APP-005722

SAND MINING OPERATIONS IN THE SWAKOP RIVER, OTJOZONDJUPA, REGION

UPDATED ENVIRONMENTAL MANAGEMENT PLAN

Compiled by:

Compiled for:

City Sand & Bricks (Pty) Ltd

March 2025

Project:	**SAND MINING ACTIVITIES IN THE SWAKOP RIVER, OTJOZONDJUPA REGION: UPDATED ENVIRONMENTAL MANAGEMENT PLAN**	
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Report Approval	2025/03/24 City Sand ECC Bosman **Quzette Bosman** Social & Environmental Practitioner	

I Henco K. Henning acting as the Proponent's representative (City Sand & Bricks (Pty) Ltd), hereby confirm that we approve the Environmental Management Plan as presented in this document. All material information in the possession of the proponent that reasonably has or may have the potential of influencing the Environmental Management Plan was provided to the consultant.

Signed at _____ on the _____ day of _____ 2025.

_____ 2001/110

City Sand & Bricks (Namibia) (Pty) Ltd Registration Number

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TABLE OF CONTENTS

1 BACKGROUND AND INTRODUCTION

Geo Pollution Technologies (Pty) Ltd was appointed by City Sand & Bricks (Pty) Ltd, to apply for the renewal of their existing environmental clearance certificate (ECC-01980) for their sand mining operations which entails the removal of sand from the Swakop River near, Okahandja Otjozondjupa Region (Figure 1-1). To renew the ECC, an updated environmental management plan (EMP) was prepared for continued operations. Operations mainly involve removal of sand deposits by means of earthmoving equipment, loading the material onto trucks and transporting it to a stockpile area next to the river. From there the resource is loaded onto trucks and transported to City Sand & Bricks' brickfield near Windhoek, where screening and crushing are conducted. All current and future sand mining operations are focussed within the active river channel and no mining is proposed or being conducted on the floodplain and overbank areas.

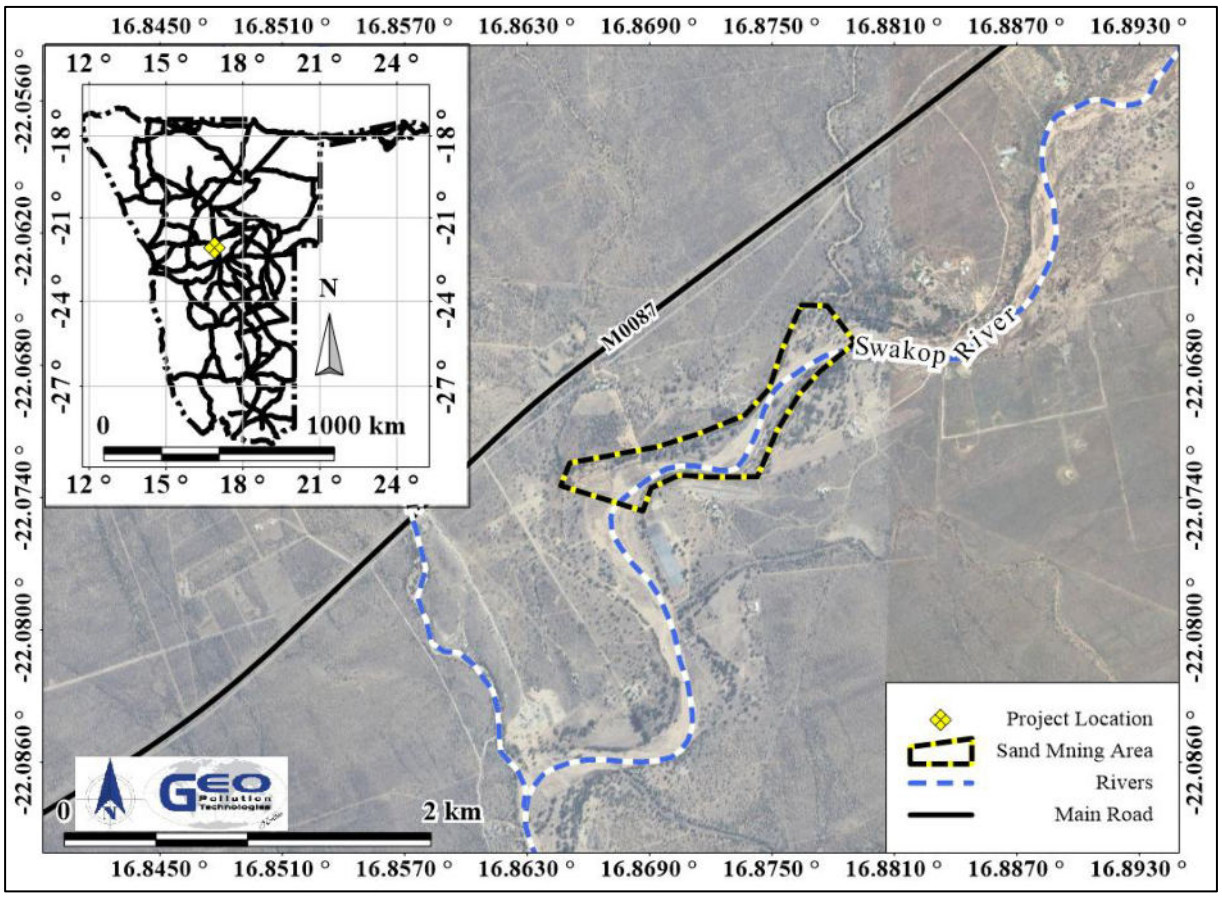

Figure 1-1 Project location

An updated environmental management plan was prepared in 2021 (Bosman et al. 2021) to determine the potential impacts of the operational, maintenance (repairs, upgrades, replacements, etc.) and possible decommissioning phases of the operations on the environment. The environment being defined in the Environmental Management Act as "land, water and air; all organic and inorganic matter and living organisms as well as biological diversity; the interacting natural systems that include components referred to in sub-paragraphs, the human environment insofar as it represents archaeological, aesthetic, cultural, historic, economic, paleontological or social values".

The updated environmental management plan was prepared in support of an ECC in compliance with Namibia's Environmental Management Act (Act No 7 of 2007) (EMA).

2 SCOPE

The scope of this assessment is to:

- Determine the potential environmental impacts emanating from the operational, maintenance and possible decommissioning activities of sand mining operations,
- Identify a range of management actions which could mitigate the potential adverse impacts to acceptable levels,
- Comply with the requirements of EMA,
- Provide sufficient information to the relevant competent authority and Ministry of Environment, Forestry and Tourism (MEFT) to make an informed decision regarding the operations, maintenance and possible decommissioning of the sand mine.

3 METHODOLOGY

The following methods were used to investigate the potential impacts on the social and natural environment due to the construction and operations of the facility:

1. Baseline information about the site and its surroundings was obtained from existing secondary information and the previous environmental assessment and EMP conducted for operations.
2. Potential environmental impacts emanating from the operations and decommissioning of operations were determined and possible enhancement measures were listed for positive impacts while mitigation / preventative measures were provided for negative impacts.
3. An updated environmental management plan was prepared to be submitted to the MEFT.

4 ADMINISTRATIVE, LEGAL AND POLICY REQUIREMENTS

To protect the environment and achieve sustainable development, all projects, plans, programmes and policies deemed to have adverse impacts on the environment require an environmental assessment, as per the Namibian legislation. The legislation and standards provided in Table 4-1 and Table 4-2 to govern the environmental assessment process in Namibia and / or are relevant to the sand mining operations.

Table 4-1. Namibian law applicable to sand mining

Law	Key Aspects
The Namibian Constitution	♦ Promotes the welfare of people ♦ Incorporates a high level of environmental protection ♦ Incorporates international agreements as part of Namibian law
Environmental Management Act Act No. 7 of 2007, Government Notice No. 232 of 2007	♦ Defines the environment ♦ Promotes sustainable management of the environment and the use of natural resources ♦ Provides a process of assessment and control of activities with possible significant effects on the environment
Environmental Management Act Regulations Act No. 7 of 2007, Government Notice No. 28-30 of 2012	♦ Commencement of the Environmental Management Act ♦ Lists activities that requires an environmental clearance certificate ♦ Provides Environmental Impact Assessment Regulations
Public and Environmental Act Act No. 1 of 2015, Government Notice No. 230 of 2020	♦ Provides standards for managing air, water, and soil ♦ Regulates the management for disposal of solid and liquid waste ♦ Provides standards for sanitation facilities.
Water Resources Management Act Act No. 11 of 2013, Government Notice No. 269 of 2023	♦ Provides for management, protection, development, use and conservation of water resources ♦ Regulates sand mining in river ♦ Prevention of water pollution and assignment of liability ♦ Provides Sand Mining Regulations
Soil Conservation Act Act. No. 76 of 1969, Government Notice No. 494 of 1970	♦ Law relating to the combating and prevention of soil erosion, the conservation, improvement and manner of use of the soil and vegetation and the protection of the water sources Namibia
Forest Regulations Act 12 of 2001, Government Notice No. 248 of 2001	♦ Makes provision for the protection of the environment and the control and management of forest fires ♦ Provides the licencing and permit conditions for the removal of woody and other vegetation as well as the disturbance and removal of soil from forested areas
Forest Regulations: Forest Act, 2001 Act 12 of 2001, Government Notice No. 170 of 2015	♦ Declares protected trees or plants ♦ Issuing of permits to remove protected tree and plant species
Local Authorities Act Act No. 23 of 1992, Government Notice No. 116 of 1992	♦ Defines the powers, duties and functions of local authority councils ♦ Regulates discharges into sewers
Public and Environmental Health Act Act No. 1 of 2015, Government Notice No. 86 of 2015	♦ Provides a framework for a structured more uniform public and environmental health system, and for incidental matters ♦ Deals with integrated waste management including waste collection disposal and recycling; waste generation and storage; and sanitation
Labour Act Act No 11 of 2007, Government Notice No. 236 of 2007	♦ Provides for Labour Law and the protection and safety of employees ♦ Labour Act, 1992: Regulations relating to the health and safety of employees at work (Government Notice No. 156 of 1997)

Law	Key Aspects
Atmospheric Pollution Prevention Ordinance Ordinance No. 11 of 1976	♦ Governs the control of noxious or offensive gases ♦ Prohibits scheduled process without a registration certificate in a controlled area ♦ Requires best practical means for preventing or reducing the escape into the atmosphere of noxious or offensive gases produced by the scheduled process
Hazardous Substances Ordinance Ordinance No. 14 of 1974	♦ Applies to the manufacture, sale, use, disposal and dumping of hazardous substances as well as their import and export ♦ Aims to prevent hazardous substances from causing injury, ill-health or the death of human beings
Pollution Control and Waste Management Bill (draft document)	♦ Not in force yet ♦ Provides for prevention and control of pollution and waste ♦ Provides for procedures to be followed for licence applications
Road Traffic and Transport Act Act No. 52 of 1999 Government Notice No 282 of 1999	♦ Provides for the control of traffic on public roads and the regulations pertaining to road transport
Road Traffic and Transport Regulations Government Notice No 53 of 2001	♦ Prohibits the transport of goods which are not safely contained within the body of the vehicle; or securely fastened to that vehicle, and which are not properly protected from being dislodged or spilled from that vehicle

Table 4-2.Relevant multilateral environmental agreements for Namibia and the development

Agreement	Key Aspects
Stockholm Declaration on the Human Environment, Stockholm 1972	♦ Recognizes the need for a common outlook and common principles to inspire and guide the people of the world in the preservation and enhancement of the human environment
1985 Vienna Convention for the Protection of the Ozone Layer	♦ Aims to protect human health and the environment against adverse effects from modification of the ozone layer are considered ♦ Adopted to regulate levels of greenhouse gas concentration in the atmosphere
United Nations Framework Convention on Climate Change (UNFCCC)	♦ The Convention recognises that developing countries should be accorded appropriate assistance to enable them to fulfil the terms of the Convention
Convention on Biological Diversity, Rio de Janeiro, 1992	♦ Under article 14 of The Convention, EIAs must be conducted for projects that may negatively affect biological diversity

Mining and quarrying related activities that are listed as activities requiring an environmental clearance certificate are (Government Notice No.29 of 2012):

Mining and Quarrying Activities

- 3.2 "Other forms of mining or extraction of any natural resource whether regulated by law or not." Sand is considered as a natural resource.
- 3.3 "Resource extraction, manipulation, conservation or related activities" Sand will be extracted / mined.

5 ENVIRONEMTNAL MANAGEMENT PLAN

The EMP provides management options to ensure impacts of the sand mining operations are minimised. An EMP is a tool used to take pro-active action by addressing potential problems before they occur. This should limit the corrective measures needed, although additional mitigation measures might be included if necessary. The EMP acts as a stand-alone document, which can be used during the various phases (operational and decommissioning) of the sand mine. All employees, contractors and sub-contractors taking part in the operational phases should be made aware of the contents of the EMP, so as to plan the relevant activities accordingly in an environmentally sound manner.

The objectives of the EMP are:

- to include all components of the sand mining operations;
- to prescribe the best practicable control methods to lessen the environmental impacts associated with the operations of the sand mine;
- to monitor and audit the performance of operational personnel in applying such controls; and
- to ensure that appropriate environmental training is provided to all operational personnel.

Various potential and definite impacts will emanate from the operations, and decommissioning phases. The majority of these impacts can be mitigated or prevented. The impacts, risk rating of impacts, as well as prevention and mitigation measures are listed below. As depicted in the below, impacts related to the operational phase are expected to mostly be of low to medium significance and can mostly be mitigated to have a low significance. The extent of impacts are mostly site specific to local and are not of a permanent nature. Due to the nature of the surrounding areas, cumulative impacts are possible and include water pollution and traffic impacts.

5.1 Planning Phase

Although operations are ongoing, extraction of future resource areas are still being planned and therefore the planning phase is still applicable. However, the impacts expected as being generated during the planning phase (which is inclusive of the renewal of the ECC) relate mostly to legal, planning and economic aspects.

During the phases of planning for future operations, construction and decommissioning of the sand mine, it is the responsibility of the Proponent to ensure they are and remain compliant with all legal requirements. The Proponent must also ensure that all required management measures are in place prior to and during all phases, to ensure potential impacts and risks are minimised. The following actions are recommended for the planning phase and should continue during various other phases of the project:

- Ensure that all necessary licenses from the various ministries, local authorities and any other bodies that governs the construction (maintenance) activities and operations of the project remains valid.
- Ensure all appointed contractors and employees enter into an agreement which includes the EMP. Ensure that the contents of the EMP are understood by the contractors, sub-contractors, employees and all personnel present or who will be present on site.
- Make provisions to have a health, safety and environmental coordinator to implement the EMP and oversee occupational health and safety as well as general environmental related compliance at the site.
- Have the following emergency plans, equipment and personnel on site where reasonable to deal with all potential emergencies:
  - Risk management / mitigation / EMP/ emergency response plan and HSE manuals
  - Adequate protection and indemnity insurance cover for incidents;
  - Comply with the provisions of all relevant safety standards;
  - Procedures, equipment and materials required for emergencies.
- If one has not already been established, establish and maintain a fund for future ecological restoration of the sand mine.
- Establish and / or maintain a reporting system to report on aspects of construction activities, operations and decommissioning as outlined in the EMP.

- Submit monitoring reports every six months to allow for future environmental clearance certificate renewal application.
- Appoint an environmental consultant to update the EMP and apply for renewal of the environmental clearance certificate prior to expiry. Bi-annual monitoring report will be required by the MEFT for the renewal of the ECC.

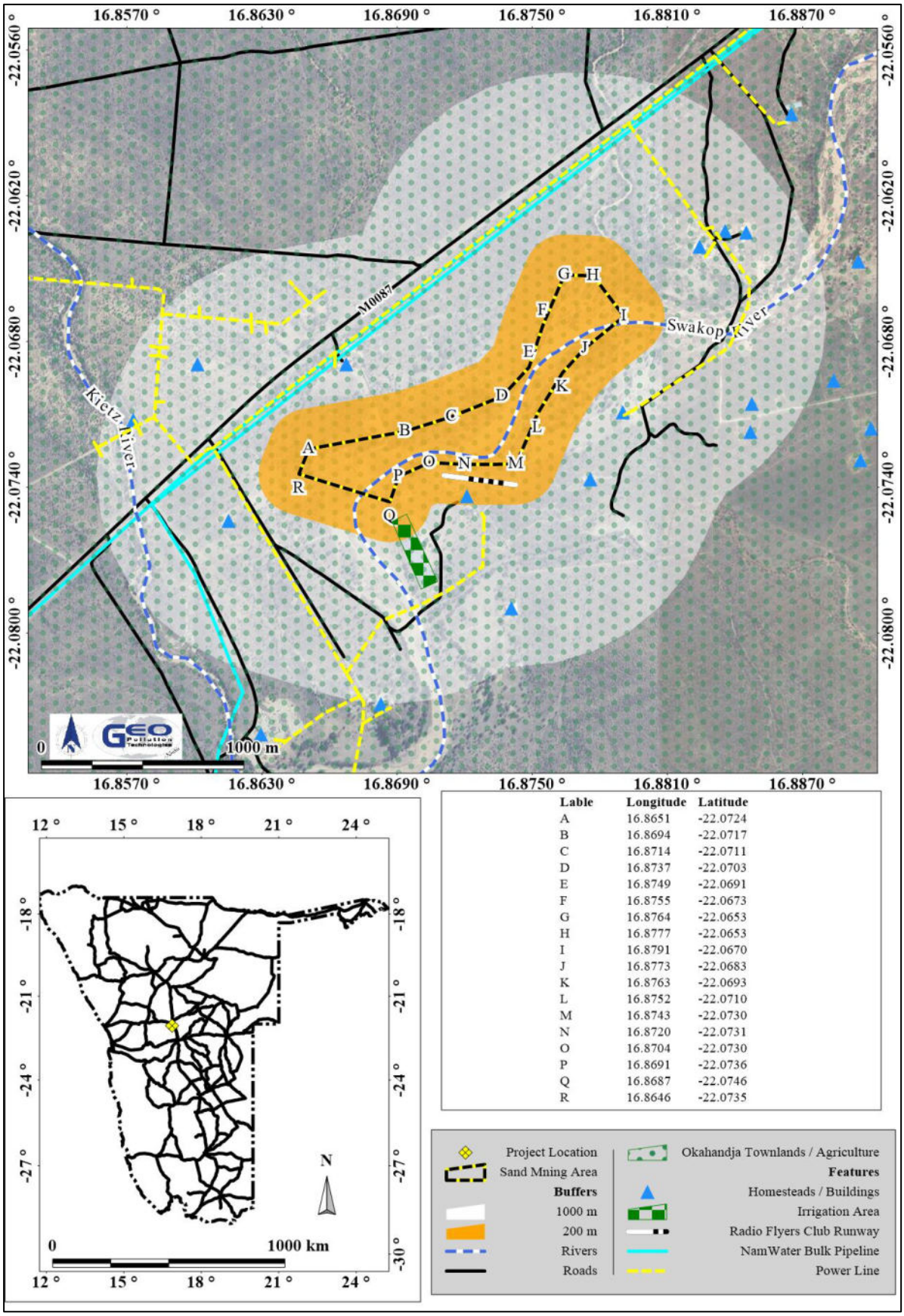

Figure 5-1 Buffer Zone Map

5.1.2 Skills, Technology and Development

During various phases of the project, training has been and will be provided to a portion of the workforce. Training is conducted to enhance efficiency within different components of sand mining and value addition activities. Skills are further transferred to the unskilled workforce for general tasks. Improvement of people and technology are key to economic development as well as operational feasibility. All employees receive emergency and evacuation plan training while the supervisors and identified employees have first-aid training.

Desired Outcome: To see an increase in skills of local Namibians, as well as development and technology advancements in the industry.

Actions

Enhancement:

- If the skills exist locally, contractors must first be sourced from the town, then the region and then nationally. Deviations from this practice must be justified.
- Skills development and improvement programs to be made available as identified during performance assessments.
- Employees to be informed about parameters and requirements for references upon employment.
- The Proponent must employ Namibians where possible. Deviations from this practise should be justified appropriately.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Record should be kept of training provided.
- Ensure that all training is certified or managerial reference provided (proof provided to the employees) inclusive of training attendance, completion and implementation.

5.1.3 Change in Land Use and Earning Potential

Change in land utilisation and related economic productivity was initiated with the construction phase. The land use being conducted, has led to revenue generation and contributed to the local, regional and national economy. The earning potential of the project area has been increased. In addition, the flow of revenue was altered as there is a difference and increase in employment, purchasing of goods and use of services. The impact is foreseen to continue having a positive impact on the economic sphere of the environment.

The related economic productivity of the current land use, will reach its full potential during the operational phase while the decommissioning phase will not share in such impact.

Desired Outcome: Contribution to local and national treasury and sustain a stable earning potential for employees and the industry.

Actions

Enhancement:

- The Proponent must employ local Namibians where possible.
- Maintain value addition activities for the life of sand mine operations where possible.
- Investigate profitable post-closure land use possibilities.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Ensure all taxes and governmental levies (where required) are paid.
- All social security and related documentation kept on file.
- Financial auditing.
- Record to be kept of all sand removed from the river, volumes submitted to MAWLR.

5.1.4 Revenue Generation and Employment

Sand mining (as opposed to no economic related activity) has led to changes in the way revenue is generated and paid to the local and national treasury. Revenue generated from the area has been increased, not only by sand mining operations, but also in the value addition activities conducted off site. This include primarily brick making. Operations have provided stable employment for the area. Such employment contributes significantly to the economic resilience of the employees as well as the surrounding area. Employment is sourced locally while skilled labour/contractors may be sourced from other regions. The sand mine further contributes to the transport sector as well as the construction industry at large. The impact is foreseen to have a positive impact on the economic and social sphere of the environment. Once the sand mine is decommissioned, there will be a change and probable loss in revenue generation, flow and employment. Possible revenue generating activities should be considered by the Proponent closer to the decommissioning phase.

Desired Outcome: Contribution to local and national treasury and provision of employment to local Namibians.

Actions

Enhancement:

- All capital investment as required for machinery and maintenance to be invested into local or regional Namibian business sector.
- The Proponent must employ local Namibians where possible.
- If the skills exist locally, employees must first be sourced from the town, then the region and then nationally.
- Deviations from this practice must be justified.
- Post-closure land-use options to be considered by the Proponent.
- Adherence to all Namibian law relating to revenue generation and employment generation.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Bi-annual summary report based on employee records.
- Financial auditing.

5.1.5 Demographic Profile and Community Health

Operations have been ongoing for an extended period, (more than five years). Current operations will not create a change in the demographic profile of the local community. Community health may be exposed to factors such as communicable disease like HIV/AIDS and alcoholism/drug abuse, associated with uneducated financial expenditure. An increase in foreign people in the area (potential job seekers) may potentially increase the risk of criminal and socially/culturally deviant behaviour. However, the Proponent is not the only employer in the area and therefore potential impacts on the demographic profile, is largely cumulative. The sand mine and related value addition operations have experienced criminal activities on site and have adopted measures to discourage such activities.

Desired Outcome: To prevent the spread of communicable disease and prevent / discourage socially deviant or criminal behaviour.

Actions

Prevention:

- Employ primarily local people from the area, deviations from this practice should be justified appropriately.
- Adhere to all municipal by-laws relating to environmental health.
- Prohibit substances abuse on the site.
- Adopt an open-door policy to reporting of socially deviant or destructive behaviour related to employment duties.
- Provide a safe protocol for the report or whistle-blowing of criminal activities.
- Implement a reward system for excellence in conduct and employment.
- Educational programmes for employees on HIV/AIDs and general upliftment of employees' social status.
- Appointment of reputable contractors.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Bi-annual summary report based on educational programmes and training conducted.
- Bi-annual report and review of employee demographics.
- Records kept of all socially deviant, destructive or criminal reports received.

5.1.6 Traffic

No increase in traffic to and from the site is foreseen for the immediate future of operations. The majority of material moved from site is transported by tipper trucks. There still however remain risks associated with the transport of sand from the site. These risks include collision and incident risks (such as break-downs).

Desired Outcome: Minimum impact on traffic and no transport or traffic related incidents.

Actions

Prevention:

- Access points onto any road should suitably strengthened according to the requirements of the Roads Authority, to accommodate the current traffic load
- Erect clear signage for access points to operational areas. Such signs should be erected for any other entrance which may be used in the future along any public road (access point).
- All contractors or employees driving heavy motor vehicles should have appropriate training and qualifications to operate such vehicles.
- All vehicles to be roadworthy and appropriately licensed.
- All trucks should have their loads covered with a suitable covering to prevent fly-off rocks, sand and debris

Mitigation:

- If any traffic impacts are expected, traffic management should be performed to prevent these.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Any complaints received regarding traffic issues should be recorded together with action taken to prevent impacts from repeating itself.
- A report should be compiled every 6 months of all incidents reported, complaints received, and action taken.

5.1.7 Health, Safety and Security

Every activity associated with operations is reliant on human labour and therefore exposes them to health and safety risks. Activities such as the operation of machinery and handling of the material, poses risks to employees. Employees will be exposed to elevated levels of dust and noise. Security risks are related to unauthorized entry, theft and sabotage. Dust from the site is not considered to pose a health or safety risk to surrounding communities. However, dust from the road has the potential to affect surrounding properties.

Only strip mining should be conducted, as circular mining poses a threat to humans and cattle, who could fall in and drown due to pooling water caused by circular mining. Riverbeds disturbed by circular mining will release sediments, degrading water quality. All areas where active mining takes place must be clearly marked to warn people that they are entering a mining zone that poses dangers.

Desired Outcome: To prevent injury, health impacts and theft.

Actions

Prevention:

- Clearly label dangerous and restricted areas as well as dangerous equipment and products.
- Implement a hazardous dust inspection, housekeeping, and control program.
- Use proper dust collection systems and filters.
- Equipment must be locked away on site and placed in a way that does not encourage criminal activities (e.g. theft).
- Provide all employees with required and adequate personal protective equipment (PPE).
- Ensure that all personnel receive adequate training on operation of equipment / handling of hazardous substances and PPE, especially the importance of dust masks.
- All health and safety standards specified in the Labour Act should be complied with.
- Implementation of a maintenance register for all equipment and hazardous substance storage areas.
- Selected personnel should be trained in first aid and a first aid kit must be available on site. The contact details of all emergency services must be readily available.
- Implement and maintain an integrated health and safety management system, to act as a monitoring and mitigating tool, which includes: colour coding of pipes, operational, safe work and medical procedures, permits to work, emergency response plans, housekeeping rules, MSDS's and signage requirements (PPE, flammable etc.).
- Strict security that prevents unauthorised entry.
- Systematic strip mining of the sand deposits to be conducted.
- Demarcate mining areas.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Any incidents must be recorded with action taken to prevent future occurrences.
- All to be educated in safety hazards around the site.
- Reports of safety inspections of the operating areas as well as machinery to be kept on file.

5.1.8 Fire

Construction and operational activities may increase the risk of the occurrence of fires. Operation of mechanical, fuel and electrical machinery increases the risk of fire on site. However, no fuel, or large volumes of hydrocarbon material is kept at the active sand mining sites. Operational areas are devoid of most combustible material while operating machines are removed from each other, thereby reducing the spread of potential fire which may occur. Similarly operational activities are located away from electrical powerlines, as well as higher voltage power lines.

Desired Outcome: To prevent property damage, possible injury and impacts caused by explosions or uncontrolled fires.

Actions

Prevention:

- Open fires should not be allowed at the site.
- Fire precautions and fire control must be present at the site.
- In addition to this, all personnel have to be sensitised about responsible fire protection measures.
- A holistic fire protection and prevention plan is needed. This plan must include an emergency response plan and firefighting plan.
- Ensure all chemicals, lubricants and flammable agents are stored according to Material Safety Data Sheet (MSDS) instructions.
- Maintain regular site, mechanical and electrical inspections and maintenance.
- Fire-fighting training to be provided to staff.
- Use appropriate electrical equipment and wiring methods.
- Control smoking (designated smoking areas), open flames, and sparks.
- Control mechanical sparks and friction and ensure mechanical parts are maintained and efficiently lubricated.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- A register of all incidents must be maintained. This should include measures taken to ensure that such incidents do not repeat themselves.
- A report should be compiled every six months of all incidents reported. The report should contain dates when fire drills were conducted and when fire equipment was tested and training given.

5.1.9 Air Quality

During operations, dust is generated through a variety of activities. Movement of material, travelling of vehicles and machines are some of the main dust generating activities. Dust may impair visibility along roads, pose health risks due to inhalation of suspended particulate matter, or inhibit plant health through settling on vegetation. Greenhouse gas emissions are only related to vehicles on site and are negligible in terms of the air shed quality. No other substance which may impact the air quality is released on site.

Desired Outcome: To prevent health impacts and minimise dust generation.

Actions

Prevention:

- Personnel issued with appropriate masks where excessive dust is present.
- A complaints register should be kept for any dust related issues and mitigation steps taken to address complaints where necessary e.g. dust suppression.
- No excavation to be conducted in excessively windy conditions.
- All sand conveyed onto tar roads, should be covered to prevent excessive dust which may impair vision.
- Dust suppression on haul roads and maintenance of such system to be conducted.
- Employ dust monitoring systems.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Any complaints received regarding dust should be recorded with notes on action taken.
- On site dust monitoring to be conducted.
- All information and reporting to be included in a bi-annual report.

5.1.10 Noise

Unusual and increased noise levels relate mainly to the transportation of the sand which may present a nuisance to affected and adjacent receptors. Additional noise generating activities are related to machine handling of material (and related warning signals) and movement of tipper trucks between the sand mining site and the off-site storage location. The natural topography shields some of noise generated on site (in the river channel), from the neighbours. Operations have the potential to alter the background noise of neighbouring receptors.

Desired Outcome: To prevent any nuisance and hearing loss due to noise generated.

Actions

Prevention:

- Personnel working in noisy environments must be issued with hearing protectors.
- No mining operations to be conducted after dark, on Sundays or on public holidays. Follow the Health and Safety Regulations of the Labour Act and World Health Organization (WHO) guidelines on maximum noise levels (Guidelines for Community Noise, 1999) to prevent hearing impairment.
- The WHO limits noise levels to an average of 70 dB over a 24 hour period with maximum noise levels not exceeding 110 dB during the period in order to prevent hearing loss.
- All machinery must be regularly serviced to ensure minimal noise production.
- Noise dampers to be fitted on machines where suitable.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Labour Act and WHO Guidelines.
- Maintain a complaints register.
- Bi-annual report on complaints and actions taken to address complaints and prevent future occurrences.

5.1.11 Waste Production

Various waste streams are produced during the construction and operational phase. Waste presents a contamination risk and when not removed regularly may become a fire and/or health hazard. Waste water, rubble and any other waste products not being contained may be washed from the site during rainfall events. All domestic waste is removed from the project area by the Proponent.

According to current operations, all vehicles and machines are washed and serviced on impermeable surfaces equipped with an oil / water separator. Vehicles on site are equipped with drip trays and maintenance records of all vehicles and machines are kept to ensure optimal running of equipment. Any hazardous waste is supplied to a waste management company. The site is kept neat and tidy at all times and no waste has ever been burned or buried on site by the Proponent. All waste is contained within the waste management area and removed on a regular bases.

Desired Outcome: To reduce the amount of waste produced, and prevent contamination, pollution and littering.

Actions

Prevention:

- Waste reduction measures should be implemented and all waste that can be re-used / recycled must be kept separate.
- Ensure adequate disposal and storage facilities are available.
- Waste collection points to be clearly demarcated and maintained.
- Hazardous waste storage facilities (such as for old oil, rags, etc.) should be on an impermeable layer.
- Ensure waste cannot be blown away by wind.
- Prevent scavenging (human and non-human) of waste.
- All waste produced on site must be removed and disposed of at a recognised disposal facility.
- No dumping of waste should be allowed on site.
- Temporary ablution facilities should be erected on site.
- Staff to receive training on waste handling and the principles of reduce, reuse and recycle as well as hazardous waste.
- See the material safety data sheets available from suppliers for disposal of contaminated products and empty containers.
- Liaise with the municipality regarding waste and handling of hazardous waste where required.

Responsible Body:

- Proponent
- Contractors

Data Ssources and Monitoring:

- A register of hazardous waste disposal should be kept. This should include type of waste, volume as well as disposal method/facility.
- Any complaints received regarding waste should be recorded with notes on action taken.
- All information and reporting to be included in a bi-annual report.

5.1.13 Ecosystem and Biodiversity Impact

Removing of sediment from the river, may change the localised habitat in some areas along the river, should mining be conducted haphazardly. Pooling and sedimentation (and erosion) may result from mining operations. Personnel working on site may use the opportunity to illegally hunt or trap animals. Plant material may not be collected such wood for fire making purposes.

The majority of habitats associated with the site have been impacted and altered. The nature of the operational activities is such that the probability of creating a habitat for flora and fauna to establish is low, apart for primary species establishment. Some large trees have established on the banks of the river and on established sand islands.

- Habitat destruction and disturbance of fauna and flora. Disturbances may range from dust, noise, movement, vibration, lighting and poaching. Destruction refers to the physical removal / damage of habitats.
- Due to the disturbance of habitats, the ecosystems integrity is compromised on the site. However, the degraded and invaded system may be enhanced by the cumulative impact of rehabilitating the river channel.

Desired Outcome: To avoid pollution of, and additional impacts on, the ecological environment. To preserve large tree and protected plant species.

Actions

Prevention:

- Mitigation measures related to waste handling and the prevention of groundwater, surface water and soil contamination should be adopted.
- All staff should be trained in identifying any sensitive plant species which may occur on site.
- All employees must be informed of the value of biodiversity. Rules and regulations regarding the illegal harvesting of natural resources from the surroundings must be made clear and the disciplinary steps that will be followed against perpetrators must be issued in writing and form part of the employees' contracts.
- Only make use of strip mining techniques when removing sand.
- Mining must be limited to the riverbed and sandbanks outside of the tree line. Soil should be sloped at an angle of less than 35 ° from the mined area to the base of the treeline (or any tree).
- Overburden (where applicable) must be stored in such a way as to prevent the unnecessary destruction of the environment surrounding the river (i.e. either in mined out areas or in areas still to be mined). The return of overburden to the mined out areas is essential in restoration of the areas.
- All mined out areas must immediately be rehabilitated and restored as close as possible to its original state.
- Excavation or mining may not expose the roots of the vegetation in any watercourse, especially native woody species.
- Avoid scavenging of waste by fauna.
- The establishment of habitats (by primary and invader species) at the mining site should be prevented. Regular clearing of invader species should be conducted to prevent spread of such species across the site and onto neighbouring properties.
- Any sighing of protected species should be documented.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Invader species eradication to be reported on.
- All information and reporting to be included in a bi-annual report.

5.1.14 River Morphology and Erosion

Removing sediment and established sand deposits may alter the flow regime of the river which may result in a change of the river morphology. Removal of sand deposits (such as bars) and a changed river morphology may lead to erosion and incision of the banks of the river. If such incision and cut-back extensively developed, it may create a weak spot in the river bank causing flood waters to break through the bank and damaging infrastructure. In addition, historic illegal and indiscriminate mining conducted by third parties, has resulted in a variety of impacts including erosion, turbidity, sedimentation and pooling. Sand and stone heaps left in the river increase turbidity and sedimentation. These factors all contribute to the cumulative impact on the change of the river morphology and micro aquatic habitats.

Desired Outcome: To protect all existing infrastructure components against possible erosion cut-back.

Actions

Prevention:

- The excavation of sand may not take place within 200 metres upstream or downstream from any infrastructure developed river bank areas or bridge.
- Systematic strip mining of the sand deposits to be conducted. Limit in-stream mining methods to bar-skimming. Adopt a systematic approach at a specific depth and width to prevent new blockages being formed or holes being made.
- The excavation of sand must be terminated 2 meters above the groundwater table.
- Removal of sand banks within the riverbed or channel only. No sand mining to be conducted on the banks of the river, or in a manner which may divert or slow down the flow of water in the river.
- All unused material to be uniformly levelled across the riverbed (not left in heaps around the site).
- A buffer zone of sand to be retained next to the riverbed of at least 1.5 metres
- The river bed must be kept as smooth as possible to reduce turbulent flow.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Continued mapping of mining area by recording GPS coordinates.
- Keep photo evidence of large trees in the mining area before and after floods.

5.1.15 Groundwater Soil and Surface Water Contamination

Leakages from earthmoving vehicles and possible breakdowns resulting in accidental fuel, oil or hydraulic fluid spills may cause contamination of the groundwater, soil or surface water (during rainfall, flood or water release events).

Desired Outcome: To prevent the exposure and or contamination of water and soil.

Actions

Prevention:

- No servicing or maintenance of machines to be conducted within pit areas.
- All machines, equipment and waste to be removed from pit areas prior to rainfall events.
- Hydrocarbon fuel spills to be remediated and significant spills to be logged on an incident register.
- Polluted soil and building rubble must be transported away from the site to an approved and appropriately classified waste disposal site.
- All vehicles must be serviced and maintained regularly.
- Spill control by making use of drip trays if there is a need to repair machinery on site. All hydrocarbon based waste must be removed from site and disposed of at a recognised hazardous waste disposal facility.
- Any polluted soil or water to be treated as a hazardous waste.
- The procedures followed to prevent environmental damage during service and maintenance, and compliance with these procedures, must be audited and corrections made where necessary.
- Proper training of employees must be conducted on a regular basis.
- Mining may not take place within 2 m of the groundwater level. It is important that water level monitoring be implemented to ensure that the level of mining takes seasonal water level fluctuation into consideration.
- Mined out quarries with stagnant water must be rehabilitated and overburden returned immediately after mining prevent exposed, stagnant water.

Mitigation:

- All spills or any contamination within the quarry pit area to be cleaned immediately to prevent contamination of groundwater resources.
- Consult relevant MSDS information and a suitably qualified specialist where needed.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- Maintain MSDS for hazardous chemicals.
- Report all spills or leaks to management and initiate clean-up immediately.
- Maintain a register of all incidents on a daily basis. This should include measures taken to ensure that such incidents do not repeat themselves.

5.1.16 Visual Impact

Operations during the dry season are prone to generate greater volumes of dust. Although mostly contained in the river valley of the operational areas, the access road will have greater amounts of dust as used by haulage vehicles. All dust generated is not expected to impact any surrounding receptors as these are located away from the expected fall-out. In addition, riparian vegetation may trap dust as generated in the riverbed. The impact is therefore considered to be very low, especially if further mitigation measures are employed.

Desired Outcome: To minimise dust creation and aesthetic impacts associated with the operations.

Actions

Prevention:

- Reduced haulage activity during very windy periods.
- Dust abatement measures to be employed during high production periods.
- Ensure rehabilitation of mined out areas in order to improve aesthetic appearance.
- The area where the removal of sand takes place shall be left clean and in a neat condition so that the view of the river is not blemished at any time.
- Regular waste disposal, good housekeeping and routine maintenance on infrastructure will ensure that the longevity of structures are maximised and a low visual impact is maintained.

Responsible Body:

- Proponent
- Contractors

Data Sources and Monitoring:

- A report should be compiled every six months of all complaints received related to aesthetic appearance of the site.

5.1.18 Loss of Paleontological, Historical and Archaeological Resources

During sand mining operations, there may be chance discoveries of archaeologically or culturally important artefacts which may have been washed down the river during river flow events. The probability of such an occurrence is however very low and any find which may be discovered has a good probability of not being in its place of origin.

Desired Outcome: To prevent the damage to, or destruction of, any archaeological, paleontological or culturally important (heritage) resources.

Actions

Prevention:

- If such a site or any other archaeologically important artefact is found during the development phase any work in that area must be halted and the relevant authorities must be informed. These include; the Namibian Police and the National Monuments Council.
- Mining may only continue at that location once permission has been granted from the relevant authorities.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Documenting of any incidents related to heritage, archaeological or paleontological resources.

5.1.19 Cumulative Impact

Cumulative impacts are those potential impacts which in itself may not be considered significant, however when considered as a collective may be significant. Some of the identified impacts may be at a regional scale.

- Sustainable and long term employment (positive),
- Contribution to local and regional economy (positive),
- Dust (negative), and
- Waste production (negative).

Desired Outcome: To minimise all cumulative impacts associated with the operations.

Actions

Mitigation:

- Addressing each of the individual impacts as discussed and recommended in the EMP would reduce the cumulative impact.
- Reviewing biannual reports for any new or re-occurring impacts or problems would aid in identifying cumulative impacts. Planning and improvement of the existing mitigation measures can then be implemented.

Responsible Body:

- Proponent

Data Sources and Monitoring:

- Create a summary report based on all other impacts to give an overall assessment of the impacts of the operational phase.

5.2 Environmental Management System

The Proponent could implement an Environmental Management System (EMS) for their operations. An EMS is an internationally recognized and certified management system that will ensure ongoing incorporation of environmental constraints. At the heart of an EMS is the concept of continual improvement of environmental performance with resulting increases in operational efficiency, financial savings and reduction in environmental, health and safety risks. An effective EMS would need to include the following elements:

- A stated environmental policy which sets the desired level of environmental performance;
- An environmental legal register;
- An institutional structure which sets out the responsibility, authority, lines of communication and resources needed to implement the EMS;
- Identification of environmental, safety and health training needs;
- An environmental program(s) stipulating environmental objectives and targets to be met, and work instructions and controls to be applied in order to achieve compliance with the environmental policy; and
- Periodic (internal and external) audits and reviews of environmental performance and the effectiveness of the EMS.
- The EMP

6 CONCLUSION

The above management measures, if properly implemented will help minimise adverse impacts on the environment. Where impacts occur, immediate action must be taken to reduce the escalation of effects associated with these impacts. To ensure the relevance of this document it must be reviewed on a regular basis. This EMP should be used as an on-site reference document during all phases of the proposed project, and auditing should take place in order to determine compliance with the EMP for the proposed site, and parties responsible for transgression of the EMP should be held responsible for any rehabilitation that may need to be undertaken. Monitoring reports and rehabilitation plans and results must be kept available for submission with future renewal applications for environmental clearance certificates. It is advised that an environmental consultant be involved in the monitoring and compilation of the monitoring reports and rehabilitation plans.