High	The receptor or resource has moderate capacity to absorb change without significantly altering its present character, has some environmental or social value, or is of district/regional importance.
5	Very High	The receptor or resource has little or no capacity to absorb change without fundamentally altering its present character, is of very high environmental or social value, or is of international importance.

5.5 Evaluation of Significant Impacts

5.5.1 Overview

The significance of each impact has been determined by assessing the impact severity against the likelihood (probability) of the impact occurring as summarised in the impact significance assessment matrix provided in Table 5.7.

5.5.2 Significance Criteria

Significance criteria for negative/adverse impacts (i.e., relative ranking of importance) are defined in Table 5.7. It is important to note that impacts have been considered without the implementation of mitigation measures. The need for appropriate mitigation measures as presented in the EMP report has been determined based on the basis of the impact assessment presented in this report.

Table 5.7: Scored impact significance criteria.

IMPACT SEVERITY (Magnitude, Duration, Extent, Probability)	**RECEPTOR CHARACTERISTICS (SENSITIVITY)**				
	Very High (5)	**High 4)**	**Medium (3)**	**Low (2)**	**Negligible (1)**
Very High (5)	Major [5/5]	Major [4/5[	Moderate [3/5]	Moderate [2 /5]	Minor 1/5
High (4)	Major [5/4]	Major [4/4]	Moderate [3/4]	Moderate [2/4]	Minor [1/4]
Medium (3)	Major [5/3]	Moderate [4/3]	Moderate [3/3]	Minor [2/3]	None [1/3]
Low (2)	Moderate [5/2]	Moderate [4/2]	Minor [3/2]	None [2/2]	None [1/2]
Negligible (1)	Minor [5/1]	Minor [4/1]	None [3/1]	None [2/1]	None [1/1]

5.5.3 Assessment Likely Significant Impacts

The main key sources of impacts that have been used in the determination of significant impacts covers the entire proposed project lifecycle from permitting, construction, operation and closure of the proposed warehousing and storage infrastructure. Overall, the results of the significant impact assessment matrix covering the permitting, construction, operation and closure of the proposed warehousing and storage infrastructure on the physical and biological environments are shown in Tables 5.8.

The overall likely negative and significant impacts of the proposed warehousing and storage infrastructure development on the leased land portion of Farm 38, Walvis Bay municipal area on the receiving environment (physical, biological and socioeconomic environments) without mitigation and covering the permitting, construction, operation and closure of the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area will be negligible with extremely unlikely probability of occurrence without mitigations.

Overall significant impacts will be negligible **[1/1]** (Table 5.8). Except for the socioeconomic components which carry a **(+)**, the rest of the likely impacts are negative **(-)**.

Table 5.8: Significant impact assessment matrix results covering the permitting, construction, operation and closure of the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area being negligible with extremely unlikely probability of occurrence without mitigations. Overall significant impacts will be negligible [1/1] except for the socioeconomic components which carry a (+), the rest of the likely impacts are negative (-).

SIGNIFICANT IMPACT	PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL AND ARCHAEOLOGICAL ENVIRONMENT				
	Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional and national socioeconomic settings	Health Safety and Environment (HSE)	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources
(i) Permitting and preconstruction activities may be required	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
(ii) Construction of the warehousing and storage infrastructure	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
(iii) Operation, ongoing monitoring and rehabilitation of the warehousing and storage	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
(iv) Decommissioning, closure and aftercare of the site.	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

IMPACT SEVERITY (Magnitude, Duration, Extent, Probability)	RECEPTOR CHARACTERISTICS (SENSITIVITY)				
	Very High (5)	High(4)	Medium (3)	Low (2)	Negligible (1)
Very High (5)	Major [5/5]	Major [4/5[	Moderate [3/5]	Moderate [2 /5]	Minor 1/5
High (4)	Major [5/4]	Major [4/4]	Moderate [3/4]	Moderate [2/4]	Minor[1/4]
Medium (3)	Major [5/3]	Moderate[4/3]	Moderate[3/3]	Minor[2/3]	None[1/3]
Low (2)	Moderate [5/2]	Moderate[4/2]	Minor[3/2]	None[2/2]	None[1/2]
Negligible (1)	Minor [5/1]	Minor [4/1]	None [3/1]	None [2/1]	None [1/1]

6. THE EMP

6.1 Summary of the EMP Objectives

The Environmental Management Plan (EMP) provides a detailed plan of action required in the implementation of the mitigation measures for minimising and maximising the identified negative and positive impacts respectively, for the proposed warehousing and storage infrastructure development on the leased land portion of Farm 38, Walvis Bay municipal area covering the following developmental project stages:

(i) Permitting and preconstruction activities may be required.

(ii) Construction of the warehousing and storage infrastructure.

(iii) Operation, ongoing monitoring and rehabilitation of the warehousing and storage, and.

(iv) Decommissioning, closure and aftercare of the site.

The EMP gives commitments including financial and human resources provisions for effective management of the likely environmental liabilities for the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area.

Regular assessments and evaluation of the environmental liabilities during the permitting, construction, operation and closure of the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area will need to be undertaken and will ensure adequate provision of the necessary resources towards good environmental management at various stages of the project development.

6.2 Implementation of EMP

6.2.1 Roles and Responsibilities

Management of the environmental elements that may be affected by the different activities of the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area is an important element of the EMP provisions.

The EMP also identifies the activity groups / environmental elements, the aspects / targets, the indicators, the schedule for implementation and who should be responsible for the management to prevent major impacts that the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area may have on the receiving environment (physical and biological environments).

6.2.2 Proponent's Representative (PR) / Project Manager (PM)

The proponent is to appoint a **Proponent's Representative (PR) / Project Manager (PM)** with the following responsibilities with respect to the EMP implementation covering the permitting, construction, operation and closure of the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area.:

- Act as the site project manager and implementing agent.
- Ensure that the proponent's responsibilities are executed in compliance with the relevant legislation.
- Ensure that all the necessary environmental authorizations and permits have been obtained.
- Assist the contractor/s in finding environmentally responsible solutions to challenges that may arise.

- Should the PR be of the opinion that a serious threat to, or impact on the environment may be caused by the proposed activities, he/she may stop work. the proponent must be informed of the reasons for the stoppage as soon as possible.

- The PR has the authority to issue fines for transgressions of basic conduct rules and/or contravention of the EMP.

- Should the Contractor or his/her employees fail to show adequate consideration for the environmental aspects related to the EMP, the PR can have person(s) and/or equipment removed from the site or work suspended until the matter is remedied.

- Maintain open and direct lines of communication between the landowners and proponent, as well as any other identified Interested and Affected Parties (I&APs) with regards to environmental matters, and.

- Attend regular site meetings and inspections as may be required.

6.2.3 Project Health, Safety and Environment (Project HSE)

The proponent is to appoint a Project Health, Safety and Environment (Project HSE) with the following responsibilities with respect to the EMP implementation covering the permitting, construction, operation and closure of the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area:

- Assist the PR in ensuring that the necessary environmental authorizations and permits have been obtained.

- Assist the PR and Contractor in finding environmentally responsible solutions to challenges that may arise.

- Conduct environmental monitoring as per EMP requirements.

- Carry out regular site inspections (on average once per week) of all operational areas with regards to compliance with the EMP. report any non-compliance(s) to the PR as soon as possible.

- Organise annual independent internal audit on the implementation of and compliance to the EMP.

- Continuously review the EMP and recommend additions and/or changes to the EMP document.

- Monitor the Contractor's environmental awareness training for all new personnel coming onto site.

- Keep records of all activities related to environmental control and monitoring and the latter to include a photographic record of the project activities, rehabilitation process, and a register of all major incidents, and.

- Attend regular site meetings.

6.2.4 Contractors and Subcontractors

The responsibilities of the **Contractors and Subcontractors** that may be appointed by the proponent to undertake certain permitting, construction, operation and closure of the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area, include:

- Comply with the relevant legislation and the EMP provision.

- ❖ Preparation and submission to the proponent through the Project HSE of the following Management Plans:
    - o Environmental Awareness Training and Inductions.
    - o Emergency Preparedness and Response.
    - o Waste Management, and.
    - o Health and Safety.
- ❖ Ensure adequate environmental awareness training for senior site personnel.
- ❖ Environmental awareness presentations (inductions) to be given to all site personnel prior to work commencement.
- ❖ The Project HSE is to provide the course content and the following topics, at least but not limited to, should be covered:
    - o The importance of complying with the EMP provisions.
    - o Roles and Responsibilities, including emergency preparedness.
    - o Basic Rules of Conduct (Do's and Don'ts).
    - o EMP: aspects, impacts and mitigation.
    - o Fines for Failure to Adhere to the EMP, and.
    - o Health and Safety Requirements.
- ❖ Record keeping of all environmental awareness training and induction presentations, and.
- ❖ Attend regular site meetings and environmental inspections.

6.3 Specific Mitigation Measures

6.3.1 Hierarchy of Mitigation Measures Implementation

A hierarchy of methods for mitigating significant adverse effects has been adopted in order of preference and as follows:

(i) Enhancement, e.g., provision of new habitats.

(ii) Avoidance, e.g., sensitive design to avoid effects on ecological receptors.

(iii) Reduction, e.g., limitation of effects on receptors through design changes, and.

(iv) Compensation, e.g., community benefits.

6.3.2 Specific Mitigation Measures Implementation

The Environmental Management Plan (EMP) provides a detailed plan of action required in the implementation of the mitigation measures for minimising and maximising the identified negative and positive impacts respectively.

The EMP also provides the management actions with roles and responsibilities requirements for implementation of environmental management strategies by the proponent through the Contractors and Subcontractors who will be undertaking the activities.

The EMP gives commitments including financial and human resources provisions for effective management of the likely environmental liabilities during and after the implementation of the proposed project.

Based on the findings of the impact assessment undertaken, the following specific mitigations have been provided for the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area:

(i) Mitigation measures for vehicles movements and access tracks management are:

- Avoid unnecessary affecting areas viewed as important habitat – i.e., Local ephemeral rivers. rocky outcrops. lithops / lichen fields.
- Make use of existing tracks/roads as much as possible throughout the area.
- Do not drive randomly throughout the area (could cause mortalities to vertebrate fauna and unique flora. accidental fires. erosion related problems, etc.).
- Avoid off-road driving at night as these increases mortalities of nocturnal species.
- Implement and maintain off-road track discipline with maximum speed limits (e.g.30km/h) as this would result in fewer faunal mortalities and limit dust pollution.
- Where tracks have to be made to off the main routes, the new routes should be selected causing minimal damage to the environment – e.g., use the same tracks. cross drainage lines at right angles. avoid placing tracks within drainage lines. avoid collateral damage (i.e., select routes that do not require the unnecessary removal of trees/shrubs, especially protected species).
- Rehabilitate all new unused tracks created, and.
- Rehabilitate all excavated or disturbed areas.

(ii) Mitigation measures to be implemented with respect to construction process are:

- Select camp sites and other temporary lay over sites with care – i.e., avoid important habitats.
- Use portable toilets to avoid faecal pollution around camp.
- Initiate a suitable and appropriate refuse removal policy as littering could result in certain animals becoming accustomed to humans and associated activity and result in typical problem animal scenarios – e.g., black-backed jackal, etc..
- Prevent the killing of species viewed as dangerous – e.g., various snakes – when on site.
- Prevent collection of unique plants (e.g., various Aloe and Lithop) or any form of illegal activities.
- Avoid introducing dogs and cats as pets to site as these can cause significant mortalities to local fauna (cats).
- Remove and relocate slow moving vertebrate fauna (e.g., tortoises, chameleon, snakes, etc.) to suitable habitat elsewhere on property.

- ❖ Avoid the removal and/or damaging of protected flora potentially occurring in the general area.
- ❖ Avoid introducing ornamental plants, especially potential invasive alien species, as part of the landscaping of the site, etc., but rather use localised indigenous species, should landscaping be attempted, which would also require less maintenance (e.g., water).
- ❖ Remove all invasive alien species on site, especially Prosopis sp.
- ❖ Inform contractors/workers regarding the EMP provisions and monitor for compliance thereof throughout.
- ❖ Rehabilitate all disturbed areas.
- ❖ Ensure that adequate firefighting equipment (e.g., fire beaters. extinguishers, etc.) is available at the sites and always manage accidental fires, and.
- ❖ Employ an independent environmental auditor to ensure compliance, especially of the rehabilitation of all the affected areas after construction.

(iii) Mitigation measures for ground components including geology, water and construction materials are:

- ❖ Limit the operation to a specific site and avoid sensitive areas (Ephemeral River Channels and protected flora). This would sacrifice the actual area for other adjacent Ephemeral River areas and thus minimise the effect on fauna and flora associated with these areas.
- ❖ Avoid placing dumping sites, overburden/storage sites and associated infrastructure in sensitive areas. This would minimise the negative effect on the local environment.
- ❖ Avoid driving randomly through the area (i.e., “track discipline”), but rather stick to permanently placed roads/tracks.
- ❖ All solid and liquid wastes generated from the proposed project activities shall be reduced, reused, or recycled to the maximum extent practicable.
- ❖ Burial of waste on anywhere is not allowed and all waste must be disposed at the Municipal Waste Disposal site.
- ❖ No littering in the site area including access roads is allowed.
- ❖ Packaging, oil cans, and all other forms of litter must be removed.
- ❖ Trash may not be burned or buried, except at approved sites under controlled conditions in accordance with the municipal regulations.
- ❖ Disposal of wastewater into any public stream is prohibited, and
- ❖ All appropriate permits must be obtained before the implementation of the project activities.

(iv) Mitigation measures to enhance positive socioeconomic impacts include the following actions to be implemented by the Proponent:

- ❖ Stipulate a preference for local contractors in its tender policy. Preference to local contractors should still be based on competitive business principles and salaries and payment to local service providers should still be competitive.

- Develop a database of local businesses that qualify as potential service providers and invite them to the tender process.

- Scrutinise tender proposals to ensure that minimum wages were included in the costing.

- Stipulate that local resident should be employed for temporary unskilled/skilled and where possible in permanent unskilled/skilled positions as they would reinvest in the town's economy. However, due to low skills levels of the local population, the majority of skilled positions would be filled with people from outside the area.

- Must ensure that potential employees are from Walvis Bay, they need submit proof of having lived in the area for a minimum of 5 years.

- Must ensure that contractors adhere to Namibian Affirmative Action, Labour and Social Security, Health and Safety laws. This could be accomplished with a contractual requirement stipulating that monthly proof should be submitted indicating payment of minimum wages to workers, against their ID numbers, payment of social security and submission of affirmative action data, and.

- Encouraged to cater for the needs of employees to increase the spending of wages locally in Walvis Bay.

(v) Mitigation measures to minimise negative socioeconomic impacts are:

- The employment of local residents and local companies should be a priority. To ensure that potential employees are from the area, they need submit proof of having lived in the area for a minimum of 5 years.

- Providing information such as the number and types of jobs available, availability of accommodation facilities and rental costs and living expenses, could make potential job seekers wary of moving to the area.

- Addressing unrealistic expectations about large numbers of jobs would be created.

- Employ local residents and local companies as far as possible.

- Tender documents could stipulate that contractor have HIV/Aids workplace policies and programmes in place and proof of implementation should be submitted with invoicing.

- Develop strategies in coordination with local health officers and NGO's to protect the local communities, especially young girls.

- Contract companies could submit a code of conduct, stipulating disciplinary actions where employees are guilty of criminal activities in and around the vicinity of the town. Disciplinary actions should be in accordance with Namibian legislation.

- Contract companies could implement a no-tolerance policy regarding the use of alcohol and workers should submit to a breathalyser test upon reporting for duty daily.

- Request that the Roads Authority erect warning signs of heavy vehicles on affected public roads as may be required.

- Ensure that drivers adhere to speed limits and that speed limits are strictly enforced.

- Ensure that vehicles are road worthy and drivers are qualified, and.

- ❖ Train drivers in potential safety issues.

(vi) Mitigation measures to minimise health and safety impacts are:

- ❖ Physical hazards: Follow national and international regulatory and guidelines provisions, use of correct Personal Proactive Clothing at all times, training programme, as well as the implementation of a fall protection program in accordance with the Labour Act.

- ❖ Some of the public access management measures that may be considered in an event of vandalism occurring are:

    - All equipment must be in good working condition and services accordingly.
    - Control access to the site through using gates on the access road(s) if required.
    - The entire site, must be fenced off and the type of fencing to be used would, however, be dependent on the impact on the visual resources and/or cost, and.
    - Notice or information boards relating to public safety hazards and emergency contact details to be put up at the gate(s) to the site.

(vii) Mitigation measures to minimise visual impacts are:

- ❖ Consider the landscape character and the visual impacts of the site from all relevant viewing angles.

- ❖ Avoid the use of very high fencing.

- ❖ Minimise access roads.

- ❖ Minimise the presence of secondary structures: remove inoperative support structures., and.

- ❖ Remove all infrastructure and reclaim, or rehabilitate the project site the activities are completed or the lease agreement is terminated.

(viii) Mitigation measures to minimise noise impacts are:

- ❖ Limit vehicle movements and adhere to the speed of 60 km/h.

- ❖ Vehicles and all equipment must be properly serviced to minimise noise pollution.

- ❖ Use of protective equipment to minimise Occupational Health Safety impacts dues to noise pollution around the site.

- ❖ National or international acoustic design standards must be followed at all times.

(ix) Mitigation measures for waste (solid and liquid) management are:

- ❖ All generated solid waste must be disposed at the Walvis Bay Municipal waste disposal site.

- ❖ Toilet and ablution facilities must be provided on site.

- ❖ Provide clearly marked onsite waste stream system, namely:

    - o General Waste, and

    - o Hazardous Waste.

- ❖ Clearly mark containers, bins, drums or bags for the different types of wastes.
- ❖ Never dispose of hazardous waste in the bins or skips intended for general waste or construction rubble.
- ❖ Never burn or bury any waste around the site, it is prohibited.
- ❖ Never overfill any waste container, drum, bin or bag. Inform your Contractor or the Environmental Control Officer / Site Manager if the containers, drums, bins or skips are nearly full.
- ❖ Never litter or throwaway any waste on the site, in the field or along any road.
- ❖ No illegal dumping, and.
- ❖ Littering is prohibited.

(x) Mitigation measures for freshwater management are:

- ❖ Always use as little water as possible. Reduce, reuse and re-cycle water where possible.
- ❖ Report any dripping or leaking taps and pipes to your Contractor or Environmental Control Officer or Site Manager.
- ❖ Never leave taps running. Close taps after you have finished using them.
- ❖ Never throw any hazardous substance such as fuel, oil, solvents, etc., onto the ground.
- ❖ Never allow any hazardous substance to soak into the soil.
- ❖ Immediately tell the Contractor or Environmental Control Officer / Site Manager when after a spill, or notice any hazardous substance being spilled onsite.
- ❖ Report to your Contractor or Environmental Control Officer / Site Manager when you notice any container, which may hold a hazardous substance, overflow, leak or drip.
- ❖ Immediately report to your Contractor or Environmental Control Officer / Site Manager when you notice overflowing problems or unhygienic conditions at the ablution facilities, and.
- ❖ Vehicles, equipment and machinery, containers and other surfaces shall be washed at areas designated by the Contractor or Environmental Control Officer/ Site Manager.

7. REHABILITATION AND MONITORING

7.1 Rehabilitation Process

The following is the summary of key rehabilitation process to be implemented by the proponent:

- **Step 1: Backfilling the mining void:**
  - Transporting all stockpiled overburden, whether being stockpiled or used as berms, back to the excavated voids.
  - Backfilling the trenches, pits and quarries using this material.
  - If applicable, backfill the various layers of overburden in the reverse order in which they were removed, i.e. Last out should be first in as far as possible, and.
  - When backfilling, bear in mind that some space must be left for the backfilling of the soil on top of the overburden.
- **Step 2: Remove all waste and unwanted materials:**
  - Once the slimes ponds have dried sufficiently, scrape out the slimes and transporting back to the excavated voids during the overburden backfilling stage.
  - Bulldoze the walls over and contour.
  - Scrape all waste that has collected in the pond and dispose of these and the pond lining at a suitable site.
  - Bulldoze the walls of the pollution control pond over and contour.
  - Collect remaining domestic waste on site and transport to an approved municipal waste disposal site.
  - Clean out the oil traps, collect the waste material in drums and transport to a suitable site for disposal, and.
  - Manually remove all weedy species that are present at the site (the entire plant can easily be removed because the plants tend not to root deeply).
- **Step 3: Remove all structures:**
  - Unwanted permanent structures such as bunkers and shades etc.
  - Disassemble all building structures including the any structures and pre-fabricated buildings.
  - Remove all building materials from the site and either:
    - Transporting to a new site if it is to be used or stored elsewhere. or
    - Disposing at a suitable site. or
    - Making them available to the local persons. or
    - Selling at an auction.

- Remove all machinery from the site and transport to a new site where it is to be used or stored or sell at an Auction.
- Remove all fences that have been constructed and either make the material available to the local persons, dispose at a suitable site or sell at an Auction.
- Remove the generators from the sites from site and either transport to a new site for storage or sell as may be required.
- Seal all containers and remove from the site to a storage facility.
- Collect all scrap metal and dispose at a suitable site or sell at an Auction.
- Break up all concrete slabs and structures on site and transport the fragments to a suitable site for disposal, and.
- The concrete reservoirs can probably remain intact provided that the land owner wishes to utilise them at some stage - this will need to be negotiated.

❖ **Step 4: Rehabilitate the excavated voids:**

- Replace the subsoil layer by backfilling the soil on top of the overburden and contour cap the subsoil with a topsoil layer about 10cm deep, and.
- Cap the topsoil containing the seedbank with a layer of gravel by manually spreading the fragments across the surface using a rake.

❖ **Step 5: Rehabilitate the storm-water channel:**

- Remove the Hyson cells or gabions.
- Dispose of the plastic/wire and use the fill material to backfill the storm-water channel if created.
- Cap with a layer of topsoil to a depth of about 10cm, and.
- Cap the topsoil containing the seedbank with a gravel layer by manually spreading the fragments across the surface using a rake.

❖ **Step 6: Rehabilitate of disturbed grounds:**

- Compaction of the substrate will result from utilisation of these areas or the pressure of overlying structures.
- Rip the surfaces to a depth of 40 cm to 50 cm using a multi-toothed ripper and tractor.
- Cover with a layer of topsoil to a depth of about 10 cm, and.
- Cap the topsoil containing the seedbank with a layer of gravel by manually spreading the fragments across the surface using a rake.

❖ **Step 7: Rehabilitate the roads:**

- Compaction of the road will result from the continuous passage of heavy vehicles so it will be necessary to break up the road surface.
- Rip the road surface to a depth of at least 50 cm using a multi-toothed ripper and tractor.

- Disk the ripped surface to break up the clods.
- Cover with a layer of topsoil to a depth of about 10 cm, and.
- Cap the topsoil containing the seedbank with a gravel layer by manually spreading the fragments across the surface using a rake.

7.2 Monitoring of the Environmental Performance

7.2.1 Rehabilitation Evaluation and Performance Monitoring

The following is the summary of key rehabilitation evaluation and performance monitoring to be implemented by the proponent:

- Monitoring: Monitoring program is instituted to ensure that the requirements of the mining site rehabilitation program are met. Rehabilitation program may be subjected to various natural or man-made forces that can hinder the progress and lead to problems or failure or the rehabilitation program. Regular monitoring will ensure that these factors are identified early so they may be resolved through appropriate recommendations.

- Frequency: All rehabilitated areas should be monitored over a 3 years period from the onset of the rehabilitation procedures. The frequency of monitoring suggested above is dependent on satisfactory performance. If, however, the requirements are not being met, the frequency of monitoring can be increased. It is suggested that the monitoring be conducted once a year around September when the grasses and forbs are flowering.

- Methods: The rehabilitated areas might be monitored by the sampling randomly located $1m^2$ quadrates. Approximately 10 quadrates per hectare (or a minimum of 3) should be sampled per plant community. The factors that will be examined in each quadrate include:
  - Percentage basal cover.
  - Percentage aerial cover.
  - Species composition and diversity.
  - Vigor and health of plants.
  - Presence of and evidence of fauna, and.
  - Nature of the substrate.

- Controls: To enable a comparison, control plots located within the surrounding un-mining areas should also be monitored. This will give an indication of the progress of rehabilitated areas versus the natural vegetation and will set the goals, which ultimately should be achieved. By monitoring the natural vegetation annually, it will also be possible to assess the natural changes that are taking place. These findings can then be applied to the rehabilitated areas so as to account for the changes, which may have resulted from natural events. Approximately 5 to 10 quadrates of $1m^2$ should be sampled per community type to set the controls.

- Maintenance: Maintenance requirements may include seeding (if there is poor germination of the seedbank), fertiliser applications, correcting erosion problems, removing weeds, etc. Maintenance of the rehabilitated areas will be necessary periodically. The need for and extent of maintenance activities will be determined during the regular monitoring of the site, and.

- Qualified Personnel: The rehabilitation procedures from implementation to monitoring should be overseen by qualified personnel. Any persons involved in the rehabilitation of the mining site should be trained in the techniques involved.

7.2.2 Overall Environmental Performance Monitoring and Reporting

The monitoring of the environmental performances for the permitting, construction, operation and closure of the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area can be divided into two (2) parts and these are:

(i) Routine / ongoing daily monitoring activities to be undertaken by the Project HSE Officer with the support of the external specialist consultants as maybe required, and.

(ii) Preparation of annual Environmental Monitoring Report and Environmental Closure covering all activities related to the EMP implementation during the permitting, construction, operation and closure of the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area to be undertaken by the Project HSE Officer with the support of the external specialist consultants as may be required.

The proponent will be required to report regularly (twice in a year or as the case maybe) to the Environmental Commissioner in the Ministry of Environment and Tourism (MET), the environmental performances as part of the ongoing environmental monitoring programme. Environmental monitoring programme is part of the EMP performances assessments and will need to be compiled and submitted as determined by the Environmental Commissioner. The process of undertaking appropriate monitoring as per specific topic (such as fauna and flora) and tracking performances against the objectives and documenting all environmental activities is part of internal and external auditing to be coordinated by the Project HSE Officer.

The second part of the monitoring of the EMP performance will require a report outlining all the activities related to effectiveness of the EMP at the end of the project (Closure stage) to be undertaken by the Project HSE Officer with the support of the external specialist consultants as may be required. The objective will be to ensure that corrective actions are reviewed and steps are taken to ensure compliance for future EIA and EMP implementation.

The report shall outline the status of the environment and any likely environmental liability after the completion of the proposed / ongoing project activities. The report shall be submitted to the Environmental Commissioner in the Ministry of Environment and Tourism and will represent the final closure and fulfilment of the conditions of the Environmental Clearance Certificate (ECC) issued by the Environmental Commissioner and the conditions of the Pro-Forma Environmental Contract signed by the Proponent, Environmental Commissioner and the Mining Commissioner.

8. CONCLUSION AND RECOMMENDATION

8.1 Conclusions

Current proposed the permitting, construction, operation and closure of the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area will have negligible localised impacts on the local receiving environment with insignificant negative impacts. Mitigation measures shall be implemented as detailed in Section 6 (EMP) of this report. The proponent (Vibrant Upstream Services (Pty) Ltd) shall obtain all the applicable permits for the proposed warehousing and storage infrastructure development.

8.2 Recommendations

It's hereby recommended that the permitting, construction, operation and closure of the proposed warehousing and storage infrastructure development on the leased land portion of Farm 38, Walvis Bay municipal area be issued with an Environmental Clearance Certificate with key conditions of adhering to the provisions of the EMP, Lease Agreement as well as all other related regulations governing, radiation sources, explosives, water resources management, health and safety and labour. The proponent (Vibrant Upstream Services (Pty) Ltd) shall take all the necessary steps to implement all the recommendations of the EMP for the successful implementation the permitting, construction, operation and closure of the proposed warehousing and storage infrastructure on the leased land portion of Farm 38, Walvis Bay municipal area.

The following is the summary of the recommended actions to be implemented by Vibrant Upstream Services (Pty) Ltd (the Proponent) as part of the management of the likely impacts through implementations of the EMP are:

(i) The proponent must implement precautionary measures / approach to environmental management.

(ii) Contract an Environmental Control Officer/ HSE/ Consultant / suitable in-house resources person to lead and further develop, implement and promote environmental culture through awareness raising of the workforce, contractors and sub-contractors.

(iii) Provide with other support, human and financial resources, for the implementation of the proposed mitigations and effective environmental management.

(iv) Develop a simplified environmental induction and awareness programme for all the workforce, contractors and sub-contractors.

(v) Where contracted service providers are likely to cause environmental impacts, these will need to be identified and contract agreements need to be developed with costing provisions for environmental liabilities.

(vi) Implement internal and external monitoring of the actions and management strategies. Final Environmental Monitoring report shall be prepared by the Environmental Coordinator / Consultant / Suitable in-house resource person and to be submitted to the regulators as may be required, and.

(vii) Develop and implement a monitoring programme that will fit into the overall company's Environmental Management Systems (EMS) as well as for any future EIA for new or expanded similar project in the area.

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