APP 002234

Environmental Scoping Report For The Proposed Stone Aggregate Quarrying At An Existing Quarry At Lüderitz, !Kharas Region

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PROJECT CONSULTANT	Mr. Ipeinge Mundjulu
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TABLE OF CONTENTS

List of figures

List of tables

ABBREVIATION

EMA	Environmental Management Act
MEFT	Ministry of Environment Forestry and Tourism
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
SM	Site Manager
ESMP	Environmental Management Plan
HIV	Human Immune Virus
AIDS	Acquired Immune Deficiency Syndrome
PPE	Personal Protective Equipment
ANFO	Ammonium Nitrate Fuel Oils
ESCI	Eben Smith Concrete Company Ltd

1 INTRODUCTION

1.1 **Proponent**

Mr. Eben Smith is a Namibian citizen who owns a company, Eben Smith Concrete Company Ltd (ESCI), with interest in civil engineering, steel and concrete and general construction company. The company has interest in reviving an old aggregate quarry[1] near Lüderitz (**see figure 1 below**).

Figure 1. The old quarry

1.2 The need and desirability of the project

Lüderitz town is expected to host one of the largest green hydrogen manufacturing plant. Additional, oil discovery at offshore areas around Lüderitz is expected to boost industries

[1] Quarrying is defined as the extraction of stone or other materials from the earth such as sand, gravel and crushed rock which are referred to as aggregates. Different forms of quarries include, 'surface mines', 'pits', 'open pits' and 'opencast mines.

development at the harbour. Needless to say, the development of these industries will require huge amount of concrete of which the requisite is the concrete / aggregate stones. Currently, developers in Lüderitz source aggregated from Keetmanshoop, about 340km away, which makes concrete work expensive and unsustainable.

1.3 Location and background of the quarry

The quarry if located at town at coordinates -26.665708°, 15.184247°. It was constructed by the contractors of Ministry of Work and Transport about 10 years ago during the construction of the B4 road which link Lüderitz to Keetmanshoop **(see Figure 1&2.)**. After the road was completed, an open quarry was left. Currently, the land is within the proposed expansion boundaries of Lüderitz Town Council.

Figure 2. Proposed quarry site with the old existing quarry

Figure 3. Bird view of the proposed Lüderitz Quarry

1.4 Regulatory Requirements

In 2007, the Environmental Management Act 2007 (Act No. 7 of 2007) 'EMA' was enacted and came into force on 6th February 2012. Part VII, Section 27 of EMA has listed activities that may not be undertaken without an Environmental Clearance Certificate (ECC). Aggregate Quarrying is amongst the listed activities under Section 27 of EMA and the annexure of EIA regulation that may not be undertaken without an Environmental Clearance Certificate (ECC) (Table 1).

Table 1. Listed activities in relation to aggregate quarrying

Activity	Listed Activity under EMA
• **Activity 3:** Mining and quarrying Activities	3.2 Other forms of mining or extraction of any natural resources whether regulated by law or not

It is against this statutory requirement that Mr. Smith has appointed Red-Dune Consulting to undertaken an environmental scoping study and develop an Environmental Management Plan for the proposed aggregate quarry operations at an old quarry.

1.5 Terms of Reference

The scope of this scoping study is guided by the Terms of References as provided for by the EIA Regulation 2012, Section 9 (a-b) but, not limited to the following;

- Provide a comprehensive description of the proposed Project.
- Identify relevant legislation and guidelines for the project.
- Identify potential environmental (physical, biological, and social) conditions of the project location and conduct risk assessment.
- Inform Interested and Affected Parties (I&APs) and relevant authorities about the proposed project to enable their participation and contribution.
- Develop an Environmental Management (EMP) that would be a legal guideline for the environmental protection by the project.

The Namibia EIA process is explained in the EIA regulation 2012, GRN Gazette No. 4878. The process is summarized in **Figure 4** below.

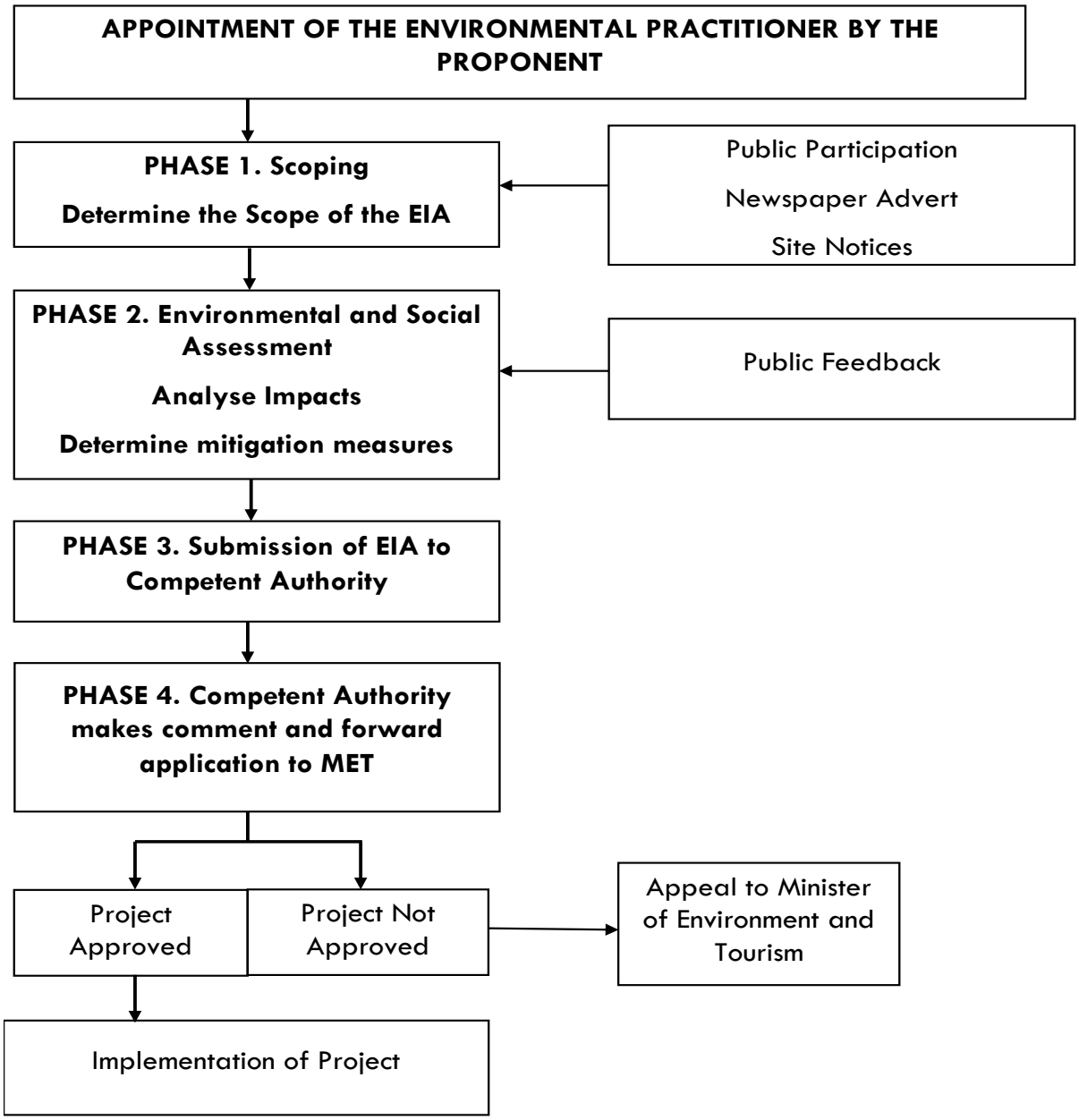

Figure 4. The EIA process in Namibia

2 PROJECT DESCRIPTION

2.1 Aggregate Quarrying

As requisite in all construction, aggregates are some of the most mined materials in the world. They serves as reinforcement to add strength to construction composition. In Namibia, aggregate are mined from surface pits. The proposed mining will involve three main phases, (i) blasting, (ii) loading and (iii) transportation of boulders. Aggregate mining make use of large earth-moving equipment such as forklifts, front loaders, excavators , conveyors belts, and machines that are designed to crush and separate aggregated into various sizes for various uses i.e. road construction, railway construction, buildings etc (**Figure 5**).

Figure 5. Illustrative picture of a quarry

2.1.1 Blasting

Blasting is required to break rock from the ground. Often, high explosives[2] packed into close vertical drill holes running into the face from quarry floor level are detonated to break the rocks. Common explosion used include the mixture of ammonium nitrate (AN) prills (small, bead-like pellet), and fuel oil FO commonly known as ANFO and ANFO/emulsion[3] blends.

Blasting produces large pieces of rocks called “boulders” which are excavated using excavators, transport by forklifts to the crushers which will break them into different sizes of aggregate.

[2] The user of explosives is required to obtain explosive license from the relevant authority.
[3] An emulsion is waterproof version of ANFO.

Safety and environmental consideration has been considered critical which determine the array in which explosives are detonated. Traditionally, explosives are detonated instantaneously which create higher ground vibration. To lower ground vibration, explosives in each drill hole are detonated in a predetermined sequence so that there are delays of a milliseconds between each detonation. This generates shock waves whose energy is much more directed energy into breaking up the stone effectively and creates much lower levels of ground vibration in the surrounding area. Blocks that are too large to go through the crusher are crushed by a 'drop balling' or using jib-mounted breakers, but not explosives.

2.1.2 Crusher and stone crushing

Generally, stone crushing plant mainly includes vibrating feeders, jaw crusher, cone crusher, impact crusher, vertical shaft impact crusher, vibrating screen, belt conveyor and electric control panel.

During crushing, large pieces of stone are fed to a jaw crusher for primary crushing. Crushed material are transferred to a cone crusher using conveyor belt for fine crushing. Finely crushed material are transported to a vibrating screen by belt conveyor for separation. Materials which do not meet requirement are returned to cone crusher for second crushing while materials that meet the requirement are transferred to a vibrating screen by belt conveyor for separation. Various sizes of screened material are transferred to different stockpiles by conveyor belts **(see Figure 6)** and are normally transported with truck to the point end user.

Figure 6. Stockpiling of aggregate

2.2 Area fencing

The mining area will be fenced off to ensure animal safety and illegal access to site.

2.3 Size and mining depth

The total land areas proposed quarrying activities will be undertaken in area of 86 hectares but will commence from the existing quarry. The current footprint for the existing old quarry is about 3683M^2 with a depth of about 10m. The quarry depth is often determined by the environmental impacts such as ground water and economically through quality of gravel as the quarry deepens. There are no ground water / borehole in the areas. The fact that it seldomly rain in the area, the chance of intersecting ground water is minimal. The EMP provides mitigation measures when mining struck ground water.

2.4 Access roads

The quarry is next to the B4 national road. There are access roads which were used by previous users which will be used during operation.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 Regional Profile

Lüderitz is found in ||Kharas Region, the largest region in Namibia with a surface area of 161 325 km^2. The region has an estimated population of 77,421 with a population density of 0.5 person per square kilometres (Census 2011) making it the least densely populated region in the country. It is predominantly home to the Nama and Damara people.

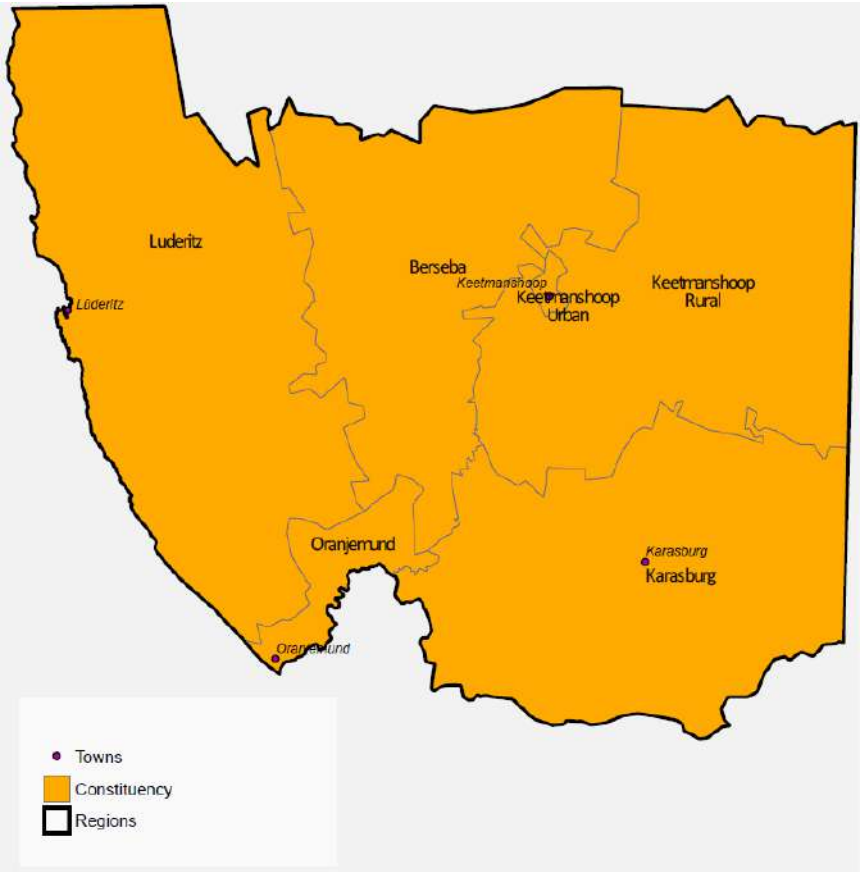

Figure 7. ||Kharas Region (Source: Census 2011)

The region is home to various protected National Parks and Game Parks such as the famous /Ai-/Ais Hot Springs Game Park, the Fish River Canyon, Tsau ||Khaeb National Park, formerly known as Sperrgebiet, and Namib-Naukluft Park.

The region's economy is supported mainly by the mining towns of Oranjemund and Rosh Pinah, as well fishing in Lüderitz. Keetmanshoop is the region's capital.

3.1.1 Lüderitz

The coastal town of Lüderitz is sandwiched between Namib sands and the cold Benguela Atlantic ocean. It has some of the country's dark history of colonialism. The town has a total population of 12 537 people. Fishing is the backbone of the town's economy. With the recent discovery of oil at the its offshore areas, and the proposed green hydrogen production, more economic activities are expected in the harbour town.

3.2 Climate

Namibia is one of the driest countries in sub-Saharan Africa. The country's climate is characterized by high climatic variability in the form of persistent droughts, unpredictable and variable rainfall patterns, variability in temperatures and scarcity of water. Rainfall decreases from east to west, with Zambezi Region receiving the highest rainfall of 600ml/year to less than 25 ml in the Southwest and West of the country.

Lüderitz climatic condition is that of hot and dry climate with temperature ranging between 18 to 20 °C and average rainfall of 25mm (it seldomly rains at Lüderitz). The lowest temperatures occurs during the dry season months of June to August. Mean monthly minimum temperatures do not, on average, fall below 0°C. High solar radiation, low humidity and high temperature lead to very high evaporation rates, which vary between 3 800 mm per annum in the south to 2600 mm per annum in the north. Surface water sources such as dams are subject to high evaporation rates. Potential evaporation is at least five times greater than rainfall.

3.3 Geology and soil

The geology of areas around Lüderitz is made of Namaqua Metamorphic Complex. These rocks have been metamorphosed to form marbles, calcitic gneisses, metaquartzites, biotite

schists, sillimanitecordierite garnet gneisses, amphibolites and granolites with minor amounts of iron formation and magnesian rocks[4] **(Figure 8&9).**

Figure 8. Surface geological feature of the quarry

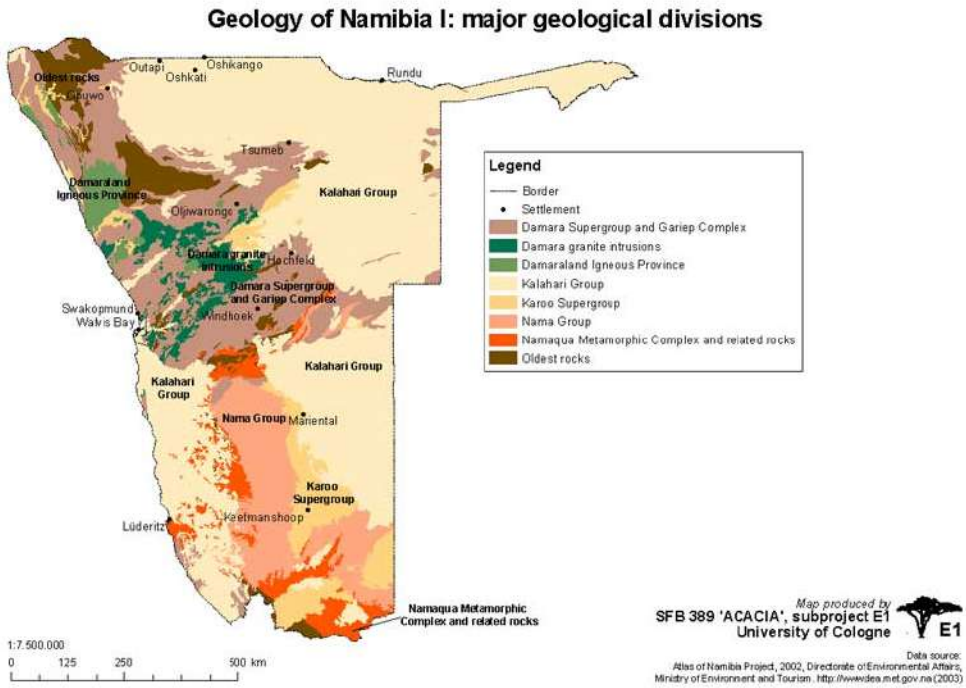

Figure 9. Geological map of Namibia (Source: Mendelsohn et al. 2002, http://www.uni-koeln.de/sfb389/e/e1/download/atlas_namibia/) (Accessed 26 October 2023).

[4]Jackson MPA 1976, High-Grade Metamorphism and Migmatization of The Namaqua Metamorphic Complex Around Aus In the Southern Namib Desert, South West Africa

The Lüderitz areas is made up of Regosols soils. These are young, minimally developed soils with no diagnostic horizons and very little evidence of soil-forming processes. Typically, they are found in medium to finely textured or unconsolidated materials. They occur where soil formation has been inhibited by adverse conditions, such as an arid and hot climate.

3.4 Topography and Hydrology

The Namib dessert has various topography, influenced by the hills and sand dunes. The study area is generally flat with undulating terrain. The area seldomly receive rainfall and there are no active drainage lines. In the surrounding however, is natural flat area that formed a salt pan **(see Figure 10).**

Figure 10. Salt Pan in the surround areas

3.5 Biodiversity

3.5.1 Flora

Composition of plant communities within the Namib Desert depends on numerous factors including soil types, climate and habitat. The seven major habitats in the region are gravel plains, coastal hummocks, sand dunes, washes, riverbeds, rocky ridges and inselbergs.

In general, the climatic condition of Namib Desert does not support high abundance of vegetation. Vegetation in the desert is normally characterized by dwarf shrubs. The general vegetation type of the area could be described as Namib desert. The Namib desert Biome makes up a large proportion (32%) of the land area of Namibia with parks making up 69% of the protected area network (Barnard, 1998). Four of the 14 desert vegetation types are adequately protected with up to 94% representation in the protected area network in Namibia (Barnard, 1998). The region has low plant diversity but high endemism in some vertebrate and invertebrate taxa.

According to Giess (1998), the most widely used classification of Namibian vegetation to date, the study area falls into the Southern Namib vegetation zone, where he describes a narrow coastal strip of hummock dunes formed around *Zygophyllum clavatum, Psilicaulon salicornioides* and *Salsola* sp. lichens individuals of *Zygophyllum stapffii* and *Arthraerua leubnitziae*.

Most of the plants along the coast can absorb the fog moisture through the modified leaves. The sparse plant cover varies according to the substrate, herbs, small shrub and grass usually grow on gravel plains. As may be expected many, if not all, of the species are adapted to the extreme conditions of the Namib, with a high proportion of annual species that rapidly germinate, grow, produce seed and die in a very short space of time after rain, and also many succulent and geophyte species. A number of species are restricted, or largely restricted, to koppies, ridges, drainage lines and rivers, which also carry the highest plant biomass for much of the year.

The study area consist of one plants species; the *Augea* capensis of the Zygophyllaceae family (See figure below 11).

Figure 11. Plant species of *Augea* capensis

The status criteria of *Augea* capensis of least concern[5], it is not endemic to Namibia, the project impact on vegetation will be minor.

3.5.2 Fauna

Ecological studies of the Namibia Desert indicated that, animal life seem to be absent during the day while in actual fact, a lot of life goes on during the night. Which is simply an arid survival of biodiversity. During the day, the temperature is extremely hot, plant and animal hide in various places, some burry themselves under the sand.

In general, the Desert is home to insects, snakes, geckos, mice, ants, beetles, spider and bigger animals such as springboks Ostriches, Oryx and Jackals. Wild horses occur in the southern Namib desert.

During site assessment, there were not sign of animals, however, small animals could be hiding in between rock in avoiding to scotching heat of the Namib. Consequently, the impact on the fauna will be minimal.

[5] Raimondo, D., von Staden, L., Foden, W., Victor, J.E., Helme, N.A., Turner, R.C., Kamundi, D.A. and Manyama, P.A. 2009. Red List of South African Plants. Strelitzia 25. South African National Biodiversity Institute, Pretoria.

4 ADMINISTRATIVE, POLICY AND REGULATORY FRAMEWORK

Table 2. Policy, legal and administrative framework policy

Legislation	Summary	Applicability to Assessment
The Namibian Constitution	The State shall actively promote and maintain the welfare of the people by adopting policies aimed at … The maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future	Protection of the environment and biodiversity
Environmental Management Act No. 7 of 2007	This act aims to promote the sustainable management of the environment and the use of natural resources and to provides for a process of assessment and control of activities which may have significant effects on the environment; and to provide for incidental matters	The acts provides a list of activities that may not be undertake without an environmental clearance certificate to prevent environmental damages
Draft Pollution Control and Waste Management Bill	This Bill serves to regulate and prevent the discharge of pollutants to air and water as well as providing for general waste management	To protect the Environment from possible hydrocarbons and oil leaks from the machinery and vehicles
Environmental Policy framework (1995)	This policy subjects all developments and project to environmental assessment and provides guideline for the Environmental Assessment.	Consideration of all possible impacts and incorporate them in the development stages
The Occupational Safety and Health Act No. 11 of 2007	Promotes the Safety and Health of employees at the work place	Employees subjected to noise and dust

Legislation	Summary	Applicability to Assessment
Public Health Act No. 36 of 1919	To Protect the public from nuisance and states that no person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health.	Application of proper mitigation measure to noise and dust
Labour Act No. 11 of 2007	This Act outlines the labour laws which encompass protection and safety of employees at work.	This project will require labour during its operational stage and decommissioning stage.
Water Act No, 54 of 1956	All water resources belongs to the State. It prevents pollution and promotes the sustainable utilization of the resource	Prevention of discharging contaminated water at unauthorised places
Soil Conservation Act No. 76 of 1969	To promotes the conservation of soil, prevention of soil erosion	Uncontrolled movement of heavy vehicles and truck at areas surrounding the site may cause land degradation
Water Resource Management Act No.11 of 2011	The Act stipulates the prevention of both Surface and Ground water sources.	Oil spillage coming from brick making machines and transporting vehicles need to minimised to avoid water contamination.
Public Health Act no. 36 of 1919	The Act gives provision for the protection for the health of all people.	The noise and dust level emanating from the project could affect the surrounding community.

Legislation	Summary	Applicability to Assessment
National Heritage Act No.27 of 2004	The Act gives provision of the protection and conservation of places and objects with heritage significance.	There were no heritage features identified on site or within the close vicinity of the cite.
Local Authority Act No. 23 of 1992 Government Notice of No.116 of 1992.	This Act underlines the duties and functions of the	All stakeholders affected by the operations of the project have been informed of the developments including that of undertaking the EIA.
Convention on Biological Diversity Rio De Janeiro (1992)	Namibia is a signatory to convention of preservation of rare and endemic species.	The area is a conservancy and of medium biodiversity importance.

5 STAKEHOLDER CONSULTATIONS

Section 21 of the EIA Regulation requires the undertaking of an Environmental Impact Assessment (EIA) to follows a robust and comprehensive public consultation. This is an important process, because it gives members of the public, especially the Interested and Affected Parties to comment or raise concerns that may affect their socio-economic or general environment because of the project. Further, it solicits crucial local knowledge that the Environmental Assessment Practitioner may not have.

The proposed project will be taking place at a disturbed area where similar activities took place. In this instance, a scoping study requires that relevant stakeholder are consulted to provide their comment on the proposed revival of the quarry. Thus, a background information document for the project was prepared and shared with the MEFT, DEA for the application of the ECC. The DEA provided TORs in which it further requested consultation with relevant authority.

Lüderitz Town Council (LTC) with its stakeholders are direct stakeholder. This is because, the existing old quarrying is less than a kilometre to Lüderitz Town boundaries which could effectively be within the townland in the future. The LTC was consulted and provided consent (**see Figure 12 below**) for the implementation of the project.

LÜDERITZ TOWN COUNCIL
P. O. BOX 19
LÜDERITZ

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14 November 2023

The Environmental Commissioner
The Ministry of Environment, Forestry and Tourism
Department of Environmental Affairs
Private Bag 13306
Windhoek

Dear Sir,

RE: Environmental Impact Assessment for the Proposed Stone aggregate Quarrying at An Existing Quarry at Lüderitz, !Karas Region

The above matter refers.

The above development triggers listed activities in terms of the Environmental Management Act (No. 7 of 2007) and the Environmental Impact Assessment Regulations (Governmental Notice No. 30 of 2012).

The applicant has complied by conducting an EIA process to investigate if there are any potential significant bio-physical and socio-economic impacts associated with the intended activities and no major impacts were raised. This same process also included public consultation as per the requirements and key stakeholders were requested to provide comments and there was a general acceptance of the intended land use.

In view of the above, the Lüderitz Town Council supports the activity and grants permission for the evaluation process of the EIA study to proceed.

Yours faithfully,

Mr. Austin Mubiana
Acting Chief Executive Officer
Lüderitz Town Council

Luderitz Town Council
Luderitz
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Tel: 063 207 800 / 063 207 801
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All official correspondence must be addressed to the Office of the Chief Executive Officer

Figure 12. Consent letter by Lüderitz Town Council

6 ENVIRONMENTAL IMPACT ASSESSMENT

Environmental and social impact assessment for this study focuses on the impact resulting from the development and operation of the quarry. The criteria to be used for assessing impacts[6] and the method of determining their significance is outlined in **Table 3** below[7][8].

Table 3. Risk assessment criteria

Risk Event	Rating	Description of the risk that may lead to an Impact
Impact type	**0**	No Impact
	+VE	Positive
	-VE	Negative
Probability	The probability that an impact may occur under the following analysis	
	1	Improbable (Low likelihood)
	2	Low probability
	3	Probable (Likely to occur)
	4	Highly Probable (Most likely)
	5	Definite (Impact will occur irrespective of the applied mitigation measure)
Confidence level	The confidence level of occurrence in the prediction, based on available knowledge	
	L	Low
	M	Medium
	H	High
Significance (Without Mitigation)	0	None (Based on the available information, the potential impact is found to not have a significant impact)
	L	Low (The presence of the impact's magnitude is expected to be temporal or localized, that may not require alteration to the operation of the project
	M	Medium (This is when the impact is expected to be of short term moderate and normally regionally. In most cases, such impacts require that the projects is altered to mitigate the impact or alternative method of mitigation is implemented
	H	High (The impact is definite, can be regional or national and in long term. The impact could have a no-go implication unless the project is re-designed or proper mitigation can practically be applied
Mitigation	The applied measure / alternative to reduce / avoid an impact	
	0	None (Based on the available information, the potential impact is found to not have a significant impact)

[6] For purpose of this report, the word impact assessment is used interchangeably with the word "risk"
[7] Risk assessment process BSI (2009)
[8] Environmental Impact Assessment Regulations of Environmental Management Act, 2007 (Government Gazette No. 4878) EIA regulations

Significance (With Mitigation)	L	Low (The presence of the impact's magnitude is expected to be temporal or localised, that may not require alteration to the operation of the project
	M	Medium (This is when the impact is expected to be of short term moderate and normally regionally. In most cases, such impacts require that the projects is altered to mitigate the impact or alternative method of mitigation is implemented
	H	High (The impact is definite, can be regional or national and in long term. The impact could have a no-go implication unless the project is re-designed or proper mitigation can practically be applied
Duration	Time duration of the impacts	
	1	Immediate
	2	Short-term (0-5 years)
	3	Medium-term (5-15 years)
	4	Long-term (more than 15 years
	5	Permanent
Scale	The geographical scale of the impact	
	1	Site specific
	2	Local
	3	Regional
	4	National
	5	International

The risk assessment approach adopted a traditional four stage risk assessment as shown in **Figure 13 below**.

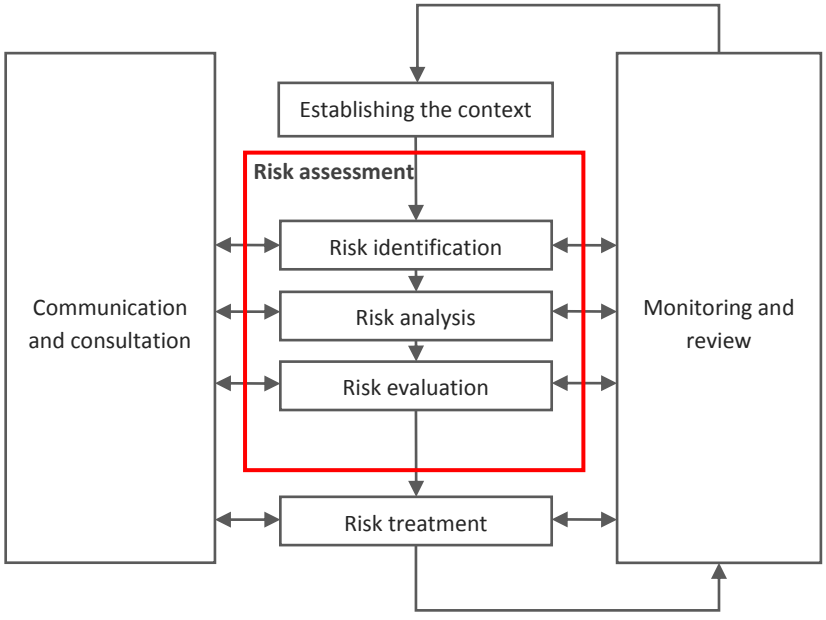

Figure 13. Risk assessment process BSI (2009)

The impact significance was determined using a risk matrix **(Table 4 below).** A five-by-five matrix was used where the impact severity was categorised and assigned scores from 1 to 5 as follows: improbable=1, Low=2, Medium=3, High=4 and Definite=5. Similarly, the likelihood was assigned scores as follows; improbable=1, unlikely=2, possible=3, likely=4, definite =5. The impact rating was determined by multiplying the impact severity and likelihood.

Table 4. Risk assessment matrix

Likelihood						
	5 Definite	5 Moderate	10 High	15 Severe	20 Severe	25 Severe
	4 Likely	4 Moderate	8 High	12	16	20 Severe
	3 Possible	3	6 Moderate	9 High	12 High	15 Severe
	2 Unlikely	2	4 Moderate	6 Moderate	8 High	10 High
	1 Improbable	1 Negligible	2 Low	3 Low	4 Moderate	5 Moderate
		1 Negligible	**2 Minor**	**3 Moderate**	**4 Major**	**5 Severe**
		Impact Severity				

6.1 Identification impacts

The identification of impacts was guided by the following environmental components;

6.1.1 Air Environment

One of the key environmental impacts of the operation of aggregate quarry is the dust emission which has the potential to deteriorate surrounding air quality from fugitive. Lüderitz area is windy nearly year-round. Boulder crushing, screening storage of aggregates and rock dust will create excessive dust which could be a health hazard to workers as well possibility of creating a dust cloud which could reduce visibility on the nearby road.

6.1.2 Noise Environment

Breaking rock from the bedrock will require the use of explosives. Although this will be site specific, the shock vibration could cause damage to surrounding properties and if not

communicated properly, it could be noise nuisance to people. Furthermore, noise will be generated at various points during the operation, such as at crushing and movements of heavy machinery which maybe a health hazard to people.

6.1.3 Water Environment

Water is a scarce resource in Namibia, particularly the coastal areas / Namib Desert. With lack rainfall, there is no surface and ground water concern at the project. However, the EMP has addressed issues of potential water pollution and interjecting ground water.

6.1.4 Biological Environment

The Namib desert has some of the highest endemism of flora and fauna. The assessment considered the vegetation biome and animals that could be affected.

6.1.5 Land Environment

The area is already disturbed. The previous operation of the quarry left an unrehabilitated quarry pit. By the nature of quarry operation, it is inevitable that a relatively shallow open pit will be created. Land degradation could happen if the movement of heavy vehicle in an area is not coordinated as well as the improper management of the top soil and overburden material that as critical for site rehabilitation. The EMP contains rehabilitation measures that will consider the landscape and drainage patterns[9] as well address issues of land degradation at the project site. Furthermore, the operation will produce pollution, household and industrial, both solid and liquid which could pollute the environment.

6.1.6 Socio-economic and Health Environment

The human component is critical. This impact will involve employment creation, occupation health and safety and prominent diseases (HIV-AIDS).

[9] Under the scenario of 1 in 50 chance of storm event.

6.1.7 Heritage and Archaeology Resources

Although this is part of the social environmental, due to its uniqueness and importance, assessment of impact on significant historical, cultural and archaeological sites/places in the area was done.

6.1.8 Hazards

The operation of a quarry involves the use of explosives which could result into flying rocks which are a safety hazard to people and animals in the surrounding. Transportation of aggregates on national road pose a safety risk to other traffic.

6.2 Risk Assessment

Risk assessment was done using table 3&4 above. The risk assessment is presented in table below.

6.2.1 Project Planning

This project is reactive to the envisioned economic growth of Lüderitz town. It is planned to use an old quarry to minimize cumulative impact on the environment if a new quarry was to be commissioned. The project planning was assed as follows;

No.	Impact	Planning question	Desired Outcome
1.	Project acceptance	Is the project accepted by relevant authority?	Consent provided by Lüderitz Town Council
2.	Human displacement	Will the project require displacement of people?	No.
3.	Project beneficial	Is the project relevant and beneficial to the country and local communities?	Yes.
4.	Project Objection	Has the project been objected by relevant authority / local communities?	No.

6.2.2 Construction Phase Risk Assessment

During construction phase, the project will involve mobilizing of machinery to the project site. Land clearing, especially top-soil. Construction of storage and supporting facilities such as, vehicle and machinery garages, perimeter fencing, rehabilitation of old access roads, office and ablution building, employees changing rooms and resting places. Supporting infrastructure such as electricity will be supplied by the NAMPOWER. Initially, water for human consumption will be trucked to the project as well as grey water for dust suppression. The last part of construction will be the installation of primary crusher, cone crusher and supporting conveyor belts.

Table 5. Construction phase risk assessment

Aspect	**Impacts**	**Risk without mitigation**			**Mitigation Measures**	**Risk with mitigation**		
		Severity	Probability	Risk rate		Severity	Probability	Risk rate
Employment / Socio-Economic advancement of local	Possible exclusion of locals / Lüderitz and Aus community from job opportunities. Unfair compensation of workers. Procurement of good and services from outside Lüderitz	L9	Possible	High	1. Ensure that all general work is reserved for local people unless in circumstances where specialized skills are required. 2. Fair compensation and labour practice as per Namibian Labour Laws must be followed 3. Ensure skill transfer to the locals 4. Use local supplier for good and service where possible	L2	Improbable	Low
Health and Safety for employees	Job opportunities leads to new social relationship which often spread	L12	Likely	High	1. Provide awareness to the employees on dangers of HIV/AIDS, alcohol and drug abuse	L6	Unlikely	Moderate

Aspect	Impacts	Risk without mitigation			Mitigation Measures	Risk with mitigation		
		Severity	Probability	Risk rate		Severity	Probability	Risk rate
	disease, particularly pandemic such as HIV and AID and substance abuse. Hiring off unlicenced employees to operate vehicles and special machinery pose safety risk to themselves, co-workers and public. Additionally, employees are subject to dust and noise pollution as well as other occupational health and safety issues				2. Provide condoms on site 3. Develop a safety plan 4. Ensure that every employee goes through an induction course about safety 5. All drivers must be in possession of appropriated driver's licenses 6. Ensure construction / operation starts from 6am-5pm only and no night operation / construction. 7. Adequate safety signs must be put at designated places. 8. Provide safe wears such as, overalls, safety boots, safety eyeglasses, Hand gloves and hard hat etc to employees 9. Adhere to the Labour act, non-toxic human dust exposure levels may not exceed 5mg/m3 for respiratory dust and 15mg/m3 for total dust. 10. Train employees on health and safety. 11. Abide by the Occupational Health and Safety and Labour Act of Namibia and other statutory requirement such as International Labour Practise (ILO)			

Aspect	Impacts	Risk without mitigation			Mitigation Measures	Risk with mitigation		
		Severity	Probability	Risk rate		Severity	Probability	Risk rate
					12. Supply adequate first aid kit 13. Supervisors must undergo an occupational health and first aid course, 14. Train employees on the possible health hazards to avoid potential risks 15. Supply clean drinking water to the site;			
Dust pollution from construction activities	Land clearing, digging and excavation of trenches, movement of vehicles and heavy machinery in site, concrete work, transportation of sand to site, will create fugitive dust which is (i) safety risk due to reduced visibility	L20	Definite	Severe	1. Movement of heavy vehicles must strictly be restricted on site. 2. Adhere to the minimum speed limit of 30 or 40km/hour. 3. Do not excavate and/or offload sand during heavy winds. 4. Trucks carrying sand must be covered. 5. Sand stock piles must be covered or regularly water sprayed with water. 6. On site where soil is loosened by vehicle movement, apply dust a suppression method such as water spraying. 7. Cement and concrete must be mixed with concrete mixers and not manually in the open.	L6	Moderate	

Aspect	Impacts	Risk without mitigation			Mitigation Measures	Risk with mitigation		
		Severity	Probability	Risk rate		Severity	Probability	Risk rate
					8. Cement bags must be stored and disposed of properly and may not be shaken in the open.			
Noise pollution	Noise pollution is expected from the movement of heavy machineries, digging and excavating of trenches and concrete mixing. This is site specific, hence affecting mostly employees.	L10	Definite	High	1. All vehicles and machinery must be well serviced . 2. Switch off engine off vehicles when not in use. 3. Drive at 30-40 km/h while on site. 4. Apply health and safety mitigation measures provided above	L6	Likely	Low
Biodiversity	Clearing of top soil will destroy all vegetation and habitat for the animals.	L9	Possible	High	1. The area vegetation is no threaten neither endemic. 2. Relocated plant to the nearby surrounding 3. Do not kill any animal found onsite. 4. Do not destroy nests if found on site.	L4	Unlikely	Moderate
Waste Generation	Construction activities will produce construction wastes such as building rubbles, used oil cans drums, metals, and	L4	Definite	Moderate	1. Maintain good housekeeping on site. 2. Designate a storage area for building rubbles. 3. Provide skip bins for construction waste. 4. Provide labelled household waste drums for household solid waste.	L2	Improbable	Low

Aspect	Impacts	Risk without mitigation			Mitigation Measures	Risk with mitigation		
		Severity	Probability	Risk rate		Severity	Probability	Risk rate
	household solid and liquid waste				5. Used oil, grease and lubricants cans must be collected in appropriate drums and disposed of at an approved site 6. Ensure separate ablution facilities for men and women.			
Land degradation and pollution Surface and Ground water Pollution	Uncoordinated movement of heavy vehicles and uncoordinated land clearing could lead to soil erosion. Possible spill and leakages of fuel and lubricants from vehicle and machinery could pollute the soil and eventually the ground water resource.	L12	Likely	High	1. Fuelling of heavy vehicles on site must be well coordinated at designated places 2. Stationary vehicles must be provided with drip tray to capture oil, lubricants and hydraulic fluid leakages 3. All vehicles and machinery must be well serviced to avoid leakages 4. Provide and train on oil spill emergency response 5. Servicing of vehicles and machinery must take place at designated sites	L3	improbable	Low
Heritage Resources	Lüderitz has a rich ancient history as well as dark history of colonialism. In areas around Lüderitz, it is possible to stumble on heritage and archaeological materials during digging and	L6	Unlikely	Moderate	1. Employee must be trained on the possible find of heritage and archaeological material in the area; 2. Implement a chance find and steps to be taken for heritage and archaeological material finding (Heritage (rock painting and drawings), human remains or artefacts) are unearthed by;	L2	Improbable	Low

Aspect	Impacts	Risk without mitigation			Mitigation Measures	Risk with mitigation		
		Severity	Probability	Risk rate		Severity	Probability	Risk rate
	excavating that could be destroyed if precaution measure are not taken.				i. Stopping the activity immediately ii. Informing the operational manager or supervisor iii. Cordoned of the area with a danger tape and manager to take appropriated pictures. Manager/supervisor must report the finding to the following competent authorities, National Heritage Council of Namibia (061 244 375) National Museum (+264 61 276800) or the National Forensic Laboratory (+264 61 240461).			
Hazards	Reduced visibility of slow-moving construction vehicles and heavy machinery may lead to accident	L12	Possible	High	1. All heavy vehicles must have a rotating flushing light installed for visibility. 2. Ensure that all vehicle are well serviced and roadworthy. 3. Tipper trucks carrying concrete stones and sand for construction must be covered to avoid flying stock and dust.	L6	Unlikely	Moderate

6.2.3 Operation Phase Risk Assessment

Table 6. Operational phase risk assessment

Aspect	Impacts	Risk without mitigation			Mitigation Measures	Risk with mitigation		
		Severity	Probability	Risk rate		Severity	Probability	Risk rate
Employment / Socio-Economic advancement of local	Same as during construction	L9	Possible	High	Same as during construction	L2	Improbable	Low
Health and Safety for employees	Same as during construction	L12	Likely	Moderate	Same as during construction	L 6	Unlikely	Moderate
Dust pollution from quarrying activities	Blasting, digging and excavation, crushing, stock piling of aggregate and rock dust, transportation of aggregated and rock dust, movement of vehicles and heavy machinery in site will produce excessive dust. which is a, (i) safety risk due to reduced visibility	Ll2	Likely	High	1. Applying dust suppression measures such as water sprays at crushing point and on conveyor belts 2. Spray water on stock piles of aggregate and rock dust 3. Where possible, rock dust stock piles must be covered 4. Movement of heavy vehicles must strictly be restricted on site. 5. Adhere to the minimum speed limit of 30 or 40km/hour. 6. Do not excavate and/or offload sand during heavy winds.	L6	Unlikely	Moderate

Aspect	Impacts	Risk without mitigation			Mitigation Measures	Risk with mitigation		
		Severity	Probability	Risk rate		Severity	Probability	Risk rate
					7. Trucks carrying concrete stones must be covered. 8. On site where soil is loosened by vehicle movement, apply dust a suppression method such as water spraying.			
Noise pollution	Noise pollution is expected from blasting, crushing, and movement of heavy machineries, digging and excavating of blasted rocks and screening of aggregate. Many are site specific hence affecting mostly employees.	L16	Likely	Severe	1. Use approved contractor to undertake blasting. 2. Blasting procedures should be undertaken within national prescribed manner 3. All vehicles and machinery must be well serviced . 4. Switch off engine off vehicles when not in use. 5. Drive at 30-40 km/h while on site. 6. Apply health and safety mitigation measures provided above	L9	Possible	Moderate
Waste Generation	Quarry operation will Overburn materials, used oil cans drums, metals, worn out vehicle and machinery parts,	L12	Possible	Medium	1. Store the overburden appropriately to be used during rehabilitation 2. Maintain good housekeeping on site. 3. Designate a storage area broken spares and worn-out parts.	L6	Possible	Moderate

Aspect	Impacts	Risk without mitigation			Mitigation Measures	Risk with mitigation		
		Severity	Probability	Risk rate		Severity	Probability	Risk rate
	household solid and liquid waste				4. Provide labelled household waste drums for household solid waste. 5. Used oil, grease and lubricants cans must be collected in appropriate drums and disposed of at an approved site 6. Ensure separate ablution facilities for men and women.			
Land degradation and pollution. Surface and Ground water Pollution	Same as during construction	L6	Improbable	Moderate	1. Same as during construction	L3	Improbable	Low
Heritage Resources	Lüderitz has a rich ancient history as well as dark history of colonialism. In areas around Lüderitz, it is possible to stumble on heritage and archaeological materials during blasting, digging and excavating that could	L6	Unlikely	Moderate	1. Employee must be trained on the possible find of heritage and archaeological material in the area; 2. Implement a chance find and steps to be taken for heritage and archaeological material finding (Heritage (rock painting and drawings), human remains or artefacts) are unearthed by; iv. Stopping the activity immediately v. Informing the operational	L2	Improbable	Low

Aspect	Impacts	Risk without mitigation			Mitigation Measures	Risk with mitigation		
		Severity	Probability	Risk rate		Severity	Probability	Risk rate
	be destroyed if precaution measure are not taken.				manager or supervisor vi. Cordoned of the area with a danger tape and manager to take appropriated pictures. Manager/supervisor must report the finding to the following competent authorities, National Heritage Council of Namibia (061 244 375) National Museum (+264 61 276800) or the National Forensic Laboratory (+264 61 240461).			
Hazards	Blasting may cause vibration and flying rocks, Reduced visibility from dust emission, slow-moving construction vehicles and heavy machinery may lead to accident	L15	Possible	Severe	1. Warn public and employee on blasting times. 2. Blasting site / areas must be free of people. 3. Use approved contractor to undertake blasting 4. All heavy vehicles must have a rotating flushing light installed for visibility. 5. Ensure that all vehicle are well serviced and roadworthy. 6. Tipper trucks carrying aggregates	L4	Improbable	Moderate

Aspect	Impacts	Risk without mitigation			Mitigation Measures	Risk with mitigation		
		Severity	Probability	Risk rate		Severity	Probability	Risk rate
					and rock dust must be covered to avoid flying stock and dust.			

6.3 Decommissioning and Rehabilitation Phase

After the life of a quarry, or any downturn event that may necessitate the closure of the quarry, it is important that the quarry areas is rehabilitated appropriately to ensure safety avoid land degradation to the environment, hence a need for a closure plan.

A closure plan is a detailed document that forms part of the Environmental Management Plan. This plan will be a guiding framework for the provisions of rehabilitation and for long term management and monitoring and maintenance of the quarry pit. The closure plan for this project was formulated through the consideration of closure objectives and the implementation of proposed mitigation measure for identified risks. It is recommended that the rehabilitation process must be progressive, which considers rehabilitation at depleted site as it is suitable due to following reasons;

- Reduces health and safety risk
- Reduces risk of soil erosion
- Improves top soil conservation
- Reduces an eye shore of pit

6.3.1 Closure plan

6.3.1.1 Staff awareness of the closure plan

Staff must be well inducted of the closure plan during operation and implement progressive rehabilitation.

6.3.1.2 Fencing of the area

During operation, the quarry site must be fenced off to prevent health and safety risk of public and animals.

6.3.1.3 Site Clean up

All foreign material brought during the operation must be removed. There must not be burying of waste material in the pit. All contaminated soils must be removed and disposed of to appropriate site

6.3.1.4 Trimming and Shaping of the pit

The final rehabilitation must ensure that the borrow pit does not have sharp angles of corners that may cause soil erosion. Trimming and shaping of the pit should follow industry practise as provided for by the competed authority. Provision must be made, such as cut-off drain for the permanent drainage to ensure smooth run-off (to make provision for (1:50 flood event). The cut off drain would be appropriate for this pit, where a deliberate drainage structure would be designed to collect storm water flow into the pit. This should be constructed on the side of the catchment area.

6.3.1.5 Waste material / Overburden

Overburden must be used during contouring or placed back into the pit.

6.3.1.6 Compaction of disturbed surrounding

The surrounding disturbed area from the movement of heavy vehicle must be compacted to prevent wind erosion. The compacted soil must be shallowly ripped to allow regrowth of vegetation.

6.3.1.7 Access roads

Access road that were made for this operation and no longer necessary, must be rehabilitated. The surface of these roads must be ripped to enable regrowth of vegetation.

7 CONCLUSION AND RECOMMENDATIONS

7.1 Conclusions

The scope of this project was guided by site visit information, and comprehensive literature review to determine possible environmental impacts and the possible mitigation measure to the impacts concerning this project. Red-Dune believes that, analysis based on the collected information sufficiently addresses the environment and socio-economic aspects of the project.

7.1.1.1 Impact analysis ranking

The impact on vegetation during construction was found to be sever since clearing of the surface will be indiscriminate. However, vegetation on site is found in the vast areas of the Namib desert hence the destruction impact will not be severe after mitigation. While, the animals, possible crawling animals and birds will naturally move. There are no established animal habitats such as nests.

7.1.1.2 Contribution to socio-economics

The economy of Lüderitz is expected to grow substantially due to offshore oil discoveries and green hydrogen project. This will propel development of associate service industries which will require aggregate materials for construction. Henceforth, the project will critically support Lüderitz local economy as well as the national economy.

The Environmental Management Plan must be the logical framework for the project to mitigate environmental risks.

7.2 Recommendations

Red-Dune recommends to the approving authority for the approval of the project and issuance of the Environmental Clearance Certificate.