
ENVIRONMENTAL MANAGEMENT & MONITORING PLAN (EMP)

**ENVIRONMENTAL IMPACT ASSESSMENT REPORTS FOR
EXTRACT AND PROCESS CLAY SOIL FROM EXCLUSIVE
PROSPECTING LICENSE NUMBER 3903, OMDEL DAM AREA,
ERONGO REGION, NAMIBIA**


Prepared and Submitted By



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**Project Proponent:
Phoenix Mineral Resources**

Project Name	Environmental Management plan for Extract and process clay soil form Exclusive prospective License number 3903 Omdel Dam, Erongo Region, Namibia
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Abbreviations and Acronyms

BAT	Best Available Technology
CBF	Clay Brick Factory
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
FBA	Face Brick Aesthetic
FBS	Face Brick Standards
HPP	The Harambee Prosperity Plan
IAPs	Interested and Affected Parties
ISO	International Organization for Standardization
m ²	Square meters
m ³	Cubic meters
MAWF	Ministry of Agriculture, Water and Forestry
MET	Ministry of Environment and Tourism
MME	Ministry of Mines and Energy
NAMPOWER	Namibia Power Corporation Pty Ltd
NAMWATER	Namibia Water Corporation Ltd
NFP	Non-Facing Plaster (Stock brick)
FBX	Face Brick Extra
NFX	Non-Facing Extra
NHC	National Heritage Council
NO ₂	Nitrogen Dioxide
NSI	Namibia Standards Institute
ORC	Erongo Regional Council
PM	Particulate Matter
PPE	Personal Protective Equipment
SABS	South African Bureau of Standards
SO ₂	Sulphur Dioxide
TLV	Threshold Limit Value
VSBK	Vertical Shaft Brick Kiln

GLOSSARY OF TERMS AND DEFINITIONS	
Anthropogenic Impact:	Human impacts on the environment which includes changes to the biophysical environments, ecosystems, biodiversity and natural resources caused directly or indirectly by human activities including global warming, environmental degradation, etc.
Beneficiation	In the context of Shale Clay, ' beneficiation ' is the manufacturing process or the value addition activities through which the mined raw material is transformed into useful and durable construction materials, i.e. clay bricks. Virtually all the mined clay is used up in the manufacturing of final products without any residue.
Clay Brick:	Shale Clay is an industrial mineral used as raw material for making many types of bricks, tiles, pipes, pottery and other manufactured products. <i>Brick</i> and tile are some of the most extensively used and highly desired materials for building homes, walls, streets, and commercial structures.
Environment:	All physical, chemical and biological factors and conditions which influence an object and or organism. It is also defined as the surroundings within which human beings exist and is made up of the land, water, atmosphere, plants and animal life (micro and macro) including interrelationships between the factors and the physical or chemical conditions that influence human health and well-being
Environmental Impact:	Environmental impact is any change to the environment whether adverse or beneficial, wholly or partially, resulting from an organization activities, products or services
Mine	When used as noun means any place where mining operations are or have been carried on, including any excavations or accessory works, which is or are necessary for, or incidental to such mining operations. When used as a verb means any operations calculated to win any mineral or group of minerals, from a mine or from any ore won from a mine and includes any operations which are necessary for or incidental to such any operation
Mining	Mining is the process of extracting mineral resources, i.e. industrial minerals (coal, manganese, salt, etc.) base metals (copper, tin, tantalite, etc.) and precious metals (diamonds, gold, etc.) from the hoist rock excluding fossil minerals.
Mining Area	A Mining Area is defined in the Minerals Act as the area of land to which a Mining Claim or a Mining Licence relates
Mining Claim	A Mining Claim means a claim registered over a mineral asset (mineral property) under Section 36 of the Minerals Act

Mining Claim:	A parcel of land not exceeding 18 ha in extent securing a mineral asset (deposit) pegged and registered as provided for in the Minerals Act which gives the holder exclusive rights to exploit the said mineral asset secured by such a Mining Claim for his or her own benefit.
Mining Operations	Mining Operations is defined in the Minerals Act as any operations carried on in connection with mining
Quarry:	A quarry is an open pit or excavation made in the ground from which nonmetal resources such as dimension stones, rock, construction aggregates, sand, gravel or slate are extracted (quarried) from.
Quarrying	When used a 'verb' quarrying is the process of removing rock, sand, gravel or other minerals from the ground in order to use them to produce materials for construction or other uses. So, a quarry is any such working on the surface of the earth where minerals are extracted.
Reserve:	Reserve is that amount of the resource which has been quantitatively proven through drilling and other sampling methods for which the level of confidence is high.
Resource:	The resource for which the extent of extractable tonnage is estimated with a low level of confidence, i.e. the resource is only inferred (estimated) from geological evidence and assumptions but has not been verified via drilling and other applicable sampling methods.
Shale	<p>Shale is a fine-grained sedimentary rock that forms from the compaction of silt and clay-size mineral particles that we commonly call "mud." This composition places shale in a category of sedimentary rocks known as "mudstones." Shale is distinguished from other mudstones because it is fissile and laminated.</p> <p>"Laminated" means that the rock is made up of many thin layers.</p> <p>"Fissile" means that the rock readily splits into thin pieces along the laminations.</p>

Executive Summary

1. Introduction

Phoenix Mineral Resources, has commissioned Namland Consultants to undertake the Environmental Impact Assessment (EIA) process and to compile an Environmental Scoping Report and Environmental Management Plan (EMP) for Process for extract and process clay from the Exclusive Prospecting license number 3903, Omdel area, Erongo Region.

Operationally, the business will be divided into two core divisions. The production facility will be established onsite at Omdel Dam and finished products will be distributed via a Depot to be established in Swakopmund. The reason for this separation is that it is not viable to transport the raw material, clay, and the main local market is in and around Swakopmund/Walvis Bay. The Omdel dam site is located 35km to the east of Henties Bay, 110km from Swakopmund, 145 km from the port of Walvis Bay in the Erongo region and approximately 350 km from Windhoek. Coastal Clay Products Project provides an exciting and viable business opportunity with the key focus to produce and sell clay products. This opportunity aligns with the development objectives of the Namibian Government, the Erongo Region as well as the Municipalities of Henties Bay and Swakopmund; additionally NAMWATER will benefit from this project in several ways

2. Project Implementation

The implementation was scheduled for as soon as the environmental clearance is granted by Ministry of Environment and Tourism.

Since Namibia is developing fast and the Construction industry is very huge and demand construction brinks.

3. Environmental Management Plan (EMP)

This Environmental Management Plan (EMP) identifies the principles, approach, procedures and methods that will be used to control and minimize the environmental and social impacts of all mining and operational activities associated with project. It is intended to complement the project Environmental and Social Impact Assessment (ESIA) and ensure that commitments made by the project Proponent, and other sub-contractors to minimize project related environmental and social impacts are upheld throughout all project phases.

The EMP is also a companion document to the prevailing Namibian legal regulations which aims to mitigate environmental impacts and avoid or minimize social impacts arising from the project.

As part of their ongoing commitment to excellence in environmental and social performance for the small scale semi-precious stones mining, the client will ensure the following:

- Fulfil all environmental and social conditions associated with project approvals;
- Develop, promote and foster a shared sense of responsibility for environmental and social performance of the project;
- Promote environmental awareness and understanding among employees and contractors through training, identification of roles and responsibilities towards environmental and social management and linking project performance to overall environmental performance;

- Encourage an understanding of social and cultural sensitivities in local communities and the importance of minimizing project impacts on local lifestyles and culture;
- Monitor environmental and social performance throughout the project and implement an adaptive management approach to continuous improvement;
- Work with local communities and project affected stakeholders to ensure that they benefit as a result of project development; and
- Maintain an ongoing commitment to informing, engaging and involving local stakeholders throughout all phases of the project.

3.1.EMP Structure and Organization

This EMP is designed as an overriding document in a hierarchy of control plans and sets out the overarching framework of environmental management principles that will be applied to the project. It is directly related to the accompanying Environmental and Social Impact Assessment (ESIA) Report for the mining of semi-precious minerals in Kaokoland

The EMP contains guiding environmental principles and procedures for communication, reporting, training, monitoring and plan review to which all construction staff, contractors and subcontractors are required to comply with throughout the preconstruction, construction and operation phases.

The EMP should also be considered as an overall framework document that establishes the terms of reference for all project environmental and social sub-plans that will be completed.

3.2.Responsibility

The responsibility for the implementation of the EMP ultimately lies with the Miner / Proponent, who is also responsible for the eventual operation of these developments. The implementation of this EMP requires the involvement of several key individuals, each fulfilling a different but vital role to ensure sound environmental management during each phase of these developments.

The Miner should appoint an Employer's Representative (ER) to oversee all aspects of these developments for all development phases (including all contracts for work outsourced). The Developer may decide to assign this role to one person for the full duration of these developments, or may assign an ER to each of the development phases – i.e. one for the Planning and Design Phase, one for the Construction / Mining Phase and one for the Operational and Maintenance Phase.

The ER will in turn appoint an Environmental Control Officer (ECO) to oversee the implementation of the whole EMP during the Construction / Mining and Operation and Maintenance Phases. Again, the ER (and/or the Developer) may decide to assign this role to one person for both phases, or may assign a different ECO for each phase – i.e. one for the Construction Phase and another for the Operation and Maintenance Phase.

The following positions and their respective responsibilities are outlined below:

- Employer's Representative;
- Environmental Control Officer; and
- Contractor (Construction and Operations and Maintenance).

3.3. Employer's Representative

The ER is appointed by the Developer to manage all contracts for work/services that are outsourced during all development phases. Any official communication regarding work agreements is delivered through this person. The ER should with the commencement of the project, appoint a competent ECO who will represent the Miner / Proponent on-site.

During the Planning and Design and Construction/Mining Tender Preparation Phase, the ER will have the following responsibilities regarding the implementation of this EMP:

- Ensuring that the necessary legal authorisations have been obtained (see Table 1);
- Developing, managing implementation of and maintaining all Development Guidelines
- Ensure that the management requirements included in Table 3 inform the planning and design of the relevant infrastructure developments (i.e. that these requirements are considered during the Planning and Design Phase not as an afterthought); and
- Ensure that the management requirements included in Table 4 inform the preparation of tender documents for the construction of the relevant infrastructure developments.

During the Construction/Mining, Operation and Maintenance Phases the ER shall assist the ECO where necessary and will have the following responsibilities regarding the implementation of this EMP:

- Ensuring that the necessary legal authorisations and permits (see Table 1) have been obtained by the Contractor;
- Assisting the Contractor in finding environmentally responsible solutions to problems with input from the ECO where necessary;
- Ordering the removal of individuals and/or equipment not complying with the EMP;
- Issuing fines for transgression of site rules and penalties for contravention of the EMP; and
- Providing input into the ECO's ongoing internal review of the EMP. This review report should be submitted on a monthly basis to the Developer.

3.4. Environmental Control Officer (ECO)

The ECO should be a competent person appointed by the ER. The ECO is the Miner's on-site representative primarily responsible for the monitoring and review of on-site environmental management and implementation of the EMP by the Contractor. If no ECO is appointed the duties of the ECO fall upon the ER. During the Construction Phase and Operation and Maintenance Phase the ECO's duties include the following:

- Assisting the ER in ensuring that the necessary legal authorisations have been obtained;
- Maintaining open and direct lines of communication between the ER, Developer, the Construction and/or Operations and Maintenance Contractor, and Interested and Affected Parties (I&APs) with regard to this EMP and matters incidental thereto;
- Monthly site inspection of all construction and/or infrastructure maintenance areas with regard to compliance with this EMP;
- Monitor and verify adherence to the EMP (audit the implementation of the EMP) and verify that environmental impacts are kept to a minimum;
- Taking appropriate action if the specifications of the EMP are not adhered to;

- Assisting the Contractor in finding environmentally responsible solutions to problems;
- Advising on the removal of person(s) and/or equipment not complying with the specifications of the EMP in consultation with the ER;
- Recommending the issuing of fines for transgressions of site rules and penalties for contraventions of the EMP; and
- Undertaking an annual review of the EMP and recommending additions and/or changes to the document.

3.5. Contractor

The Contractor/Miner is responsible for the implementation of the EMP, on-site monitoring and evaluation of the EMP. It is envisaged that various contractors might be appointed at various periods for various tasks throughout the life cycle (construction through to decommissioning phase) of this project. These can be broadly grouped into Construction / Mine Contractors and Operations and Maintenance Contractors. In order to ensure sound environmental management, the relevant sections of this EMP should be included in all contracts of work outsourced thus legally binding all appointed contractors and sub-contractors. All contractors (miners) shall ensure that adequate environmental awareness training (see Section E) of senior site personnel takes place and that all construction workers and newcomers receive an induction presentation on the importance and implications of the EMP. The presentation shall be conducted, as far as is possible, in the employees' language of choice.

The Contractor / Miner should keep records of all environmental training sessions, including names, dates and the information presented.

3.6. Management Requirements

This EMP has been structured so as to provide its various intended recipients (Developer, ER, consulting engineers and contractors) with mitigation measures immediately applicable to their respective scopes of work.

4. An Overview of the Clay Brick Making Process

Raw materials (Shale Clay) is mined from MCs and hauled to the brick plant by a dump truck. The closest MCs to the CBF is 300 m while the furthest is $\pm 1\ 200$ m. At the CBF the Shale Clay is crushed through a primary crusher – reducing it from ± 300 mm down to 80 mm. Further grinding follows in the Hammer Mill delivering a final size fraction of 3 mm which is the feed materials to the shaping section of the brick plant.

The less plastic Nosib Shale is mixed together with a more plastic Karoo Shale in the ratio of 70% to 30%. Body fuel in the form of coal dust (sourced as waste material from Nampower's Van Eik Power Station in Windhoek) is added to the dry mix in a 15% by mass ratio to enhance the firing process. Water is added to the dry materials and thoroughly mixed together. The resultant mixture is de-aired in a vacuum chamber of the extruder before it is finally pushed out in a sausage like shape which is cut into bricks.

Raw bricks at the moisture content of 17% are dried atmospherically in the drying section of brick plant where the moisture content has to drop down to 3% before packing the bricks on clamps for firing. The clamp furnace is ignited with coal nuts up to $\pm 2.5\%$ of the dry mass on the clamp. Depending on its size a clamp will normally take two to three weeks to burn through. After the clamp has cooled down, it is de-hacked (unpacked), the bricks are

sorted and inspected for quality and colour and packed in cubes ready for delivering to the construction site.

5. **Assessment Criteria**

Summarised in the tables below are assessment of each impact identified with respect to the Quarrying (Mining) and Beneficiation covering both the Construction and Operational Phases for the clay brick facility. A **Significant Rating** was then determined for each assessment. This essentially means significance for decision to approve the project.

- ✓ Impacts with LOW (-ve) Significance Ratings will not affect the decision to approve the project.
- ✓ Impacts with MEDIUM (-ve) Significance Rating will affect a decision to approve the project unless such impacts are effectively mitigated.
- ✓ Impacts with HIGH (-ve) Significance Ratings would essentially indicate that the impacts will affect the decision irrespective of mitigation measures

Summerised Environmental Impacts Assessment Associated with QUARRYING (MINING) of Shale Clay			
Impact Aspect	Construction	Operational	Possible Mitigation
Impact on Topography and Land Use	Low (-)	Medium (-)	<ul style="list-style-type: none"> Plan and demarcate all access and internal routes well Limit mining within the confines of each Mining Claim
Impact on National Road D3700	Zero (0)	Zero (0)	<ul style="list-style-type: none"> No haulage of raw materials on public roads Haul routes from the MCs to the CBF should be well planned and clearly demarcated
Impact on Potable Water	Zero (0)	Zero (0)	<ul style="list-style-type: none"> No water installations is to be erected on MCs Use a water bowser to water haulage route
Impact on Energy Supply (Electricity)	Zero (0)	Zero (0)	<ul style="list-style-type: none"> No electrical installations is to be made on MCs
Impact on Ambient Air Quality	Low (-)	Low (-)	<ul style="list-style-type: none"> Maintain all earthmoving machinery well Use diesel with low sulphur content (50ppm)
Dust Nuisance	Low (-)	Low (-)	<ul style="list-style-type: none"> Water down internal haul routes Provide suitable PPEs
Noise Impact	Low (-)	Low (-)	<ul style="list-style-type: none"> Maintain all earthmoving machinery well Provide suitable PPEs
Handling of Solid Waste	Low (-)	Low (-)	<ul style="list-style-type: none"> No littering on the MCs is allowed Windblown littering should be picked up Transport waste to the waste bins at the CBF
Handling of Liquid Waste	Low (-)	Low (-)	<ul style="list-style-type: none"> No servicing of earthmoving is allowed on MCs Any accidental spills (use oil, lubricants, etc.) should be collected and transported to the CBF
Impact on Visual Intrusion	Low (-)	Medium (-)	<ul style="list-style-type: none"> No man-made permanent structures should be erected on or around the quarries Internal routes should be sited away from sensitive and elevated areas Pick up all windblown littering
Impact on Archaeological & Cultural Heritage	Low (-)	Low (-)	<ul style="list-style-type: none"> Train employees on items related to archaeological & cultural heritage Safeguard any cultural heritage item unearthed
Impact on Fauna	Low (-)	Low (-)	<ul style="list-style-type: none"> Illegal killing or hunting of livestock is a criminal offense No killing of reptiles (snakes, lizards, etc) No killing of birds
Impact on Flora	Low (-)	Medium (-)	<ul style="list-style-type: none"> No cutting down of trees for firewood Confine mining activities within each MCs Rehabilitate areas outside MCs affected during the Construction
Fuel Storage, Handling & Management	Low (-)	Low (-)	<ul style="list-style-type: none"> No fuel installation maybe erected on MCs Use a mobile diesel bowser for offsite refueling Only trained personnel may handle fuel
Employment Creation	Medium (+)	Medium (+)	<ul style="list-style-type: none"> Adopt 'a local first' policy when recruiting Enhance benefits through training

Summserised Environmental Impacts Assessment Associated with BENEFICIATION (Manufacturing Activities)			
Impact Aspect	Construction	Operational	Possible Mitigation
Impact on Topography and Land Use	Localised & Low (-)	Low (-)	<ul style="list-style-type: none"> • Fence the entire 5 ha accommodating the Clay Brick Factory • Confine all construction of brick plant facilities, within the fenced in area
Impact on National Road D3700	Low (-)	Low (-)	<ul style="list-style-type: none"> • Trucks leaving the CBF premises should pass over a weighbridge to avoid overloading • Bricks loaded on trucks should be well secured & fastened to avoid any spills • Respect and comply with all road regulations • Provide adequate signage at the CBF
Impact on Potable Water	Low (-)	Low (-)	<ul style="list-style-type: none"> • Water should be used sparingly • Harvest rainwater to supplement water sourced from Namwater
Impact on Energy Supply (Electricity)	Low (-)	Medium (-)	<ul style="list-style-type: none"> <input type="checkbox"/> Electricity is expensive and the supply is limited - use wisely & conservatively <input type="checkbox"/> Install solar panels on rooftops to reduce dependence on grid power
Impact on Ambient Air Quality	Low (-)	Medium (-)	<ul style="list-style-type: none"> • Maintain all machinery & equipment well • Source coal with high carbon content and low volatile matter • Install dust collector at points where dust is generated • Use diesel with low sulphur content (50ppm) • Train employees on the environment & EMP
Dust Nuisance	Low (-)	Medium (-)	<ul style="list-style-type: none"> • Try to pave factory routes used by forklifts & wheeled loader • Install dust collector at source point • Provide PPE and enforce wearing
Noise Impact	Low (-)	Low (-)	<ul style="list-style-type: none"> • Maintain all equipment & machinery used at CBF • Provide PPE to employees working in areas where noise level maybe high
Handling of Solid Waste	Low (-)	Low (-)	<ul style="list-style-type: none"> • Provide adequate marked waste skips at CBF • Littering at will should be reprimanded • Encourage and maintain a high standard of housekeeping • Transport waste to the landfill site of Ruacana Town Council

Handling of Liquid Waste (Hazardous)	Low (-)	Low (-)	<ul style="list-style-type: none"> • Store hazardous wastes separately (used oil, lubricants, oil filters, batteries, etc.) • Liaise with Nampower on the disposal of hazardous wastes • Any accidental spills (use oil, lubricants, etc) should be collected • Train employees on waste handling
Impact on Visual Intrusion	Low (-)	Medium (-)	<ul style="list-style-type: none"> • Paint building rooftops with a less reflective paint • Security lighting should face towards the premises and not away from it
			<ul style="list-style-type: none"> □ Windblown littering around factory should be picked to avoid visual decay
Impact on Archaeological & Cultural Heritage	Low (-)	Zero (0)	<ul style="list-style-type: none"> • Train employees on aspects related to archaeological & cultural heritage • Follow recommendations in the EMP
Fuel Storage, Handling and Management	Low (-)	Low (-)	<ul style="list-style-type: none"> • Isolate fuel storage area and preferably locked • Display appropriate and adequate signage • Only trained personnel may handle fuel
Impact on Fauna	Low (-)	Low (-)	<ul style="list-style-type: none"> • No killing or hunting of livestock • No killing of reptiles
Impact on Flora	Low (-)	Low (-)	<ul style="list-style-type: none"> • No cutting down of trees & plants for firewood • Leave big trees intact • Birds nesting in trees may not be disturbed
On Employment Creation	Medium (+)	Medium (+)	<ul style="list-style-type: none"> • Adopt 'a local first' policy when recruiting • Enhance benefits through training • Consider people from marginalized communities in the area • Comply with labour legislations & laws
On the Local Economy	Medium (+)	High (+)	<ul style="list-style-type: none"> • Procure goods and services from local businesses • Make all statutory payments due to the State, Social Security, etc. • Join local lobby groups NCCI
Health and Safety Aspects	Low (-)	Medium (+)	<ul style="list-style-type: none"> • Develop a Health and Safety Plan for the brick operation • Develop an Emergency Response Plan • Maintain high standard of housekeeping • Train employees on all aspects of the EMP • Discourage cash payments from clients

6. Conclusion and Recommendation

The project will manufacture clay bricks of the highest quality meeting all building industry standards. Bricks are critically needed in the construction of residential, institutional, commercial and industrial properties throughout the country. Clay brick are

environmentally friendly products invented by man-kind. Facing brick are particularly useful in that they are virtually maintenance free. The clay brick operation will also create employment opportunities in the region with the highest unemployment rate in the country.

Firing clay bricks in clamps is associated with gaseous emissions into the atmosphere but this can be mitigated by procuring coal with high carbon content and low volatile matter. Compliance monitoring will be needed to ensure that the brick complies with the recommendations outlined in the EMP. In the context of past disturbances in the Omdel plani, the project has a comparatively smaller footprint.

It is the recommendation of the EIA Consultant that an Environmental Clearance Certificate for Clay Products RCP be renewed covering the amendments explained in this document.

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1. PROJECT BACKGROUND

1.1 Introduction

Phoenix Mineral Resources, has commissioned Namland Consultants to undertake the Environmental Impact Assessment (EIA) process and to compile an Environmental Scoping Report and Environmental Management Plan (EMP) for Process for extract and process clay from the Exclusive Prospecting license number 3903, Omdel area, Erongo Region to do the following

- formalise the pegging and registration of four Mining Claims (MCs) held by RCP with these numbers: 68318, 68584, 68585 and 68586
- allow the quarrying (mining) of raw materials (Shale Clay) from those four mineral rights or MCs
- permit the construction and operation of a Clay Brick Factory (CBF) on one Mining Claim No. 3903
- allow and permit beneficiation (value addition) of the quarried raw materials into useful infrastructural construction materials - clay bricks and related building products

Operationally, the business will be divided into two core divisions. The production facility will be established onsite at Omdel Dam and finished products will be distributed via a Depot to be established in Swakopmund. The reason for this separation is that it is not viable to transport the raw material, clay, and the main local market is in and around Swakopmund/Walvis Bay. The Omdel dam site is located 35km to the east of Henties Bay, 110km from Swakopmund, 145 km from the port of Walvis Bay in the Erongo region and approximately 350 km from Windhoek. Coastal Clay Products Project provides an exciting and viable business opportunity with the key focus to produce and sell clay products. This opportunity aligns with the development objectives of the Namibian Government, the Erongo Region as well as the Municipalities of Henties Bay and Swakopmund; additionally NAMWATER will benefit from this project in several ways .

1.2 Project Scope and Scale

RCP will manufacture fired clay bricks with an annual production pegged at 20 million brick units by processing approximately 40 000 m³ of Shale Clay. The brick range will consist but not limited to the following:

- ✓ Face Brick Standards (FBS)
- ✓ Face Brick Aesthetic (FBA)
- ✓ Non-Facing Plastered (NFP) or stock brick
- ✓ Non-Facing Extra (NFX)
- ✓ Maxi Brick (Hollow Block) for single leaf construction
- ✓ Paving Bricks

The bricks will be manufactured in a range of different sizes, textures and colours to meet the growing demand for bricks needed in the country.

1.3 Project Implementation Status

The implementation for the clay brick operation will commence as soon the Ministry of environmental and tourism, department of environmental affair grant the Environmental clearance certificate.

2. PROJECT OVERVIEW

2.1 Introduction

The project entails quarrying Shale Clay raw from Mining Claims, loading and hauling the quarried raw materials to the Clay Brick factory for beneficiation. The construction materials manufactured are fired clay bricks – which are environmentally friendly products. For clay brick making, all mined clay is used up in the brick manufacturing without any residues.

2.2 The Production Process

The production flow process to manufacture burnt bricks from Shale Clay is as depicted in Figure 6 below.

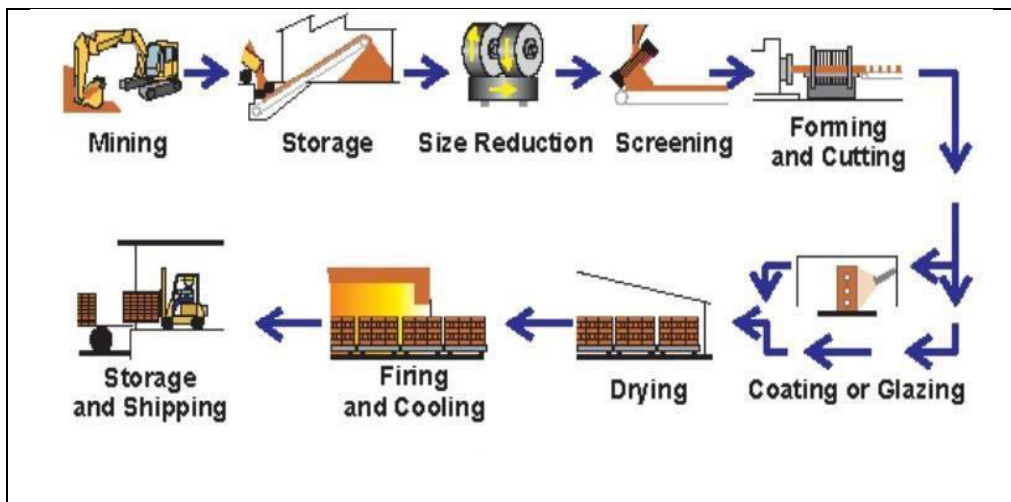


Figure 6: Clay Brick Manufacturing Process Flow Sheet

The steps involved in the manufacturing of fired clay bricks from Shale are listed here below and briefly described in the following section

- ✓ Quarrying of the Raw Materials (Shale Clay)
- ✓ Loading and Hauling of Shale Clay
- ✓ Stockpiling of Raw Materials
- ✓ Preparation of Raw Materials
- ✓ Shaping or Forming of Bricks
- ✓ Coating or Glazing
- ✓ Drying of Green Bricks
- ✓ Firing of Bricks
- ✓ Sorting and packing of fired bricks

2.2.1 Quarrying of Raw Materials

The Shale Clay required for brick making is extracted mechanically with a bulldozer which cuts, rips and dozes the materials onto heaps leaving such materials stockpiled in the mining area of each Mining Claim. Ripping and dozing activities are shown in Figure 7. The $\pm 40\,000\text{ m}^3$ of Shale Clay required by RCP to manufacture 20 million brick units per year is excavated by a bulldozer within a period of approximately six weeks. Drilling and blasting is not required.



Figure 7: Bulldozer dozing materials (Left) & Bulldozer ripping (Right)

2.2.2 Loading and Hauling of Raw Materials

Shale Clay already quarried and heaped is retrieved by a front-end loader or hydraulic excavator and loaded into a tip-end truck which hauls and dumps it at the raw material stockpile section of the brick factory. The distance between the furthest Mining Claims and CBF is 1 200 m (1.2 km) while the nearest Mining Claim to CBF is 300 m. One tip-end truck with a payload of 20 m³ can therefore handle the Shale Clay required at CBF of approximately 120 m³ (180 tons) per day.

2.2.3 Stockpiling of Raw Materials

At the CBF the clay from the quarry is, either tipped directly into the plant for processing or stockpiled for later processing. It is intended to stockpile enough materials at brick plant such that no loading and hauling is done during the rainy season. Leaving the raw materials stockpiled and exposed to the elements has the added advantage of allowing the clay to „age“ which improves its plasticity and workability in the subsequent processes.

2.2.4 Preparation of Raw Materials

Good preparation of the raw material is needed in order to achieve the correct consistency for the clay brick making process. Shale Clay will be crushed in two stages.

During primary crushing, the Shale is broken from large lumps of ± 250 mm down to size fractions smaller than 80 mm. This is followed by secondary crushing where the product is milled down to the final size fractions smaller than 3 mm (about the same size as the white sugar crystals). No water is added during these crushing processes.

2.2.5 Shaping or Brick Forming

The ground clay is conveyed to a double shaft mixer where coal dust and/or ordinary sand are added to assist in the subsequent manufacturing process (i.e. sand to give the necessary drying strength and coal dust to improve the firing). At this stage, water is added for the first time. The mixed Shale then enters the pug sealer for intensive, high shear mixing and de-airing followed by extrusion of a clay column which is cut into bricks. In Figure 8, an extruder machine and a clay column being extruded are displayed.



Figure 8: The Extruder Machine (L) & A column of clay being extruded (R)

2.2.6 Drying of Green Bricks

Extruded bricks are packed onto wooden pallets and dried out in open air. For the first few days, extruded bricks are covered with tarpaulin to avoid direct exposure to the sun. Bricks are extruded at the moisture content of 17% and drying is expected to reduce the moisture content to 3% before the bricks are ready for firing in clamps. In Figure 9 below, two methods of brick drying are shown.



Figure 9: Bricks being dried mechanically (L) & Natural open air drying (R)

2.2.7 Firing of Bricks

The aim of firing clay bricks is to transform the relatively weak dried clay into strong, durable bricks. The firing is quite a complex subject, largely because of the difference in the types of clay used, in the method of manufacturing, in the types of kiln used and in the types of ceramic wares. As the bricks are fired to higher temperatures, the minerals within the clay undergo a series of physical and chemical reactions. The effects of firing bricks include shrinkage, weight loss, increased strength and a change in colour.

Naturally, clay differs in composition and behaviour when fired, and the material's reaction is also influenced by the atmosphere in the kiln. To produce well fired bricks, the firing schedule, i.e. the time of firing and the rate at which the temperature rises must be regulated so that certain reactions

have time to take place under the correct conditions and at the appropriate temperatures.

Typically, clay bricks are fired in two main processes which are:

- ✓ Intermittent or Batch Processes
- ✓ Continuous Firing Processes

Bricks are normally fired with liquid fuel (heavy fuel, paraffin, gas, etc.) and solid fuel (coal, charcoal, saw dust, husks, etc.)

2.2.7.1 Intermittent Kilns

With this method clay bricks are fired in batches with the fire allowed to die out after a batch of bricks has been fired and bricks allowed to cool down. Once the bricks cool down the kiln is emptied and a new batch of batch of bricks is loaded again and a new fire is ignited.

The clay brick industry in South Africa produces over 3.5 billion clay bricks per year. Over 80% of these bricks are fired in intermittent kilns called Clamp Kilns. It is the oldest clay brick firing technology which is still widely used in several parts of the world especially in the developing countries due to several advantages which the Clamp offers.

This is the firing method which RCP will initially employ, most likely for the first five to six years of its existence. Firing in clamps has been demonstrated in Figure 10. This is method which will be used by RCP.

2.2.7.2 Continuous Kilns

With this type of firing, once the fire is ignited, it keeps burning for as long as there are bricks to fire. All associated activities ranging from the firing of bricks, loading of bricks inside the kiln, cooling down of bricks and unloading of fired bricks take place simultaneously in different parts of the kiln.

The Tunnel Kiln is at the top end of the ceramic firing spectrum, highly mechanised and producing top quality face bricks which fetch relatively high margins in the market. The cost for a Tunnel kiln is quite high and therefore not an option for consideration by RCP at this stage of its project.

RCP intends to fire its green bricks in clamps during the first phase and only investigate the construction of a tunnel kiln during phase two. A separate EIA for such a firing system will be conducted and submitted for assessment and approval by MET. Continuous firing in a tunnel kiln is shown in Figure 11. A tunnel kiln is desired by RCP but the initial capital investment required is rather heavy for RCP at this stage. When compared to clamp firing, a tunnel kiln has the lowest operating cost and the lowest wastages. All kinds of ceramic wares can also be fired in a tunnel kiln which is not possible with a clamp firing. RCP will explore all possible avenues to invest in this type of kiln in future

2.2.8 Sorting of Fired Bricks

Firing bricks in clamps is a labour intensive process which requires the hiring of unskilled labour to pack the clamps and for de-clamping after firing. While this is an advantage for the operation promoted by RCP at Ruacana where unemployment is rife, firing in clamps is also associated with high production losses which could hit the bottom line of the business.

According to the South African clay brick industry practice, an experienced packer can pack between 900 and 1000 raw bricks per hour and for declamping between 500 and 700 bricks per hour. During the de-clamping, bricks are manually sorted and individually inspected for quality, colour and texture.

Thirty people working 8 hours per day will take about two weeks (ten working days) to pack a clamp consisting of one million raw bricks and three weeks to unpack the same clamp after firing. Firing itself could take as long as four weeks depending on the number of bricks in the clamp. Good quality bricks and minimal losses are achieved when millions of bricks are fired in a clamp as opposed to a few thousands.

Bricks are packed in pack sizes of 500 bricks (as opposed to 360 for cement bricks) with weights of approximately 1250 kg (1.25 tons) per pack. They are commonly stacked and strapped in a self-supporting manner and designed with forklift holes to enable transportation and handling. Bricks can also be palletised, shrink-wrapped or bagged in one ton bulk bags.



Figure 10: Dried brick being packed on a clamp for firing (top left) & A packed clamp being covered with tarpaulin to protect bricks against rain (top right)

Bottom left: Unpacking of fired bricks from a clamp kiln & Bottom Right: Wastage from clamps could be as high as 15% being covered

2.3 Description of a Clamp Kiln

Clamps are traditional form of firing clay bricks dating back thousands of years. Essentially, a clamp is a pyramid of green bricks interspersed with combustible materials with no permanent structures. Clamps are carefully

built up on a stable flat surface base with the first two layers of bricks built on a thin layer of coal nuts (approximately $\pm 2.6\%$ of the total weight of bricks being fired) which serve to ignite the firing process.

To enhance the clamp firing process, coal duff is added up to 15% of the weight of a brick mass and thoroughly mixed into the clay body. A small amount of sand up to 5% of the weight mass of a brick is also added which helps to improve the strength of the raw bricks. The green bricks are ready to be packed on the clamp when their moisture content drops from the extrusion moisture content 17% down to 3%.

Once the clamp has been fully packed with dry bricks (as much as 1 000 000 brick pieces) the coal nuts inserted in the base row of the clamp is ignited and each brick progressively fires up until the whole clamp completely burns out. Firing bricks on clamps is more of an art than science. A clamp with 1 000 000 bricks will take approximately three weeks to burn through and about one week to cool down. Losses could be as high as 15%.

The advantages of clamp firing are that, there is no capital investment required because the clamp has no fixed structures and are capable of yielding good quality bricks in a varied of colours.

The disadvantages of clamps are that they are susceptible to weather conditions, are very labour intensive and not all clay bricks can be fired in clamps. They also tend to be energy inefficient and since the firing temperature is not controlled, losses can be quite substantial. Clamps are also associated with the release of harmful gaseous emissions into the atmosphere but this largely depending on the type of clay being processed and type of fuel being used.

Where coal is used to fire the clamp, coal with high carbon content and low volatile matter should be procured to minimise harmful emissions.

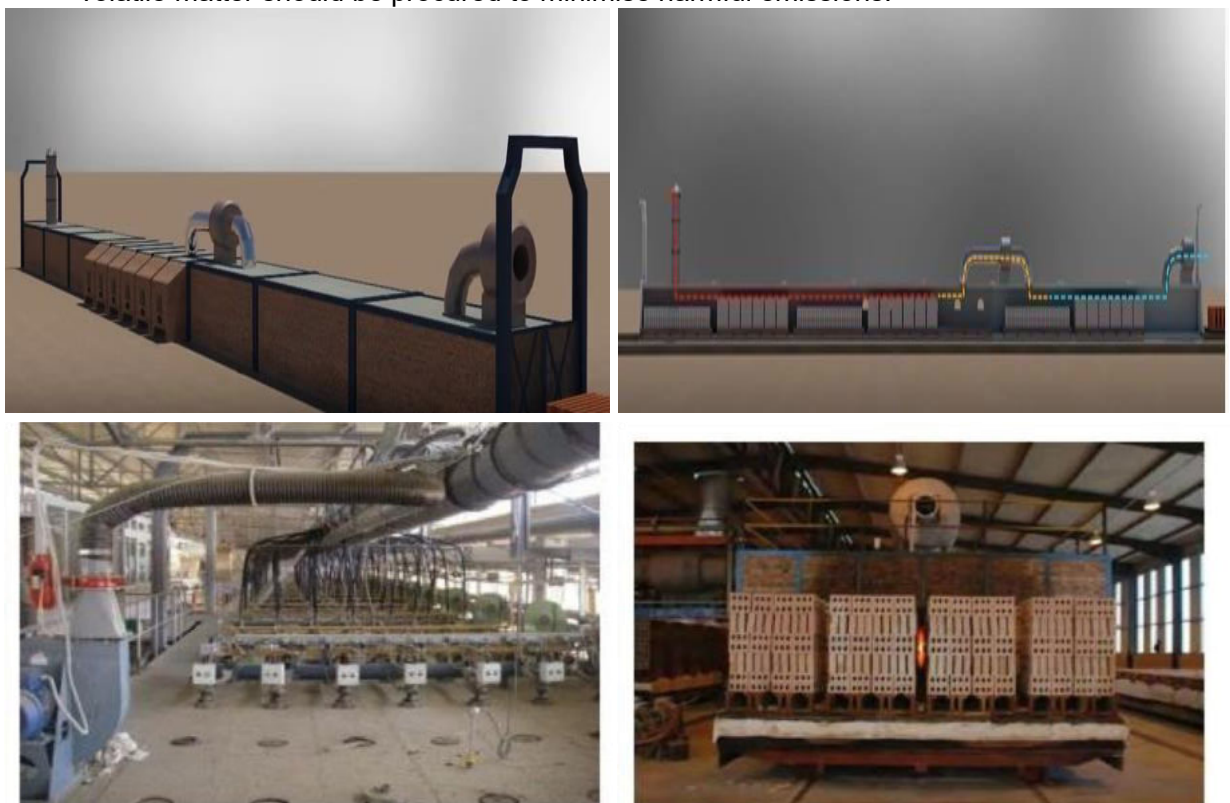


Figure 11: Top left : A schamatic view of a tunnel kiln showing exhaust fans & Top Right: Heat flowing through a tunnel kiln

Bottom Left: The heating system on top of the tunnel kiln & Bottom Right: Fired bricks exiting the tunnle kiln. Bricks are fired while packed on kiln cars/trollories

3. THE DEVELOPMENT - AN OVERVIEW

3.1 Introduction

In the context of this EMP the development of the clay brick proposed by RCP has been divided into three phases – the Construction, Operational and Decommissioning. The clay resource is estimated at $\pm 2\,600\,000\text{ m}^3$ down to a depth of 10 m. Based on the extraction rate of $40\,000\text{ m}^3$ per annum the project is expected to have a lifespan of ± 65 years. In this regard, guidelines for decommissioning are merely provided in the event of the brick operation having to close down prematurely, i.e. on grounds of insolvency or as a result of economic factors beyond the control of the owners such as economic recession.

The activities which have a bearing on the environment during the Construction and Operational Phases are described here below:

3.2 The Construction Phase:

This phase consists of construction activities taking place at the Mining Claims in the valley and at the Clay Brick Factory.

3.2.1 Construction Activities at the Mining Claims

Construction activities will primarily involve the following:

- ✓ **Access Road:** The single road is also used by Namwater when conducting inspections to the overland water pipeline which transverses the valley. The single track road is shown in Figure 12 bottom left photo.
- ✓ **Internal Routes:** All internal routes within each MC have to be properly planned and well demarcated. There are **NO** permanent structures and/or permanent infrastructures to be erected on the MCs.
- ✓ **Removal of Overburden:** The Shale Clay is covered by waste soil which has to be removed. The depths of these waste materials vary from a shallow depth of 0.8 m down to 2 m.

3.2.2 Construction Activities at the Clay Brick Factory

The factory is to be built on land Swakopmund

Construction activities at the brick factory will involve the provision of services such as:

- ✓ Water infrastructures connection & installation
- ✓ Electrical - an overhead powerline from Nampower Hydropower Station
- ✓ Reticulation of electrical cables to various parts of the CBF
- ✓ Steel shed to house the brick machinery : 40 m x 18 m x 7 m (high)
- ✓ Installation of a complete clay brick plant inside the shed
- ✓ One machine repair workshop shed (30 m x 15 m x 5 m (high)
- ✓ Clearing and leveling of terrain
- ✓ Fencing around the perimeter
- ✓ Building of an administrative office (150 m²)
- ✓ Installation of a Weighbridge
- ✓ Installation of an onsite surface mounted fuel (diesel) storage tank
- ✓ Installation of ablution facilities including a sewerage system

- ✓ Construction of a security/guard room
- ✓ Parking area for employees and visitors

3.3 **The Operational Phase**

This phase will entail the following activities

- ✓ Quarrying or mining of Shale Clay in the MCs
- ✓ Loading & Hauling of clay from the MCs to CBF
- ✓ Stockpiling of mined Shale Clay at the CBF
- ✓ Stockpiling of coal/charcoal used for firing
- ✓ Preparation section (crushing and grinding of Shale Clay)
- ✓ Shaping (forming of clay bricks)
- ✓ Drying of bricks in open air
- ✓ Firing of bricks in clamp kilns
- ✓ Sorting, inspection and packing of fired bricks
- ✓ Sales and distribution of bricks

3.4 **Decommissioning Proposal**

This will entail the following:

Mining Claims:

- ✓ rehabilitation of all areas disturbed by quarrying activities
- ✓ restoration of all internal routes
- ✓ profiling of all excavated areas with waste materials
- ✓ re-vegetation of all profiled areas

Brick Plant

The first option before breaking down the structures will be to see if alternative use for the brick plant cannot be found. Naturally, decommissioning will involve the:

- ✓ demolishing of all fixed structures
- ✓ cleaning up all stockpiles (for coal and raw materials) ✓
removal of all fencing, if alternative grading

3.5 **Brief Description of the Current Environment**

The project is located in the Omdel dam and the baseline conditions (biophysical, cultural and socioeconomic) of the project site and the surrounding areas have been outlined in the Scoping Assessment Report section of the EIA.

Generally, the clay brick project is located in an area which had a fair share of environmental disturbances resulting from major commercial undertakings, i.e. the development of the hydropower station built in the mid-seventies, construction of water infrastructures, overhead powerlines, overland water pipelines, tarred road, etc. Some of these structures are depicted in Figure 12 below. There are no homesteads or people living in the valley.

4. THE LEGAL AND REGULATORY FRAMEWORK

4.1 Regulatory Framework

Listed in the Table 1 below are some of the laws and regulations applicable to proposed development:

TABLE 1 : REGULATORY FRAMEWORK	
Legislations/ Regulations	Brief Descriptions
<i>The Constitution of the Republic of Namibia, as adopted on 9 February 1990</i>	The Constitution is the supreme law of Namibia and makes provision for the establishment of three tiers of the State namely the Executive, Legislative and Judiciary. It consists of 21 Chapters and 148 Articles. Chapter 11, Article 95 (l) is applicable to this development. The State shall actively promote and maintain the welfare of people by adopting..... “ „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, in particular, the Government shall provide measures against the dumping or recycling of foreign nuclear and toxic waste on Namibian territory’
<i>Water Resource Management Act (Act 11 of 2013)</i>	The line ministry is the Ministry of Agriculture, Water and Forestry. This Act provides for the management, protection, development, use and conservation of water resources; to provide for the regulation and monitoring of water services and to provide for incidental matters.
<i>Minerals (Prospecting & Mining) Act, Act 33 of 1992</i>	The Act provides for reconnaissance, prospecting and mining of minerals and/or disposal of and the exercise of control over all minerals in Namibia, and all matters incidental thereto.
<i>Environmental Management Act, Act No. 7 of 2007</i>	This Act was gazetted in December 2007 (Government Gazette No. 3966) and the Environmental Impact Assessment Regulations: Environmental Management Act, 2007 (Government Gazette No. 4878) were promulgated in February 2012. The chief custodian of the Environmental Management Act is the Environmental Commissioner in the Ministry of Environment and Tourism custodian
<i>Road Administration Act of 1999 as Amended</i>	Regulates traffic and use of public roads in Namibia including aspects related to road safety, vehicle licensing, roadworthiness, Mass Distance Charges, abnormal loads, etc.
<i>Atmospheric Pollution Prevention Act (Act No. 45 of 1965)</i>	This Act was enacted in 1965 is still being applied in independent Namibia today and resorts under the Ministry of Health and Social Services. The Act attempts to guard against pollution of the atmosphere. A number of sections of this Act relate to „Air Pollution Control Certification“, dust control, etc. At present, the Ministry does not grant any certificates as no procedures or guidelines exist. The best practice would be to notify the Ministry of the anticipated emissions.
<i>Hazardous Substance Ordinance 14 of 1974</i>	The Ordinance provides for the control of <i>substances</i> which may cause injury or ill-health to or death of human beings by reason of their <i>toxic</i> , corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure thereby in certain circumstances; to provide for the division of such <i>substances</i> into groups

<i>Atmospheric Pollution Prevention Ordinance 11 of 1976</i>	To provide for the prevention of the pollution of the atmosphere, and for matters incidental thereto.
<i>The Nature Conservation Ordinance 4 of 1975</i>	To consolidate and amend the laws relating to the <i>conservation of nature</i> ; the establishment of game parks and <i>nature reserves</i> ; the control of problem animals; and to provide for matters incidental thereto
<i>National Heritage Council Act (Act No. 27 of 2004) As Amended</i>	The line ministry is Ministry of Youth, Sport and Culture. The National Heritage Council Act provides for the protection and conservation of places and objects of heritage significance and the registration of such places and objects. It also makes provision for archaeological „impact assessments“. Part V: Permits, paragraphs 51 and 52). If applicable, the relevant permits must be obtained before disturbing or destroying a heritage site as set out in the Act.
<i>Atomic Energy and radiation Protection Act (Act No. 5 of 2005)</i>	The Hazardous Substance Ordinance No. 14 of 1974 was repealed and amended by the Atomic Energy and Radiation Protection Act. The Act provides for the control of substances which may cause injury or ill-health or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitising or flammable nature. Whilst the environmental aspects are not really explicitly stated, the Act provides guidelines with respect to importing, handling and storage, etc. of hazardous substances. The line ministry is the Ministry of Police, Safety and Security (the Drag Law Enforcement Unit).
<i>Regional Council Act (Act No. 23 of 1992)</i>	The Act resorts under the Ministry of Urban and Rural Development and was enacted to promote the planning and coordination of policies at the regional level. Under Article 28, the powers, duties, functions, rights and obligations of regional councils include overseeing the general implementation of regional development activities.
<i>The Petroleum Products & Energy Act (Act No.13 of 1990) As Amended</i>	The Act provides measures for saving of petroleum products and an economy in the cost of the distribution thereof, and for the maintenance of a price therefore, for control of the furnishing of certain information regarding petroleum products, and for the rendering of services of a particular kind or services of a particular standards, in connection with motor vehicles, for the establishment of the National Energy Fund and for the utilization thereof, for the establishment of the National Energy Council and the functions thereof, for the imposition of levies on energy sources, and to provide for matters incidental thereto.
<i>The Labour Reform Act (Act No. 11 of 2007)</i>	To consolidate and amend the labour law; to establish a comprehensive labour law for all employers and employees; to entrench fundamental labour rights and protections; to regulate basic terms and conditions of employment; to ensure the health, safety and welfare of employees; to protect employees from unfair labour practices; to regulate the registration of trade unions and employers" organisations; to regulate collective labour relations; to provide for the systematic prevention and resolution of labour disputes; to establish the Labour Advisory Council, the Labour Court, the Wages Commission and the labour inspectorate; to provide for the appointment of the Labour Commissioner and the Deputy Labour Commissioner; and to provide for incidental matters

4.2 Health Screening Criteria

For the purpose of the health risk assessment, proposed evaluation criteria taken from the various international criteria are provided in Table 2 below.

TABLE 2 REFERENCE EXPOSURE FOR SO₂, NO₂, PM₁₀ AND DUST (AIRSHED PLANNING PROFESSIONALS 2014)			
Pollutant	Averaging Period	Selected Criteria (ug/m³)	Source
SO ₂	1- Hour Mean	350	EC Limit & SA Standards
		660	California OEHHA RfC
	8-Hour TWA	5 640	Nam Occupational Exposure Limit
		1 410	European Community (EC)
	24-Hour Mean	125	WHO IT1, SA, Botswana and EC Limit
		20	WHO AQG
Annual Mean	50	SA standard	
NO ₂	1 Hour	200 (a)	EC limit & SA Standards
		470	California OEHHA RFC
	Annual Mean	40	WHO AQG
PM ₁₀	8-Hour TWA	10 000	Nam Occupational Exposure limit
	24-hour Mean	75(a)	WHO IT3 & SA Standard
		50	WHO AQG
	Annual Mean	30	WHO IT3
Dust	8-hour TLV	2	ACGIH TLV

4.3 Standards and Guidelines

(a) Air Quality

The Namibian Atmospheric Pollution Prevention Ordinance (No. 11 of 1976) does not include any ambient air standards to comply with. Typically, when no such local criteria exists, or are in the process of being developed, reference is made to international criteria.

TABLE 3: AMBIENT AIR QUALITY GUIDELINES FROM VARIOUS INTERNATIONAL ORGANIZATION AS ACCEPTED BY THE WORLD BANK (AIRSHED PLANNING PROFESSIONALS 2014)					
Pollutant	Averaging Period	WHO Guidelines Value (ug/m³)	EC Directive Limits (ug/m³)	US NAAQS (ug/m³)	RSA NAAQS (ug/m³)
Sulphur Dioxide SO ₂	1 Year	-	20		50
	24 Hours	125 (IT-1)	125		125
		50 (IT-2)			
		20 (guideline)			
	1 Hour		350	196	350
	10 Minute	500 (guideline)			500
Carbon Monoxide (CO)	1 Hour	30 0000 (guideline)	-	40 000	30 000
Nitrogen Dioxide (NO ₂)	1 Year	40 (guideline)		100	40
	1 Hour	200 guideline	40	188	200
Particulate Matter (PM ₁₀)	1 Year	70 (IT-1)	20		50
		50 (IT-2)			40
		30 (IT-3)			
		20 guideline			
	24 Hour	150 (IT-1)	50	150	120

Particulate Matter (PM2.5)	1 Year	100 (IT-2)			75
		75 (IT-3)			
		50 guideline			
	24-Hour	35 (IT-1)			
		25 (IT-2)			25
		15 (IT-3)		15	20
		10 guideline			15
		75 (IT-1)			
		50 (IT-2)			65
		37.5 (IT-3)		35	40
25 guideline			20 s)		

5. ENVIRONMENTAL MANAGEMENT PLAN

5.1 Introduction

This EMP has been prepared for RCP to serve as a standalone plan to manage the potential impacts associated with its envisaged clay brick operation near the small town of Ruacana. Mitigation measures are based on the assessments and findings of the Scoping Assessment and should be read in the context of what is written in the Final Scoping Report (FSR). Since the EMP is a working document, changes will continue to be made with future upgrades, extensions and improvements to CBF.

5.2 Purpose of the EMP

The ultimate aim of this EMP is to ensure that the **Environmental Impacts** associated with the CBF are managed, mitigated and kept to the minimum. This EMP therefore endeavours to provide clearly defined actions that should be implemented during the construction and operational phases of the clay brick works. The EMP is a dynamic document that is flexible and responsive to new and changing circumstances and should be updated, as and when required. Any substantive changes to the EMP will require authorization and endorsement of the competent authority.

The EMP is binding on RCP, on all contractors who may be hired to implement the project, all employees who may be recruited as well as to the visitors to the operation. It must be included as part of any tendering, procurement and/or contractual documents between RCP and third parties.

5.3 Environmental Management Objectives

The implementation of this EMP is a recurring process that converts mitigation measures into actions and through monitoring, auditing, review and corrective action, ensures conformance with the overall aims and objectives of the CBF. These objectives are to:

- ✓ ensure compliance with the terms of the ECC once renewed by the Environmental Commission
- ✓ propose practical measures to prevent, minimise, mitigate and/or rehabilitate areas affected by the operation
- ✓ conserve significant aspects of the biophysical and social environments
- ✓ protect human health and ensure safety of workers and the general public;

- ✓ propose plans to monitor and manage the CBF in a manner that ensures that the project is technically sound, economically feasible and environmentally sustainable

5.4 **Acceptance of the EMP**

The acceptance of the EMP by the Environmental Commissioner will confer a legal obligation to RCP to comply with its provisions. Should RCP fail to comply with the requirements of this EMP, it is deemed to be a contravention in terms of Environmental Act of 2007 and as such is criminally prosecutable.

5.5 **Roles and Responsibilities**

The roles and responsibilities of key players in the implementation of this EMP are listed in the table below:

TABLE 4: ROLES AND RESPONSIBILITIES OF ROLE PLAYERS IN THE EMP
Ministry of Environment & Tourism
<p>The Environmental Commissioner is statutory office responsible for ensuring and enforcing compliance with the relevant Environmental Legislations. Amongst its responsibilities are:</p> <ul style="list-style-type: none"> • Assessing the EIA and to grant or refuse the ECC • Granting the ECC (Environmental Clearance Certificate) • To review and enforce compliance with the terms of the ECC & EMP □ <p>To review this document and any revisions or amendments thereof.</p> <ul style="list-style-type: none"> • To undertake site audits at their discretion. • To review Audit Reports • To renew the ECC • To enforce legal mechanisms for contravention of EMA and ECC
Ministry of Mines & Energy
<p>The Mining Commissioner is the statutory officer appointed in terms of Section 4 (1) of the Mineral (Prospecting and Mining) Act.</p> <p>The Mining Commissioner is responsible for, amongst others:</p> <ul style="list-style-type: none"> • Approval of Mining Claims • Renewal of Mining Claims • Enforce compliance of the Minerals Act as it relates to the Mining Claims
Ruacana Clay Products – The Proponent

The proponent is expected to ensure that the brick operation is permitted, allowed and licensed to function within the laws and applicable industry regulations. This means therefore that:

- Mining and manufacturing are listed activities – hence ECC
- Mining Claims should be pegged and lawfully registered
- Registration with Inland Revenue for tax payments
- Registration with Social Security & Workmen’s Compensations
- Building products to meet and pass industry standards and specifications as stipulated by the Namibia Standards Institute (NSI) and/or the South Africa Bureau of Standards (SABS) pertaining to clay masonry
- Certificate of Fitness from Ruacana Town Council once brick factory becomes operational
- Registration with affiliated lobby groups (Namibia Chamber of Commerce and Industry, Namibia Chamber of Mines, etc.)
- Complying with the EMP

5.6 Recommended Inspections

In the table below a list of possible inspections that should be performed for the CBF are listed:

TABLE 5: RECOMMENDED INSPECTION SCHEDULE		
Inspections	Frequency	Responsibility
Compliance with the provisions of the EMP	At all times during Construction and Operational Phases of the operation	RCP Management
Earthmoving Plants, Road Trucks & LDVs: <ul style="list-style-type: none"> • Alcohol check for each employee • Pre-start checks • General conditions & cleanliness • No overloading • No spills from loaded trucks 	Daily Daily Daily Daily	RCP Management or as delegated
Littering : <ul style="list-style-type: none"> • Access route to the Quarry • Mining Claim internal routes • Access route to the CBF • Machine Repair Workshop • Administrative block • Raw Stockpile Section • Coal & Charcoal Stockpile Section • Preparation Section • Shaping Section • Drying Section • Clamp Kiln Sections • Weighbridge area • Parking area 	Daily Daily Daily Daily Daily Daily Daily Daily Daily Daily Daily Daily	RCP Management or as delegated
General conditions <ul style="list-style-type: none"> • boundary fence • ablution facilities • finished product stockpile areas • internal routes • drainage sections • Wearing of PPE 	Biweekly Weekly Daily Biweekly Quarterly Daily	RCP Management or as delegated
Hazardous Spills: <ul style="list-style-type: none"> • Oil • Fuel • Lubricants • Coal/Charcoal 	When reported	RCP Management or as delegated

Ambient Air Quality <ul style="list-style-type: none"> • Dust emissions • Gaseous emissions <ul style="list-style-type: none"> ➤ SO₂ ➤ CO ➤ PM₁₀ ➤ PM_{2.5} 	Once before commissioning of brick works and six months intervals during the operation phase	RCP Management or as delegated
Waste Disposal: <ul style="list-style-type: none"> • Household wastes • Hazardous wastes • Scrap wastes (old machines, tyres, etc.) 	Weekly	RCP Management or as delegated
Noise nuisance (machinery, plants & equipment)	Daily	RCP Management or as delegated
Good housekeeping practices <ul style="list-style-type: none"> • Administrative Office • Workshop Section • Wash Plant Section • Stockpile Areas • Quarry internal routes 	Daily	RCP Management or as delegated
Internal Environmental Reporting	Monthly	RCP Management
Overall Operational Environmental Audit	Annually	General Manager

6. MITIGATION OF IDENTIFIED IMPACTS

6.1 Introduction

This EMP has been developed based on the findings of the baseline information compiled during the Environmental Assessment (EA) conducted by Namland Consultant cc, from the numerous visits to the project site and from desk studies of literature materials for similar projects implemented in the region and elsewhere as referenced.

6.2 Presentation of Impacts and Mitigation Measures

In the tables that follow below, a brief description of each environmental aspect as it relates to the construction and operation phase for the quarrying (mining activities taking place at the MCs) and beneficiation (processing activities taking place at the brick factory), is presented. This is followed by listing potential impacts associated with such activities and mitigation measures recommended to avoid, reduce and/or to minimise such impacts.

Finally, an indication has also been proposed on aspects related to monitoring of identified impacts and the party responsible for ensuring that the recommendation are implemented and adhered to. The table should therefore be used as a checklist during the construction and as a „guiding tool“ during the operational phase.

As regards decommissioning a more detailed and specific checklist should be developed during the course of the operational phase.

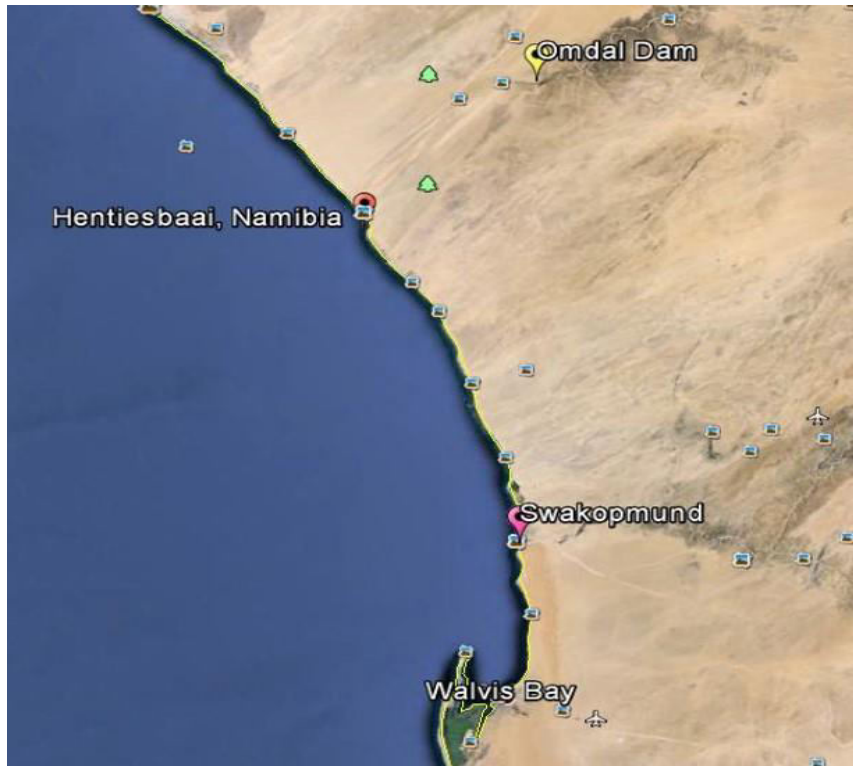


Figure 13: Location Omdel dam

TABLE 6: ENVIRONMENTAL ASPECTS - TOPOGRAPHY AND LAND USE	
Quarrying:	<p>All MCs are located downstream in the Omdel and construction of access roads; internal routes and quarrying (mining) activities will impact on the topographic view and natural sense of the valley. On land use, the terrain is rocky to support irrigated cropping activities notwithstanding the abundant water in the river. Cattle and donkeys are often encountered grazing around in the valley.</p> <p>The Omdel itself is a brownfield area which has borne the brunt of environmental disturbances emanating from the construction of the country's hydropower station and water infrastructures as depicted in Figure 12.</p> <p>➤ <i>Impact during the Construction and Operation: Localised & Medium Significance: Low</i></p>
Beneficiation:	<p>The CBF is to be built on the land measuring about 50 000 m² (5 ha) of MC 68318. The specific land was previously used as a military base of the South African Defence Force during the war of national liberation. To some extent, plant and bush clearing has been partially carried out</p> <p>➤ <i>Impact during the Construction and Operation : Localised & Low & Significance: Negligible</i></p>
Potential Impacts	<ul style="list-style-type: none"> • Loss of plant & vegetation • Loss of grazing • Loss of habitat • Possible soil erosion

Mitigation	<p>Access roads: Any new access road should be well planned and carefully demarcated such that topographically sensitive areas are avoided. Construction should be confined and limited to such demarcations.</p> <p>Internal Routes: All internal routes within each MC must be well planned and clearly demarcated. Movements of trucks must be restricted to such routes.</p> <p>Mining Footprint: Limit all quarrying activities within the confines of each MC. Overburden stripping & waste materials should be well planned and carefully executed.</p> <p>Erosion Monitoring: Develop an erosion monitoring plan whereby mined out areas and all potential erosion sites within mining areas are visually monitored. Erosion gullies should be repaired.</p> <p>Stormwater Drainages: Under no circumstances may natural stormwater drainage traversing any MC be blocked by stockpiling waste materials onto them.</p> <p>Aesthetic Appeal: Areas disturbed should be graded and rehabilitated to improve the visual and aesthetic appeals within the valley. This is important because the adjacent tarred D3700 highway is used by many tourists visiting the Omdel dam as well as other places of interests within the great mighty Erongo Region</p>
Monitoring	Monthly during the construction and ongoing throughout the operation
Responsibility	ECP Management

TABLE 7: ENVIRONMENTAL ASPECTS - DUST DISTURBANCES	
Quarrying:	<p>Construction of access roads and internal routes will involve some ground disturbances which are likely to generate dust. However, the nature of the clay being extracted is damp such that little dust is expected during the quarrying, loading and hauling. The access road and all internal routes are constructed over hard rock surfaces hence minor dust little is expected.</p> <p>➤ <i>Impact during Construction and Operation: Very Low & Significance: Low</i></p>
Beneficiation:	<p>Dust is expected during terrain leveling, digging of foundations for the brick plant and associated support buildings and structures. During the operation dust will be generated at the primary & secondary crushing (milling) units, the double shafted mixer and during the removal (sorting) of fired bricks from the clamp kilns</p> <p>➤ <i>Impact during Construction: Very Low & Significance: Low</i></p> <p>➤ <i>Impact during Operation: Medium & Significance: Low</i></p>
Potential Impacts	<ul style="list-style-type: none"> • Eye and noise irritation • Health hazard • Amenity nuisance • Airborne dust particles

Mitigation	<p>Hauling: Keep to the speed limit of 20km/hr on access roads and quarry internal routes.</p> <p>Clay Crushing: Install dust collectors at input and output points of each crushing unit and double shafted mixer.</p> <p>Stockpiles: Design and site stockpiles for raw materials and coal (for brick firing) in locations of CBF where they are least exposed to wind. Source and use good quality coal with high carbon content and low volatile matters. Charcoal can also be used.</p> <p>Paved Areas: Outside areas where forklifts and trucks are operated on within the CBF should be paved and movements of machines & vehicles restricted to such areas.</p> <p>PPE: Employees working in areas where dust is generated (unpacking bricks from clamps, spraying coal on the base of the clamp, etc.) should be provided with suitable PPE</p>
Monitoring	Monthly during the construction and ongoing throughout the operation
Responsibility	RCP Management

TABLE 8: ENVIRONMENTAL ASPECTS -AIR POLUTION /EMISSIONS INTO THE ATMOSPHERE	
Quarrying:	<p>Three pieces of earthmoving machinery: one bulldozer, one front-end loader (or hydraulic excavator) and one tip-end truck will be involved in the quarrying, loading and hauling. Such machinery will release gaseous emissions into the atmosphere impacting on the ambient air quality.</p> <p>➤ <i>Impact during the Construction and Operation : Very Low & Significance: Low</i></p>
Beneficiation:	<p>Generally clay brick operations are associated with gaseous pollutants (emissions) into the atmosphere as a result of combustion of fossil fuel used in the firing process. The specific firing method (clamps) proposed is also prone to releasing smoke and other noxious air pollutants into the atmosphere (depending on the coal used).</p> <p>➤ <i>Impact during the Construction: Very Low & Significance: Low</i></p> <p>➤ <i>Impact during the Operation: High to Medium & Significance: Medium</i></p>
Potential Impacts	<ul style="list-style-type: none"> • Breathing problems • Irritations and uneasiness • Greenhouse gas emissions • Reduced atmospheric visibility

Mitigation	<p>Air Emissions: Procure and utilize fuel energy (coal) for firing bricks with high carbon content and less harmful volatile particulates. A full analysis of the fuel energy (coal) used, should be provided when requested by the authority. Ensure that emissions are kept within allowed threshold limits</p> <p>Sampling: Develop and implement a gaseous emission sampling campaign, sampling once before commissioning with brick production, and at intervals of six months during the production phase.</p> <p>PPE: Provide suitable PPE to employees working in areas where gaseous emissions are generated. Wearing of such PPE should be compulsory and enforced.</p> <p>Plant & Machinery: All machinery and equipment used in the operation should be properly maintained, regularly serviced and idling times limited, so as to minimize fumes and gaseous emissions. Where possible use diesel with low sulphur content (50 ppm).</p> <p>Complaints: Any complaint related to air quality pollution received from the community/stakeholders should be recorded, investigated and corrective action taken within a reasonable timeframe.</p>
Monitoring	Once before commissioning brick production and at six month intervals during the production phase
Responsibility	Management or as delegated

TABLE 9: ENVIRONMENTAL ASPECTS - NOISE POLLUTION AND DISTURBANCES	
Quarrying:	<p>Noise is unwanted/undesirable sound that can affect job performance, safety and health of humans. Noise levels will increase in the valley as a result of heavy earthmoving equipment used during the construction and operation of access roads, internal routes and quarrying activities.</p> <p>Perhaps the highest noise levels but with a pleasing sense is experienced in valley when the Omdel is in full swing particularly during the rainy period.</p> <p>➤ <i>Impact during the Construction and Operation: Very Low & Significance: Negligible</i></p>

Beneficiation:	<p>Noise of low level is expected from the earthmoving machinery handling raw materials, from plants crushing and grinding the raw materials, from the double shafted mixer and extrusion. Forklifts handling unfired and fired bricks, trucks collecting bricks from the factory, etc. are also expected to generate some noise.</p> <p>There are no sensitive noise receptors (Lodges, Schools, etc.) in close proximity of CBF and/or the quarrying site within the MCs.</p> <p>➤ <i>Impact during the Construction: Very Low & Significance: Low</i> ➤ <i>Impact during the Operation: Medium & Significance: Low</i></p>
Potential Impacts	<ul style="list-style-type: none"> • Long term exposure could lead to hearing impairment • Psychological effects – annoyance & lack of concentration • Amenity nuisance • Interference with communication when exposure is intense
Mitigation	<p>Maintenance Standard: Ensure machineries and equipment used in the brick operation are properly maintained and regularly serviced. Defective silencers should be replaced, and where applicable, equipment should be operated at the minimal ratings to undertake required tasks.</p> <p>Hooting: Machineries must be switched off when not in use and unnecessary hooting, idling & revving should be avoided.</p> <p>PPE: Employees working in areas where noise levels are high should be provided with suitable PPE. Wearing of such devices should be enforced.</p> <p>Training: Employees should be trained on the importance of wearing PPE and on all the provisions of the EMP including the Health and Safety Management Plan of the company.</p> <p>Complaints: Any complaints related to noise disturbances received from stakeholders/community should be recorded, investigated and corrective action promptly taken</p>
Monitoring	Monthly during the construction period, ongoing throughout
Responsibility	RCP Management

TABLE 10: ENVIRONMENT ASPECTS - SURFACE AND UNDERGROUND WATER	
Quarrying:	<p>Open surface water is only available in the Omdel dam which is 4km and to the west of the MCs. Several dry streams which only flow during the rainy season are encountered in the valley. No potable water will be installed at the MCs.</p> <p>➤ <i>Impact during the Construction and Operation: None & Significance: Negligible</i></p>

Beneficiation:	<p>Namwater has a pipeline which runs adjacent the CBF and water supply to the factory will be connected from that pipeline. A dry water stream is running southeast of the clay brick factory.</p> <p>There are no boreholes in the CBF vicinity. Water requirement for the brick works is $\pm 0.15 \text{ m}^3$ per ton of clay processed which translates into $\pm 7\,500 \text{ m}^3$ per annum.</p> <p>➤ <i>Impact during the Construction and Operation : Very Low & Significance: Low</i></p>
Potential Impacts	<ul style="list-style-type: none"> • Contamination from poor handling of lubricants, oil, fuels, etc. • Contamination due to poor waste management • Possibly overflow from sewerage system
Mitigation	<p>Onsite Water Storage Facilities: Store water in suitable tanks which are properly installed and leak-free. Inspection of water storage facilities should be done on a regular basis so that defects and leaks are detected early and repairs effected timeously.</p> <p>Waste water: No waste water should be disposed of in the natural environment.</p> <p>Sewage Installation: The design should make use of technologies that are tried and proven in Namibian conditions. All designs and installations should be approved by the Erongo region Council. Maintenance of such systems should be to a very high standard to avoid leakages.</p> <p>Good Housekeeping: Maintain a high standard of housekeeping which includes regular inspections of surface water installations and storage facilities (tanks and containers) at the brick plant.</p> <p>Rainwater: Harvest water from rooftops for cleaning purposes and other uses</p>
Monitoring	Weekly during the construction
Responsibility	RCP Management

TABLE 11: ENVIRONMENTAL ASPECTS - WASTE STORAGE, HANDLING & MANAGEMENT	
Quarrying:	<p>Waste will occur at the mining site only if carried there by employees – this could include plastics, cans, bottles, papers, food items, etc. Repairing machines on site could result in hazard wastes, i.e. used oil, filters, etc.</p> <p>➤ <i>Impact during the Construction and Operation: Localised and Very Low & Significance: Negligible</i></p>
Beneficiation:	<p>During the construction phase, waste could include building rubble, steel structures, paint containers, household wastes, etc. Various types of wastes will occur during the operation: office & household wastes (plastics, papers, old files, old office furniture, cartridges, cartons, etc.) and hazardous wastes (used oil, filters, old batteries, etc.) and scrapped machines, equipment, tyres, etc.</p> <p>➤ <i>Impact during the Construction: Very Low & Significance: Low ➤ Impact during the Operation: Medium & Significance: Low</i></p>

Potential Impacts	<ul style="list-style-type: none"> • Odour • Unsightly hence visual nuisance • Attracts flies, rats, etc.
Mitigation	<p>Waste Management Plan: Develop and implement a <u>Waste Management Plan</u> which includes project and site-specific waste types, procedures and facilities where it should be disposed of.</p> <p>Waste Handling: All waste should be properly handled, correctly stored, suitably transported and carefully disposed of at designated sites.</p> <p>Waste Bins: Provided suitable bins for different types of wastes which should be emptied regularly at the waste landfill site of the Ruacana Town Council. Bins should be clearly marked.</p> <p>Hazardous Waste: Store hazardous wastes (used oil, filters, lubricants, etc.) in lockable and leak-proof containers. Maintenance and washing of machinery & equipment should take place at a designated workshop area lined with concrete and supplied with an oil-water separator.</p> <p>(Nampower has a huge workshop nearby - liaise with them on the disposal of hazardous wastes).</p> <p>Trained Personnel: Train and educate employees on how to handle different types of wastes, on the importance of maintaining a high standard of housekeeping.</p> <p>Sewerage & Grey Water: The onsite sewage system should be designed and installed by professionals and approved by the Ruacana Town Council. No waste may be discharged directly into the environment.</p>
Monitoring	Daily, ongoing throughout the project lifespan
Responsibility	RCP Management or as delegated

TABLE 12: ENVIRONMENTAL ASPECTS - FUEL STORAGE, HANDLING & MANAGEMENT	
Quarrying:	<p>No fuel installation facility will be made at the mining site. Re-fuelling of heavy earthmoving equipment (loader or bulldozer) working in quarry should be done from a certified mobile bowser. Any accidental spills of fuel should be contained and wastes collected.</p> <p>➤ <i>Impact during the Construction and Operation: Localised and Very Low & Significance:</i></p>
Beneficiation:	<p>At full production the brick plant is projected to use approximately 132 000 liters of diesel per annum (approximately 12 000 litres per month, taken over eleven months since the brick plant will close for one month each year during the builders' holiday).</p> <p>Diesel will be procured in bulk and stored on site in a 15 000-litre capacity surface mounted tank provided by fuel supplier</p> <p>➤ <i>Impact during the Construction and Operation: Localised and Low & Significance: Low</i></p>

Potential Impacts	<ul style="list-style-type: none"> • Leakage (groundwater contamination) • Fire hazard • Safety hazard
Mitigation	<p>Designated Area: Fuel must be stored within designated areas – diesel in a surface mounted tank with access strictly controlled and lubricants in a separate locked room at the workshop. Store fuel in the manner as provided for in the Petroleum Act.</p> <p>Storage: Storage facilities should not be located within 60 m of a watercourse or near a wetland area or where there is a potential for any spilled fuel to enter a watercourse or groundwater. Signage for „Danger“ „No Smoking“ „No Open Fire“ and „No Unauthorised Entry“ must clearly be displayed.</p> <p>Fuelling: Vehicles and equipment fuelling should be undertaken on a hard impermeable surface or over drip pans to ensure spilled fuel is captured and cleaned up. Defective hoses, valves and containment structures should be promptly repaired.</p> <p>Re-fuelling Outside the Factory: A suitable bowser should be used to transport fuel for re-fuelling machinery working in the quarry.</p> <p>Trained Personnel: Fuelling and re-fuelling should only be handled by trained personnel and access to the fuel storage facility should be restricted to such an individuals.</p>
Monitoring	Daily and weekly inspections
Responsibility	RCP Management or as delegated

TABLE 13: ENVIRONMENTAL ASPECTS - TRAFFIC IMPACT ON D3700 HIGHWAY

Quarrying:	<p>Hauling of raw materials from the MCs to the CBF will be done on nonpublic roads. One tip-end truck with a payload of 20 m³ will deliver the mined Shale Clay to CBF for processing.</p> <p>➤ <i>Impact during the Construction and Operation: Very Low & Significance: Negligible</i></p>
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Beneficiation:	<p>Once the brick factory is successfully commissioned, and becomes operational, traffic on the D3700 highway to and from the brick plant is expected to increase as a result of heavy duty trucks travelling to collect bricks and those travelling from brick factory to deliver bricks.</p> <ul style="list-style-type: none"> ➤ <i>Impact during the Construction Very Low & Significance: Negligible</i> ➤ <i>Impact during the Operation: Medium to Low & Significance: Low</i>
Potential Impacts	<ul style="list-style-type: none"> • Overloading - hence damage to public roads • Over speeding • Unlicensed and non-road worthy vehicles • Incidents/ Accidents □ Spillage
Mitigation	<p>Weighbridge: Each truck collecting bricks from the brick factory must pass over a weighbridge for their payloads to be recorded. Overloading will cause undue wear and tear on national public roads and must be avoided at all times.</p> <p>Road Regulations: All company vehicles operated on public roads must be licensed, roadworthy, supplied with Mass Distance Logbooks and operated by licensed drivers with valid public driver"s permits. No over speeding on public roads and drivers found over speeding should be reprimanded. All road signs should be respected and complied with.</p> <p>Road Traffic Signage: Adequate traffic signs on either side of highway D3700 should be displayed to warn road users of movements of heavy vehicles around the brick factory. Additional turning lanes maybe need to be constructed in future if the traffic volume around the brick factory justifies such a need.</p> <p>Loading of Bricks: Bricks loaded onto delivery trucks should be fastened and tightly secured on the trails with suitable straps to avoid bricks falling off from the trails causing safety hazards to road users.</p> <p>Complaints: Any complaint(s) received with respect to traffic violations should be recorded, promptly investigated and corrective action taken.</p>
Monitoring	Daily, ongoing throughout the lifespan of the brick operation
Responsibility	Management or as delegated

TABLE 14: ENVIRONMENTAL ASPECTS - ON THE NATURAL ENVIRONMENT (FAUNA AND FLORA)	
Quarrying:	<p>Quarrying activities are to be conducted within the limits of each Mining Claim. Generally, the Ruacana Valley is a brownfield area which bears visible signs of disturbances from human activities as depicted in Figure 12.</p> <p>The scope of the proposed operation is of a small scale and, if it is managed well, it is not expected to have negative impacts on the floral and faunal aspects of the area.</p> <ul style="list-style-type: none"> ➤ <i>Impact during the Construction: Very Low & Significance: Negligible</i> ➤ <i>Impact during the Operation: Medium to Low & Significance: Low</i>

Beneficiation:	<p>The clay brick factory will be built on 50 000 m² (5 ha) of land which previously served a military base for the South Africa Defence Force (SADF) and has therefore been partially cleared of vegetation and plants.</p> <p>➤ <i>Impact during the Construction and Operation: Very Low & Significance: Low</i></p>
Potential Impacts	<ul style="list-style-type: none"> • Loss of habitat • Loss of grazing • Displacement of flora & fauna • Possibility for soil erosion
Mitigation	<p>Planning: All access roads, quarry internal routes, mining layout and sequences should be well planned and affected areas clearly marked.</p> <p>Training: All employees should receive an environmental induction specifically dealing with aspects related to the ecosystem.</p> <p>Vegetation: Allow vegetation to grow on overburden stockpiles. Storm water management should be put in place to limit the potential of soil erosion. Big trees and any trees in which birds are nestling should be avoided and left undisturbed when stripping the topsoil to expose the Shale Clay</p> <p>Quarry Internal Routes: Earthmoving machinery should be operated on dedicated quarry internal routes which should be well maintained.</p> <p>Fire Wood: Illegal harvesting of trees for fire wood or for any other purposes is prohibited. Open fire is not allowed.</p> <p>Livestock: Illegal hunting, killing and/or theft of livestock grazing are criminal offences punishable by law and are not allowed. The same applies to reptiles and small insects.</p> <p>Rehabilitation: Topsoil stripped to expose the rock resource underneath should be stockpiled and preserved for future rehabilitation of the quarry.</p>
Monitoring	Weekly during the construction, ongoing during the operation
Responsibility	RCP Management or as delegated

TABLE 15: IMPACT ON ARCHAEOLOGICAL & CULTURAL HERITAGE

Quarrying:	<p>There are no known or recorded sites of Cultural Heritages or Archaeological interest in the Ruacana Valley. Explosives devices have been spotted in the MCs as shown in Figure 13.</p> <p>In the event that any archaeological remains (fossil bones, coins, indigenous items, stone artifacts, bone remains, rock art, etc.) are discovered during the pre-construction and or during the actual quarrying such findings must be reported to the NHC and not disturbed further until the necessary permission is granted. This applies to any Human Remains.</p> <p>➤ <i>Impact during the Construction & Operation: Low & Significance: Low</i></p>
Beneficiation:	<p>Same as above.</p> <p>➤ <i>Impact during the Construction: Very Low & Significance: Low</i></p> <p>➤ <i>Impact during the Operation : Unlikely</i></p>
Potential Impacts	<ul style="list-style-type: none"> • Damage to items of archaeological & cultural interest • Unearthing live or unexploded ordnances

Mitigation	<p>Heritage & Archaeological Sites: Should any such site be uncovered or during the quarrying or construction phase of the project, a “chance find” the following procedure should be applied:</p> <ul style="list-style-type: none"> • If operating a machinery or equipment stop work immediately; • Demarcate the site with plastic warning tape; • Report findings, site location and actions to Management • Alert office of NHC in Windhoek and get their guidance • Any unearthed items of Archaeological or Cultural Heritage nature may not be disturbed <p>Human Remains: Follow these steps:</p> <ul style="list-style-type: none"> • Apply the chance find procedure as described above; • Inform the local police & NHC to confirm that remains are human; • Remains to be recovered and removed by police or NHC officials □ Flow instruction given by the police and NHC <p>Unexploded Ordnances: The Hydropower and water supply networks in the Ruacana Valley were heavily guarded by the SADF during the war of independence; it is therefore likely that unexploded ordnances are still present in the valley (bombs, grenades, mortars, landmines, etc.) which could pose a danger during the mining activities. It is recommended to RCP to request the Explosive Unit of the Namibia Police to conduct an ordnance detection search over the area covered by the Mining Claims.</p> <p>Training: Provide training on cultural and archaeological matters</p>
Monitoring	Ordinance detection before activities & Ongoing throughout
Responsibility	RCP Management

TABLE 16: IMPACT ON VISUAL INTRUSION	
Quarrying:	<p>Land clearing and construction of an access road to the MCs will slightly alter the visual sense of the valley. There are, however several manmade structures, overhead powerlines and overland water pipelines, which, to some extent have comprised the visual appeal of the valley. See Figure 12 <i>Impact during the Construction & Operation: Low & Significance: Low</i></p>
Beneficiation:	<p>The brick factory will consist of relatively high structures such as shed housing the clay brick plant (15 m high), the machine repair workshop shed and stockpiles for raw materials. The clamps will also be high and there could be five to six at any given time.</p> <p>Some smoke is likely to be released from the clamps during the firing. Process. All these structures will in some way impact on the visual aspect of the area, but there are other structures in the valley as shown in Figure 12.</p> <p><i>Impact during the Construction & Operation: High & Significance: Medium</i></p>
Potential Impacts	<ul style="list-style-type: none"> • Product & waste stockpiles (location) • Light pollution • Waste pollution (papers & plastics) • Airborne dust/smoke particles

Mitigation	<p>Structures: Reduce visual impacts of permanent structures by painting roofs and walls with paint of matt finish so as to reduce reflection. Locate infrastructures away from sensitive and elevated area.</p> <p>Stockpiles: Topsoil stockpiles for materials to be used in future quarry rehabilitation, should be vegetated to reduce the risk of soil erosion and decrease visual disturbance to the locals visitors using D3700 highway. Keep the heights of product stockpiles as low as possible to reduce visual impact.</p> <p>Dust Suppression: Ensure effective suppression of dust at dust prone areas such as stockpiles for raw materials and coal by spraying with water where dust collectors cannot be installed. Avoid dust and smoke from escaping into the atmosphere becoming a visual nuisance to the general public.</p> <p>Light Pollution: Ensure that security light at the brick factory does not offend the traffic using the adjacent roads. The lighting layout should direct lights inwards to the factory premise and not outwards to the highway.</p> <p>Maintenance: Factory buildings and all permanent structures should be well maintained and regularly painted to avoid visual nuisance and decay.</p> <p>Waste: Wind-blown papers and plastics around the factory premises should be regularly picked up to avoid visual nuisance. Maintain a high standard of housekeeping.</p>
Monitoring	Ongoing throughout the clay brick operation
Responsibility	Management

TABLE 17: ENVIRONMENTAL ASPECTS - HEALTH, SAFETY AND SECURITY	
Quarrying & Beneficiation	<p>All activities are handled by human beings, i.e. heavy earthmoving machineries are operated by people, bricks are packed and unpacked on clamp kilns by people, etc. as such health and safety are inherently integral to the operation.</p> <p><i>Impact during the Construction & Operation: Medium to Low with mitigation & Significance: Low</i></p>
Potential Impacts	<p>Poor health, safety and security standards could lead to:</p> <ul style="list-style-type: none"> • Incidents & accidents • Injuries • Loss of life • Loss of assets/properties • Unhygienic conditions

Mitigation	<p>Alcohol: Develop an alcohol zero tolerance policy which includes testing each employee entering the factor premises reporting for duty. Any employee who tests positive for alcohol should be sent home and loose a day"s wages.</p> <p>Health & Safety Plan: Develop a Health and Safety Plan which makes provision for raising of awareness, sharing of information as well as access to health care services. The health and safety of workers should be protected and safeguarded at all times.</p> <p>Emergency Response: Develop an Emergency Response and Procedures Framework for the brick operation to deal with any safety incidents or accidents occurring such as : □ accidentally Spill of hazardous materials, <ul style="list-style-type: none"> • accidents involving personnel on the work sites, and • fire or major landslide or structural failure, etc </p> <p>Personal Protective Equipment (PPE): Provide and supply adequate and suitable PPE to all employees working at the brick factory and enforce wearing of such PPE.</p> <p>Security: Offices should be locked while equipment and small tools at the workshop should be placed in secure places such that criminal activities (theft) are not encouraged. Encourage customers to make direct bank transfers instead of accepting cash at the factory.</p> <p>Housekeeping Practice: Maintain a high standard of housekeeping which ensures adherence to the Labour Laws, Health and Safety legislations</p> <p>Training: Provide training to all employees on all aspects related to health & safety and on the provisions of the EMP</p>
Monitoring	Ongoing throughout the clay brick operation
Responsibility	Management

TABLE 18: ENVIRONMENTAL ASPECTS - CREATION OF JOB OPPORTUNITIES	
Quarrying & Beneficiation	<p>At full production the clay brick operation will provide employment opportunities to a large number of people – at least over a 100 people. There will be opportunities both for skilled and unskilled workforce. Firing bricks in clamps is a labour intensive operation requiring mostly less skilled labour.</p> <p>The promoter should strive to ensure that employment is offered in compliance of applicable labour laws and regulations terms.</p> <p><i>Impact during the Construction & Operation: High (+ve) & Significance: Medium</i></p>
Potential Impacts	<ul style="list-style-type: none"> • Poverty eradication • Improved standard of living • Good income /salary • Support to family/relatives • Dignified life

Mitigation	<p>Hiring Of Employees:</p> <ul style="list-style-type: none"> ✓ Adopt a „local first policy” when hiring workers for non-skilled positions at the brick plant. ✓ Hire employees from the local communities without prejudice on the basis of gender, language, background, religion or political affiliations ✓ People from marginalized communities (i.e. Ovahimba who reside in the area) should be considered and offered employment ✓ People with disabilities should likewise be considered for suitable employment opportunities. ✓ Ensure that the recruitment of employees is done in a transparent, and gender inclusive manner. <p>Employees’ Wellbeing:</p> <p>Develop a policy on social ills to deal with aspects related to drug and alcohol abuse by the employees. Initiatives should also be made with regard to raising awareness on the danger of unsafe sex practices which lead to HIV/AIDS and other sexual transmitted diseases.</p> <p>Training:</p> <p>All employees should be given training given an induction workshop on this EMP Provide and offer on-the-job training opportunities for employees to improve their skills level which ultimately leads to high productivity and efficiencies</p>
Monitoring	Ongoing throughout the clay brick operation
Responsibility	Management

TABLE 19: ENVIRONMENTAL ASPECTS - LABOUR AND WORKING CONDITIONS	
Quarrying & Beneficiation	<p>The underlying objective should be for RCP to create a harmonious working environment in which employees feel appreciated for their contributions and are working in an environment which is safe and hazardous-free. Suitable on-the-job training should be offered to employees for them to improve their knowledge and skills level which in turn help to improve productivity, cut wastages and enhance production efficiencies.</p> <p><i>Impact during the Construction & Operation: Medium to Low with mitigation & Significance: Low</i></p>
Potential Impacts	<ul style="list-style-type: none"> • unsafe working environments • bias recruitment practices • poor standard of hygiene & cleanliness

Mitigation	<p>Employment Contract: The terms and conditions of each employee should be clearly spelled out in a written contract with a copy held on the file at the office and one copy given to the employee. The contract should amongst other things spell out job specifications, working hours, remuneration, etc.</p> <p>Employee Transport: Employees should reside in the town of Henties Bay with the company providing free transport to and from work. Only security personnel working rotational shifts are allowed to reside on the company premises during working hours only.</p> <p>Trade Unions: Allow the employees to exercise their rights to join and belong to a trade union of their choice. Allow each employee charged with a misconduct the right to be represented during a disciplinary hearing</p> <p>Records: Proper records should be kept with respect to the number of people employed whether fulltime or part-time, contractors hired, payments made to contractors, salaries and wages paid to full-time and part-time employees, number of non-locals hired and the salaries paid to non-Namibians, etc.</p> <p>The amount spent on salaries will be an indication of the amount of money that will be spent in the local and regional economy by the employees.</p>
Monitoring	Ongoing throughout the clay brick operation
Responsibility	Management

TABLE 20 : ENVIRONMENTAL ASPECTS - SOCIAL AND COMMUNITY IMPACTS	
Quarrying & Beneficiation	<p>RCP should try to be a responsible and caring SME – this will include procuring from local business community, caring in its own way for the community in which it operates by for instances donating bricks to build.</p> <p><i>Impact during the Construction & Operation: Medium to Low with mitigation & Significance: Low</i></p>
Potential Impacts	<ul style="list-style-type: none"> • Extend economic opportunities to local businesses • Promote industrial relations • Contribute to worthy causes in the community

Mitigation	<p>Goods & Services: Source and procure goods and services required for the brick operation from local suppliers (spare parts, fuel, PPEs, stationery, etc.) where applicable. Contribution to the regional and national economy should be monitored and reported on through annual reviews where applicable.</p> <p>Workers: Try as much as possible, to hire and recruit people for manual and unskilled labour from within the constituency with preference given to those already having accommodation in the town of Henties Bay.</p> <p>Complains from the Community: Engage with the community and provide information in a transparent and open manner so as to manage their expectations. Any complain and or grievance received from the community should be addressed timeously.</p> <p>Corporate Social Responsibility: Contributions made by the clay brick company to the community should be reported on in the media so as to enhance the profile of the company to the general public. Membership of the Chamber of Mines and/or the Namibia Chamber of Commerce and Industry (NCCI) is recommended.</p> <p>Logbook: A logbook should be kept at the gate of the brick factory where all vehicles visiting the operation are recorded, the time of entry, exit, the type of vehicle, and its destination. This will give an indication of the number of vehicles visiting the operation.</p> <p>Tourists: Tourists and members of the public who may wish to view the clay brick operation should be allowed and given the space to do so, provided prior arrangements have been made or when such visits do not interfere with the operation.</p>
Monitoring	Ongoing throughout the clay brick operation
Responsibility	Management

7. BRICK OPERATION CLOSURE FRAMEWORK

7.1 Introduction

The write-up in this section has been adopted from the „*Overview of International Mine Closure Guidelines by Dawn H Garcia*. Plans for closure of a mining operation and associated plant facilities as well as post-closure use of the land, must be presented to stakeholders as part of the „permitting process“ and to obtain the „social licence“ from the community.

The International Financing Corporation (2007) has also guidelines which require a proponent of a mining operation to develop a mine closure plan which covers both socio-economic considerations and physical rehabilitation to be an integral part of the project life cycle. The objectives of such a plan should be structured so that:

- ✓“future public health and safety“ are safeguarded and not compromised
- ✓the after use of the site is beneficial and sustainable to the affected communities in the long term
- ✓adverse socio-economic impacts are minimized while socio-economic benefits are maximized”

7.2 Objectives

Ideally, the objectives for a mine closure and rehabilitation of disturbed areas are:

- ✓ to ensure that the site is made safe for both humans and animals
- ✓ that the residual impacts are managed to acceptable levels and will not deteriorate over time
- ✓ that closure is achieved with minimal socio-economic upheaval
- ✓ to ensure that the biodiversity and environment on the site is protected
- ✓ to provide sufficient funds at the end of life of mine, to properly implement the closure plan
- ✓ to establish a self sustaining vegetation community using appropriate indigenous native tree, shrub and grass species, and
- ✓ that the land where the raw materials have been quarried is made stable, both in terms of geotechnical parameters and erosion so that post mine land use is not compromised by site instability

7.3 Closure Planning

RCP should develop a **Closure and Rehabilitation Framework Plan** right from the start of its operation, which should be adapted and updated during the operational phase of the brick project, refining the closure criteria and associated costing on an ongoing basis. The Closure and Rehabilitation Plan should reflect changes in the clay brick factory development, operational planning, environmental and social conditions.

At this stage it is not possible to provide explicit details as to how this process will take place, because technology, science and legislative requirements may well have changed by the time the brick plant begins its decommissioning process, which based on planned extraction rate has a lifespan in excess of 60 years. However, a thorough **Closure and Rehabilitation Framework Plan** closure development strategy has to be formulated now which should be reviewed and improved throughout the lifecycle of the clay brick project.

Ideally, the Closure and Rehabilitation Framework Plan final closure strategy should include and provide for a continuous rehabilitation and final closure.

7.4 Continuous Rehabilitation Plan

This plan has to make provision for:

- ✓ Progressive Rehabilitation Plan
- ✓ Monitoring Plan

7.5 Considerations for Final Closure:

In the final closure plan provision should be made for:

- ✓ a structured risk/opportunity assessment that considers risks associated with health and safety and the natural and social environment, legal risks and financial risks
- ✓ social plan (employees and communities)

- ✓ decommissioning plan
- ✓ final rehabilitation plan
- ✓ monitoring plan
- ✓ financial breakdown for closure

The closure plan should make provision for all possible closure scenarios including:

- ✓ life of mine closure (i.e. planning closure at the completion of mining operations), and
- ✓ immediate closure (i.e. a sudden closure of operations due to economic factors such as recession)

Although planning for the latter cannot be done in much detail, being prepared for such unforeseen circumstances rely on having an updated detailed closure plan, which gives the promoter the ability to rapidly evaluate the remaining unknowns and risks associated with closure and to develop an appropriate decommissioning plan.

7.6 **Conceptual Closure Plan**

The purpose of this Section in the EMP is to provide a conceptual closure plan, including closure and rehabilitation objectives, financial provisioning and potential suggestions for post mining land use. The structure of this plan is in accordance to the Namibian Mine Closure Framework (The Chamber of Mines of Namibia, 2010).

7.7 **Socio-Economic Considerations**

It is important to identify and engage key stakeholders in the formulation of a successful Mine Closure Plan since a project (mine) closure can often be responsible for substantial changes in both the community and the environment in which it operates (The Chamber of Mines of Namibia, 2010).

Engagement will enable stakeholders to have their interests considered as part of the clay brick factory closure planning process, whilst creating an understanding for their views and expectations and formulating a balanced, realistic and achievable closure outcome.

Stakeholder engagement is an ongoing process that should start in the planning phase, and continue throughout the operation and mine closure phases. It should include consultation, listing and feedback, as well as distribution of information.

The parties that should be consulted are divided into those that are directly affected:

- ✓ employees of the clay brick factory
- ✓ main contractors and sub-contractors
- ✓ local authority such the Ruacana Town Council
- ✓ service providers
- ✓ GRN institutions (MME, MET, etc)
- ✓ product end-users (building contractors, etc)

7.8 **Mechanism to Manage Socio-economic Effects**

Various mechanisms are available to manage post closure social issues. The following mechanisms could be considered:

- ✓ establishment of a Future Forum
- ✓ mechanisms to Save Jobs and avoid Job Losses and a Decline in Employment
- ✓ mechanisms to provide alternative solutions and procedures for creating job security where job losses cannot be avoided; and
- ✓ mechanisms to improve the social and economic impact on individuals, regions and economies when retrenchment or closure of the brick plant is certain

At this stage, no financial provision is made for the above mentioned mechanisms and Brick will need to ensure that sufficient provision is made for the management of these issues within future iterations of the Clay Brick Closure Plan.

7.9 Provision for Retrenchments

The financial provision for socio-economic effects should be structured to include:

(a) Employee Costs:

- ✓ Retrenchment provision (e.g. severance or retention packages)
- ✓ New employment opportunities
- ✓ Retraining costs

(b) Social Aspects (sustainability of associated communities):

- ✓ Exit strategy (i.e. process by which the brick factory will cease to support local initiatives)
- ✓ Social transition (i.e. support that will be provided to the community to transition to new economic activities).

7.10 Physical Rehabilitation

The key clay brick infrastructure components that will be decommissioned and rehabilitation are:

- ✓ the quarry (the excavated pit)
- ✓ access roads to the quarry
- ✓ the preparation section (Crushing & Grinding)
- ✓ the shaping section (brick extrusion section)
- ✓ brick drying yard
- ✓ ripping and profiling of firing area
- ✓ administrative & ancillary support facilities
- ✓ water supply line
- ✓ electrical connections (transformer, distribution boxes, etc)
- ✓ workshops
- ✓ weighbridge & security office
- ✓ rehabilitation of paved areas
- ✓ sewer treatment facility
- ✓ fencing around the brick plant premises

7.11 Post Closure Monitoring

Post-Closure monitoring and management is also accounted for and it is recommended that this involve:

- ✓vegetation succession monitoring and management
- ✓erosion monitoring and management
- ✓surface run-off monitoring
- ✓monitoring and management pollution control

Post closure monitoring should continue for a minimum period of five years depending on anticipated risks.

7.12 Financial Provisions

The Minerals Policy of Namibia (1999) endorses the „polluter pays“ principle which places responsibility for pollution mitigation on the party that caused the pollution. This principle is strengthened by the Mine Closure Framework (The Chamber of Mines of Namibia, 2010) and IFC (IFC, 2007). It aims to ensure that environmental liabilities do not remain with the government but that mechanisms are put in place by mining companies to make sure that adequate financial resources have accrued at the time of closure to cover these costs at a time when revenue is no longer being generated.

RCP should review the closure provision on an annual basis to ensure that provisions are correct and up to date.

No projection for cost of closure has been provided here.

8. CONCLUSIONS AND RECOMMENDATIONS

This Closure Plan cannot anticipate all of the issues that will arise during the projected life of the brick operation and therefore, is not intended to be a definitive closure prescription. This document does, however, provide an outline of the closure process that may be undertaken. A detailed closure plan must be prepared closer to the actual closure date, when the date of closure has been confirmed.

It is recommended that the renewal of the ECC be granted.

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