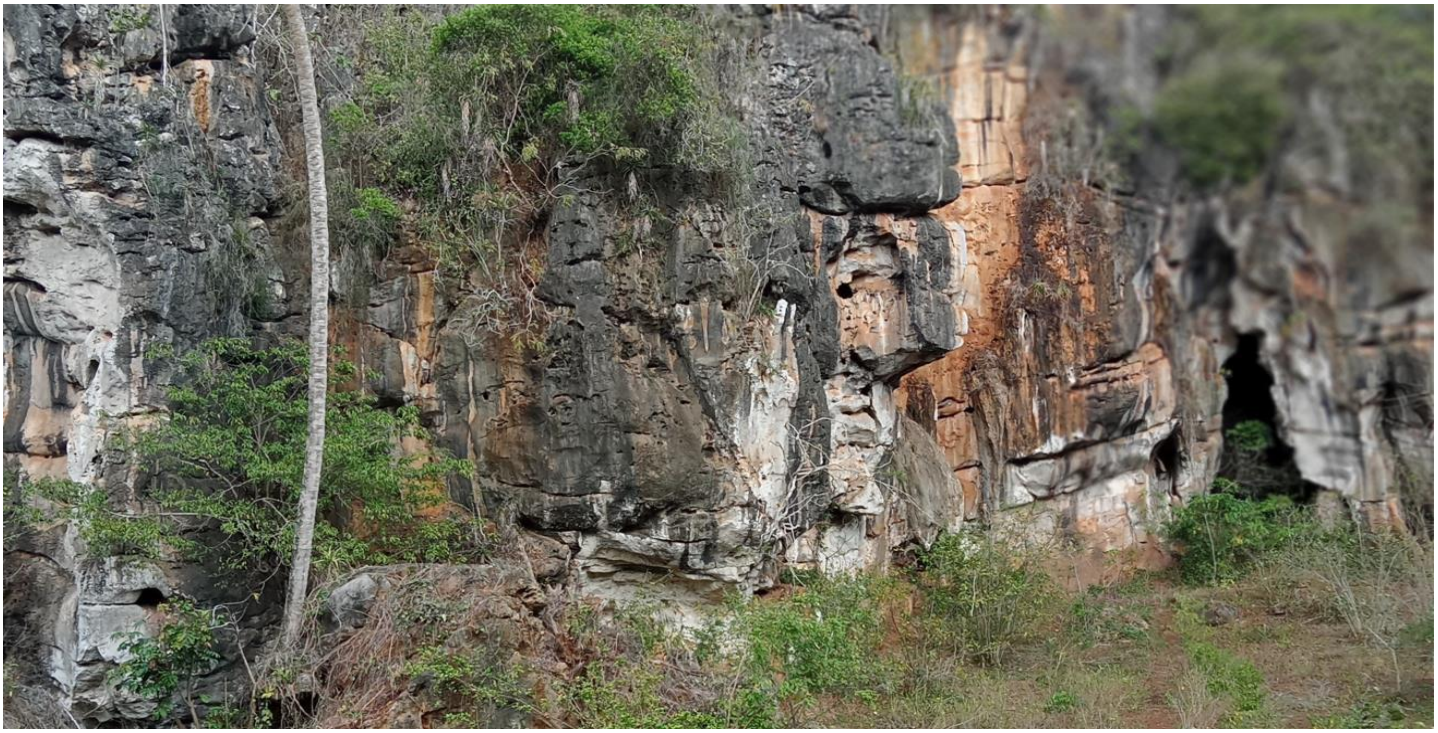
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED MASHUJAA Q&M PLC LIMESTONE MINE SITE AT CHASIMBA SUB-LOCATION, KILIFI SOUTH SUB-COUNTY IN KILIFI COUNTY.

TERMS OF REFERENCE NO: (NEMA/TOR//5/2/256)

GPS COORDINATES: ***(3° 44' 32.5" S 39° 42' 06.4" E)***



Submitted to NEMA in Accordance with The Environmental Management and Coordination Act, EMCA 1999, The Environmental (Impact Assessment / Audit) (Amended) Regulations, 2019 Gazetted on 30th April 2019 Under Legal Notice No. 31 And 32 For Submission to The National Environment Management Authority.

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EXPERTS AND PROPONENT DETAILS

PROJECT TITLE:

Environmental and Social Impact Assessment Study Report for the Proposed Mashujaa Q&M PLC Limestone Mine Site at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County.

PROPONENT:

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Disclaimer:

The Environmental and Social Impact Assessment (ESIA) study report is based on information made available by the Proponent to the Consultant and findings from field assessment. It is strictly confidential to the Proponent and any materials thereof should strictly be in accordance with the agreement from the Proponent. It is, however, subject to conditions in the Environmental (Impact Assessment and Audit) Regulations, 2003 and thereafter subsequent amendment.

ACKNOWLEDGEMENTS

This ESIA report is based on the compilation of the work conducted to develop the proposed Mashujaa Q& M limestone mine site. The team of experts is grateful to the dedication of the project proponent for having availed the necessary resources, legal documents, goals, objectives, and work plans that are vital in ensuring a comprehensive and sustainable ESIA report is adapted.

The EIA consultants are also grateful to the list of experts, professionals, and technicians that assisted in conducting research, site survey, site investigation, data collection analysis and interpretation, comparisons from past similar work projects, and literature reviews.

In addition, the team of experts is also thankful for the input, advice, and recommendations given by the public, especially near the project site. In addition, the dedication of the neighbors during the consultation and public participation processes; filing questioners, interviews, and necessary site meetings conducted as per the COVID-19 health regulation.

Lastly, the final compilation of this ESIA report was conducted by the team of EIA/EA registered experts that coordinated the wholes works of sites visits, data collection, analysis, interpretation, literature review, consultations, public participation, soft copies, and hard copies of the report through printing and binding of the document.

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ACRONYMS

0C	Degrees Celsius
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
EMC	Estate Management Company
EMCA	Environmental Management Coordination Act
EMP	Environmental Management Plan
ESMP	Environmental and social Management Plan
ML	Mining License
PL	Prospecting License
Ft	Feet
Ha	Hectare
IEA	Initial Environmental Audit
IMCE	Inter-Ministerial Committee on Environment
KM	Kilometers
KVA	Kilo Volts Amperes
NEC	National Environment Council
NEAP	National Environment Action Plan
NEMA	National Environment Management Authority
NES	National Environment Secretariat
NPEP	National Poverty Eradication Plan
PEC	Poverty Eradication Commission

PPE	Personal Protective Equipment
TOR	Terms of Reference
V	Volts
WRMA	Water Resources Management Authority
WSSD	World Summit for the Social Development

OBJECTIVE

The ultimate objective for the Environmental and Social Impact Assessment (ESIA) Study Report for the proposed Mashujaa Q&M PLC Limestone Mine Site in compliance with the Environmental Management and Coordination Act (EMCA) 1999 (amendments), the Environmental (Impact assessment / Audit) (Amended) Regulations, 2019 gazette on 30th April 2019 under Legal Notice No. 31 and 32 is structured to ensure sustainable project development.

The objective of the ESIA study report is to ensure that environmental and social concerns are integrated into the development of the project and therefore ensure sustainable development. It has covered and considered all environmental-related features and aspects. Notably, identifying the potential environmental impacts associated with the project, Impact mitigation measures, and Environmental and Social Management Plans (ESMP). Limestone is a common type of sedimentary carbonate rock. Limestone has numerous uses; it is an essential component of concrete Portland cement, it is a source of lime (calcium oxide) for industrial steel manufacturing, used as an aggregate for the base of roads, as white pigment or filler in products such as toothpaste or paints, and as a soil conditioner. An increase in the exploitation of limestone ore mining will lead to the supply of readily available raw materials for different industrial purposes.

EXECUTIVE SUMMARY

Introduction

The Proponent has contracted NEMA registered experts to carry out consultation, referred to as the "consultants." The Proponent, **Mashujaa Q&M PLC, address P.O. Box 43170-00100, Nairob**i, has proposed to develop the Mashujaa Q&M Limestone Mine Site at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County and on GPS. Coordinates **Latitude: (3° 44' 32.5" S), Longitude: (39° 42' 06.4''E).** The project proponent submitted the Terms of Reference **(NEMA/TOR/5/2/360**) to NEMA for review and approval. The TOR was approved as per the reference letter **(NEMA/TOR/5/2/360)** on **21st December 2021**. The Proponent contracted the EIA/EA registered experts to conduct an Environmental Impact Assessment Study Report (ESIA) for the proposed Mashujaa Q&M Limestone Mine/Quarry Site at Chasimba Sub-Location in Kilifi County. The team of registered EIA/EA experts and other stakeholders conducted the environmental impact assessment for the proposed Limestone Mine/Quarry Site; site visit, data collection, analysis and interpretation, stakeholder's engagements, consultations, and public participation compiled the ESIA report. The experts provided a summary statement of the proposed project's possible environmental and social effects.

The mining project is on a limestone mineral-bearing zone by the **Kenya Ministry of Petroleum and Mining**. Some of the existing industries operating in the neighborhood are; Manganese ore artisanal mines at Galanema, river sands extractions at Kizingo, National Cement Company Limited, ballast stone production, and Mombasa cement at Vipingo area. Kilifi county hosts several mineral ores; manganese ore, iron ore, limestone and titanium at Vipingo and Sokoke area.

By enactment, mining and other related activities including precious metals; salt firms; gemstones; ferrous and non-ferrous ores; coal; phosphates; limestone and dolomite projects located in the indigenous forest including those outsides of gazetted forests; and any project in an environmentally sensitive area, is a **prescribed activity as per the second schedule in section 58, of Environment Management and Coordination Act**, among other law enactments. Under these laws, any action out of character with its surroundings which is likely to cause substantial impact to the environment in areas such as waste disposal, sustainable resource use, ecosystem's maintenance, social environment, land use, and water extraction; an Environmental and Social Impact Assessment (ESIA) study report is required to assess such impacts and propose mitigation measures.

By law, the project proponent must submit an ESIA report to NEMA for approval before commencing implementation of the project. By this report, the relevant government authorities can monitor impacts within the project's life span on the immediate environment to enable significant stakeholders of the project, including the

government agencies, to manage the environment for the community's well-being. This ESIA report has been prepared based on the screening and scoping results, field visits, and information collected from primary and secondary sources in addition to the information provided by the project proponent, Mashujaa Q&M PLC. Preparation for this ESIA Study report is based on the **General Guidelines for conducting ESIAs in Kenya as per environment (Impact Assessment and Audit) regulations, 2003 (amendments) 2019 gazette on 30th April 2019 under Legal Notice No. 31 and 32, which operationalizes the Environmental Management and Coordination Act, (EMCA) 1999**.

Site visits, investigations, and data analysis examined and assessed the project's potential impacts on its environment, concentrating on all the project phases (Mineral prospecting and exploration, mineral discovery, mine/quarry design, mine development, mineral exploitation/quarry operation, mine closure, and rehabilitation plans). It examined the physical environment, biological environment, Socio-economic and cultural constraints. The Proponent availed all the relevant legal documents necessary for compilation submission approval of the ESIA Study report. All the primary and secondary data collected, including the photos and questionnaires, have been attached to the report. Notably, this ESIA Study report has discussed the potential environmental impacts and suggested the necessary mitigation measures to minimize the negative impacts. The consultant also prepared an Environment and Social Management Plan for the proposed project to ensure environmental sustainability in all project phases.

The proposed Mashujaa Q&M Limestone Mine Site has an initial target of mining 1MTPA (one million tons per Annum) of limestone ore to meet its commercial target. The mine site area will comprise of; mineral ore-limestone mining area, ore haulage, mineral ore storage area, ore loading, site garage, waste dump area, parking, administrative site offices, canteen, and other related infrastructure on the private land parcel as shown on the attached surveyed map sheet and land ownership documents.

The mining method to be used is open cast/open pit mining. The project will involve the development of a limestone mine/quarry and other auxiliary equipment such as excavators, front-end loaders, surface miner (SF), compressor, drill wagon, transport, conveyors, and ore storage. The limestone mine/quarry will be conducting open cast/open-pit mining, limestone ore sizing, conveying, and transporting to produce 1MTPA of limestone ore. As mentioned, limestone extraction will be carried out by the open cast/open pit mining method. Limestone will be extracted from the rock either by mechanical excavation or controlled blasting based on the hardness of the rock. The limestone beds will be drilled for blast holes using down-the-hole drill-DTH, after which the rocks undergo blasting. The limestone rocks will then undergo primary sizing to obtain rock pieces of suitable size for

easy conveyance, transportation, and industrial processing. In consumer cement factories, limestone is ground further to a fine powder, one material for clinker production.

The mining process will consist of limestone mine block and sizing area, ore loading, waste dump, haulage, ore storage, ore loading area. Extracted limestone ore will be conveyed and transported to the storage ground area by haulage trucks. Mining waste (stripping material, topsoil, and rocks) will rehabilitate and restore the land.

The limestone mine/quarry will be virtually free of water pollution as no effluents are involved. Even regarding air pollution, which particulates and undesirable gases can cause, open cast mining operations will keep any mine dust emissions within the prescribed limits. In contrast, adequate dust control measures are enforced to minimize mine dust at the points of dust generation during limestone mining. Keeping the above philosophy in view, the proposed limestone mine will adopt a mining technology that ensures minimum emission and enforces standard dust control measures.

A very substantial part of the project cost shall be earmarked for pollution control measures to ensure negligible dust emission to do this mine project. Limestone is a common type of sedimentary carbonate rock. Limestone has numerous uses. It is an essential component of concrete Portland cement; it is a lime (calcium oxide) source for industrial steel manufacturing. It is used as an aggregate for the base of roads, as white pigment or filler in products such as toothpaste or paints, and as a soil conditioner. An increase in the exploitation of limestone ore mining will lead to the supply of readily available raw materials for different industrial manufacturing companies. The mine development is a critical project in line with the pillars of Kenyan Vision 2030 and the Kenyan Government Big Four Agenda, more so the manufacturing industry and affordable housing. It is a fact that very few countries in the world have realized high economic growth rates and incomes without the manufacturing sector playing a pivotal role.

The manufacturing industry is a crucial engine for sustainable economic growth and development, job creation and poverty alleviation. Historically, the manufacturing sector's contribution to the economy in Kenya has stagnated at around 10% of the gross domestic product (GDP) and was about 8.4% in 2017. There is renewed interest in the manufacturing sector through the Big 4 Agenda, which seeks to increase the GDP contribution of the industry to 15% by 2022. The investors have committed to developing a sustainable limestone mine/quarry project with reduced environmental impacts.

Environmental Impacts and Mitigation Measures

The project has both positive and negative impacts. However, the negative impacts can be mitigated and monitored.

Positive environmental impacts

- Employment opportunities. The project will create direct and indirect employment opportunities in the country.
- Increase in the supply of limestone for cement manufacturing and other industries.
- Increased revenue to government (royalties, taxes, cess fee))
- In line with the aims of The Kenya Vision 2030
- High demand for raw material inputs to conduct mining activities
- Support the local businesses in Chasimba and Kilifi South Sub-County area.
- Transfer of mining technology to the local people

Negative environmental impacts

- Impact on Land and Environment (land contamination)
- Increased Air Pollution
- Dust Emissions-Particulate Matter (PM)
- Gaseous emissions
- Noise pollution and Vibration disturbance
- Occupational Injuries and or Accidents
- Solid Waste Related Pollution
- Impact On Water Environment
- Water Scarcity
- Impact Social Economic Environment
- Impact On Biological Environment
- Negative Impacts on Local Flora and Fauna
- Negative Impacts on Avifauna

Proposed mining method to be used in the project

The mining technology is a semi-mechanized open pit/open cast mining. Limestone will be extracted from the rock either by mechanical excavation or controlled blasting. The mining method depends on the hardness of the rock. The limestone beds will be drilled for blast holes using down the hole drill-DTH, after which the rocks

undergo blasting. The limestone rocks will then undergo sizing to obtain rock pieces of suitable size for easy conveyance, transportation and processing. In consumer cement factories, limestone is ground further to fine powder used to manufacture cement clinker.

Table 1a: A summary of potential negative environmental impacts and mitigation measures of the Mashujaa Q&M PLC Limestone Mine Site.

ENVIRONMENTAL IMPACT	PROPOSED MITIGATION MEASURES
Impacts On Land Topography	•Backfill the open pits –waste dump, overburden and topsoil. •Revegetate the land with indigenous plant species •Provide measures for long-term run-off and erosion control •Reuse topsoil in landscaping to leave a final landform visually compatible with the surrounding natural landscapes •Provide for a buffer zone between the site, road and human settlements • Continuous mine rehabilitation
Impacts On Drainage	•The dump slope will have a retaining wall and garland drain to arrest the wash off from the dumps •Garland will be connected to the settling tank, and settled water will be transferred to the water reservoir and used for green belt development and dust suppression •As there is no natural permanent or season river passing through the project area, there will be no diversion of the drainage pattern of the area •Minimize surface runoff (e.g. by minimizing the area of impervious surfaces)

ENVIRONMENTAL IMPACT	PROPOSED MITIGATION MEASURES
	•Oil water separators and grease traps should be installed and maintained as appropriate at refuelling facilities, workshops, parking areas, fuel storage and containment areas
Land Environment and Land Use	•The mine site open pits will be backfilled and levelled with fertile soils •The reclaimed land will be planted with vegetation. •The Proponent will convert part of the mine area to a water reservoir for the communities in the area. The neighbouring community utilize the water reservoir for irrigation and pisciculture purpose •Waste dumping will be temporary and will be utilized to construct and improve external and internal roads within the mine site area. •Plantation of local species will be undertaken in the surrounding safety zone in the mining area. Mashujaa Q & M will utilize soil and compost manure for the growth & nourishment of trees. •The Proponent will take utmost care to ensure the survival & growth of existing trees in the area and will plant drought-resistant & fast-growing trees in the no-tree land to form a comprehensive green belt all around the mine area of the •Planting of trees will commence during the onset of mine operation
Fertility Status Of The Soil	•Garland drain and retaining wall will be constructed in the waste dump and mineral stack slope. So the surface runoff from the dump will be

ENVIRONMENTAL IMPACT	PROPOSED MITIGATION MEASURES
	passed through the garland drain and settled in a settling pit before discharging outside to minimize soil erosion or deposition of the contaminants on the agricultural land. •The Proponent will use the topsoil generated during the mining activity for plantation on the rehabilitated land. •The workers in the mines are from the nearby areas, so there will be no residential colony development within the mine area. This result in a very small generation of domestic solid waste. •Plant vegetation on bare land •Paving walkways •Provide measures for long-term runoff and erosion control •Install cut-off drains, exit drains to direct water from the site and reduce flow velocities, and by sediment traps to minimize sediment discharge from the site •Provide for a buffer zone between the site, road and homesteads •Sanitation waste will be connected to the bio septic tank.
Solid Waste Generation (Mining Waste/Spoil and other solid waste)	•It is proposed to store the top-soil in the earmarked site and will be utilized for plantation purpose after separating from the mixed rock boulders and pebbles.

ENVIRONMENTAL IMPACT	PROPOSED MITIGATION MEASURES
	•The portion of soil and any overburden unsuitable for plantation will be sold out to intending users for construction purposes with permission from county government authorities. •Mashujaa Q& M will utilize waste generated during mining for the making of mine roads and allied infrastructures •Dump slope will be provided with retaining wall and garland drain to prevent the wash off. •Maintain a stable dump slope angle with horizontal •During the mine development phase, the waste generated will be utilized completely for road construction and levelling of ground area for site structures •Recycle and reuse where applicable segregate for appropriate disposal •Contract a licensed waste collection and disposal company •Provide proper sanitary facilities for the workers •Raise awareness on waste management •Mining design improvement to minimize waste generations •Material substitution to minimize waste generation •Technological improvement to minimize waste generation •Sorting of waste at source

ENVIRONMENTAL IMPACT	PROPOSED MITIGATION MEASURES
	•Waste disposal as provided for in the Environmental Management and Coordination (Waste Management) Regulations,2006. •Absolute electronic equipment and other electronic waste to be returned to manufacturers for safe disposal. •Establishing waste management priorities at the outset of activities based on an understanding of potential Environmental, Health, and Safety (EHS) risks and impacts and considering waste generation and its consequences •Establishing a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes •Avoiding or minimizing the generated waste materials, as far as practicable •Where waste generation cannot be avoided but has been minimized, recovering and reusing waste; •Where waste cannot be recovered or reused, treating, destroying, and disposing of it in an environmentally sound manner •Establishment of priorities based on a risk analysis that takes into account the potential EHS risks during the waste cycle and the availability of infrastructure to manage the waste in an environmentally sound manner; •Definition of opportunities for source reduction, as well as reuse and recycling

ENVIRONMENTAL IMPACT	PROPOSED MITIGATION MEASURES
	•Definition of procedures and operational controls for onsite storage •Definition of options/procedures / operational controls for treatment and final disposal
Particulate Matter (PM)	•Water sprinkling on mining site, dumping area and haul road during dry wind periods, using a water tanker •Dust emissions due to vehicles can be minimized by avoiding spillage from the loaded trucks. •Workers to be provided with PPE Enforcement of onsite speed limits •Water sprinkling on the topsoil and overburden dump to minimize wind erosion. •Trees can act as efficient biological filters. A systematic and planned greenbelt development not only reduces the fugitive dust but also checks runoff and enhances the aesthetic beauty of an area •There is the proposal of a proper green belt along the boundary for the reduction of dust and noise emission from the lease area •Plant dust catching species •Plantation will be provided in the dump slope •the proponent will construct safety shelter within mine area •Wet drilling and blasting will be carried out •All trucks and machinery should be in good serviceable condition

ENVIRONMENTAL IMPACT	PROPOSED MITIGATION MEASURES
	•Design and maintain safe systems of work and pollution prevention measures •Comply with Air Quality Regulations (2014) and Public Health Act provisions. •Minimize dust through strict enforcement of onsite speed controls •Ventilation at the workplace to be sufficient
Vehicular emission of particulates SOx, NOx, CO, CO2	• Proper maintenance of vehicles and other oil-operated equipment. Roadworthy vehicles not be allowed into the mine area •Suitable green belt development and mining of limestone •Mining equipment and machinery should be in good serviceable condition
Increased Noise Pollution	•Development of green belt in the mine site buffer zone, which acts as a barrier for noise reduction. •The Proponent will properly maintain the noise generating pieces of machinery •Choosing quieter machinery provided with efficient silencers •Confining noise by isolating the source •The proponent will provide the workers with proper PPEs to minimize the occupational exposures of noise. •Developing and implementing an effective noise control and hearing conservation program •Fitting noise machines with noise reduction devices •Posting notices and signs in noisy areas

ENVIRONMENTAL IMPACT	PROPOSED MITIGATION MEASURES
	•Educating all workers on the importance of making correct use of PPE provided to protect them against high noise levels •Carrying out an audiometric test by a designated medical practitioner to all workers exposed to noise levels above 85dB(A);
Impact On Water Quality-surface & underground water	•The mining method to use is Opencast/open pit. There will be no wastewater generated due to the mining activity. The domestic effluents being generated will be discharged to soak pits through bio septic tank •Mashujaa Q & M will restrict mining activities to the layer above the groundwater table •Construct garland drains, settling tank and check dam in the mining area •The garland drains will be connected to the settling tank, and after settling, the water will be discharged to the natural drainage. •Convert some of the open pits to rainwater storage tank •The rainwater stored in the pit will be utilized for plantation and dust suppression. •Mining activities will be restricted to the layer above the groundwater table. •Run-off water/stormwater during rains to be desilted and discharged

ENVIRONMENTAL IMPACT	PROPOSED MITIGATION MEASURES
	•Reclaimed pits will be stabilized with plantation where ever possible, and other areas will be converted to the water reservoir •Oil water separators and grease traps should be installed and maintained as appropriate at refuelling facilities, workshops, parking areas, fuel storage and containment areas •Treatment to meet national standards for sanitary wastewater discharge •Ensure regular monitoring of the sewage sanitation system
Waste Water Related Pollution And Sanitation Management	•Segregation and pre-treatment of oil and grease containing effluents (e.g. use of a grease trap) before discharge into the environment; •Treatment to meet national standards for sanitary wastewater discharges •Sewage from the office blocks to be discharged to either a bio septic system or where the land is used as part of the treatment system, treatment to meet Environmental Management and Coordination (Water Quality) Regulations, 2006, standards for sanitary wastewater discharges
Storm Water-Surface Water Management	•The Proponent will separate Stormwater from sanitary wastewater and wastewater streams to reduce the volume of wastewater to be treated before discharge

ENVIRONMENTAL IMPACT	PROPOSED MITIGATION MEASURES
	•The proponent will prevent surface runoff from mine machine areas or potential sources of contamination •Where this approach is not practical, runoff from storage areas should be segregated from potentially less contaminated runoff •Runoff from areas without potential sources of contamination should be minimized (e.g. by minimizing the area of impervious surfaces), and the peak discharge rate should be reduced (e.g. by using vegetated swales and retention ponds) •Where stormwater treatment is deemed necessary to protect the quality of receiving water bodies, priority should be given to managing and treating the first flush of stormwater runoff where the majority of potential contaminants tend to be present •When water quality criteria allow, Stormwater should be managed as a resource, either for groundwater recharge or for meeting water needs at the facility; •Oil-water separators and grease traps should be installed and maintained as appropriate at refuelling facilities, workshops, parking areas, fuel storage, and containment areas •Sludge from stormwater catchments or collection and treatment systems may contain elevated levels of pollutants and should be disposed of in compliance with the Environmental Management

ENVIRONMENTAL IMPACT	PROPOSED MITIGATION MEASURES
	and Coordination (Water Quality) Regulations, 2006
Occupational Injuries And Accidents	•All the mines workers will be provided with personal protective equipment like nose mask, earmuff, helmet, goggles etc. to address residual exposures following the adoption of the engineering controls •Display safety signs on mine site •Regular inspection of mining equipment and vehicles •Provide workers with insurance covers •Appoint safety supervisor •Development of green belt in the mine site buffer zone, which acts as a barrier for noise reduction. •The noise generating machinery will be properly maintained •Medical examination of employees at the initial stage and periodically, shall be done by a team of qualified medical officers provided by the project proponent. •the Proponent will arrange regular medical checkups to detect occupational diseases and minor diseases in nearby settlements. •Free checkup and medicine for treatment for their acute and chronic illness shall be provided •Education and training arrangement for the mines workers about the safety and various occupational health risks related to mining operation

ENVIRONMENTAL IMPACT	PROPOSED MITIGATION MEASURES
	•Control of dust through the implementation of good housekeeping and maintenance •Use of mobile vacuum cleaning systems to prevent dust buildup on paved areas •Recommended prevention and control techniques against exposure to heat include the following: •Shielding surfaces where workers' proximity and close contact with hot equipment is expected; •Using personal protective equipment (PPE), as needed (e.g., insulated gloves and shoes); •Minimizing the work time required in high-temperature environments by implementing shorter shifts at these locations; •Making available and using, as needed, air- or oxygen supplied respirators •Implementing specific personal protection safety procedures in the process to avoid potential exposure to exothermic reactions
Use of explosives	•Ensure proper handling and storage of explosives •Ensure only licensed and qualified blasters can handle and detonate explosives. •Ensure proper and adequate notification of the neighbouring public and road users during blasting Comply with noise and excessive vibration Pollution, Control regulations and explosives Act
Water Scarcity	•Raise awareness on water conservation •Provide water storage facilities •Where possible, reuse wate

ENVIRONMENTAL IMPACT	PROPOSED MITIGATION MEASURES
Energy Resource Utilization	•Raise awareness on energy conservation Switch off electrical equipment, appliances and lights when not being used •Install occupation sensing lighting at various locations such as storage areas that are not in use all the time •Install energy-saving fluorescent tubes at all lighting points within the plant instead of bulbs that consume higher electric energ
Fire hazards and Accidents	•Install proper firefighting equipment during operation •Avoid storage of flammable materials near the possible fire source •Sensitize workers on fire safety Conduct fire audits
Security	•Contract a reputable security firm to guard the site •Collaborate with authority and have community policing
Increased vehicular traffic along Kilfi- Kaloleni	•Liaise with Kenya National Highway Authority to ensure that appropriate road signs before the exit/entry junction area are erected •Drivers to strictly observe the Highway Code •Speed limits to be strictly observed
Parking of vehicles at Mashujaa Q& M limestone mine project	•Provide sufficient space for internal parking of lorries awaiting to deliver material or to collect material

To summarize, it is recommended to develop the proposed Mashujaa Q& M limestone mine project. The potential negative impacts of the project are low and can be mitigated through the recommended mitigation measures. The positive impacts and the benefits to the community are immense and welcomed. Therefore, it is recommended that the project proceeds with the outlined mitigation measures put in place.

CHAPTER 1: BACKGROUND INFORMATION

1.1 Introduction

The Proponent, **Mashujaa Q&M Public Limited Company, address P.O. Box 43170-00100**, Nairobi, has proposed to develop **Mashujaa Q&M PLC Limestone Mine Site at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County and on GPS. Coordinates Latitude: (30 44' 32.5" S), Longitude: (390 42' 06.4''E)**. The project location site is at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County, **off Kilfi-Kaloleni Road**. The site location is on the mineral ore-rich parcel of land shown on the attached surveyed map sheet and land ownership documents. The adjacent land area is extensive and sparsely populated. NEMA registered experts have been contracted to conduct and prepare the Environmental and Social Impact Assessment (ESIA) study report for the proposed Mashujaa Q&M PLC Limestone Mine Site. The proponent has planned to apply for a mining license (ML) at the Ministry of Petroleum and Mining to extract/exploit limestone at the proposed project site in the Chasimba sub-location. The company has already acquired land from the private landowners at Chasimba Sub-Location in Kilifi South Sub-County. The proponent has planned to extract limestone ore at the proposed site for commercial and other industrial use. The proposed mine design, open-pit mining, is non-polluting, ensuring environmental sustainability.

Figure 1: *Proposed limestone mine site area at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County*.

Figure 2: *Proposed limestone mine site area at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County.*

The mine life is estimated to be over 50 years. Owing to the nature of the mine site, the proponent has proposed to exploit the mineral ore using open-pit mining methods. The mining method is non-polluting, ensuring environmental sustainability. The energy source is a mechanical, electrical, and low sulfur diesel-powered engine. Nevertheless, the ultimate goal is to minimize air pollutants.

Figure 3*: A photo image showing the mineral ore-bearing rock outcrop at the proposed site in Chasimba Sub-Location*.

The geology of the Chasimba area harbors commercially viable limestone. Limestone is a common type of sedimentary carbonate rock. It has numerous uses: it is an essential component of concrete Portland cement, it is a source of lime (calcium oxide) for industrial steel manufacturing, used as aggregate for the base of roads, as white pigment or filler in products such as toothpaste or paints, and as a soil conditioner. An increase in the exploitation of limestone ore mining will increase the supply of readily available raw materials for different industrial purposes. It will also boost the economic development of the Chasimba Location and the community in Kilifi County. The mine will create jobs for the local community directly or indirectly through other related

business ventures. The proposed mine site area has steep, random, and rocky slopes. There is no human settlement on the proposed mine site area. The Geology and topography of the mineral-rich ore land are inaccessible and not suitable for agriculture and human settlements. The proposed mine site area is in **Chamba Sub-Location, Kilifi South Sub-County in Kilifi County on GPS coordinates Latitude: (3° 44' 32.5" S), Longitude: (39°42' 06.4''E)**. By enactment, mining and other related activities including precious metals; salt firms; gemstones; ferrous and non-ferrous ores; coal; phosphates; limestone and dolomite projects located in the indigenous forest including those outsides of gazette forests; and any project in an environmentally sensitive area, is a prescribed activity as per the second schedule in section 58, of Environment Management and Coordination Act, among other law enactments. Under these laws, any activity that causes a substantial impact to the environment in areas such as waste disposal, sustainable resource use, ecosystem's maintenance, social environment, land use, and water extraction; an Environmental and Social Impact Assessment (ESIA) study report (EIA for High-Risk Projects; mining and quarrying activities) is required to assess such impacts and propose mitigation measures.

By law, **Environmental Management and Coordination Act, (EMCA) 1999, the project proponent must submit an Environmental Social Impact Assessment (ESIA) report to NEMA for approval before commencing implementation of any project**. Therefore, government agencies can depend on the ESIA report to monitor environmental impacts within the life span of the project particularly, the immediate environment enabling stakeholders of the project, including the government agencies, to manage the environment to benefit the community. This SR report has been prepared based on the screening and scoping results, field visits, and information collected from primary and secondary sources, in addition to the information provided by the project proponent, Mashujaa Q&M PLC. Preparation for this Study Report is based on the **General Guidelines for conducting ESIAs in Kenya as per environment (Impact Assessment and Audit) regulations, 2003 (amendments) 2019 gazette on 30th April 2019 under Legal Notice No. 31 and 32, which operationalizes the Environmental Management and Coordination Act, (EMCA) 1999** (amendments).

1.2 Limestone

Limestone is a sedimentary rock composed primarily of calcite, a calcium carbonate mineral with a chemical composition of $CaCO_3$. It may contain considerable amounts of magnesium carbonate (dolomite); minor constituents also commonly present include clay, iron carbonate, feldspar, pyrite, and quartz. It usually forms in clear, calm, warm, shallow marine waters. Most limestone has a granular texture. Their constituent grains range

in size from 0.001 mm (0.00004 inches) to visible particles. In many cases, the grains are microscopic fragments of fossil animal shells.

Limestone is usually a biological sedimentary rock, forming from the accumulation of shell, coral, algal, fecal, and other organic debris. It can also form by chemical sedimentary processes, such as the precipitation of calcium carbonate from lake or ocean water and mechanical transport and deposition of preexisting limestone, forming clastic deposits. Travertine, tufa, caliche, chalk, sparite, and micrite are all varieties of limestone.

1.2.1 Biological Limestone

Most limestone ore are formed in calm, clear, warm, shallow marine waters. That type of environment is where organisms capable of forming calcium carbonate shells and skeletons can thrive and quickly extract the needed ingredients from ocean water.

When these animals die, their shell and skeletal debris accumulate as sediment that might be lithified into limestone. Their waste products also contribute to sediment mass.

Limestone formed from this type of sediment is a biological sedimentary rock. Their biological origin is often but not always revealed in the rock by the presence of fossils.

Sometimes evidence of a biological origin is destroyed by currents, organisms, dissolution, or recrystallization.

1.2.2 Chemical Limestone

Some limestone forms by direct precipitation of calcium carbonate from marine or freshwater. Limestone formed this way are chemical sedimentary rocks. They are thought to be less abundant than natural limestone.

Most biological limestone contains significant amounts of directly precipitated calcium carbonate. After the biological grains have accumulated and are buried, water saturated with dissolved materials moves slowly through the sediment mass. Calcium carbonate precipitated directly from the solution forms as a "cement" that binds the biological grains together. Cementation is an essential step in transforming sediment into rock. If the biological grains are not cemented together, a rock will not be formed. The amount of precipitated calcium carbonate in a biological limestone can be as low as a few percent of the rock by volume, or it can be higher than 50% of the rock by volume.

1.2.3 Evaporative Limestone

Limestone can also form through evaporation. Stalactites, stalagmites, and other cave formations are examples of limestone formed through evaporation.

In a cave, droplets of water seeping down from above enter the cave through fractures or other pore spaces in the cave ceiling. There they might evaporate before falling to the cave floor.

When the water evaporates, calcium carbonate dissolved in the water will be deposited. Over time, this evaporative process can accumulate icicle-shaped calcium carbonate on the cave ceiling. These features are known as stalactites.

If droplets fall to the floor and evaporate there, stalagmites could eventually grow upwards from the cave floor.

The limestone that makes up these cave formations is known as "travertine," a chemical sedimentary rock. A rock known as 'tufa' is a limestone formed by evaporation at a hot spring or on the shoreline of a lake in an arid area.

Environmental concerns should be part of the planning and development process and not an afterthought. Opencast limestone mining is a heavy industry producing waste, dust, and other product materials. It requires project-affected persons to be consulted through the EIA process. The participation of the project neighbors is critical to sort out any concerns during the EIA process. Having this in mind, the Proponent undertook this CPR report and incorporated environmental concerns as advised by the experts. Finally, a comprehensive Environmental and Social Management/Monitoring Plan (ESMP) is mandatory for this magnitude and nature project to guide mine planning, mine design, mine development, mineral exploitation, and mine closure and rehabilitation plans.

1.3 Project Justification

There is justification for the proposed Mashujaa Q&M limestone project in many aspects. Kilifi and Kwale counties have vast mineral deposits whose exploitation could boost the region’s economy. The rise in income among the residents will improve their lifestyles. Mashujaa Q & M PLC will transfer mining skills and knowledge to the local workers. The proposed Limestone mine site will employ local geologists, chemists, and technical staff. The project will complement agribusiness, tourism and fishing that will boost the economy of Kilifi County. It will enhance roads and new businesses to attract other investors in the area.

The proposed mine site area has steep, random, and rocky slopes. There is no human settlement on the proposed mine site area. The Geology and topography of the mineral-rich ore land are inaccessible and not suitable for agriculture and human settlements. The total target area of the land is … Ha and contains commercially viable limestone ore hence not conducive for farming, leaving mineral exploitation as the best alternative land use. In addition, most vegetation, the trees have poor root growth due to the area being stony and usually falls before maturity,

Eco-friendly Open Pit Mining technologies have been utilized. Mining and Production of limestone as an industrial raw material for cement manufacturing will help to alleviate the high demand for Portland cement in the country. Over the past ten years, records show many construction projects around the country and in the eastern Africa region. The project revolves around infrastructure, civil, and building works. Notably, houses are being constructed daily due to the high demand for decent, affordable housing in the country, as evidenced by the high rent fees charged for housing.

The project also helps to achieve the **Kenya Vision 2030** that aims to transform Kenya into a newly industrializing, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment. This entire project requires readily available construction material inputs. Limestone is a raw material for cement production in industries. Cement is one of the raw materials used as a binder in concrete works. Kenya cannot meet the high demand for decent and affordable without readily available Portland cement. In this view, the Proponent has planned to establish a Mashujaa Q&M limestone mine site to produce … MTPA (one million tons per Annum). The Proponent targets to increase the limestone mine production to a higher number in the future.

Major concerns in mining are accidents, injuries, hearing loss, dust-related lung diseases. Mashujaa Q & M PLC will prevent Health hazards in the project site. The Proponent can improve working conditions with simple means and minimal cost.

1.4 Scope and Criteria of the Environmental Impact Assessment Study

The scope of the assessment covered development works of the proposed Mashujaa Q&M Limestone Mine Site, which included ground preparation, pit excavations, mineral ore extraction, masonry and installation of service lines, and the utilities required for mine development. The output of this work was a comprehensive Environmental and Social Impact Assessment (ESIA) project report to apply for an EIA license.

The Environmental Impact Assessment included the necessary specialist studies in determining the environmental impacts relating to the biophysical and socio-economic aspects and determining the issues or concerns from the relevant authorities and interested and affected parties. The appropriate measures to ensure the co-existence of the proposed mine development with other social and economic activities in the area are provided in the Environmental Management Action Plan.

1.5 The objective of the Environmental Impact Assessment

The proposed project aims to put up an eco-friendly and sustainable limestone mine site that will involve the extraction and storage piling of the limestone ore to produce 1MTPA (one million tons per Annum) of limestone ore. The mine life for the quarry is anticipated to be over 50 years.

The specific objectives of the EIA are to:

- Collect and analyze baseline information for physical, biological, and socio-economic environments in the project area;
- Discuss the legal and regulatory issues associated with the proposed project;
- Predict and assess the potential impacts of the project;
- Propose appropriate mitigation measures for any negative impacts and enhancement measures for the positive impacts resulting from implementing the project;
- Allow for public participation to incorporate the views of stakeholders during the project implementation;
- Prepare an environmental management plan;
- Prepare an Environmental and Social Impact Assessment **(**ESIA) Study Report (SR) for submission to NEMA.

1.6 Terms of Reference (TOR) for the EIA Study Process

The scope of the assessment covered implementation works of the proposed limestone mine development, which included mine engineering survey, ground preparation, excavations construction, installations, and associated utilities required by the project. The output of this work was a comprehensive Environmental and Social Impact Assessment (ESIA) Study Report (SR) to apply to NEMA an EIA license and, after that, apply for a Mining Licence in the Ministry of Petroleum and Mining. The assignment's main objective was to assist the project proponent in preparing an SR report for the proposed project and taking appropriate measures to mitigate any

adverse environmental impacts. The assessment identified existing and potential environmental impacts and possible concerns that interested and affected parties have with the development and the associated prevention and mitigation measures for the adverse effects as stipulated in the Environmental and Social Management Plan (ESMP) proposed.

The Environmental Impact Assessment included the necessary specialist studies in determining environmental impacts relating to the biophysical and socio-economic aspects and determining the issues or concerns from the relevant authorities and interested and affected parties. The appropriate measures to ensure the co-existence of the proposed mine development with other social and economic activities in the area are provided in the Environmental and Social Management Action Plan.

The consultant, on behalf of the project proponent, conducted the assessment by incorporating but not limited to the following terms of reference: -

- Location of the proposed project site;
- A concise description of the national environmental legislative and regulatory framework,
- Baseline information and any other relevant information related to the project;
- The objectives of the proposed project;
- The technology, procedures, and processes to be used in the implementation of the project;
- The materials to be used in the mine development, construction, installations, and implementation of the project;
- The products, by-products, and waste to be generated by the project;
- A description of the potentially affected environment;
- The environmental effects of the project, including the social-economic and cultural effects and the direct, indirect, cumulative, irreversible, short-term, and long-term effects anticipated;
- Provide alternative technologies and processes available and reasons for preferring the chosen technology and processes;
- Analysis of alternatives including project site, design, and technologies;
- An Environmental and Social Management Plan proposing the measures for eliminating, minimizing, or mitigating adverse impacts on the environment, including the cost, timeframe, and responsibility to implement measures;

- Provide an action plan for the prevention and management of the foreseeable accidents and hazardous activities in the cause of carrying out quarry development activities;
- Propose measures to prevent health hazards and to ensure security in the working environment for the employees, residents, and the management in case of emergencies;
- Identification of gaps in knowledge and uncertainties encountered in compiling the information;
- An economic and social analysis of the project;
- Such other matters as the Authority may require.

1.7 Data Collection Procedures

First, the consultant undertook environmental screening and scoping to avoid unnecessary data. The data collection was carried out through consultations with the proponent representatives, administration of questionnaires, observations and photography, site visits, desktop environmental studies, professional judgment, and scientific tests, where necessary in the manner specified in Part V (section 31-41) of the Environmental (Impact Assessment and Audit) Regulations, 2003.

1.8 EIA Organization and Structure

The ESIA was carried out to full completion under the guidance of the lead expert, who coordinated the day-to-day functions and any related institutional support matters. First, the consultant undertook the collection of data. Data collection was carried out through questionnaires/standard interview schedules, use of checklists, observations, site visits, desktop environmental studies, and scientific tests, where necessary in the manner specified in Part V (section 31-41) of the Environmental (Impact Assessment and Audit) Regulations, 2003. Then data collected underwent environmental screening and scoping to avoid unnecessary data.

1.9 Reporting and Documentation

An Environmental and Social Impact Assessment Study report from the findings was compiled under the guidelines issued by NEMA for such works and was prepared and submitted by the project proponent for consideration and approval. The consultant ensured regular briefing of the Proponent during the exercise. Open-pit mine design layout plans and relevant documentation are part of the appendices.

1.10 Responsibilities and Undertaking

The team undertook to meet all logistical costs relating to the assignment, including producing the report and any other relevant material. The consultant arranged for their transport and travels during the exercise. At the proposed limestone ore mine site, the Proponent provided a contact person(s) to provide the information required by the team. The Proponent also provided;

- The mine design layout
- The actual size of the site area,
- Future mine development plans,
- Company documents,
- Baseline data,
- Land-ownership documents, and
- Estimated project cost.

The output from the consultants includes the following: An Environmental and Social Impact Assessment Project Report (ESIA) comprising of an executive summary, study approach, baseline conditions, anticipated impacts, and proposed mitigation measures, an Environmental and Social Management Plan outlines, which also forms part of the report recommendations.

1.11 Methodology Outline

The proposed site is located within an unsettled area richly endowed with limestone ore, with no other natural resources whose total effect on the surroundings could be adversely affected. Therefore, the intended development and use of the mine will offer the maximum utility of the land. An Environmental and Social Impact Assessment Project Report (ESIA) is seen to be

1.12 Environmental Screening

The experts applied the step to determine whether an Environmental and Social Impact Assessment Project report was required and the necessary level of assessment. It was done concerning the requirements of the EMCA, 1999, and specifically as per the second schedule. Issues considered include the physical location, sensitive issues, and anticipated impacts.

1.13 Environmental Scoping

The scoping process helped narrow down the most critical issues requiring attention during the assessment. The experts categorized the Environmental issues into physical, biological/natural/ecological, social, economic, and cultural aspects.

1.14 Desktop Study

It included a documentary review on the nature of the proposed activities, project documents, design policy, legislative framework, and the environmental setting of the area, among others. It also included discussions with the Proponent's representatives and design engineers and interviews with neighboring communities.

1.15 Site Assessment

Field visits were made for physical inspections of the site characteristics and the environmental status of the surrounding areas to determine the anticipated impacts. It also included further interviews with random members of the surrounding area.

1.16 EIA Public Participation

In ensuring adequate public participation in the EIA process, questionnaires were administered. The Proponent commenced the progressive public participation meetings with the community in 2019. The face-to-face interviews and focused group meetings, Barraza with the community and or project-affected persons at the proposed site venue, at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County held to seek public views towards the proposed limestone mine project and any anticipated effects of the project on the surrounding. The focused group discussions and Barraza were held on 2nd - 3rd November 2021, 1st - 2nd of December 2021, 27th -28th January 2022. The information gathered was subsequently synthesized and incorporated in the Environmental and Social Impact Assessment Project Report.

1.17 Reporting

In addition to the regular briefing of the client, the experts prepared this environmental impact assessment study report. The contents were presented for submission to NEMA as required by Kenyan environmental laws and regulations.

1.18 Kenyan mining sector

The mining sector currently contributes less than 1% of Kenya's Gross Domestic Product but can contribute 4% to 10%. This means that much of Kenya's natural resource wealth is yet to be exploited, and there could be a significant opportunity for growth. Kenya is still in the early exploration of its mineral potential. Nonetheless, Kenya has numerous ores and industrial minerals established to be in substantial quantities. These minerals include soda ash, fluorspar, titanium, niobium and rare earth elements, gold, coal, iron ore, limestone, manganese, diatomite, gemstones, gypsum, and natural carbon dioxide.

Magadi Soda and Base Titanium predominantly run Kenya's mineral sector. The industry contributes Sh67billion to the country's Gross Domestic Product. Since 2013, titanium valued at over 35.5 billion Kenya shillings has been produced and exported as the essential mineral for Kenya.

In Kenya, the Ministry of Petroleum and Mining was established to provide leadership in managing the extractive sector in the country as guided by executive order No. 1 of 2018. This includes the development of Petroleum and Mining policies, creating a favorable legal and regulatory environment for investments, and building capacity for effective management of programs and projects. President Uhuru Kenyatta created the Mining Ministry in 2013 to try and diversify the east African economy that relies mainly on tourism and agriculture.

Petroleum Exploration in Kenya began in the 1950s within the Lamu Basin. Until 2012, the first commercially viable oil discovery was made in the Tertiary rift, followed by significant gas discoveries in the offshore Lamu Basin. Near Lake Victoria, the remote regions of western Kenya are rich in gold ore. Most of the country's artisanal and small-scale gold mining activities are carried out in these rural areas, where mining and subsistence agriculture are the primary ways of earning a living. Limestone is mainly mined at Athi River near Nairobi and Bamburi near Mombasa. The limestone along the Coast extends to Mombasa Island and is primarily formed from remains of corals. Limestone rocks are dug up in large masses using the open cast method and crushed using large mechanical rollers.

The Ministry of Petroleum and Mining is working on a law that will help define the sector and relationship between different players, including the government, artisanal miners, mining companies, and investors. Kenya's royalties sharing scheme IS as follows; 70% of royalties are granted to the national government, 20% to the county government, and 10% to local communities. This system ensures that local communities benefit from capital to develop their assets and infrastructure and continue investing in them. There is the Mining Cadastre Portal, whose

goal is to provide an electronic platform for all stakeholders in the mining sector in Kenya to engage directly with the Ministry of petroleum and Mining.

A survey to map Kenya's mineral deposits is ongoing to determine the number of underground minerals. The aerial mapping will evaluate the country's mineral wealth, which is vital to boost investment in the sector. The Kenya mineral sector can lift the economy significantly if well harnessed.

A robust economic recovery is now a matter of high priority for the country, as we continue to feel the impact of Covid-19. The mining industry has enormous economic potential and could play a crucial role in making this a reality. For the mining sector to grow effectively, there is an urgent need to address critical issues that hampered its growth.

Kenya has been reforming the mining sector's legal framework through the Mining Act 2016 and updated geodata through the recent airborne survey. However, this potential is yet to be fully realized, and Kenya has seen limited mining exploration and almost no new investment due to the unresolved issues in the extraction sector.

In the context of a globally competitive investment environment, where investors are looking at all opportunities, these issues mean that many potential Kenyan mining investments are not attractive compared to options in other countries. The mining industry has vast economic potential and could play a crucial role in making this a reality. Kenya can achieve growth of the extractive sector by combining regulatory reform, engagement with counties and small miners, and integrating equity and sustainability into the industry.

CHAPTER 2: PROJECT DESCRIPTION AND DESIGN

2.1 Introduction

The proponent**, Mashujaa Q&M PLC, address P.O. Box 43170-00100**, has proposed to develop the **Mashujaa Q&M Limestone Mine Site at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County and on GPS. Coordinates Latitude: (3° 44' 32.5" S), Longitude: (39° 42' 06.4''E)**. The company has contracted NEMA EIA/EA experts to carry out an Environmental and Social Impact Assessment Study Report (ESIA) for the proposed limestone mine site. Mashujaa Q&M PLC `is incorporated in Kenya and has a registered office address, P.O. Box 43170-00100, Nairobi. The proposed Mashujaa Q&M Limestone Mine Site has an initial target of mining … MTPA (one million tons per Annum) of limestone ore to meet its commercial target. The mine site area will comprise of; mineral ore-limestone mining area, ore haulage, mineral ore storage area, ore loading, site garage, waste area and parking, administrative site offices, canteen, and other related infrastructure on the land parcel as shown on the attached surveyed map sheet and land ownership documents.

There are no existing houses on the proposed mine site. The topography and geology of the mine area are inhabitable for human settlement. During mineral prospecting, exploration, and feasibility study, geologist and mining engineers contracted to conduct mineral exploration found the proposed site area contained commercially viable mineral ore-limestone. Therefore, limestone mine development can achieve maximum utility for the land, which will boost the economy of Chasimba Location and Kilifi County. The proponent will employ an open-pit surface mining method. Eventually, rehabilitate the ground to accommodate other economic activities. Limestone mining will involve removing the overburden, topsoil, and rock waste to expose the mineral-rich ore.

Kenyan geological mineral records indicate the Kilifi-Mazera region to hold limestone ore, particularly the Chasimba area. After conducting a mineral feasibility study, ore prospecting, and exploration, the team of hired geologists and mining engineers discovered the proposed Mashujaa Q&M Limestone Mine Site. Mineral prospecting and exploration found the proposed site area to contain commercially viable mineral ore. To add, feasibility study and mineral exploration conducted culminated on the proposed site as the best on maters mine life, mineral economic, and environmental sustainability.

The proponent, Mashujaa Q&M PLC, has a team of competent and experienced directors with vast knowledge in the extractive industry. The company has also employed qualified and experienced staff in the mining and mineral processing industries.

2.2 Physical location and size of the project

The project is on private land located at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County, and GPS. Coordinates Latitude: **(3° 44' 32.5" S),** Longitude**: (39° 42' 06.4''E).** The site is bout 24km from Kilifi town and about 12km from Kaloleni town. The site location is arrived by road driving along Kilifi-Kaloleni road. Start at Kilifi town, you drive along Kilifi-Mombasa road and arrive at Mavueni Bus Stage. From the Mavueni Bus stage, drive along Kilifi-Kaloleni road towards Chasimba High School. About 900m, from Chasimba High School and driving along a murram road, you arrive at the proposed site area, Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County, and on GPS. Coordinates Latitude: (3° 44' 32.5" S), Longitude: (39° 42' 06.4''E). The outskirts of the site area are sparsely populated with scattered, commercial, and social structures. The proponent has acquired land consent forms bought and leased part of the land from the community living in Chasimba Sub-Location. Kwale and Kilifi counties have vast mineral deposits whose exploitation could boost the region's economy. Mineral deposit includes; Manganese, Iron, Lead, Zinc, Coal Limestones (cement manufacture) building Stones.

In the neighborhood, there are other ongoing mining and industrial development. Some of the existing mining and industries operating in the area are; Manganese ore artisanal mines at Galanema, river sands excavation at Kizingo, National Cement Company Limited, ballast stone production, and Mombasa cement at Vipingo area.

There are scattered human settlements in the outskirts of the project site area. The proposed project will alleviate unemployment for the community in Chasimba and Kilifi-Sub County at large.

Figure 4: *A photo image of proposed limestone mine site area at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County.*

2.3 Map for The Proposed Site Area.

Figure 5: *A map depicting the neighboring character*.

2.4 Sketch Map to Access the Proposed Site Are

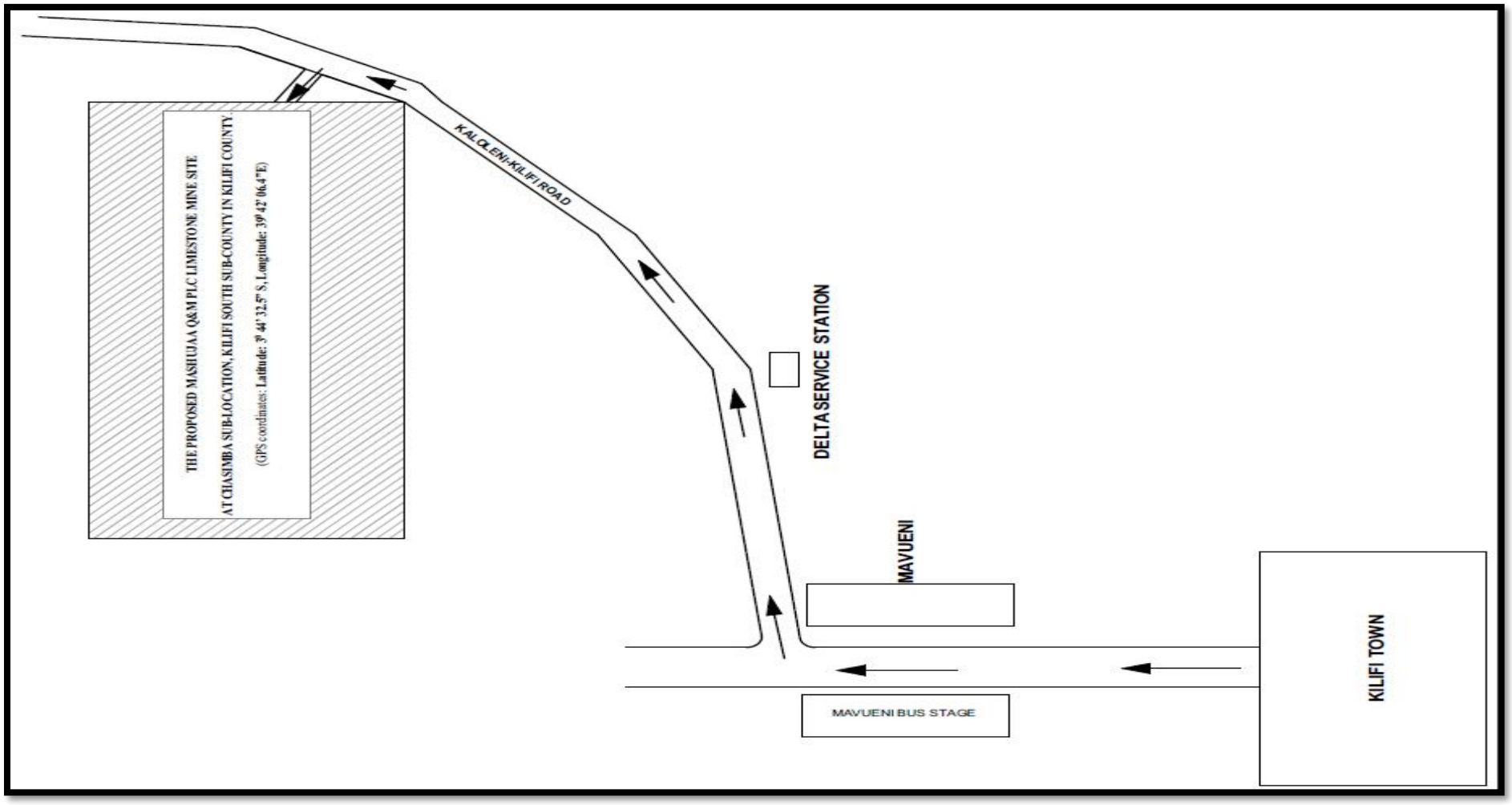

Figure 6: *A sketch map for the proposed site.*

2.5 Roads

The main access road to the proposed Mashujaa Q&M PLC Limestone Mine Site is Kilifi-Kaloleni. Kilifi-Kaloleni is tarmacked and in good condition. However, most road networks are murram. They have proper natural drainage that prevents flooding in the area.

To access the site, you drive along Kilifi-Kaloleni road. Start at Kilifi town, drive along Kilifi-Mombasa road and arrive at Mavueni Bus Stage. From the Mavueni Bus stage, drive along Kilifi-Kaloleni road towards Chasimba High School. About 900m, from Chasimba High School and driving along a murram road, you arrive at the proposed site area, Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County, and on GPS. Coordinates Latitude: (3° 44’ 32.5” S), Longitude: (39° 42’ 06.4’’E).

The proposed mine site area has steep, random, and rocky slopes. There is no human settlement on the proposed mine site area.

The Geology and topography of the mineral-rich ore land are inaccessible and not suitable for agriculture and human settlements.

2.6 Current Status of the Project Site

There is no human settlement in the proposed site area. The site area is open, unfenced with no observable corrugated boundary beacons. In addition, it is within a less agriculturally productive area where conditions are not much favorable for farming and vegetation. The vegetation on the site is scattered shrubs, cashew trees (Anacardium occidentale), and coconut trees (Cocos nucifera).

2.7 Project Budget

The total budget for the proposed project is estimated to cost KShs 1,500,000,000/= (One billion, five hundred million Kenya Shillings). The Proponent will distribute the funding to various project activities involved in mine development that include; buying and leasing land, mine survey, and engineering works, builder's work, mine operations, and loading, site garage, waste area, and parking, administrative site offices, canteen, and other related infrastructure, electrical services installations, mechanical service installations, external works, water reticulation, and drainage services, site installations, preliminaries, and contingencies.

2.8 Project activities to be undertaken;

Mashujaa Q& M limestone mining activities shall involve mining engineering works; civil, mechanical, and electrical as here on:

- Engineering Survey and demarcation of open-pit mining block area (Limestone)
- Design and development of mineral ore haulage, ore storage, ore loading area,
- Construction of mine site garage, parking area,
- Establish a waste area for the mine,
- Construct site emergency rooms,
- Construct site offices block for the limestone mine,
- Construct sanitation facility for use in the mine site,
- Provision of the water storage reservoir,
- Development utilities (water, drainage, electricity)
- Construction of associated walkways in the mine,
- Canteen, and,
- Other related infrastructure on the land parcel, as shown on the attached map sheet and land ownership documents,
- Government inspection/ relevant permit, licensing, and completion of works,
- Commencing of mining operation works (open-pit ore excavation).

The ultimate objective for the Environmental and Social Impact Assessment (ESIA) Study Report for Mashujaa Q&M PLC Limestone Mine Site in compliance with the Environmental Management and Coordination Act (EMCA) 1999 (amendments), the Environmental (Impact assessment / Audit) (Amended) Regulations, 2019 gazette on 30th April 2019 under Legal Notice No. 31 and 32 is structured to ensure sustainable project development.

The objective of the ESIA study report is to ensure that environmental concerns are integrated into the development of the project and therefore ensure sustainable development. It has covered and considered all environmental-related features and aspects. Notably, identifying the potential environmental impacts associated with the project, Impact mitigation measures, and Environmental and Social Management Plans (ESMP). Limestone is a common type of sedimentary carbonate rock. Limestone has numerous uses; it is an essential component of concrete Portland cement, it is a source of lime (calcium oxide) for industrial steel manufacturing,

used as an aggregate for the base of roads, as white pigment or filler in products such as toothpaste or paints, and as a soil conditioner. An increase in the exploitation of limestone ore mining will lead to the supply of readily available raw materials for different industrial purposes.

2.9 Environmental and Social Impact Assessment Consultant

The Proponent has contracted NEMA registered experts to carry out consultation, referred to as the consultants 'with a team of experts with a proven track record of excellence focusing mainly on environmental management, mining, mineral processing, manufacturing industries, earth sciences, and engineering projects. The team of experts has experience preparing quality Environmental Impact Assessment and Audit Reports that go a long way in ensuring sustainable projects development and utilization of natural resources.

EIA Team of Experts

The team of experts comprised the following profession;

Table 2: *Team of Experts.*

Sr./No.	Name	QUALIFICATION
1.	Purity Muthoni Njeru	Masters of Science in Occupation Safety and Health Bachelor of Science Environmental Studies (science). Impact Assessment and Audit EIA/EA (Lead)
2.	Wilson Irungu Kamande;	BSc. Mining and Mineral Processing Engineering Environmental; Impact Assessment and Audit EIA/EA
3	Mumia Titus Lutta	University of Nairobi, BSc. Geology, Diploma in Computer studies.
4	Timothy Ngobu Michuki	BSc. Environment science.
5	Joseph Githaiga;	BSc. Industrial Chemistry with management.
6	Dennis MasivayiWekhuyi	Bachelors in Tourism Management, Diploma Wildlife and Conservation Management.
7.	Ngumbao Mwabaya	Bachelor of Arts in Economics and Sociology- Second Class Upper Division.

8.	Honorata MuthoniNgungi	Bachelor of Arts in Peace and Conflict Studies.

2.10 The Scope of Work Undertaken

The Environmental and Social Impact Assessment Report has covered the following:

2.11 Project Objectives

- A complete description of the site location for the proposed Mashujaa Q&M limestone mine site/quarry.
- Anticipated critical environmental issues of concern by presenting baseline data, which should include social, cultural, and heritage considerations. Assess public views and concerns of the proposed limestone mine/quarry.
- Relevant Policies, Legislation, and Regulations relevant to the proposed cement grinding plant.
- Potential negative and positive impacts of the project on the described environment, including direct, indirect, and cumulative impacts, and their relative importance to the design of the cement grinding Plant.
- Possible mitigation measures to minimize predicted adverse environmental impacts if necessary and quantify associated costs.
- Environmental and social management plans for the projects.
- The Environmental and Social Monitoring Plan that will ensure that the mitigation plan is adhered to.
- The available alternatives to the project are considerate to the proposed site or any other location, including a no-action option.
- Conclusions and recommendations

2.12 Project design

- Open-pit mining block area (Limestone),
- Ore haulage, ore storage, ore loading area,
- Mine site/ quarry garage, parking area,
- Waste dump area
- Site emergency rooms,
- Site offices block for the limestone mine,

- Sanitation facility for use in the mine site,
- Water storage reservoir,
- Development utilities (water, drainage, electricity, etc.)
- Walkways in the mine,
- Canteen, and, Security room.

2.13 Proposed Mashujaa Q&M Limestone Mine/Quarry Site Layout

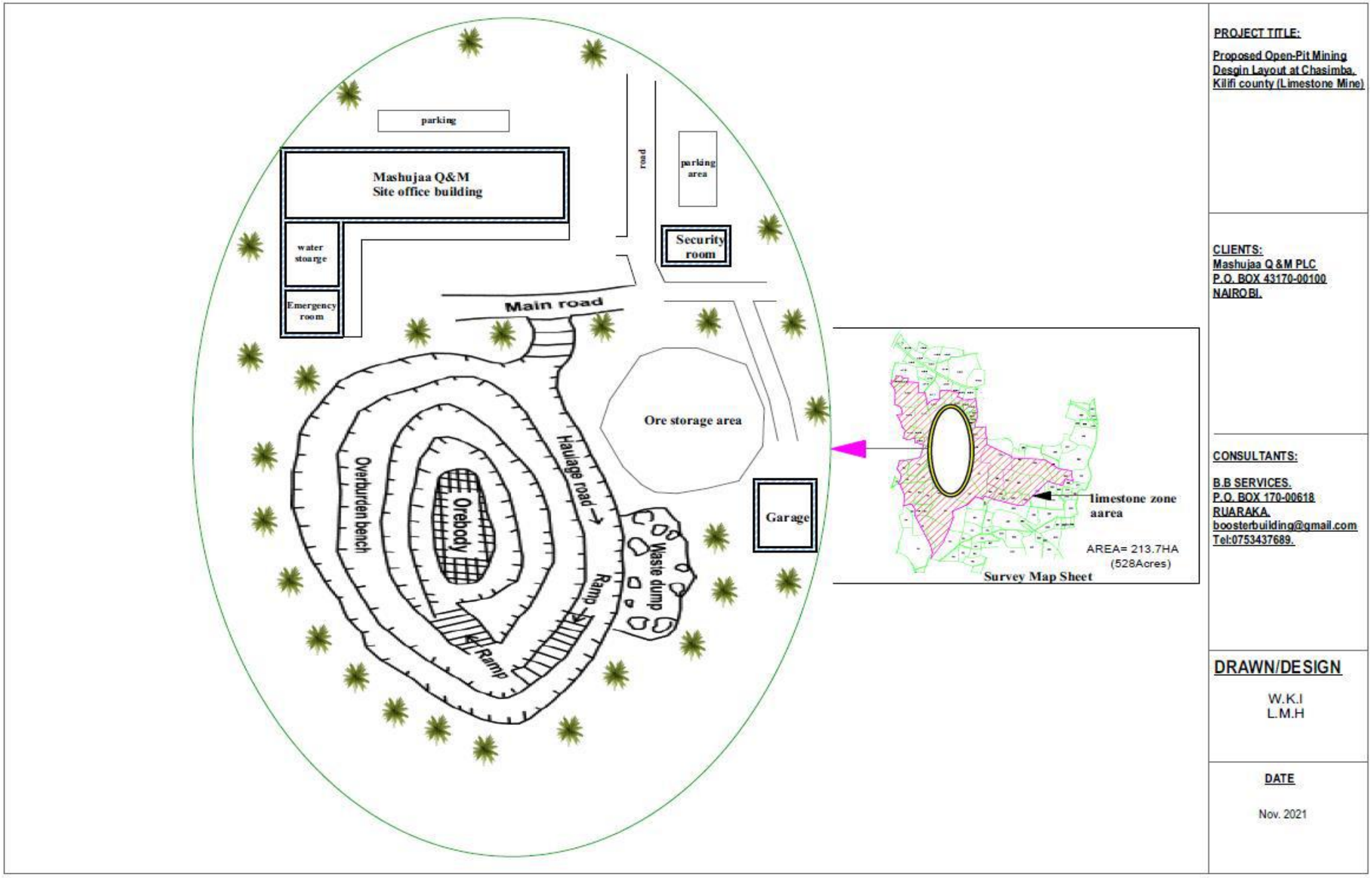

Figure 7: *Proposed Mashujaa Q&M Limestone Mine/Quarry Site layout.*

The project will involve the development of a limestone mine/quarry and other auxiliary equipment such as excavators, front-end loaders, surface miner (SF), compressor, drill wagon, transport, conveyors, and ore storage. The limestone mine/quarry will be conducting open cast/open-pit mining, limestone ore sizing, conveying and transporting the overall limestone to produce MTPA of limestone ore. As mentioned, limestone extraction will be an open cast/open pit mining method. Limestone will be extracted from the rock either by mechanical excavation or controlled blasting. The extraction method will depend on the hardness of the ground rock. The limestone beds will be drilled for blast holes using drilling machines, after which the intact ore-bearing rocks undergo blasting. The limestone rocks will then undergo sizing to obtain rock pieces of suitable size for easy conveyance, transportation, and processing. In consumer cement factories, limestone is ground further to a fine powder.

The process will consist of limestone mine block and sizing area, waste dump, haulage, ore storage, ore loading. Extracted limestone ore will be transported to the storage ground area by trucks. Mining waste (stripping material, topsoil, and rocks) will rehabilitate and restore the land.

The limestone mine/quarry will be virtually free of water pollution as no effluents are involved. Even regarding air pollution, which particulates and undesirable gases can cause, open cast mining operations will keep any mine dust emissions within the prescribed limits. In contrast, Mashujaa Q & M will enforce adequate dust control measures to minimize mine dust at the dust generation points during the limestone mining process. Keeping the above philosophy in view, the proposed limestone mine will adopt a mining technology that ensures minimum emission and enforces standard dust control measures.

A very substantial part of the project cost shall be earmarked for pollution control measures to ensure negligible dust emission to do this mine project.

2.14 Sources of power

The Proposed Mshujaa Q&M limestone mine project will be powered by an electrical supply network from Kenya Power. The Proponent will install electrical works such as electrical gadgets and appliances, including electrical cables, lighting apparatus, and sockets. The Proponent will also install Stand-by electrical power generators to support the emergency requirement during the power interruptions.

2.15 Selection Criteria of Mining Design Method

The following method can do limestone mining.

2.16 Opencast/Open Pit Mining Method

Open-pit mining, or open-cast or open-cut mining, and in larger contexts is a surface mining technique of extracting rock or minerals from the earth from an open-air pit.

This form of mining differs from extractive methods that require tunneling into the earth, such as long wall mining. Open-pit mines are employed when deposits of commercially viable ore or rocks occur near the surface. It is applied the ore found at the surface because the overburden is relatively thin or the material of interest is structurally unsuitable for tunneling. In contrast, minerals that have been found underground and are difficult to retrieve due to hard rock are extracted using a form of underground mining.

To create an open-pit mine, the miners must determine the information of the ore that is underground. An investigation is done by drilling probe holes in the ground then plotting each hole location on a map. The information gained through the holes provides an idea of the vertical extent of the ore's body. This vertical information is then used to pit tentative locations of the benches in the mine. It is important to consider the grade and economic value of the ore in the potential pit. Open-pit mines that produce building materials and dimension stones are commonly referred to as quarries.

Open-pit mines enlarge until either the mineral resource is exhausted or an increasing ratio of overburden to ore makes further mining uneconomic. When this occurs, the exhausted mines are sometimes converted to landfills to dispose of solid wastes. Nevertheless, water control is required to keep the open pit from becoming a lake if the mine is in a climate of considerable precipitation or any layers of the pit forming the mine border productive aquifers.

Open-pit produces harmful pollutants depending on the mineral being mined and the mining method used.

Open-cast mines are dug on benches, which describe vertical levels of the hole. The interval of the benches depends on the deposit being mined, the mineral being mined, and the size of the machinery used. Generally, large mine benches are 12 to 15 meters thick. In contrast, many quarries do not use benches, as they are usually shallow. Mining can be conducted on more than one bench at a time, and access to different benches is done with a system of ramps. The width of each bench is determined by the size of the equipment being used, generally 20–40 meters wide. Downward ramps are created to allow mining on a new level to begin. This new level will become progressively wider to form the new pit bottom.

Most pit walls are mined on an angle less than vertical. Waste rock is stripped when the pit becomes deeper; therefore, this angle is a safety precaution to prevent and minimize damage and danger from rock falls. However,

this depends on how weathered and eroded the rocks are and the type of rocks involved. It also depends on the number of structural weaknesses within the rocks, such as faults, shears, joints, or foliations.

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Figure 8: *Open Cast Mining Method: Source - Mining & Resource Stock Library.*

The walls are stepped. The inclined wall section is known as the batter, and the flat part of the step is known as the bench or berm. The steps in the walls help prevent rock falls from continuing down the entire face of the wall. In some instances, additional ground support is required, and rock bolts, cable bolts, and shotcrete are used. De-watering bores may be used to relieve water pressure by drilling horizontally into the wall, often enough to cause failures in the wall.

A haul road is usually situated at the side of the pit, forming a ramp up which trucks can drive, carrying ore and waste rock.

2.17 Ecological advantage of open cast mining

Open-pit mining does offer some advantages over traditional deep shaft mining. Pit mining is more cost-effective than shaft mining because it can extract more ore quickly. The working conditions are safer for the miners because there is no cave-in or toxic gas risk.

Figure 9: *Open Pit Mining, Ore Loading Mining Photo - Mining & Resource Stock Library.*

2.18 Open Pit-Surface Miner

Surface Miner is a machine that cuts the insitu rock in thin vertical or horizontal slices without drilling and blasting, the output size being less than 150 mm. The principle of SM involves cutting the rocks, layer by layer, and loading the cut materials into a dumper or conveyor system, which is entirely different from the concept of formation of benches and faces for extraction of mineral by conventional mining.

2.18.1 Mining activities comprise of;

• Removal of topsoil by excavator and preparing the face for Surface miner operation.

• The in situ limestones is mined by using Surface Miners.

• Hauling of Surface miner product by using dumpers to the stock

Figure 10: *Surface Miner's Photo Source - Mining & Resource Stock Library.*

2.18.2 Advantages of Surface Miner

- Selective Mining
- Eco-friendly Mining Machine.
- Total elimination of Drilling and Blasting.
- Cutting and loading in a single pass.
- Has a very effective inbuilt dust suppression system.
- Maximum recovery of limestone without affecting nearby villages.
- Better Quality control.
- Surface miner mills insitu limestone continuously and delivers -150 mm size
- particles.

- Better safety and supervision, Less workforce, and easy management.

2.19 Description of the project's mine development and construction activities

2.19.1 Pre-construction investigations

Mineral prospecting, exploration, and feasibility studies identified commercially viable limestone ore. The implementation of the project's open cast mine design, mine development, and construction phase will start with a thorough site investigation, soil, chemical, and physical properties, and water table level determination.

2.19.2 Mining Equipment, Machinery, and Construction Materials

Greater emphasis will be laid on the procurement of construction materials and equipment from within the local area, which will make both economic and environmental sense as it will reduce negative impacts of transportation of the materials and equipment to the project site through a reduced distance of travel by the materials transport vehicles. Trucks will transport these materials and equipment from their extraction, manufacture, and storage sites to the project site. The construction materials to be used in the project's construction will be sourced from Kilifi County and the surrounding areas. The Proponent will import some of the specialized mining equipment from outside Kenya.

2.20 Storage of Mining Equipment and Construction Materials

Mashujaa Q & M will provide construction materials and mining equipment on-site. Mine operations will carefully pile bulky materials such as rough stones, ballast, sand, and steel on site. To avoid collecting large quantities of materials on-site, the project proponent will order bulky materials such as sand, gravel, and stones in quotas. Materials such as cement, paints, and glasses, and equipment will be stored in storage structures that are already within the project site for this purpose.

2.20.1 Excavation and Foundation Works-Mining Site structure

Contractors will carry out the excavation works at the proposed project site to set up a foundation for the Mashujaa Q& M limestone site office building, security, garage water reservoir, and other equipment. The work will use heavy earth-moving machineries such as tractors and bulldozers.

Masonry, Concrete works, and related activities

The construction of the foundations, structural frames, pavements, drainage systems, perimeter fences, and other components of the project, will involve many masonry work and related activities. General masonry and associated activities will include concrete mixing, plastering, slab construction, construction of foundations,

erection of structural frames, and curing new concrete surfaces. These activities are labor-intensive and will be supplemented by machinery such as concrete mixers.

2.20.2 Electrical work

During the development of the proposed Mashujaa Q& M limestone site and other construction works, electrical work will include installing electrical gadgets and appliances, including electrical cables, lighting apparatuses, and sockets; in addition, there will be other activities involving the use of electricity such as welding and metal cutting.

2.20.3 Landscaping

The Proponent will conduct landscaping to improve the site's aesthetic value or visual quality once mine development works cease. The work will require the establishment of flower gardens and flourishing grass lawns and will involve replenishing the topsoil. It is noteworthy that the Proponent will use plant species available locally, preferably indigenous ones, for landscaping.

2.21 Description of the Project's Operational Activities

The operations phase of the Proposed Mashujaa Q&M Limestone Mine Site will involve open cast/open pit mining of limestone ore at the designated mining block area. Limestone ore mining activities will use local and imported mining equipment such as excavators, front-end loaders, surface miners (SF), drill wagons, compressors, trucks, conveyors, and ore storage shades.

The Mshujaa Q& M open-pit mining process aims to produce 1MTPA of limestone ore.

As mentioned, limestone extraction will be carried out by the open cast/open pit limestone mining method. Limestone will be extracted by mechanical excavation or controlled blasting, depending on the hardness of the ground rock. The limestone beds will be drilled for blast holes using drilling machines, after which the rocks undergo blasting. The limestone rocks will then undergo sizing to obtain rock pieces of suitable size for easy conveyance, transportation, and processing. In consumer cement factories, limestone is ground further to a fine powder.

The mining process will consist of limestone mine block and sizing area, waste dump, haulage, ore storage, ore loading, extracted limestone ore will be conveyed and transported to the storage ground area by trucks. Mining waste (Overburden, topsoil, and rocks) will rehabilitate and restore the land.

The limestone mine/quarry will be virtually free of water pollution as no effluents are involved. Even regarding air pollution, which particulates and undesirable gases can cause, open cast mining operations will keep any mine dust emissions within the prescribed limits. In contrast, adequate dust control measures are enforced to minimize mine dust at the points of dust generation during limestone mining. Because of the above philosophy, the proposed limestone mine will be adopting a mining technology that is non-polluting and enforces standard dust control measures.

A substantial part of the project cost shall be earmarked for pollution control measures to ensure negligible dust emission to do this mine project and transporting the overall limestone to produce.

2.21.1 Sustainability Mining Method and Technologies to be used

As discussed above, the mining design and other technology for the proposed Mashujaa Q & M limestone mining operations are Opencast/Open Pit mining. The mining activities will be carried out using local and imported mining equipment such as excavators, surface miners (SM), drill wagons, haulage trucks, conveyors, primary sizing equipment, and loaded. Priority will be the procurement of the latest and eco-friendly mining equipment. Surface Miner that eliminates drilling and blasting mining operation.

2.21.2 Surface Miner-SM

Surface miners cut primary resources such as coal, gypsum, iron ore, salt, phosphate, bauxite, limestone, or granite, achieving high degrees of purity in the process. They are increasingly used as primary extraction equipment in newly opened-up opencast mines or extensions of existing opencast mine operations.

2.21.3 Mechanism of Rock Excavation

As the surface miner moves forward, a special cutting drum rotates against the direction of travel, cutting layers of material from the rock formations and crushing it in the process. The primary conveyor picks up the material in the drum housing and transports it towards the rear of the machine, where it is then accepted by the slewable and height-adjustable discharge conveyor. The discharge conveyor loads the material into trucks or dumpers or discharges it to the side of the miner. The technicians can adjust the discharge to the height of the transport vehicles. The surface miner is driven via four steerable and height-adjustable track units. An automatic leveling system ensures precise adherence to the cutting depth, thus enabling even thin seams or layers to be mined selectively and with maximum accuracy.

2.21.4 Environmental Sustainability of Surface Miner

Surface Miner impresses its environmentally friendly technology as it cuts, crushes, and loads rock in a single operation. It eliminates drilling and blasting. It also creates the possibility of mining in areas where administrative regulations are imposed against blast. A tremendous advantage of selective mining is that low levels of dust and noise accompany the vibration less mining operation without drilling and blasting. The low environmental impact also permits maximum deposit exploitation right up to the edge of residential areas. The selective mining of high-quality materials requires considerably less space than conventional mining methods. Our fuel-efficient, intelligently controlled engines comply with the strictest exhaust emission standards.

2.22 Advantages of surface miner

- Higher productivity and lower mining costs.
- Elimination of drilling and blasting. It avoids the chance of dilution of pay minerals and also offers more safety. It will also create the possibility of mining the areas where administrative regulations are imposed against blasting.
- Saving of cost due to elimination of crushing system.
- Higher yield of pay minerals
- State-of-the-art engine technology reduces exhaust and noise emissions.
- Anti-vibration engine support reduces vibration and noise emissions.
- The state-of-the-art machine reduces exhaust and noise emissions.
- Soundproofing reduces noise emissions

2.22.1 Air Pollution and Controls

The impact on the air environment due to the mining and allied activities arises during the land development phase and the mining process. The excavation/removal of topsoil and dumping of overburden (topsoil and host rock) generates fugitive dust in that area.

Mining operations are carried out by opencast semi-mechanized methods that generate dust particles due to various activities like excavation, loading, handling of minerals, and transportation. The air quality in the mining areas depends upon the nature and concentration of emissions and meteorological conditions. The major air pollutants due to mining activities include: -

• Particulate matter (dust) of various sizes.

• Gases, such as Sulphur dioxide, oxides of nitrogen, carbon monoxide, etc. from machine & vehicular emission.

Dust is the single air pollutant observed in open cast mines. Diesel operating drilling machines, blasting, and movement of machinery/ vehicles produce NOx, SO2, and CO, usually at low levels. Dust can be of significant importance to land users and potential health risks in some circumstances.

The generation of fugitive dust during the mining activity will impact the existing vegetation of the Core and nearby area. The dust may settle on the leaf surface, decreasing the plant's evapotranspiration. There is a decrease in photosynthesis due to plugging the chlorophyll on the leaf surface by the dust. The most significant air pollutant from mining is particulate matter, which will disperse in the ambient air and negatively affect the ambient air quality in the vicinity of the mine. On-Point Sources are the major contributors to air pollution during mining operations (which cause fugitive emissions). Transportation of final products, activities such as loading and unloading products by the dumpers, and transport of stone from the mining site to the last point will involve heavy vehicles. The dust will be generated during transportation, affecting the localities adjacent to the transport route.

Types of controls used may include;

- Using a water tanker, water sprinkling on mine site/quarry, dumping area, and haul road during dry wind periods.
- Dust emissions due to vehicles can be minimized by avoiding spillage from the loaded trucks.
- Vehicular emission of particulates, SO2, NOx, hydrocarbons can be minimized by proper maintenance of vehicles and other oil-operated equipment.
- Water sprinkling on the topsoil and overburden dump to minimize wind erosion.
- Trees can act as efficient biological filters. A systematic and planned greenbelt development reduces fugitive dust, checks runoff, and enhances the aesthetic beauty of an area.
- There is the proposal of a proper green belt along the boundary to reduce dust and noise emission from the mine area.
- Plant dust catching species
- Cleaning; Mashujaa Q& M PLC will be responsible for cleaning the mine site, the parking areas, and the compound. Cleaning operations will involve the use of water, disinfectants, and detergents.
- General repairs and maintenance
- The proposed Mashujaa Q& M limestone mine site project and associated facilities will be repaired and maintained regularly during the project operation phase. Such activities will include repairs of machinery, repairs and maintenance of electrical gadgets, and equipment repairs.

2.23 Description of the project's decommissioning activities

2.24 Mine Closure and Rehabilitation Plans

2.24.1 Demolition works

The project components, including equipment, pavements, drainage systems, staff and parking areas, and perimeter fence, will be demolished upon decommissioning. That will produce much solid waste, which will reuse for other construction works, and those not reusable disposed of appropriately by a licensed waste disposal company.

2.25 Dismantling of equipment and fixtures

All equipment, including electrical installations, furniture, finishing fixtures partitions, pipe-work, and sinks, among others, will be dismantled and removed from the site on decommissioning of the project. Priority will be given to the reuse of this equipment in other projects that can be achieved through the resale of the equipment to other contractors.

2.25.1 Restoration of the Mine Site Area

The mine rehabilitation plan will include the following steps: contouring of land; backfilling of open pits and placement of topsoil or an approved substitute on the graded area then reseed with native vegetation, revegetation using indigenous plant species, crops, and trees followed by years of careful monitoring to assure success.

2.25.2 Components, and Activities of the Proposed Project

The study's objective was to provide a comprehensive description of the proposed limestone mine/quarry project and the surrounding environment, specifying any information necessary to identify and assess the environmental impacts of the limestone mine/quarry. It includes project objectives and information on the rationale for the project and background, nature, location/existing setting, timing, duration, frequency, general layout, and other impacts on the surrounding communities, pre-construction activities, construction methods, works, and time, and post-construction plans. An accurate and detailed description of the open cast/open pit mining method. The mining method and processes to be used for ore beneficiation and waste dumping. In addition, areas to be reserved for construction and areas to be preserved in their existing state as well as activities and features which introduce risks or generate impact (negative and positive) on the environment.

The report has assessed all the factors and activities related to the projects. Such factors and activities include;

2.25.3 Components:

A description and assessment of the location of the land, the land use characteristics, including the planned use of the land, a description of the existing land use and their patterns within a 3-km radius from the boundary of the Project area, and project characteristic

2.25.4 Activities:

Description and assessment of the specific phases and activities; including timing and location, for:

Prospecting, exploration and feasibility study, design plan preparation and seeking of the appropriate approvals from the relevant authorities, baseline condition appraisal, mine development and mineral exploitation.

- Prospecting, exploration and feasibility study
- Mine development phase (establishment of the project camp, site clearance, acquisition and transportation of mining equipment, building materials, establish mining blocks);
- Exploitation phase (Operation of Mashujaa Q & M limestone mine site and managing the mining activities as per the laid down rules and procedures; and
- Mine Closure and Rehabilitation (decommissioning) phase (demolition of the mine structures, backfilling of the open pits, and revegetation of the land)

CHAPTER 3: BASELINE INFORMATION

This chapter describes the biotic and abiotic elements of the ecosystem present, particularly in the specific project site location area at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County, and on **GPS. Coordinates Latitude: (30 44' 32.5" S), Longitude: (390 42' 06.4''E)**. In addition, it discusses the environmental conditions current in the project area, including the physical environment, ambient air qualities, noise, geology of the site area, soil and rock characteristics, social-economic aspects, demography, and historical facts.

3.1 Physical Environment

3.1.1 Data information gathering procedure

The experts undertook site visits to get information on the project site and environmental status in the immediate neighborhood. Site data was also gathered from different professional experts and key stakeholders. Several site testing measurements were conducted to get detailed baseline data, such as the site area's ambient air qualities, noise, and geology. The experts gathered further information through discussions with the proponent regarding the proposed site. The physical observation was made regarding the geological status, including the geological history and the stratigraphy of the site area, drainage systems, weather conditions, biodiversity, waste disposal, settlement patterns, and typical socio-economic activities.

3.2 Kilifi County

There are 47 counties in Kenya. Kilifi County code 3 is among the 47 counties found in Kenya. Kilifi County was born in 2010 from the merger of Kilifi District and Malindi District. Its capital is Kilifi having its largest town is Malindi. The county has a population of 1,453,787(Census2019). It covers an area of 12,245.90 km^2.

The county is north and northeast of Mombasa. Kilifi has fewer tourists than Mombasa County, but there are some tourist beaches in Kikambala, Watamu, Malindi, and Kilifi**.**

It borders the counties of Tana River to the North, Taita Taveta to the West, Mombasa and Kwale to the South, and the Indian Ocean to the East. There are seven constituencies in total; Kilifi North, Kilifi South, Kaloleni, Rabai, Ganze, Malindi, and Magarini.

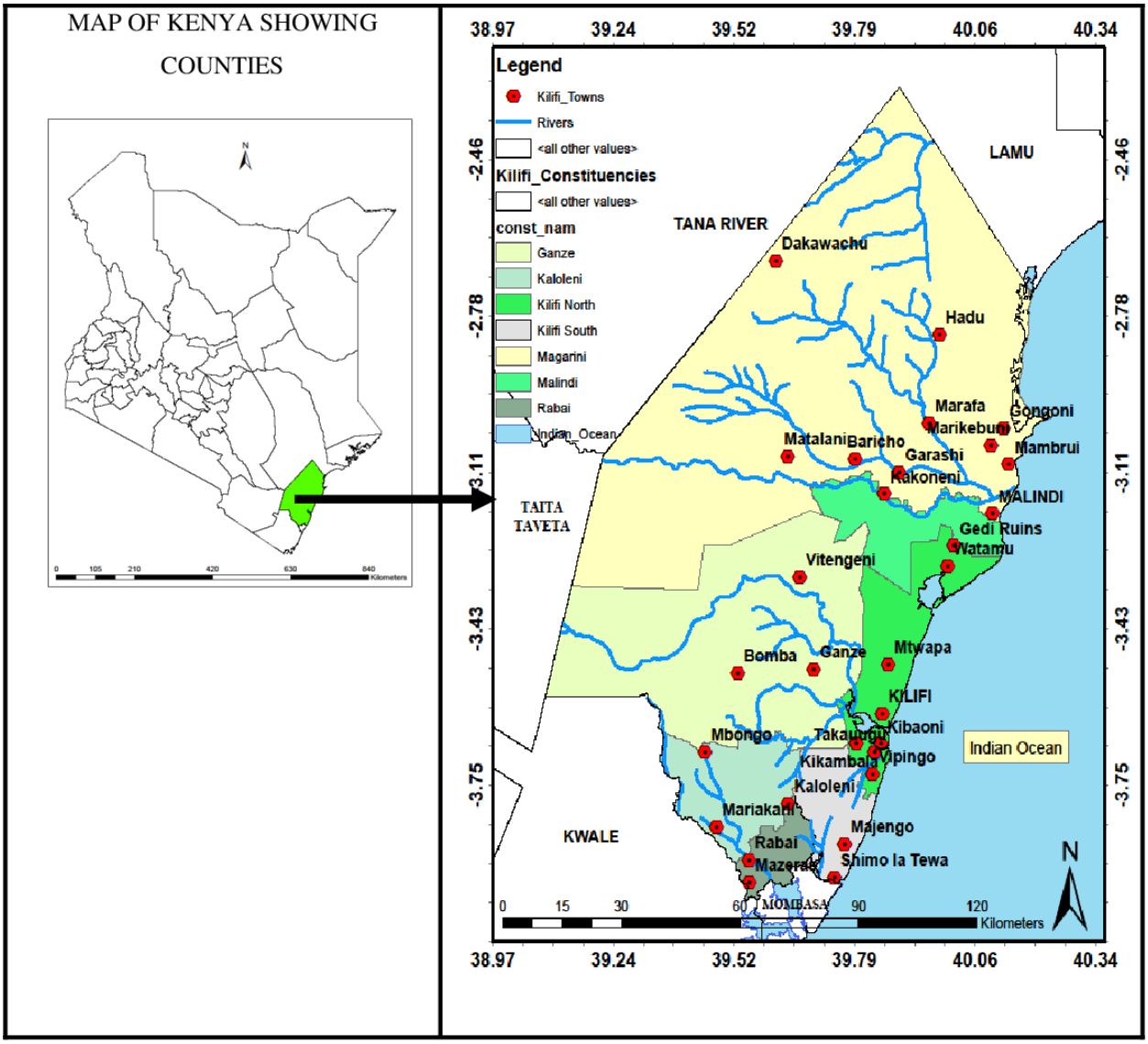

Figure 11*: Map of the County's Political and Administrative Boundaries Source: Digital Map Source.*

3.3 Altitude and Climate of Kilifi County

3.3.1 Altitude

Kilifi, Coastal Kenya, Kenya (-3.15074 39.67507) Coordinates: -3.99495 39.08790 -2.31166 40.24073 - Minimum elevation: **0 m** - Maximum elevation: **2,254** m **- Average elevation: 205 m.** Barometric Pressure is approximately 101KPa. The Geology and topography of the mineral-rich ore land are inaccessible and not suitable for agriculture and human settlements. The site is on an area with an approximate altitude **(150M-20M).**

The land terrain slopes towards the south-eastern side while the general attitude on the globe lowers southwards. The topography of the site has an approximate 40-meter-deep rocky valley at the center area that flows gently towards the south eastern side. The storm water therefore drains naturally eliminating possibility of any flooding in the area. These altitudes are believed to affect the amounts of rainfall received in the area. The site area is generally dry with scattered shrubs. Opportunities exist in agriculture, particularly livestock and crop farming. However, most areas are dry, with some regions being semi–arid.

3.3.2 Climate in Kilifi County

In Kilifi, the summers are short, hot, and overcast; the winters are warm, dry, windy, and partly cloudy; and it is oppressive year round. Over the course of the year, the temperature typically varies from 72°F to 89°F and is rarely below 70°F or above 91°F.Based on the beach/pool score, the best time of year to visit Kilifi for hot-weather activities is from late June to mid-October.

Mashujaa Q&M limestone site is characterized by low primary vegetation productivity and high geographical and seasonal variability in water availability (both surface and accessible groundwater). This is witnessed by the availability of some dry seasonal rivers. This also explains the scant vegetation in the area. Soil erosion has taken place first in the areas where vegetation has been cleared either through clearingor overgrazing. Finally, decay occurs along the sloppy paths used by the indigenous communities as there are no paved footpaths and tarmacked roads in the interior regions.

The **hot season lasts for 2.4 months**, from February 4 to April 17, with an average daily high temperature above **87°F**. The hottest month of the year in Kilifi is March, with an average high of 89°F and low of **78°F.**

The cool season lasts for 3.1 months, from June 15 to September 18, with an average daily high temperature below 82°F. The coldest month of the year in Kilifi is August, with an average low of 72°F and high of 81°F.

The climate here is tropical. The summers are much rainier than the winters in Kilifi. The climate here is classified as Aw by the Köppen-Geiger system. The average annual temperature is 26.0 °C | 78.8 °F in Kilifi. In a year, the rainfall is 888 mm | 35.0 inch.

The driest month is February, with 21 mm | 0.8 inch of rain. The greatest amount of precipitation occurs in May, with an average of 173 mm | 6.8 inch

March is the warmest month of the year. The temperature in March averages 27.5 °C | 81.5 °F. The lowest average temperatures in the year occur in July, when it is around 24.4 °C | 76.0 °F.

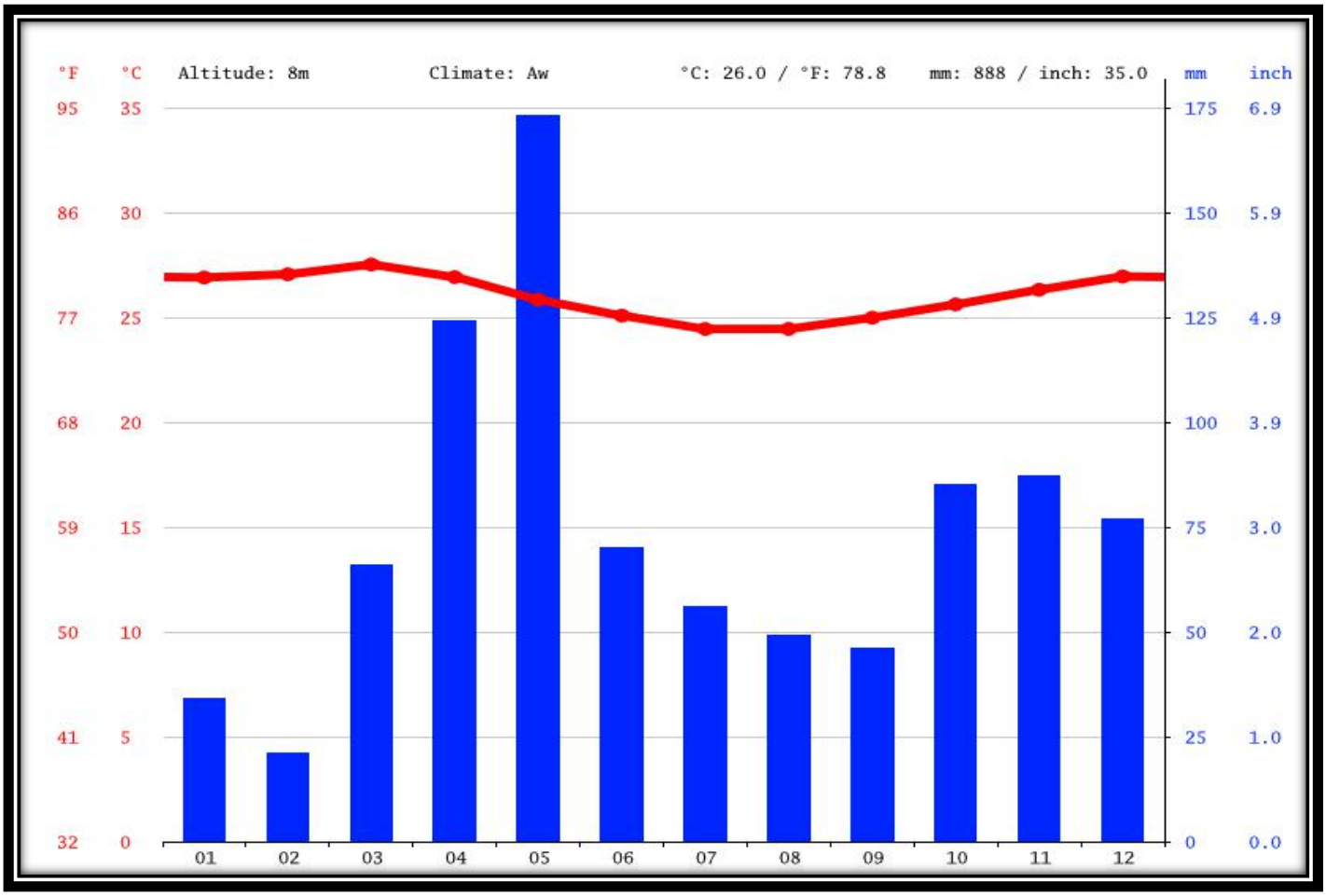

Figure 12: *Kilifi Climate Graph // Weather by Month* ***Source****: Climate-Data.Org. Records.*

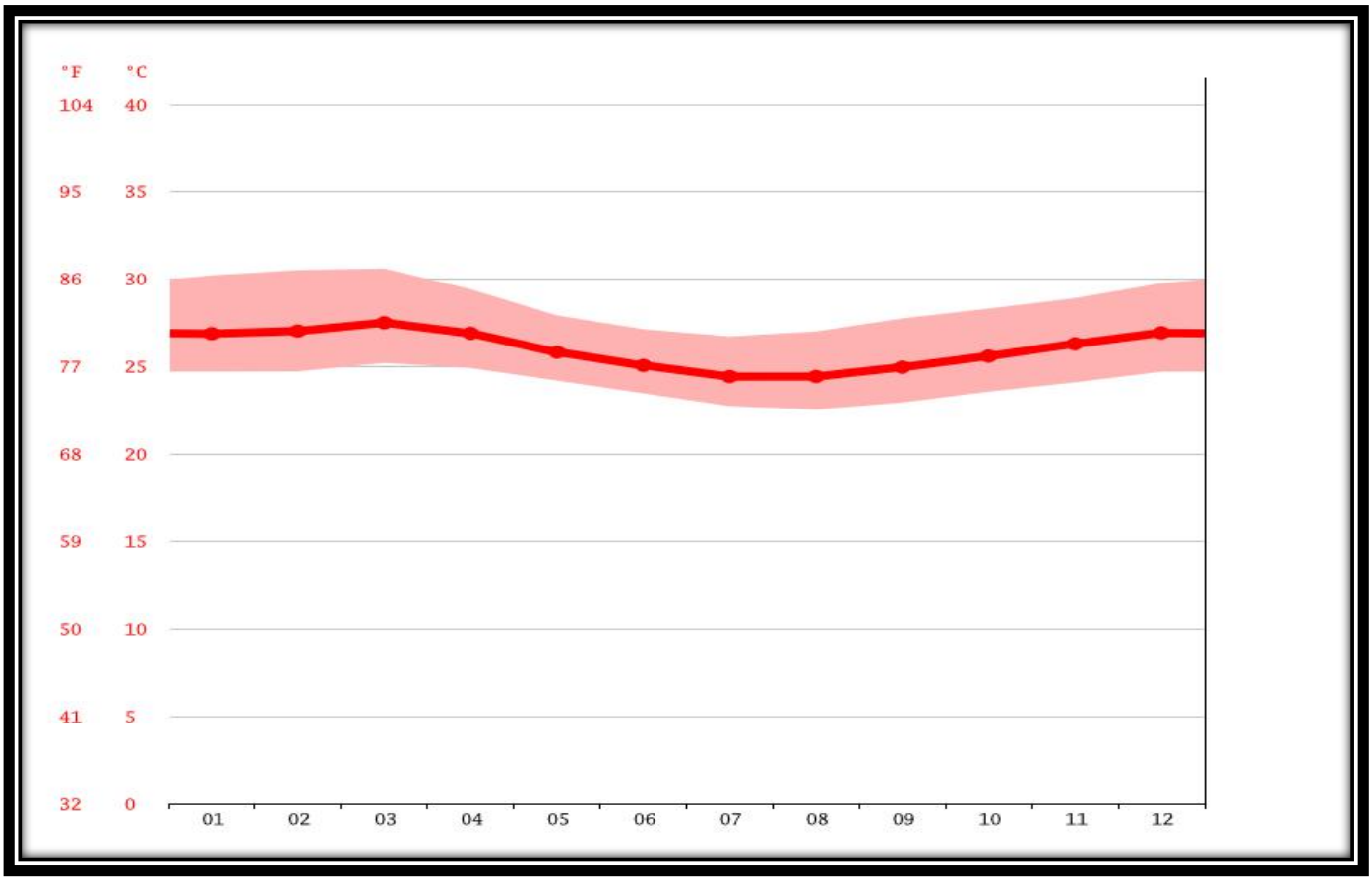

Figure 13: *Kilifi Average Temperature. Source: Climate-Data.Org. Records.*

There is a difference of 152 mm | 6 inches of precipitation between the driest and wettest months. The variation in temperatures throughout the year is 3.1 °C | 5.5 °F.

The month with the highest relative humidity is November (80.39 %). The month with the lowest relative humidity is February (75.31 %).

The month with the highest number of rainy days is April (24.97 days). The month with the lowest number of rainy days is February (5.00 days).

Kilifi is in the middle, and the summers are that easy to define.

The best time to visit is January, February, March, April, June, July, August, September, October, November, December.

In Kilifi, the month with the most daily hours of sunshine is December, with an average of 8.42 hours of sunshine. In total, there are 261.02 hours of sunshine throughout December.

The month with the fewest daily hours of sunshine in Kilifi is January, with an average of 8.42 hours of Sunshine a day. In total, there were 261.02 hours of sunshine in January.

Around 2860.74 hours of sunshine are counted in Kilifi throughout the year. On average, there are 94.05 hours of sunshine per month

3.4 Economy of Kilifi County

3.4.1 Tourism

Tourism and fishing in Kilifi are major economic activities due to its proximity to the Indian Ocean. Kilifi county has some of the best beaches and popular resorts and hotels. Kilifi town is on the coast of Kenya, north of Mombasa and near Kilifi Creek, along an estuary of the Goshi River. The town is known for Indian Ocean beaches, including Bofa Beach, dotted with resorts. Nearby, green turtles swim among coral reefs in Watamu Marine National Park and Reserve. Other attractions include historical sites such as the Mnarani Ruins, which date between the fourteenth and seventeenth centuries.

3.4.2 Fishing

After tourism, the primary source of income, which dwindled during the Covid-19 pandemic, has been fishing. Fishing activities occur along the shores of the Indian Ocean from Mtwapa in the south to Ngomeni in the north in Kilifi County. The fishing industry has provided a livelihood for the Kilifi residents for many years. It brings together the entire fish dwellers with a population of over 30,000 people.

3.4.3 Mining

Kwale and Kilifi counties have vast mineral deposits whose exploitation could boost the region's economy. Mineral deposit includes; Manganese, Iron, Lead, Zinc, Titanium. Coal, limestone (cement manufacture), building Stones. Most quarries use the open-pit method of mining. Approximately 1.4 billion tonnes of titanium have been discovered in Kilifi county at Vipingo and Sokoke area.

There are ongoing mining and industrial development in the neighborhood near the proposed site. Some of the existing mining and industries operating in the area are; Manganese ore artisanal mines at Galanema, river sands excavation at Kizingo, National Cement Company Limited, ballast stone production, and Mombasa cement at Vipingo area.

The proposed mine site project will alleviate unemployment for the community in Chasimba and Kilifi-Sub County at large.

Figure 3: *Stone Crushing Plant at Chasimba.*

3.4.4 Manufacturing industries

The county has a robust industrial sector with the Mabati Rolling Mill, stone crushing plant, mineral ore processing; cement manufacturing such as Athi River Cement Factory, Mombasa Cement at Vipingo, **Krystalline Salt Ltd, Mombasa salt company** that contribute to the region's economy, both in employment provision and income generation.

3.4.5 Agriculture

Thanks to fertile soil and good weather, opportunities exist in agriculture, particularly dairy and crop farming. The county had a potential cashew nut milling industry. Notably, the geology of the site area is not suitable to practice agriculture.

3.5 Demographic

According to the census 2019, Kilifi County has a total population of 1,453,787, of which 704,089 are males, 749,673 females, and 25 intersex persons. There are 298,472 households with an average household size of 4.4 persons per household and a population density of 116 people per square kilometer.

3.6 Location of the Study Area

The project is located privately at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County, and **GPS. Coordinates Latitude: (3° 44' 32.5" S), Longitude: (39° 42' 06.4''E).** The site is bout 24km from Kilifi town and about 12km from Kaloleni town. The site location is arrived by road driving along Kilifi-Kaloleni road. Start at Kilifi town, you drive along Kilifi-Mombasa road and arrive at Mavueni Bus Stage. From the Mavueni Bus stage, drive along Kilifi-Kaloleni road towards Chasimba High School. About 900m, from Chasimba High School and driving along a murram road, you arrive at the proposed site area, Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County, and on GPS. Coordinates Latitude: **(3° 44' 32.5" S),** Longitude: **(39° 42' 06.4''E).** The outskirts of the site area are sparsely populated with scattered, commercial, and social structures.

The proposed mine site area has steep, random, and rocky slopes. There is no human settlement on the proposed mine site area. The Geology and topography of the mineral-rich ore land are inaccessible and not suitable for agriculture and human settlements.

Figure 3*: A photo image showing the mineral ore-bearing rock outcrop at the proposed site in Chasimba Sub-Location*.

Figure 4: *Proposed site area at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County.*

3.7 Topography and geology of the site area

The proposed mine site area has steep, random, and rocky slopes. There is no human settlement on the proposed mine site area. The Geology and topography of the mineral-rich ore land are inaccessible and not suitable for agriculture and human settlements. The site is on an area with an approximate altitude (150M-20M). The land terrain slopes towards the southeastern side while the general attitude on the globe lowers southwards. The site's topography has an approximate 40-meter-deep rocky valley at the center area that flows gently towards the southeastern side. The stormwater, therefore, drains naturally, eliminating the possibility of any flooding in the area. These altitudes are believed to affect the amounts of rainfall received in the area. The site area is generally dry with scattered shrubs.

3.8 Geology of Kilifi-Mazeras area

The rocks of the Kilifi-Mazeras area are whole of sedimentary origin and range in age from Triassic to Recent; they fall naturally into three well-marked divisions: -

(I) The Duruma Sandstone Series.

(2) The Jurassic rocks

(3) The Cainozoic rocks

The **Duruma Sandstone Series** is the Kenya correlative of the Karroo System of South and Central Africa and consists of grits, sandstones, and shales that, for the most part, were deposited under lacustrine or sub-aerial conditions. Miller (1952, p. 12) has proved the existence of a marine band in the lower part of the series, and others in the upper part have been hinted, but such intercalations constitute a very small percentage of the total thickness. The series is readily divisible into three broad lithological units with coarse sandstones and grits at the top and bottom of the succession and finer sandstones and shales in the middle. In the Kilifi area, only the upper and upper-middle units are represented.

The **Jurassic rocks** are entire of marine origin and consist of limestone, mudstones, shales, and occasional thin sandy beds, ranging from the Bajocian to the Middle Kimmeridgian. They share the easterly regional dip of the Duruma Sandstone Series; against which they are down-faulted throughout most of the area.

The **Cainozoic rocks** include a thick series of terrestrial sands and gravels that are probably of Upper Pliocene age, a Pleistocene coral reef with associated lagoonal deposits of coral breccia, calcareous sands, beach sands, and various subsidiary sandy beds that seem to be of late Pleistocene or Recent age. They are all more or less flat-bedded, and the rest uncomfortably upon members of the older divisions.

In a general way, the boundaries between the systems or groups and their sub-divisions parallel to the coastline, the rocks become progressively older as one travels inland.

3.9 Economic geology

Several deposits of minerals of economic value have been recorded from the Kilifi-Mazeras area, but it is doubtful whether many of them are of sufficient magnitude to justify development. The deposits include manganese, lead, zinc, titanium coal, limestone (used for lime and cement), building stone, and water, their dispositions being shown in figure below.

3.10 Limestone (Cement Manufacture)

There is active cement manufacturing at Bamburi. The materials used in the cement manufacture are a mixture of Pleistocene coral and Jurassic shale, both of which are abundant in the area.

3.11 Sample test result Chasimba-Bundacho area

	5 %	6 %	7 %
SiO_2	5·08	11·32	4·04
Al_2O_3	0·73	1·09	0·72
Fe_2O_3	0·34	0·27	0·29
MgO	0·14	0·09	0·07
CaO	48·33	47·16	50·74
Alkalies as Na_2O ..	0·32	0·29	0·27
Loss on ign. ..	41·98	38·50	41·88
TiO_2	0·05	0·08	0·03
SO_3	0·02	0·06	0·15
S, Cl, and F ..	0·08	—	—
	97·07	98·86	98·19

Figure 17: *Sample test result Chasimba-Bundacho area Source**:** Ministry of Petroleum and Mining; Geology of The Kilifi-Mazeras Area-P.V. CASWELL, B.Sc., F.G.S., F.R.G.S.*

From these analyses, it is clear that limestone from the locality is suitable for use in cement manufacture. Other considerations, the available limestone reserves, ease of working, transport, and water supply, also appear. To favor the Cha Simba locality. The limestone reserves are unlimited; the outcrop at this locality is nearly two miles wide, at least 1,500 ft. thick, and can be followed along the strike for many miles in both directions. Its relative inaccessibility is one of the more serious difficulties, although this is by no means unsurmountable provided the projected scale of working is sufficiently large.

3.12 Building Stones

Few of the coastal sediments are suitable for use as building stones. The Pleistocene coral or coral breccia is most generally used, quarried at several localities along the coast. The handiness of the outcrop and the ease of dressing are factors controlling its choice. It is cut into large blocks that make a satisfactorily resistant material when cement-faced. The Pleistocene sands could probably be used as a filler and constituent in mortar and concrete.

3.13 Soil and Rock Properties (Mineral Ore)

A soil and rock survey was conducted on the proposed site area. The experts used the open pit method to dig and collect soil and rock samples. The open-pit depth was a minimum of 10 feet; the experts dug 6 open pit sample points to collect soil and rock samples for chemical analysis in the laboratory. The six soil and rock sample points' chemical and physical properties were similar.

Figure 18: *Rock and soil samples (Open pit soil and rock survey method used to collect soil and rock samples)*

The soil profile revealed a thin top layer of soil and rock particles followed by an intact limestone rock beneath. The geological ground stratigraphy indicates limestone rock extending beyond 20 meters beneath. The soil and rock samples were taken to the laboratory for analysis, as shown in the figure below

REPUBLIC OF KENYA

MINISTRY OF PETROLEUM AND MINING

DIRECTORATE GEOLOGICAL SURVEYS

MINERAL CERTIFICATION LABORATORY

MADINI HOUSE
MACHAKOS ROAD
P.O. Box 30009-00100 GPO
NAIROBI

e-mail:cg@mining.go.ke
When replying please quote ref No & date

Ref. No.ORIGINAL CERT NO. 506/22

Date... 24th February, 2022

LABORATORY ASSAY REPORT

SENDER'S NAME	:	**MASHUJAA CEMENT PLC**
DATE	:	**24.02.2022**
SAMPLE TYPE	:	**ROCK**
SAMPLE NO	:	**506/22**

RESULT

CHEMICAL COMPOSITION:

Calcium as $CaCO_3$	75.19%
Silica as SiO_2	21.02%
Aluminium as Al_2O_3	1.05%
Iron as Fe_2O_3	0.42%
Potassium as K_2O	0.39%
Phosphorus as P_2O_5	0.39%
Titanium as TiO_2	0.10%
Manganese as MnO	0.02%
Calcium as CaO	**42.11%**

FOR DIRECTOR OF GEOLOGICAL SURVEYS
24 FEB 2022
Box 30009-00100 NAIROBI

JOSEAH K. CHUMO
FOR: DIRECTOR OF GEOLOGICAL SURVEYS.
The results are based on test sample only.

Figure 18a: *Rock laboratory assay report.*

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MINERAL CERTIFICATION LABORATORY

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e-mail:cg@mining.go.ke
When replying please quote ref No & date

Ref. No.ORIGINAL CERT NO. 506/22

Date... 24th February, 2022

LABORATORY ASSAY REPORT

SENDER'S NAME	:	MASHUJAA Q & M
DATE	:	24.02.2022
SAMPLE TYPE	:	SOIL
SAMPLE NO	:	506/22

RESULT

CHEMICAL COMPOSITION:

Silica as SiO_2	80.56%
Aluminium as Al_2O_3	11.74%
Iron as Fe_2O_3	4.88%
Titanium as TiO_2	1.58%
Calcium as CaO	0.56 %
Phosphorus as P_2O_5	0.51%
Potassium as K_2O	0.03%

FOR:

JOSEAH K. CHUMO
FOR: DIRECTOR OF GEOLOGICAL SURVEYS.
The results are based on test sample only.

FOR DIRECTOR OF GEOLOGICAL SURVEYS
24 FEB 2022
P.O. Box 30009-00100
NAIROBI

Figure 18b: *Soil laboratory assay report.*

3.14 Noise levels

Baseline air quality monitoring and noise level measurement for the mining area was done from **22nd to 24th November** at 6 points. The six monitoring locations were methodologically selected to represent the project site at the time of monitoring to represent baseline air and noise quality at the proposed quarry/mining site. **Mashujaa Q&M PLC contracted Polucon Services Kenya Limited** to conduct Baseline Ambient Air Quality and Noise levels monitoring for their proposed project area before the commencements of the project's activities to access, quantity, and record the current air and noise condition of the area. The experts undertook baseline noise assessment at the proposed site area at **Chasimba -Sub location, Kilifi South Sub-County in Kilifi County**, to obtain data that can be used to form a basis for planning the control measures to eliminate or control noise exposure to the workers.

3.14.1 Noise exposure standards (schedules)

Table 4: ***EMCA Legal Notice 61 First Schedule Extract***

ZONE		***Sound Level Limits dB (A)L eq, 14 h***		***Noise Rating Level (NR)L eq, 14 h***	
		DAY	**NIGHT**	**DAY**	**NIGHT**
A	Silent Zone	40	35	30	25
B	Place of worship	40	35	30	25
C	Residential: Indoor Outdoor	45 50	35 35	35 40	25 25
D	Mixed Residential (with some commercial and places of entertainment)	55	35	50	25
E	Commercial	60	35	55	25

Source: *EMCA noise and excessive vibration pollution control, 2009.*

NB: The project site according to EMCA (Noise & Excessive Vibrations), Regulations 2009 fall under the commercial category.

Table 5: *International Ambient Noise Levels Criteria at Workplaces and residential areas*

Receptor	**Maximum allowable Leq (hourly) in dB(A)**			
	World Bank		World Health Organization	
	Daytime 0700-2200 hrs	Night-time 2200 – 0700 hrs	Day time 0700-2200 hrs	Night-time 2200 – 0700 hrs
Residential, Institutional and Educational	55	45	50	45
Industrial and Commercial	70	70	85	85

NB: According to the WHO & WB Noise Levels Limits, the project site falls under the Industrial and Commercial Zone .

3.15 A map showing Limestone Mine Site Area

Figure 19: *A map showing the Proposed Mashujaa Q&M Limestone Mine Site Area at Chasimba -Sub location, Kilifi South Sub-County in Kilifi Ciounty.*

Noise, which is often referred to as unwanted sound, is typically characterized by intensity, frequency, periodicity (continuous or intermittent), and sound duration. Sound is a result of pressure changes in the air. The pressure changes are caused by vibration (Thompson, 1994).

Measuring noise levels in noise-sensitive areas and workers' noise exposures is the most important part of a hearing conservation and noise control program. It helps identify locations where there are noise problems in the noise-sensitive areas, employees who may be affected, and where additional noise measurements need to be made.

Excessive noise pollution from various construction-related activities can harm the human's eye.

For these reasons, environmental monitoring is paramount to assess noise objectively and quantify and evaluate its potential impact to develop comprehensive conservation and control programs.

Baseline noise levels monitoring is essential as it describes the noise levels of the area before the commencement of any activity in the area. The experts should accurately capture baseline noise levels to assess any environmental noise pollution related to the introduction of the project's activities.

Six monitoring locations were selected methodologically to measure the existing ambient noise levels within the proposed project site. The teal of experts selected the six sample locations at the extreme ends of the mine site to give a sample representative of the whole project site.

3.16 Description of the monitoring locations

Poin	GPS Coordinates	Weather	Description
Point 1	S -3^0 44' 02.71'' E – 39^0 42' 07.11''	Sunny and slightly windy daytime. Cold at night	This point was located near a rough road and the main Mavueni-Kaloleni highway.
Point 2	S -3^0 43' 53.42'' E – 39^0 42' 18.11''	Sunny and slightly windy daytime. Cold at night	This point was located near a rough road and the main Mavueni-Kaloleni highway.
Point 3	S -3^0 43' 43.92'' E – 39^0 42' 33.60''	Sunny and slightly windy daytime. Cold at night	The area was located within valleys and hills. There are no bordering roads just foot paths
Point 4	S -3^0 43' 34.86'' E – 39^0 42' 31.33''	Sunny and slightly windy daytime. Cold at night	The area was located within valleys and hills. There are no bordering roads just foot paths
Point 5	S -3^0 43' 36.82'' E – 39^0 42' 39.94''	Sunny and slightly windy daytime. Cold at night	This point was located opposite the Mavueni-Kaloleni highway
Point 6	S -3^0 43' 13.55'' E – 39^0 42' 42.32''	Sunny and slightly windy daytime. Cold at night	This point was located opposite the Mavueni-Kaloleni highway

Table 6: *Description of Site 1 Mining Area (Mashujaa Q&M PLC).*

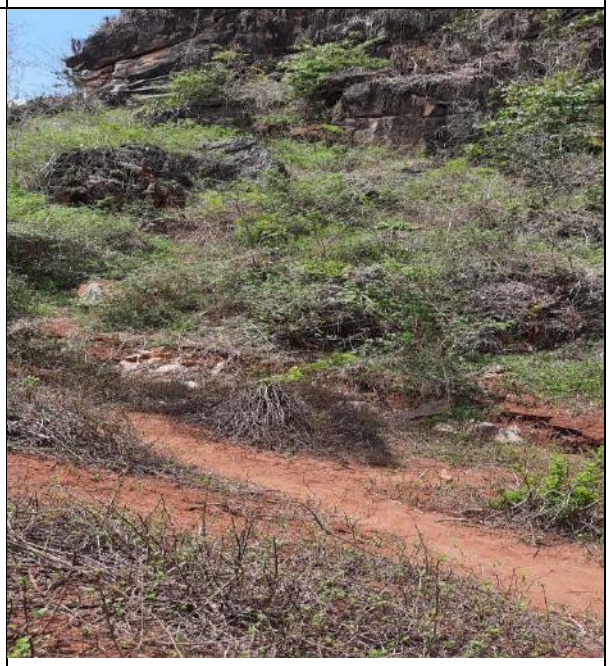
	
Air quality measurement ongoing during the day-Instrumex AQM	Air quality measurement ongoing during the night-Instrumex AQM
	
Simultaneous noise and air quality measurement ongoing during the day	Site area prior to mine development

Figure 20: *Pictorial Summary-Air Quality Measurements.*

3.16.1 Monitoring frequency and location

Baseline air quality monitoring and noise measurement was done from **22nd to 24th November 2021** at the Chasimba area at the proposed project site. Six monitoring locations were methodologically selected to represent the proposed quarry/mining area project site at monitoring. Selection of monitoring locations was done to represent the whole project site and monitor the existing ambient conditions before the project's activities.

3.16.2 Noise Measurements Results

Noise measurement results for Site 1 – Proposed Mining Area (Mashujaa Q&M PLC)

Table 7a: Noise measurements Results for Point 1

DATE: 22.11.2021								
Monitoring location: Point 1								
Monitoring site: Monitoring Site 1 (Mining site)								
DATE	**TIME**	**Leq**	**LAmax**	**LAmin**	**L5**	**L50**	**L95**	**Site Notes**
		(dBA)	**(dBA)**	**(dBA)**	**(dBA)**	**(dBA)**	**(dBA)**	
DIURNAL								
22/11/2021	1140-1240hrs	45.5	56.7	40.2	52.2	50.8	49.2	Vehicular movement, Psithurism and birds chirping
22/11/2021	1240-1340hrs	42.2	53.2	38.8	51.1	49.8	48.8	Vehicular movement, Psithurism and birds chirping
22/11/2021	1340-1440hrs	50.2	51.9	37.8	50.8	48.8	47.3	Vehicular movement, Psithurism and birds chirping
22/11/2021	1740-1840hrs	36.6	44.2	29.9	40.8	38.2	36.4	Vehicular movement, Psithurism and birds chirping

23/11/2021	0640-0740hrs	32.2	38.5	25.4	37.5	36.7	35.6	Vehicular movement, Psithurism and birds chirping
23/11/2021	0740-0840hrs	35.5	49.8	27.8	45.3	44.2	43.3	Vehicular movement, Psithurism and birds chirping
Average		**40.4**	**49.1**	**33.3**	**46.3**	**44.8**	**43.4**	Vehicular movement, Psithurism and birds chirping
NOCTURNAL								
22/11/2021	1840-1940hrs	34.4	40.1	28.2	37.2	36.1	34.4	Vehicular movement, Psithurism and birds chirping
22/11/2021	1940-2040hrs	37.2	45.9	31.2	43.1	42.1	41.4	Vehicular movement, Psithurism and birds chirping
22/11/2021	2340-0040hrs	29.9	33.2	22.2	31.3	30.2	29.6	Vehicular movement, Psithurism and birds chirping
23/11/2021	0040-0140hrs	28.8	33.1	21.8	30.8	29.8	28.4	Vehicular movement, Psithurism and birds chirping
23/11/2021	0140-0240hrs	27.4	31.2	20.6	29.8	27.8	26.4	Vehicular movement, Psithurism and birds chirping
23/11/2021	0540-0640hrs	31.2	36.8	23.8	34.4	33.4	32.9	Vehicular movement, Psithurism and birds chirping
Average		**31.5**	**36.7**	**24.6**	**34.4**	**33.2**	**32.2**	Vehicular movement, Psithurism and birds chirping

Table 7b: Noise measurements Results for Point 2

DATE: 22.11.2021								
Monitoring location: Point 2								
Monitoring site: Monitoring Site 1 (Mining site)								
DATE	**TIME**	**Leq**	**LAmax**	**LAmin**	**L5**	**L50**	**L95**	**Site Notes**
		(dBA)	**(dBA)**	**(dBA)**	**(dBA)**	**(dBA)**	**(dBA)**	
DIURNAL								
22/11/2021	1440-1540hrs	40.8	48.8	32.2	46.6	44.3	42.2	Cattle, Psithurism and birds chirping
22/11/2021	1540-1640hrs	42.2	52.8	37.8	50.8	46.4	44.2	Cattle, Psithurism and birds chirping
22/11/2021	1640-1740hrs	38.9	46.7	30.6	44.3	42.2	40.8	Cattle, Psithurism and birds chirping
23/11/2021	0840-0940hrs	40.2	51.2	38.8	48.8	46.6	45.6	Cattle, Psithurism and birds chirping
23/11/2021	0940-1040hrs	42.2	55.6	40.3	52.3	51.2	50.4	Cattle, Psithurism and birds chirping
23/11/2021	1040-1140hrs	36.6	44.6	43.2	42.9	41.2	40.6	Cattle, Psithurism and birds chirping

Average		**40.2**	**50.0**	**37.2**	**47.6**	**45.3**	**44.0**	Cattle, Psithurism and birds chirping
NOCTURNAL								
22/11/2021	2040-2140hrs	33.2	38.7	25.4	37.6	35.6	34.6	Cattle, Psithurism and birds chirping
22/11/2021	2140-2240hrs	31.5	36.6	23.3	34.4	33.2	31.8	Cattle, Psithurism and birds chirping
22/11/2021	2240-2340hrs	30.8	35.4	22.2	33.2	30.2	29.8	Cattle, Psithurism and birds chirping
23/11/2021	0240-0340hrs	27.4	30.2	20.2	28.8	27.2	26.8	Cattle, Psithurism and birds chirping
23/11/2021	0340-0440hrs	26.6	28.8	19.9	27.8	26.3	25.4	Cattle, Psithurism and birds chirping
23/11/2021	0440-0540hrs	28.8	29.9	20.1	26.6	25.9	24.4	Cattle, Psithurism and birds chirping
Average		**29.7**	**33.3**	**21.9**	**31.4**	**29.7**	**28.8**	Cattle, Psithurism and birds chirping

Table 7c: Noise measurements Results for Point 3

DATE: 23.11.2021								
Monitoring location: Point 3								
Monitoring site: Monitoring Site 1 (Mining site)								
DATE: 23.11.2021	**TIME**	**Leq**	**LAmax**	**LAmin**	**L5**	**L50**	**L95**	**Site Notes**
		(dBA)	**(dBA)**	**(dBA)**	**(dBA)**	**(dBA)**	**(dBA)**	
DIURNAL								
23/11/2021	1140-1240hrs	40.4	48.2	31.2	47.6	45.5	44.2	Cattle, Psithurism and birds chirping
23/11/2021	1240-1340hrs	40.0	48.0	30.1	47.2	46.2	43.2	Cattle, Psithurism and birds chirping
23/11/2021	1340-1440hrs	42.2	54.2	38.8	53.2	48.8	47.3	Cattle, Psithurism and birds chirping
23/11/2021	1740-1840hrs	34.1	40.6	28.2	39.8	37.2	37.8	Cattle, Psithurism and birds chirping
24/11/2021	0640-0740hrs	33.2	39.1	28.3	38.2	37.4	36.3	Cattle, Psithurism and birds chirping

24/11/2021	0740-0840hrs	30.1	37.2	27.2	36.4	35.1	34.8	Cattle, Psithurism and birds chirping
Average		**36.7**	**44.6**	**30.6**	**43.7**	**41.7**	**40.6**	Cattle, Psithurism and birds chirping
NOCTURNAL								
23/11/2021	1840-1940hrs	33.6	39.4	27.6	38.6	36.1	35.2	Cattle, Psithurism and birds chirping
23/11/2021	1940-2040hrs	32.8	36.5	25.2	34.5	32.8	31.2	Cattle, Psithurism and birds chirping
23/11/2021	2340-0040hrs	25.4	30.1	25.5	29.2	28.8	27.7	Cattle, Psithurism and birds chirping
24/11/2021	0040-0140hrs	25.1	27.7	21.8	26.3	25.3	24.3	Cattle, Psithurism and birds chirping
24/11/2021	0140-0240hrs	24.4	26.1	19.8	25.3	24.3	23.2	Cattle, Psithurism and birds chirping
24/11/2021	0540-0640hrs	32.1	38.2	25.7	37.1	36.4	35.4	Cattle, Psithurism and birds chirping
Average		**28.9**	**33.0**	**24.3**	**31.8**	**30.6**	**29.5**	Cattle, Psithurism and birds chirping

Table 7d: Noise measurements Results for Point 4

DATE: 23.11.2021								
Monitoring location: Point 4								
Monitoring site: Monitoring Site 1 (Mining site)								
DATE: 23.11.2021	**TIME**	**Leq**	**LAmax**	**LAmin**	**L5**	**L50**	**L95**	**Site Notes**
		(dBA)	**(dBA)**	**(dBA)**	**(dBA)**	**(dBA)**	**(dBA)**	
DIURNAL								
23/11/2021	1440-1540hrs	39.8	47.8	30.0	45.5	42.2	42.8	Cattle, Psithurism and birds chirping
23/11/2021	1540-1640hrs	38.8	47.2	29.8	45.1	43.2	42.5	Cattle, Psithurism and birds chirping
23/11/2021	1640-1740hrs	36.6	42.2	27.5	40.2	39.8	39.2	Cattle, Psithurism and birds chirping
24/11/2021	0840-0940hrs	39.8	47.8	30.0	45.5	42.2	42.8	Cattle, Psithurism and birds chirping
24/11/2021	0940-1040hrs	38.8	47.2	29.8	45.1	43.2	42.5	Cattle, Psithurism and birds chirping

24/11/2021	1040-1140hrs	36.6	42.2	27.5	40.2	39.8	39.2	Cattle, Psithurism and birds chirping
Average		**38.4**	**45.7**	**29.1**	**43.6**	**41.7**	**41.5**	Cattle, Psithurism and birds chirping
NOCTURNAL								
23/11/2021	2040-2140hrs	30.2	35.2	22.1	34.4	33.1	32.4	Cattle, Psithurism and birds chirping
23/11/2021	2140-2240hrs	29.2	34.1	21.4	33.2	32.1	31.7	Cattle, Psithurism and birds chirping
23/11/2021	2240-2340hrs	27.5	32.9	31.1	31.9	30.2	29.4	Cattle, Psithurism and birds chirping
24/11/2021	0240-0340hrs	21.1	25.1	17.8	24.3	23.2	22.8	Cattle, Psithurism and birds chirping
24/11/2021	0340-0440hrs	23.2	28.4	18.8	27.8	26.5	25.3	Cattle, Psithurism and birds chirping
24/11/2021	0440-0540hrs	24.2	29.3	20.1	27.2	25.2	24.2	Cattle, Psithurism and birds chirping
Average		**25.9**	**30.8**	**21.9**	**29.8**	**28.4**	**27.6**	Cattle, Psithurism and birds chirping

Table 7e: Noise measurements Results for Point 5

DATE: 24.11.2021								
Monitoring location: Point 5								
Monitoring site: Monitoring Site 1 (Mining site)								
DATE: 23.11.2021	**TIME**	**Leq**	**LAmax**	**LAmin**	**L5**	**L50**	**L95**	**Site Notes**
		(dBA)	**(dBA)**	**(dBA)**	**(dBA)**	**(dBA)**	**(dBA)**	
DIURNAL								
24/11/2021	1140-1240hrs	45.5	56.7	40.2	52.2	50.8	49.2	Vehicular movement, Psithurism and birds chirping
24/11/2021	1240-1340hrs	42.2	53.2	38.8	51.1	49.8	48.8	Vehicular movement, Psithurism and birds chirping
24/11/2021	1340-1440hrs	50.2	51.9	37.8	50.8	48.8	47.3	Vehicular movement, Psithurism and birds chirping
24/11/2021	1740-1840hrs	36.6	44.2	29.9	40.8	38.2	36.4	Vehicular movement, Psithurism and birds chirping
25/11/2021	0640-0740hrs	33.2	39.1	28.3	38.2	37.4	36.3	Vehicular movement, Psithurism and birds chirping

25/11/2021	0740-0840hrs	30.1	37.2	27.2	36.4	35.1	34.8	Vehicular movement, Psithurism and birds chirping
Average		**39.6**	**47.1**	**33.7**	**44.9**	**43.4**	**42.1**	Vehicular movement, Psithurism and birds chirping
NOCTURNAL								
24/11/2021	1840-1940hrs	34.4	40.1	28.2	37.2	36.1	34.4	Vehicular movement, Psithurism and birds chirping
24/11/2021	1940-2040hrs	37.2	45.9	31.2	43.1	42.1	41.4	Vehicular movement, Psithurism and birds chirping
24/11/2021	2340-0040hrs	21.1	25.1	17.8	24.3	23.2	22.8	Vehicular movement, Psithurism and birds chirping
25/11/2021	0040-0140hrs	23.2	28.4	18.8	27.8	26.5	25.3	Vehicular movement, Psithurism and birds chirping
25/11/2021	0140-0240hrs	24.2	29.3	20.1	27.2	25.2	24.2	Vehicular movement, Psithurism and birds chirping
25/11/2021	0540-0640hrs	32.1	38.2	25.7	37.1	36.4	35.4	Vehicular movement, Psithurism and birds chirping
Average		**28.7**	**34.5**	**23.6**	**32.8**	**31.6**	**30.6**	Vehicular movement, Psithurism and birds chirping

Table 7f: Noise measurements Results for Point 6

DATE: 24.11.2021								
Monitoring location: Point 6								
Monitoring site: Monitoring Site 1 (Mining site)								
DATE: 23.11.2021	**TIME**	**Leq**	**LAmax**	**LAmin**	**L5**	**L50**	**L95**	**Site Notes**
		(dBA)	**(dBA)**	**(dBA)**	**(dBA)**	**(dBA)**	**(dBA)**	
DIURNAL								
24/11/2021	1440-1540hrs	39.8	47.8	30.0	45.5	42.2	42.8	Vehicular movement, Psithurism and birds chirping
24/11/2021	1540-1640hrs	38.8	47.2	29.8	45.1	43.2	42.5	Vehicular movement, Psithurism and birds chirping
24/11/2021	1640-1740hrs	36.6	42.2	27.5	40.2	39.8	39.2	Vehicular movement, Psithurism and birds chirping
25/11/2021	0840-0940hrs	40.4	48.2	31.2	47.6	45.5	44.2	Vehicular movement, Psithurism and birds chirping
25/11/2021	0940-1040hrs	40.0	48.0	30.1	47.2	46.2	43.2	Vehicular movement, Psithurism and birds chirping

25/11/2021	1040-1140hrs	42.2	54.2	38.8	53.2	48.8	47.3	Vehicular movement, Psithurism and birds chirping
Average		**39.6**	**47.9**	**31.2**	**46.5**	**44.3**	**43.2**	Vehicular movement, Psithurism and birds chirping
NOCTURNAL								
24/11/2021	2040-2140hrs	25.4	30.1	25.5	29.2	28.8	27.7	Vehicular movement, Psithurism and birds chirping
24/11/2021	2140-2240hrs	25.1	27.7	21.8	26.3	25.3	24.3	Vehicular movement, Psithurism and birds chirping
24/11/2021	2240-2340hrs	24.4	26.1	19.8	25.3	24.3	23.2	Vehicular movement, Psithurism and birds chirping
25/11/2021	0240-0340hrs	27.4	30.2	20.2	28.8	27.2	26.8	Vehicular movement, Psithurism and birds chirping
25/11/2021	0340-0440hrs	26.6	28.8	19.9	27.8	26.3	25.4	Vehicular movement, Psithurism and birds chirping
25/11/2021	0440-0540hrs	28.8	29.9	20.1	26.6	25.9	24.4	Vehicular movement, Psithurism and birds chirping
Average		**26.3**	**28.8**	**21.2**	**27.3**	**26.3**	**25.3**	Vehicular movement, Psithurism and birds chirping

Summary of Site 1 – Proposed Mining Area (Mashujaa Q&M PLC) Noise results compared to Regulatory Limits

Table 7g: Diurnal Noise Measurement Results for Site 1- Proposed Mining Area

Measurement Point	Measured Diurnal Sound Pressure Level (dBA)		
	LAeq	**Lmax**	**Lmin**
Point 1	40.4	49.1	33.3
Point 2	40.2	50.0	37.2
Point 3	36.7	44.6	30.6
Point 4	38.4	45.7	29.1
Point 5	39.6	47.1	33.7
Point 6	39.6	47.9	31.2
EMC Limits	**60**	-	-
World Bank Limits	**70**	-	-
WHO Limits	**85**	-	-

Table 7h: Nocturnal Noise Measurement Results for Site 1- Proposed Mining Area

Measurement Point	**Measured Nocturnal Sound Pressure Level (dBA)**		
	LAeq	**Lmax**	**Lmin**
Point 1	31.5	36.7	24.6
Point 2	29.7	33.3	21.9
Point 3	28.9	33.0	24.3
Point 4	25.9	30.8	21.9
Point 5	28.7	34.5	23.6
Point 6	26.3	28.8	21.2
EMC Limits	**35**	**-**	**-**
World Bank Limits	**70**	**-**	**-**
WHO Limits	**85**	**-**	**-**

Baseline Ambient noise levels conducted at the proposed mining area project site for the six monitoring locations complied with the EMC limits, World Bank, WHO Noise Limits, both diurnally and nocturnally.

However, the contractor is bound to maintain the noise levels within limits, especially during the construction and mineral ore exploitation phase. Noise permits can be issued if the contractor will be operating at night. However, Mashujaa Q&M PLC has an elaborate noise conservation program during the construction and operation phase of the mine. This includes, and is not limited to; maintaining the noise levels within limits, strict usage of the hearing protectors in noisy areas, proper usage of these protectors, posting of safety signs at the noisy areas, safety talks, noise permits, annual noise surveys and audiometric examinations to workers exposed to noise above 85.0dB(A). This goes a long way in ensuring the health and safety of the workers.

3.17 Air quality

Baseline air quality monitoring and noise level measurement for the mining area was done from **22nd to 24th November** at 6 points. The essence of the baseline air quality testing was to determine air pollutants in ambient air using a gas monitor to measure O_2, CO_X, NO^X, H_2S, SO_X, and Dust using the ambient air quality standards shown in the table below. The six monitoring locations were methodologically selected to represent the project site at the time of monitoring and to represent baseline air and noise quality at the proposed quarry/mining site. **Mashujaa Q&M PLC contracted Polucon Services Kenya Limited** to conduct Baseline Ambient Air Quality and Noise levels monitoring for their proposed project area before the commencements of the project's activities to access, quantity, and record the current air and noise condition of the area. The team undertook the baseline noise assessment at the proposed site area at **Chasimba -Sub location, Kilifi South Sub-County in Kilifi County**, to obtain data that can be used to form a basis for planning the control measures to eliminate or control noise exposure to the workers.

3.18 Ambient Air Quality Tolerance Limits.

Table 8: *Ambient Air Quality Tolerance Limits.*

	Pollutant	**Time weighted Average**			
			Industrial area	**Residential, Rural & Other area**	**Controlled areas*** **
1.	Sulphur oxides (SO_X);	Annual Average*	80 µg/m³	60 µg/m³	15 µg/m³
		24 hours**	125 µg/m³	80 µg/m³	30 µg/m³
		Annual Average		0.019 ppm/50µg/m³	
		Month Average			
		24 Hours		0.048ppm /125µg/m³	
		One Hour			
		Instant Peak		500 µg/m³	
		Instant Peak (10 min)		0.191 ppm	
2.	Oxides of Nitrogen (NO_X);	Annual Average*	80 µg/m³	60 µg/m³	15 µg/m³
		24 hours**	150 µg/m³	80 µg/m³	30 µg/m³
		8 hours			
		Annual Average		0.2 ppm	
		Month Average		0.3 ppm	
		24 Hours		0.4 ppm	
		One Hour		0.8 ppm	
		Instant Peak		1.4 ppm	
3.	Nitrogen Dioxide	Annual Average	150 µg/m³	0.05 ppm	
		Month Average		0.08 ppm	
		24 Hours	100 µg/m³	0.1 ppm	
		One Hour		0.2 ppm	
		Instant Peak		0.5 ppm	
4.	Suspended Particulate	Annual Average*	360 µg/m³	140 µg/m³	70 µg/m³

1

	Pollutant	**Time weighted Average**			
	matter (SPM)				
		24 hours**	500 µg/m³	200 µg/m³	100 µg/m³
			Industrial area	**Residential, Rural & Other area**	**Controlled areas*** **
		mg/Kg			
		Annual Average****		100 µg/m³	
		24 hours***		180 µg/m³	
5.	Respirable Particulate Matter (<10 µm) (RPM)	Annual Average*	70 µg/m³	50 µg/m³	50 µg/m³
		24 hours**	150 µg/Nm³	100 µg/Nm³	75 µg/Nm³
6.	$PM_{2.5}$	Annual Average	35 µg/m³		
		24 hours	75 µg/m³		
7.	Lead (Pb)	Annual Average*	1.0 µg/Nm³	0.75 µg/Nm³	0.50 µg/m³
		24 hours**	1.5 µg/m³	1.00 µg/m³	0.75 µg/m³
		Month Average		2.5	
8.	Carbon monoxide (CO)/ carbon dioxide (CO_2)	8 hours**	5.0 mg/m³	2.0 mg/m³	1.0 mg/m³
		1 hour	10.0 mg/m³	4.0 mg/m³	2.0 mg/m³
		mg/Kg			
		24 hours**			
9.	Hydrogen Sulphide	24 hours**	150µg/m³		
10.	Non-methane hydrocarbons				
		instant Peak	700ppb		
11.	Total VOC	24 hours**	600 µg/m³		
12.	Ozone	1-Hour	200 µg/m³	0.12 ppm	
		8 hour (instant Peak)	120 µg/m³	1.25 ppm	

3.18.1 Description of the monitoring locations

Table 9: *Description of Site 1 Mining Area (Mashujaa Q&M PLC)*

Point	GPS Coordinates	Weather	Description
Point 1	S -3^0 44' 02.71'' E – 39^0 42' 07.11''	Sunny and slightly windy daytime. Cold at night	This point was located near a rough road and the main Mavueni-Kaloleni highway.
Point 2	S -3^0 43' 53.42'' E – 39^0 42' 18.11''	Sunny and slightly windy daytime. Cold at night	This point was located near a rough road and the main Mavueni-Kaloleni highway.
Point 3	S -3^0 43' 43.92'' E – 39^0 42' 33.60''	Sunny and slightly windy daytime. Cold at night	The area was located within valleys and hills. There are no bordering roads just foot paths
Point 4	S -3^0 43' 34.86'' E – 39^0 42' 31.33''	Sunny and slightly windy daytime. Cold at night	The area was located within valleys and hills. There are no bordering roads just foot paths
Point 5	S -3^0 43' 36.82'' E – 39^0 42' 39.94''	Sunny and slightly windy daytime. Cold at night	This point was located opposite the Mavueni-Kaloleni highway
Point 6	S -3^0 43' 13.55'' E – 39^0 42' 42.32''	Sunny and slightly windy daytime. Cold at night	This point was located opposite the Mavueni-Kaloleni highway

Figure 21: *A map showing the Proposed Mashujaa Q&M Limestone Mine Site Area at Chasimba -Sub location, Kilifi South Sub-County in Kilifi Ciounty.*

3.18.2 Results of the Findings

Air Quality

Air Quality measurement results for Site 1 – Proposed Mining Area (Mashujaa Q&M PLC)

Table 11: ***Air quality results for Site 1***

Point	Temp(^{0}c	Humidity	PM2.5(ug/m^3)	PM10(ug/m^3)	CO(mg/m^3	SO2(ug/m^3	H2S(ug/m^3	NO2(ug/m^3	O3(ug/m^3	NO(ug/m^3
Point 1	26.76	78.14	9.00	10.00	0.39	8.27	14.91	35.45	13.95	5.45
Point 2	26.88	74.80	8.45	9.45	0.35	10.18	14.09	31.91	13.82	6.27
Point 3	26.68	79.02	9.62	10.92	0.51	6.08	14.92	18.69	18.12	8.77
Point 4	26.93	74.80	10.91	12.09	0.50	4.73	16.55	18.91	17.65	7.91
Point 5	26.68	78.73	8.62	9.77	0.35	7.31	12.69	18.92	20.72	11.38
Point 6	26.93	74.80	8.18	9.36	0.32	7.27	10.00	30.82	19.78	8.09
EMC	**-**	**-**	**75**	**150**	**8**	**125**	**150**	**100**	**120**	**150**

3.18.3 Graphical representation and discussion of the findings

Site 1 – Proposed Mining Area (Mashujaa Q&M PLC)

3.18.4 Particulate matter (PM 2.5)

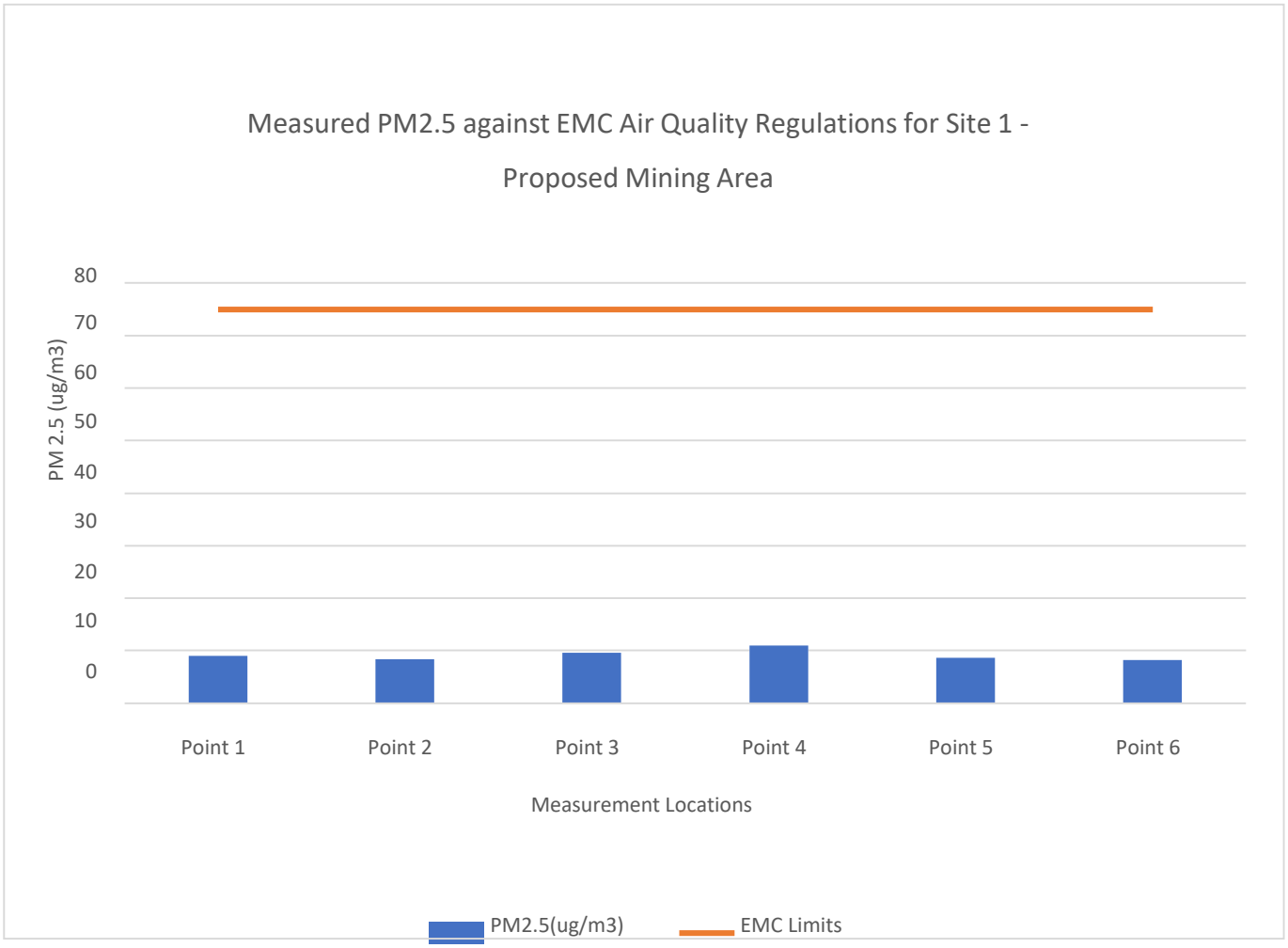


Figure 22: *Measured PM2.5 against EMC Air Quality Regulations 2014 for Site 1 - proposed mining area.*

Airborne particulate matter is categorized into different size fractions. Large particles generally PM10 which have a diameter larger 10 microns come from natural source stirred up by wind and human activities. Small particles generally PM2.5 have a diameter less than 2.5 microns are products of combustion e.g. emissions from vehicles.

Particulate matter (PM2.5) recorded at all monitoring locations showed compliance with the EMC (Air Quality) Regulations, 2014.

3.18.5 Particulate matter (PM 10)

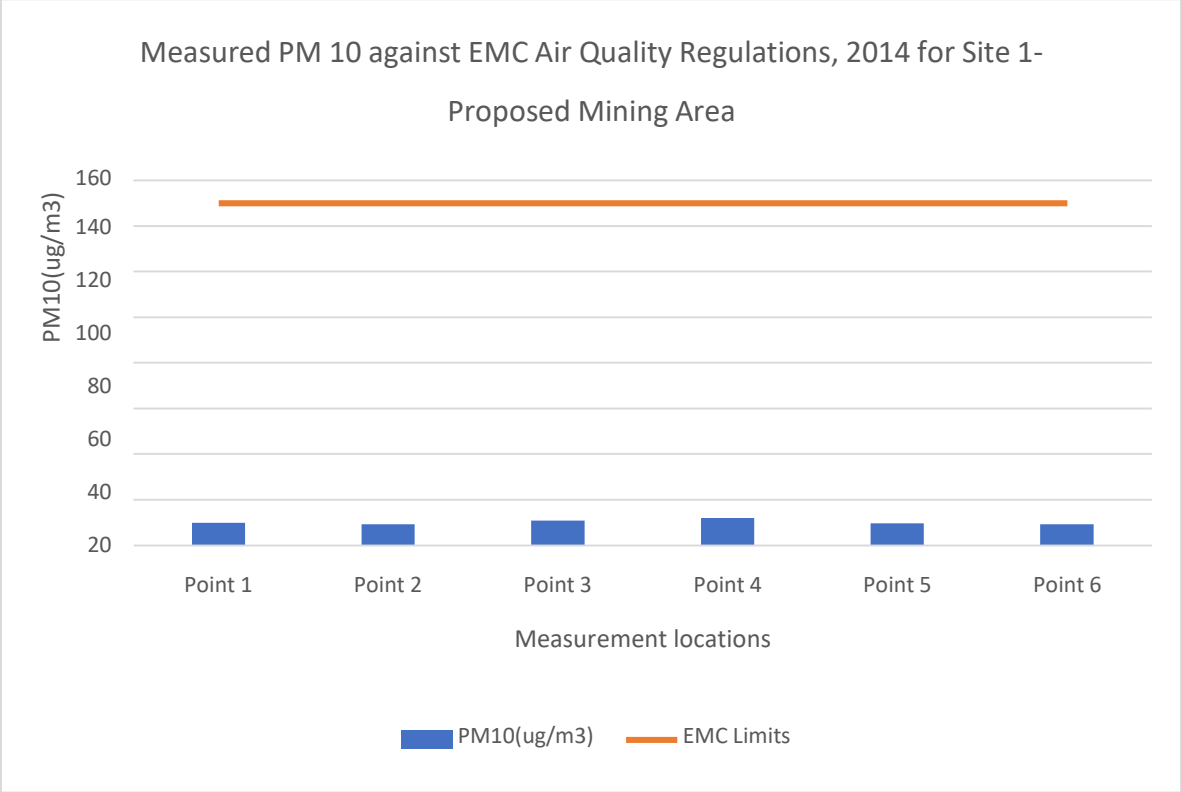


Figure 23: *Measured PM10 against EMC Air Quality Regulations 2014 for Site 1 - proposed mining area.*

Particulate matter (PM10) recorded at all monitoring locations showed compliance with the EMC (Air Quality) Regulations, 2014.

3.18.6 Carbon Monoxide

Carbon monoxide is a product of incomplete combustion of fossil fuels.

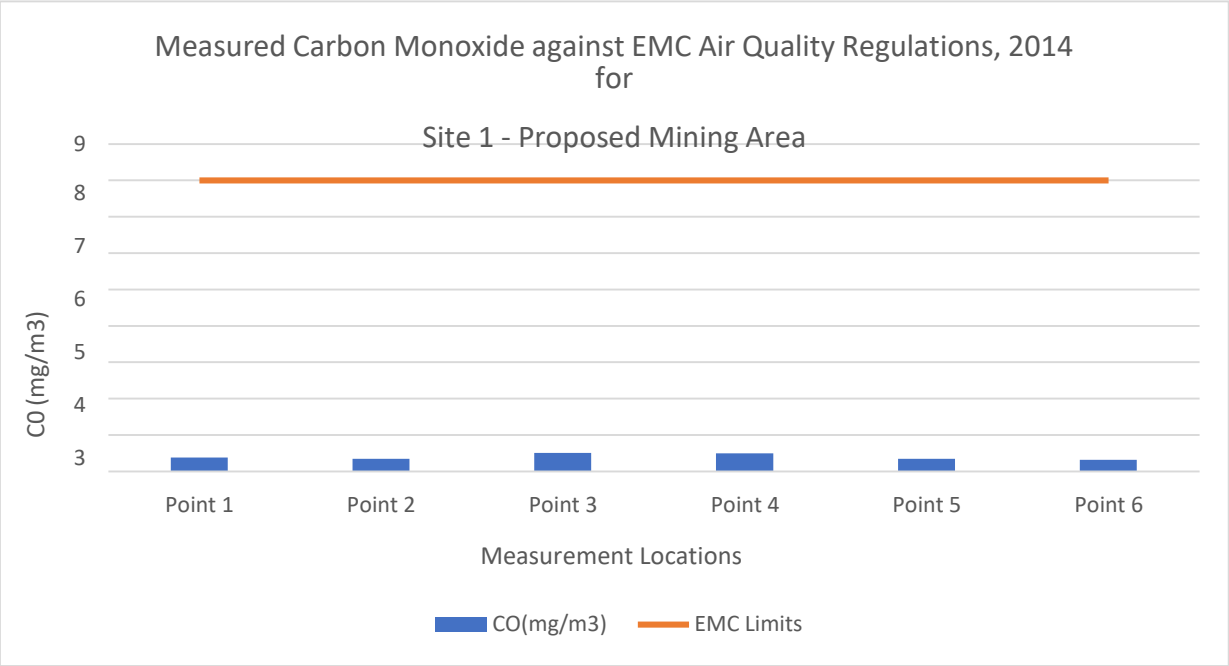


Figure 24: *Measured CO against EMC Air Quality Regulations 2014 for Site 1 - proposed mining area.*

All the monitoring stations had CO levels within the stipulated EMC (Air Quality) Regulations, 2014.

3.18.7 Hydrogen Sulphide

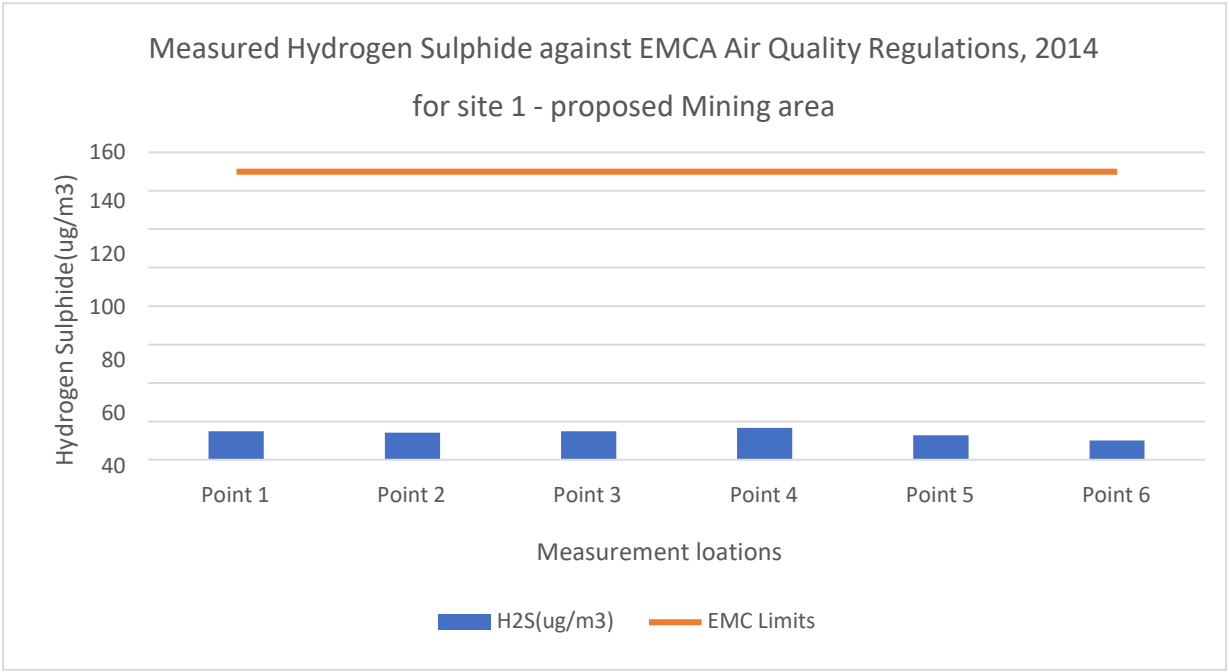


Figure 25: *Measured H2S against EMC Air Quality Regulations 2014 for Site 1 - proposed mining area.*

All the monitoring stations had H2S levels within the stipulated EMC (Air Quality) Regulations, 2014.

3.18.8 Ozone

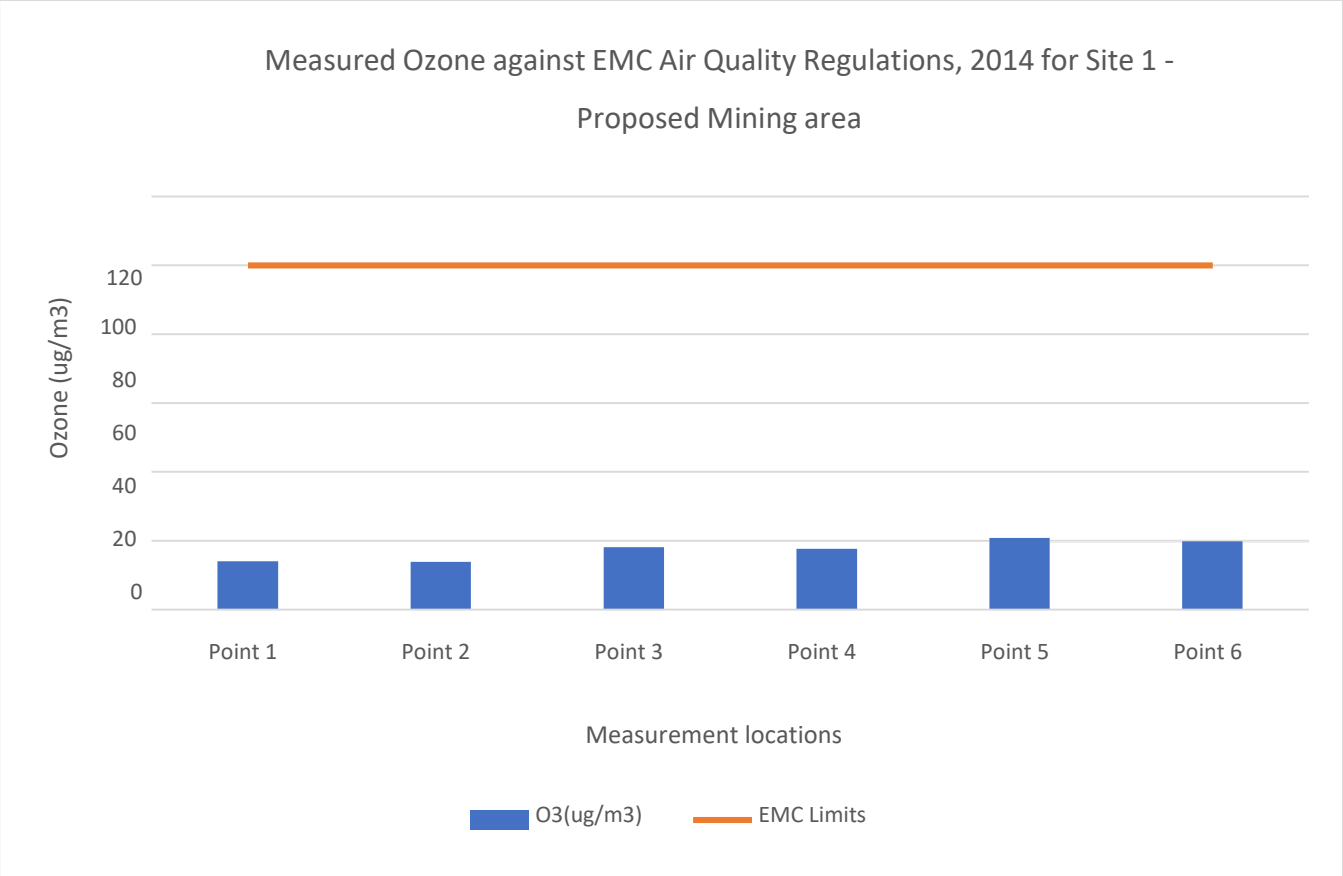


Figure 26: *Measured Ozone against EMC Air Quality Regulations 2014 for Site 1 - proposed mining area*

All the monitoring stations had ozone levels within the stipulated EMC (Air Quality) Regulations, 2014.

3.18.9 Nitrogen Dioxide

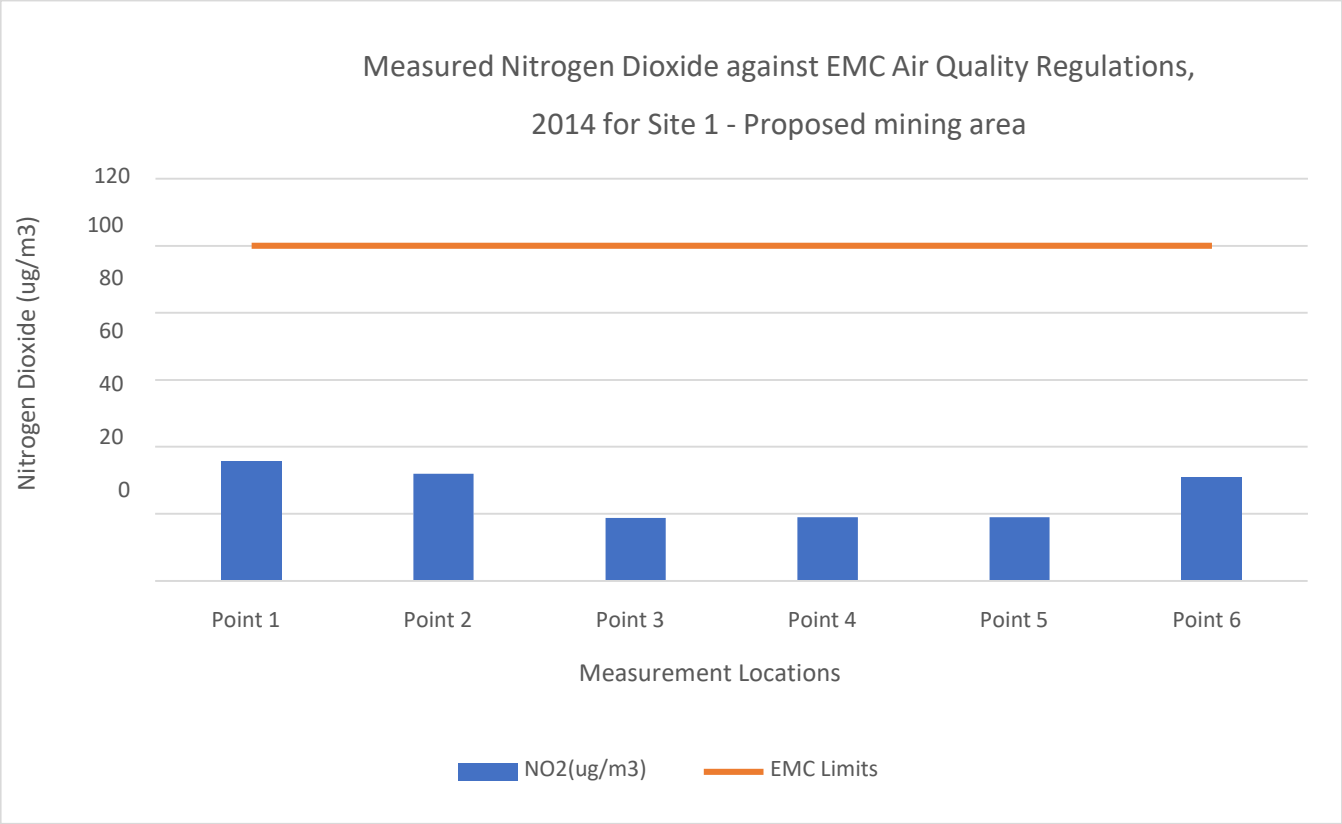


Figure 27: *Measured NO2 against EMC Air Quality Regulations 2014 for Site 1 - proposed mining area.*

Nitrogen dioxide (NO2) and nitric oxide (NO) are formed simultaneously in combustion processes and other high temperature operations such as metallurgical furnaces, blast furnaces, and internal combustion engines. NOX is a term commonly used to refer to the combination of NO and NO2. Nitrogen dioxide can be formed through oxidation process of nitric oxide on presence of oxygen. Nitrogen dioxide can be formed form combustion of fossil fuels.

All the monitoring stations had NO2 levels within the stipulated EMC (Air Quality) Regulations, 2014.

3.18.10 Sulphur Dioxide

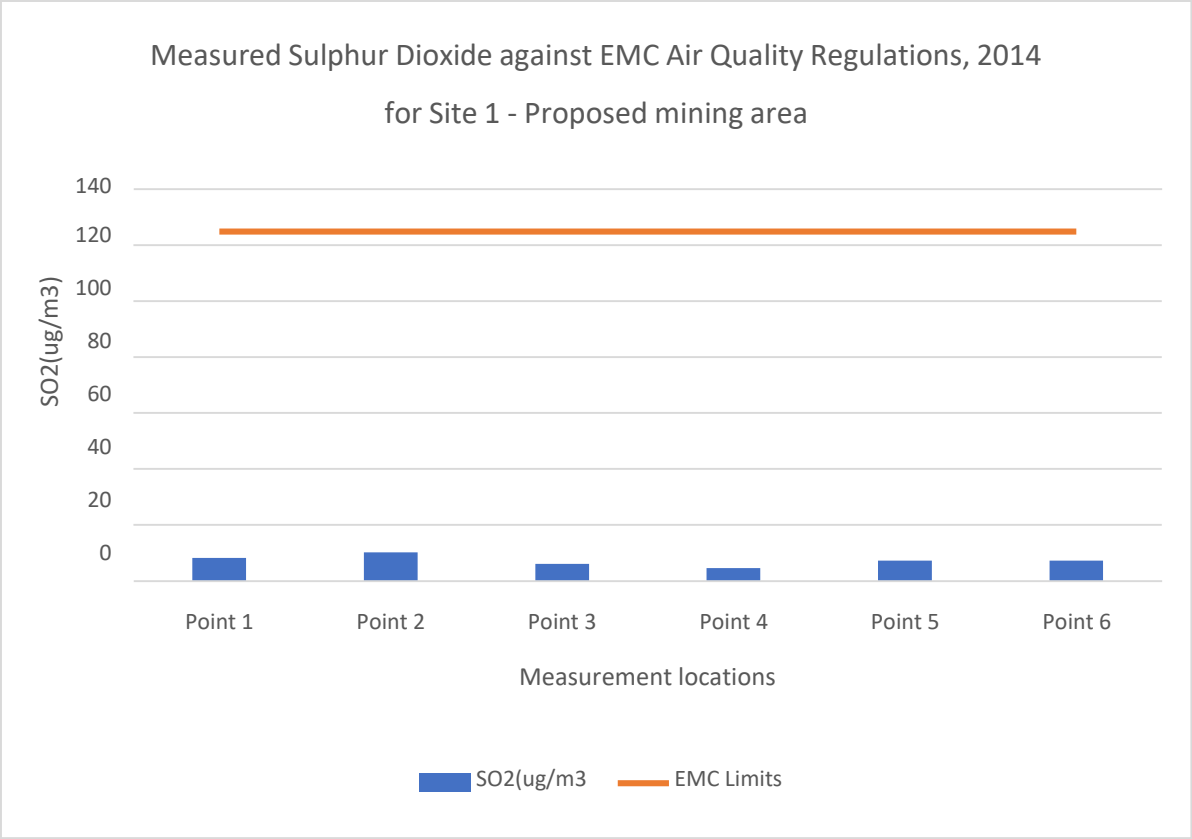


Figure 28: *Measured SO2 against EMC Air Quality Regulations 2014 for Site 1 - proposed mining area*

Sulphur Dioxide is produced by burning fossil fuels and by the smelting of mineral ores that contain sulphur.

All the monitoring stations had SO2 levels within the stipulated EMC (Air Quality) Regulations, Limits, 2014.

3.18.11 Discussion

Baseline ambient air quality conducted at the project sites indicate that low levels of gaseous and particulate matter levels were recorded at all the monitoring locations. Nonetheless, the concentrations were noted to be below the EMC (Air Quality) Regulations, 2014.

This baseline results will be used to assess the quality of the ambient air at the project site during the mine development and exploitation phase. The client is tasked to maintain the concentration levels of the tested parameters within the acceptable limits.

Proper monitoring tools should be employed to check for the quality of the ambient air quality within the project site during the mine development phase of the project. Evaluation of ambient air quality will be done through correlation of the subsequent monitoring data against the baseline and the EMC (Air Quality) Regulations, 2014.

3.19 Biological Environment

3.19.1 Flora

The site is located within a less agriculturally productive area where conditions are not favorable for farming and vegetation. Hence, the proponent has proposed to utilize the land maximally by putting up a limestone mine. The vegetation on the site is scattered shrubs, cashew trees (Anacardium occidentale), and coconut trees (Cocos nucifera).

Figure 29: *Proposed site area in Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County.*

3.19.2 Fauna

There is no existing structure on the site. The site area is open with no observable corrugated boundary beacons. There is a scarce number of monkeys living on the outskirts of the proposed site area. However,

there is no fauna/wildlife threatened by the project. The site had the presence of some insects such as ants, butterflies, mosquitoes, and birds.

3.20 Social Economic Environment

3.20.1 Roads and Accessibility

The project is on private land off Kilifi-Kaloleni road at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County, and GPS. Coordinates Latitude**: (3° 44' 32.5" S), Longitude: (39° 42' 06.4''E).** The site is bout 24km from Kilifi town and about 12km from Kaloleni town. The site location is arrived by road, driving along Kilifi-Kaloleni road. Start at Kilifi town, you drive along Kilifi-Mombasa road and arrive at Mavueni Bus Stage. From the Mavueni Bus stage, drive along Kilifi-Kaloleni road towards Chasimba High School. About 900m, from Chasimba High School and driving along a murram road, you arrive at the proposed site area, Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County, and on GPS. Coordinates Latitude: (3° 44' 32.5" S), Longitude: (39° 42' 06.4''E). The outskirts of the site area are sparsely populated with scattered, commercial, and social structures.

The proposed mine site area has steep, random, and rocky slopes. There is no human settlement on the proposed mine site area. The Geology and topography of the mineral-rich ore land are inaccessible and not suitable for agriculture and human settlements.

Figure 30: *Kilifi-Kaloleni Road.*

Figure 31: *Access road to the proposed site at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County.*

3.20.2 Sewerage System

The Proponent has committed to liaise with Kilifi-Mariakani Water & Sewerage Co Ltd **(KIMAWASCO)** for any public sewerage services and seek advice on the most modern means to handle sewerage in the project. During the initial stages of the project, foul water drainage from the project site will be connected to a conventional biodigester septic tank. There are also plans to ensure further water cleaning and recycling.

3.20.3 Surface- Stormwater Drainage

When rain falls, much water is anticipated to overflow the surface as run-off. In connection to this, the volume of water reaching the natural and public drain system will be large, and as such, it greatly influences the design of an effective surface drainage system within the proposed project. In line with the above, Surface drainage systems will effectively be designed to manage the stormwater, which may be derived from the parking, driveways, and roofs of the site offices). The Proponent will use open (concrete drainage-inverted concrete drains) to drain the site off the excess surface water/storm.

3.20.4 Water Supply

The Proponent has committed to liaising with **Kilifi-Mariakani Water & Sewerage Co Ltd (KIMAWASCO)** for public water services. Rainwater will be harvested and stored in the tanks. Nevertheless, there are also plans to buy water from other water supply companies in the area.

Backup storage tanks will be placed on the site to provide emergency water when the area experiences water shortages and serve during temporal water shortages.

3.20.5 Solid Waste Management

Wastes from the site will be mostly during mine development, mining activities, and decommissioning of the proposed project. The streams of the solid wastes (thus) include the following: -

- Topsoil, surface rock, and all stripping material
- The excavated materials during the construction of site structures
- All wooden met-rock panels and glass materials result from related activities during implementation stage.
- Wastes materials result from sewerage, drainage and water systems, electricity works.
- Office waste materials and other waste, especially during the operation phase.
- Sanitary litter as generated during mine development and mining operations

All debris generated during the mine development process will be disposed suitably into the approved dumpsite or as directed by the local authorities in charge. The handling of solid wastes has been considered in the plans of the proposed project. Therefore, proper handling of solid wastes, mostly during mining activities, will be fundamentally enhanced. The entire project will harmonize the storage, collection, transportation, and disposal.

Solid waste management will consist of dustbins stored in cubicles protected from rain and scavenging animals. The waste will then be collected by a private waste management company to be composted, palletized, or recycled depending on the waste management strategy to be adopted.

3.20.6 Waste Water Management

The Proponent will provide facilities for handling any wastewater generated within the mine site area. The Proponent has committed to liaise with **Kilifi-Mariakani Water & Sewerage Co Ltd (KIMAWASCO**) for public water and sewerage services and seek advice on the most modern means for wastewater management in the project. During the initial stages of the project, Mashujaa Q & M will channel foul water drainage from the project site to a conventional biodigester septic tank. There are also plans to ensure further water cleaning and recycling.

3.20.7 Energy

The project will consume energy during the mine development and mining operations phases. The power (electricity) is accessible from the neighborhood (along Kilifi-Kaloleni and site access road). The Proponent will make the electric connection to the existing grid line from Kenya Power Company. The Proponent has planned to install Solar energy. Mashujaa Q & M will emphasize The need for energy conservation during mine development and commercial mining activities. However, the ultimate goal is to ensure sustainable mining operations by employing green energy.

3.2.2.8 Communication

The area is well covered by communication facilities such a Telkom, Safaricom, and Airtel. All these will facilitate communication during the implementation and operation of the project.

3.20.8 Security

The Proponent will hire a private firm to provide security on the premises. All the security details that will make the premises secure will be included. The Proponent will hire a security firm to provide security services at the site during the limestone mine development and during the mine operation phase of the project.

3.20.9 Economic Activity

The proposed Mashujaa Q& M limestone mine site is in Kilifi South-Sub County, one of the centers of commercial and industrial development in Kilifi County. The project is on avast mineral deposits (limestone) land. The land area is not suitable for agriculture. The project is in line with one of the big four agendas by the government of Kenya to raise manufacturing sector contribution to GDP from 8.5% to 15% and create 1,000,000 new jobs in the manufacturing sector. Limestone has numerous uses; it is an essential component of concrete Portland cement, it is a source of lime (calcium oxide) for industrial steel manufacturing, used as an aggregate for the base of roads, as white pigment or filler in products such as toothpaste or paints, and as a soil conditioner. An increase in the exploitation of limestone ore mining will lead to the supply of readily available raw materials for different industrial purposes.

I. Tourism

Tourism and fishing in Kilifi are major economic activities due to its proximity to the Indian Ocean. Kilifi county has some of the best beaches and popular resorts and hotels. Kilifi town is on the coast of Kenya, north of Mombasa. It's near Kilifi Creek, along an estuary of the Goshi River. The town is known for Indian Ocean beaches, including Bofa Beach, dotted with resorts. Nearby, green turtles swim among coral

reefs in Watamu Marine National Park and Reserve. Other attractions include historical sites such as the Mnarani Ruins, that date back to between the fourteenth and seventeenth century.

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II. Fishing

After tourism, the primary source of income, which dwindled during the Covid-19 pandemic, has been fishing. Fishing activities occur along the shores of the Indian Ocean from Mtwapa in the south to Ngomeni in the north in Kilifi County. The fishing industry has provided a livelihood for the Kilifi residents for many years. It brings together the entire fish dwellers with a population of over 30,000 people.

III. Mining

Kwale and Kilifi counties have vast mineral deposits whose exploitation could boost the region's economy. Mineral deposit includes; Manganese, Iron, Lead, Zinc, Titanium. Coal, limestone (cement manufacture), building Stones. Most quarries use the open-pit method of mining. Approximately 1.4 billion tonnes of titanium have been discovered in Kilifi county at Vipingo and Sokoke area.

There are ongoing mining and industrial development in the neighborhood near the proposed site. Some of the existing mining and industries operating in the area are; Manganese ore artisanal mines at Galanema, river sands excavation at Kizingo, National Cement Company Limited, ballast stone production, and Mombasa cement at Vipingo area.

The proposed mine site project will alleviate unemployment for the community in Chasimba and Kilifi-Sub County at large

3.20.10 Neighborhood

Kwale and Kilifi counties have vast mineral deposits whose exploitation could boost the region's economy. Mineral deposit includes; Manganese, Iron, Lead, Zinc, Coal Limestones (cement manufacture) building Stones.

There are other ongoing mining and industrial development in the neighborhood proximity to the proposed mine site. Some of the existing industries operating in the neighborhood are; Manganese ore artisanal mines at Galanema, river sands extractions at Kizingo, National Cement Company Limited, ballast stone production, and Mombasa cement at Vipingo area, as shown in the pictures below.

Figure 32a: *Artisanal Manganese ore mining in the neighbourhood at Galanema in Kilifi South Sub-County.*

3.20.11 Housing condition

The proposed mine site area has steep, random, and rocky slopes. There is no human settlement on the proposed mine site area. The Geology and topography of the mineral-rich ore land are inaccessible and not suitable for agriculture and human settlements

There are scattered human settlements in the outskirts of the project site area.

Figure 32b: *Sparse human settlement in the outskirts of the proposed project site.*

Figure 33c: *Sparse human settlement in the outskirts of the proposed project site.*

CHAPTER 4: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

4.1 General Overview

This chapter highlights the policies, legislation, guidelines, standards, and regulations used in advising the EIA process. Environmental Impact Assessment (EIA) as a tool for environmental conservation has been identified as a critical component in new project implementation. At the national level, Kenya has put into place necessary legislation that requires EIA to be carried out on every new project, activity, or program (EMCA, 1999.), and a report submitted to the National Environmental Management Authority (NEMA) for approval and issuance of relevant certificates and licenses.

The National Environment Management Authority (NEMA), is established under the Environmental Management and Co-ordination Act No. 8 of 1999 (EMCA) to exercise general supervision and coordination over all matters relating to the environment and to be the principal instrument of the Government of Kenya in the implementation of all policies relating to the environment. NEMA uses Environmental Impact Assessment (EIA) as a tool for ensuring sustainable development for the future by mainstreaming environmental and social safeguards in all projects, plans, and programs.

In ensuring facilitation and implementation of this process, there has been the establishment of the EIA regulations amendments, the Environmental (Impact Assessment/Audit) (Amended) Regulations, 2019 gazetted on 30 April 2019 Under Legal Notice No. 31 and 32 for submission of the Summary Project Report (SR), Comprehensive Project Report (CPR), and ESIA study reports.

Besides, several other national policies and legal statutes have been reviewed to enhance environmental sustainability in national development projects across all sectors.

4.2 National Policy Framework

Environment Policy (Sessional Paper No.6 of 1999 on Environment and Development)

Most of the current Kenya environment policy is embodies in the Sessional draft paper No. 6 of 1999 (Environment and Development). It focuses on a range of environmental issues and challenges.

Chapter 5, part 5 of the sessional Paper No. 6 of 1999 on Environment and Development dealt with the EIA. It defined ESA and underscored its importance in environmental protection, it also emphasized monitoring

at all stages of the project and the need to carry out period environment audits to determine if the developers are fully mitigating identifies in the assessment.

The Environment Policy called on the Government to:

- Formulate comprehensive EIA guidelines, procedures, and legislation
- Strengthen and develop environmental standards
- Establish a system for EIA audits, monitoring, evaluation, and appeal
- Subject new and existing projects and programs to ecological monitoring and auditing;
- Strengthen capacities in institutions and local communities with regards to EIA; and
- Incorporate social and cultural values in the EIA.

Most of what the policy called for was later incorporated in the amended EMCA, 2015 and the Environmental Impact Assessment Regulations, 2003

Among the key objectives of the Policy Paper on Environment and Development (Sessional Paper No. 6 of 1999) are: -

(i) To ensure that from the onset, all development policies, programs, and projects take environmental considerations into account,

(ii) To ensure that an independent environmental impact assessment (EIA) report is prepared for any industrial venture or other development before implementation,

(iii) To come up with effluent treatment standards that will conform to acceptable health guidelines.

Under this paper, broad categories of development issues have been covered that require a sustainable approach. These issues include the waste management and human settlement sectors. The policy recommends the need for enhanced re-use/recycling of residues, including wastewater, low non-waste technologies, increased public awareness-raising, and appreciation of a clean environment. It also encourages the participation of stakeholders in the management of wastes within their localities. Regarding human settlement, the paper encourages better planning in both rural and urban areas and provision of basic needs such as water, drainage, and waste disposal facilities. The proponent submits to adhere to this policy through

undertaking an EIA (CPR) as required while ensuring that all adequate environmental safeguards will be implemented through the project lifecycle.

4.3 The National Environment Policy, 2013

This policy builds on the Sessional Paper No. 6 of 1999 on environment and development and has emerging issues such as;

- Climate change Invasive Species Disaster management
- Gender and Youth Mainstreaming in the environment management
- Partnership and stakeholder involvement

4.4 National Environmental Action Plan (NEAP)

According to the Kenya National Environment Action Plan (NEAP, 1994), the Government recognized the negative impacts on ecosystems emanating from industrial, economic, and social development programs that disregarded environmental sustainability. The NEAP also established the process of identifying environmental problems and issues, awareness raising, building national consensus, defining policies, legislation and institutional needs and planning environmental projects. Following this, the establishment of appropriate policies and legal guidelines, and harmonization of the existing ones, have been accomplished and/or are in the process of development. The policy is relevant to this establishment because the investment falls under the key identified stakeholders of the ESIA Process and also among the key contributors of environmental negative impacts. The proponent has adhered to the policy since he has ensured that an EIA (CPR) is undertaken by licensed experts, who have ensured all due process is followed.

4.5 National Policy on Water Resources Management and Development

While the National Policy on Water Resources Management and Development (1999) enhances a systematic development of water facilities in all sectors for promotion of the

The country's socio-economic progress also recognizes the by-products of this process as wastewater. It, therefore, calls for the development of appropriate sanitation systems to protect people's health and water resources from institutional pollution.

Development projects, therefore, should be accompanied by corresponding waste management systems to handle the wastewater and other waste emanating therefrom. The same policy requires that such projects

should also undergo comprehensive EIAs that will provide suitable measures to be taken to ensure environmental resources and peoples' health in the immediate neighborhood and further downstream are not negatively impacted by the emissions.

In addition, the policy provides for charging levies on wastewater on quantity and quality (similar to polluter-pays-principle) in which those contaminating water are required to meet the appropriate cost on remediation, though the necessary mechanisms for the implementation of this principle have not been fully established under the relevant Acts. However, the policy provides for the establishment of standards to protect water bodies receiving wastewater, an ongoing process. The proponent will adhere to this act requirement by ensuring that waste water is managed through appropriate measures before disposing them to the environment. The proponent will also apply for all necessary permits in relation to wastewater and effluent discharge.

4.6 Institutional Framework

Kenya has several institutions that are mandated with the responsibility of participating and managing the review process of the ESIA. These are;

- The national environment management authority
- Lead agencies
- Technical Advisory Committee (TAC)
- Standards and Enforcement Review Committee
- National Environmental Tribunal
- County Environment Committees

Interested and Affected Stakeholders (IAS) also should participate in the EIA process and give their comments regarding the proposed projects. An extensive and detailed public participation including all IAS was conducted, indicating the proponent's commitment in ensuring stakeholders are consulted while gathering their inputs, views and concerns for consideration in the EIA (CPR) decision making process.

4.7 Environmental Legal Aspects

Relevant Sectoral laws govern different sectors of the environment. Applications of national statutes and regulations on environmental conservation suggest that the owner of any project has a legal duty and responsibility to discharge wastes of acceptable quality to the receiving environment without compromising

public health and safety. This position enhances the importance of an EIA for the proposed extension project to provide a benchmark for its sustainable operation when it is finally commissioned. The key national laws that govern the management of environmental resources in the country have been briefly discussed in this chapter. Notably, wherever any of the laws contradict each other, the Environmental Management and Coordination Act 1999 prevails. The key sectoral laws that touch on EIA include the following;

Provisions in the Environmental Management and coordination (amendments) Act 2015 Relating to EIA

Part VI of EMCA provides for the Environment Impact Assessment (EIA) Project proponents are imposed to conduct EIA at their own cost by expert registered and by the NEMA. The second schedule of the Act list all the projects that must undergo EIA.EMCA requires that the EIA be conducted under the environmental impact assessment regulations, guidelines, and procedures issued under the Act. NEMA is empowered to set up a technical advisory committee to advice on the ESIA reports. Lead agencies are also invited by NEMA to give their comments regarding the EIA report. The proponent has embarked towards adherence to the Act by initiating an EIA (CPR) process being undertaken by licensed experts, who have ensured all due process is followed.

4.7.1 The Environment Management and Coordination Act, 1999 (Amendments)

Established in 1999 and is the most comprehensive on matters of the environment in Kenya. The Act has amendments. Notably, there is the Environmental Management and coordination (amendments) Act 2015.

Part II of the Environment Management & Coordination Act, 1999 states that every person in Kenya is entitled to a clean and healthy environment and has to safeguard and enhance the environment. To ensure this is achieved, part VI of the same Act directs that any proponent of a new project should undertake an EIA study and prepare an appropriate report for submission to the National Environmental Management Authority (NEMA), who in turn may issue a license as appropriate. The second schedule of the same Act lists the proposed project among the key urban developments that must undergo EIA before implementation. The proponent has initiated the EIA (CPR) process as required.

Part VIII section 72 of the Act prohibits discharging or applying poisonous, toxic, noxious, or obstructing matter, radioactive, or any other pollutants into the aquatic environment. Section 73 requires that operators of projects which discharge effluent or other pollutants submit to NEMA accurate information about the quantity and quality of the effluent. Section 74 demands that all effluent generated from point sources are discharged only into the existing sewerage system upon issuance of a prescribed permit from the local

authorities. The proponent submits total adherence to effluent discharge requirements as outlined in the aforementioned sections.

4.7.2 Climate Change Act, 2016

On 6 May, Kenya's Climate Change Act, 2016 became law. President Uhuru Kenyatta assented to Kenya's Climate Change Bill, 2014 after it was approved by both houses of Parliament (the National Assembly and the Senate). This Act provides a framework for action that promotes low carbon, climate resilient development in Kenya, and is an important milestone on the country's path towards developing its economy while simultaneously reducing greenhouse gas emissions.

The outcomes will include:

- mainstreaming climate change responses into development planning, decision making and implementation
- formulating programs and plans to enhance the resilience and adaptive capacity of human and ecological systems to the impacts of climate change
- reinforcing climate change disaster risk reduction in strategies and actions of public and private entities
- mainstreaming intergenerational gender equity in all aspects of climate change responses
- providing incentives and obligations for private sector contributions to achieving low carbon climate resilient development
- promoting low carbon technologies to improve efficiency and reduce emissions intensity
- mobilizing and transparently managing public and other financial resources for climate change responses
- providing mechanisms to facilitate climate change research and development, training, and capacity building
- mainstreaming the principle of sustainable development into planning and decision making on climate change responses
- integrating climate change into the exercise of power and functions of all levels of governance, and enhancing cooperative climate change governance between national and county governments

The proponent shall adhere to the regulations as enforced by the climate change act 2016.

4.7.3 Mining Act 2016

This Act was assented by the President on 6 May 2016. The purpose of the Act is to give effect to Articles 60, 62 (1)(f), 66 (2), 69, and 71 of the Constitution in so far as they apply to minerals; provide for prospecting, mining, processing, refining, treatment, transport and any dealings in minerals. This Act however does not apply to petroleum and hydrocarbon

Mining regulations also require an applicant to obtain License from NEMA offices, prepare a feasibility report and mine closure plans before issuance of a mining license. Gases.

Every mineral in its natural state in, under or upon the land in Kenya; in or under a lake, river, stream, or watercourses in Kenya; in the exclusive economic zone and an area covered by the territorial sea or continental shelf is the property of the Republic and is vested in the National Government in trust for the people of Kenya.

In addition to this, the State has a right of pre-emption of all strategic minerals raised, won, or obtained within the territory of Kenya before they are sold.

The Cabinet Secretary (CS) in charge of mining is responsible for the administration of the Mining Act and has powers to develop regulations to provide for activities in the mining life cycle. Further, the law provides for a Mineral Rights Board that will support the CS on administration aspects such as granting and revoking licenses, designating areas for certain mining operations such as small scale and artisanal mining operations, excluding areas from mining activity.

The CS can declare certain minerals or deposits to be strategic by advising and seeking approval of the Cabinet. The Act also establishes two directorates to assist with the administration – the

Directorate of Mines and the Directorate of Geological Survey. Together, they will manage the activities and information related to mining operations in the country including establishing operational linkages between the national and county governments. The proponent commits total adherence to the aforementioned requirements.

4.7.4 Explosives Act (Blasting explosive rules) 1962

The explosives (Blasting explosives (Amendment) rules 1969, authorizing the use of blasting material and explosives (Blasting explosives) rules 1962, dealing with storage and handling of explosives specifies

conditions within which a facility should operates. The proponent commits to adhere to the requirements of this regulation.

The Physical and Land Use Planning Act, 2019

Physical and Land Use Planning Act, 2019 (the 2019 Planning Act) came into force on 5 August 2019, repealing the Physical Planning Act of 1996 (the 1996 Act). The 2019 Planning Act shall now govern matters relating to the planning, use, regulation, and development of land in Kenya. The drawings (plans) of the quarry project were submitted to Kilifi County Government for approval.

4.7.5 Occupational safety and health act, 2007. (Rev 2010)

The Act makes provision for the health, safety, and welfare of persons employed in factories and other places of work. The provisions require that all practicable measures be taken to protect persons employed in a factory from dust, fumes, or impurities originating from any process within the facility. The provisions of the Act are also relevant to the management of hazardous and non- hazardous wastes, which may arise at a project site.

For developments such as construction projects, the Act is important as it requires project proponents to have adequate management procedures of occupational safety and health at the workplaces. For safe construction works, the contractor and project managers should ensure the following:

- Provision of personal protective equipment (PPE), fire safety, electrical safety, and other precautions essential for safe construction work.
- Provision of physical barriers and solid separators (dust barriers, hazard barriers, temporary walkways, among others, as explained in the extract of the Act.)
- Inspection of construction equipment to ensure that they are in good working condition before beginning a job. In addition, the proponent will ensure that regular inspections and maintenance of the equipment are conducted accordingly.

The proponent commits to adhere to OSHA 2007 requirements in an effort to ensure safety and health off the workers during all project phases.

4.7.6 The Public Health Act (Cap. 242) (Rev 2012)

Under this Act, the proponent and the contractor of the proposed project are required to adapt practicable measures to prevent injurious conditions in the operation site. The act requires the proponent to enhance effective management of Nuisances i.e. noxious matter or wastewater as will be discharged from the operation site and proposed project once completed. To achieve this, systems on the management of both solid and liquid waste (effluent) will be adopted as proposed in the report. For instance, the effluent will be discharged into a waste water treatment bio digester tank before discharging it into the environment. The solid waste shall be handled by a professional garbage collector on regular basis and disposed accordingly.

4.7.7 The County Government Act, 2012

The Act empowers County Governments to make by-laws in respect of suppression of nuisances, imposing fees for any license or permit issued in respect of trade or charges for any services. Local authorities are given the power to control or prohibit all developments which, because of smoke, fumes, chemicals, gases, dust, smell, noise, vibration, or other cause, may be or become a source of danger, discomfort, or annoyance to the neighborhood, and to prescribe the conditions subject to which such developments shall be carried on. In compliance, the EIA (CPR) report has proposed potential mitigation measures (in the EMP and monitoring plan; and the environmental management Framework in the report.

4.7.8 Wildlife (Conservation and Management) Act

The Wildlife Conservation and Management Act, 2013 is the main statute governing all Wildlife resources, and its main aim is to improve the protection, conservation, sustainable use, and management of wildlife resources. The Act revises the Wildlife (Conservation and Management) Act of 1976 and brings wildlife legislation into compliance with the Constitution. Principles of the Act: devolution, effective public participation, ecosystem approach, recognition of wildlife conservation and management as a form of land use on public, community, and private land, self- sustainability (benefits from wildlife offset costs), sustainable utilization, and equitable benefit sharing.

The Wildlife Act conforms to the EMCA on conservation, protection, and management of the environment (Section 26, 1) as well as the hearing of disputes by the National Environment Tribunal and the Environment and Land Court. The Act also conforms to the provision of EMCA, 1999 concerning strategic environmental, cultural, economic, and social impact assessment licenses, where required. In this regard, the proponent will ensure adequate measures will be put in place to ensure maximum protection of the wildlife.

4.7.9 The Water Act 2002

The aim of the Water Act 2002 is to make better provisions for the conservation, apportionment, and use of water resources of Kenya.

Part II section 18 of this Act provides for national monitoring and information systems on water resources. Following this, sub-section 3 allows the Water Resources Management Authority to demand from any person or institution, specified information, documents, samples, or materials on water resources. Under these rules, specific records may require to be kept by an owner of the project and the information thereof furnished to the authority.

Section 73 the Act of the Act allows a person with a license (licensee) to supply water to make regulations for purposes of protecting against degradation of water sources. Section 75 and sub- section 1 allow the licensee to construct and maintain drains, sewers, and other works for intercepting, treating, or disposing of any foul water arising or flowing upon the land for preventing pollution of water sources within his/her jurisdiction.

Section 76 states that no person shall discharge any trade effluent from any trade premises into sewers of a licensee without the consent of the licensee upon application indicating the nature and composition of the effluent, maximum quantity anticipated, the flow rate of the effluent and any other information deemed necessary. The consent shall be issued on conditions including payment of rates for the discharge as may be provided under section 77 of the same Act. The proponent will ensure that relevant licenses and permits related to water and effluent issues are secured in adherence to this act. Among these are the effluent discharge license, borehole drilling permit etc.

4.7.10 The Building Code 2000

Section 194 requires that where a sewer exists, the occupants of the nearby premises shall apply to the local authority for a permit to connect to the sewer line and that all wastewater must be discharged into the sewers. The code also prohibits the construction of structures or buildings on sewer lines. The proponent has put measures in place while developing the design plans approved by Kilifi County Goverment.

4.7.11 The Penal Code (Cap. 63)

Section 191 of the Penal Code states that any person or institution that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offense. Section 192 of the same Act says a person who makes or vitiates the atmosphere in any place to make it noxious to the health

of persons/institution in dwellings or business premises in the neighborhood or those passing along a public way, commits an offense. The proponent shall adhere to the regulations provided in the penal Code.

Environmental management and Co-ordination (Waste management) Regulations 2006

These regulations define the responsibilities of waste generators and define the duties and requirements for transportation and disposal of waste. It provides for mitigation of pollution and provides for hazardous and toxic wastes. The regulations require a waste generator to dispose waste only to a designated waste receptacle. The proponent shall adhere to the regulations and proposes to contract a NEMA registered waste collector.

4.7.12 EIA Guidelines

The EIA guidelines require that EIA be conducted per the issues and general guidelines spelled out in the second and third schedules of the regulations. These include coverage of the issues on schedule 2 (ecological, social, landscape, land use, and water considerations) and general guidelines on schedule 3 (impacts and their sources, project details, national legislation, mitigation measures, a management plan, and environmental auditing schedules and procedures.

4.7.13 Energy Act 2016

The Energy (Solar Water Heating) Regulations, 2012 require among other things that: -

1. All premises within the jurisdiction of local authorities with hot water requirements of a capacity exceeding one hundred liters per day shall install and use solar heating systems;

2 Within five years from the effective date of the Regulations, all existing premises with hot water requirements of a capacity exceeding one hundred liters per day shall install and use solar heating systems.

4.7.14 National Construction Authority Act No. 41 of 2011

This is an Act of Parliament to provide for the establishment, powers, and functions of the National Construction Authority and connected purposes.

The Act defines ―construction works‖ as the construction, extension, installation, repair, maintenance, renewal, removal, renovation, alteration, dismantling, or demolition of: -

1. Any building, erection, edifice, structure, wall, fence, or chimney, whether constructed wholly or partly above or below ground level;

2. Any road, harbor works, railway, cableway, canal, or aerodrome;

3. Any drainage, irrigation, or river control works;

4. Any electrical, mechanical, water, gas, petrochemical, or telecommunication works; or

5. Any bridge, via-duct, dam, reservoir, earthworks, pipeline, sewer, aqueduct, culvert, drive, shaft, tunnel, or reclamation works, and includes any works which form an integral part of or are preparatory to or temporary for the works described in paragraphs (a) to (e), including site clearance, soil investigation, and improvement, earth-moving, excavation, laying of the foundation, site restoration, and landscaping.

The Act establishes the National Construction Authority which among its functions includes overseeing the construction industry and coordinating its development. The National Construction Authority (N.C.A) is mandated to streamline, overhaul and regulate the construction industry in Kenya and establish a code of conduct for the industry.

Among the powers of the Authority include; with the approval of the Minister, to facilitate, or promote the establishment or expansion of, companies, corporations or other bodies to carry on any activities related to construction either under the control or partial control of the Authority or independently.

The Act states the conditions required for one to be registered to trade as a contractor in the country, whether a local or a foreigner. It defines a contactor as;

A person who carries on business as a contractor where such person, for reward or other valuable consideration, undertakes the construction, installation or erection, for any other person, of any structure situated below, on or above the ground, or other work connected therewith, or Execution, for any other person, of any alteration or otherwise to any structure or other work connected therewith, and undertakes to supply: -

1. The materials necessary for the work, or is authorized to exercise control over the type, quality, or use of the materials supplied by any other person;

2. The labor necessary for the work, or is authorized on behalf of the person for whom the work is undertaken or any other person, to employ or select workmen for employment for the execution of the work, whether under a contract of service or otherwise.

The proponent shall adhere to the regulations stipulated in the National Construction Authority Act.

4.7.15 Way leaves Act Cap 292

According to the Way leaves Act cap 292 Section 2, Private land does not include any land sold or leased under any Act dealing with Government lands.

Section 3 of the Act states that the Government may carry any sewer, drain or pipeline into, though, over or under any lands whatsoever, but may not in so doing interfere with any existing building. Section 8 further states that any person who, without the consent of the Permanent Secretary to the Ministry responsible for works (which consent shall not be unreasonably withheld), causes any building to be newly erected over any sewer, drain or pipeline the property of the Government shall be guilty of an offense and liable to a fine of one hundred and fifty shillings, and a further fine of sixty shillings for every day during which the offense is continued.

4.7.16 Registration of Titles Act Cap 281

Section 34 of this Act states that when land is intended to be transferred or any right of way or other easement is intended to be created or transferred, the registered proprietor or, if the proprietor is of unsound mind, the guardian or other person appointed by the court to act on his/her behalf in the matter, shall execute, in original only, a transfer in form F in the First Schedule, which transfers shall, for the description of the land intended to be dealt with, refer to the grant or certificate of title of the land.

4.8 Regulatory Framework

4.8.1 The Environment (Impact Assessment and Audit) Regulations, 2003

Environmental (Impact Assessment / Audit) (Amended) Regulations, 2019 gazette on 30 April 2019 Under Legal Notice No. 31 and 32 for submission of the Summery Project Report (SR), Comprehensive project Report (CPR), and ESIA study reports (SR).

These are entrenched under sections 58 and 69 of the EMCA. The regulations provide the framework for carrying out EIAs in Kenya on any commencing project and EAs for undergoing projects.

The Environmental Management and (Water Quality) Regulations, 2006

These regulations set the standards for domestic water and wastewater. The regulations are meant for pollution control and prevention and provide for the protection of water sources. The proposed project will put in adequate measures to ensure the water quality regulations are adhered to. The proponent shall adhere to the water regulations provided.

4.8.2 Environmental Management and Co-ordination (Waste management) Regulations 2006

These regulations define the responsibilities of waste generators and define the duties and requirements for the transportation and disposal of waste. It provides for the mitigation of pollution and provides for hazardous and toxic wastes. The regulations require a waste generator to dispose of waste only to a designated waste receptacle. The proponent shall adhere to the regulations and proposes to contract a NEMA registered waste collector.

Environmental Management and Coordination (Noise and Excessive Vibrations Pollution) (Control) Regulations, 2009

The noise and excessive vibrations regulations require that noise and excessive vibrations should be minimized to the largest extent possible ant that this should not exceed particular decibels. To minimize the impacts of noise and vibrations from the activities, the activities will be limited to working hours between, 8.00 am and 5.00 pm. All possible care will be undertaken to ensure that the machinery is properly greased and oiled to reduce friction and possible noise emission. The proponent shall strictly adhere to the provisions and requirements of these Regulations.

4.8.3 Environmental Management and Co-ordination (Air Quality) Regulations, 2013

This Regulation provides for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. It provides for the establishment of emission standards for various sources such as mobile sources (e.g. motor vehicles) and stationary sources (e.g. industries) as outlined in the EMCA, 1999. It also covers any other air pollution source as may be determined by the Cabinet Secretary in consultation with the Authority. Emission limits for various equipment and facilities have been set. The regulations also establish the procedures for the issuance of emissions licenses, measurement of emissions, inspection and monitoring programs, and reporting requirements. The proponent commits to adhere to the requirements of this regulation.

4.8.4 Conservation of Biological Diversity (BD) Regulations 2006

These regulations are described in Legal Notice No. 160 of the Kenya Gazette Supplement No. 84 of December 2006. These Regulations apply to conservation of biodiversity which includes Conservation of threatened species, Inventory and monitoring of BD and protection of environmentally significant areas, access to genetic resources, benefit sharing and offences and penalties. The proponent commits to adhere to the requirements of this regulation.

4.8.5 Fossil Fuel Emission Control Regulations 2006

These regulations are described in Legal Notice No. 131 of the Kenya Gazette Supplement no. 74, October 2006. The regulations include internal combustion engine emission standards, emission inspections, the power of emission inspectors, fuel catalysts, licensing to treat fuel, cost of clearing pollution and partnerships to control fossil fuel emissions. The fossil fuels considered are petrol, diesel, fuel oils and kerosene. *The proponent commits to adhere to the requirements of this regulation.*

4.9 International Conventions and Treaties

Kenya has ratified or acceded to numerous international treaties and conventions. Those that have implications on the project are described below:

Convention on Biological Diversity (CBD) 1993: The CBD adopts a broad approach to conservation. It requires Parties to the Convention to adopt national strategies, plans and programmes for, the conservation of biological diversity, and to integrate the conservation and sustainable use of biological diversity into relevant sectoral and cross-sectoral plans, programmes and policies. The proposed project is expected to conserve biodiversity in the project area and its environs in compliance with the Conservation of Biological Diversity Regulations, 2006.

United Nations Framework Convention on Climate Change 1992: Sets an ultimate objective of stabilizing greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system. Development projects in Kenya such as the proposed project are expected to take climate change considerations into account, to the extent possible, in their relevant social, economic and environmental policies and actions.

United Nations Convention to Combat Desertification 1994: Addresses the problem of the degradation of land by desertification and the impact of drought, particularly in arid, semi-arid and dry semi-humid areas. This convention is domesticated in EMCA 1999 via Section 46 where County Environment Committees are required to identify areas that require re-forestation or afforestation as well as to the locals to carry out these activities.

The proponent shall adhere to the relevant international convention and treaties.

CHAPTER 5: CONSULTATION AND PUBLIC PARTICIPATION

Objectives of Consultation and public Consultation

The objectives of public consultations and stakeholder's engagement in conforming to the environmental legislation in Kenya is to ensure that:

• All stakeholders and interested parties are fully informed of the proposed project and have the opportunity to raise their concerns;

• Any issues resulting from this process are addressed in the EIA and incorporated into the design and implementation of the project.

• Consultation is done on sensitive issues, and baseline information is established to manage any impacts that may arise during the implementation and operation phase of the project.

5.1 Legal Requirements

5.2 EIA and Audit Regulations

Section 17 of the Environmental (Impact Assessment and Audit) Regulations 2003 (Amendments) states that an EIA process should "seek the views of persons who may be affected by the project."

5.3 Consultation with interested and affected parties

Public participation was conducted through key informant interviews, meetings, and discussions mainly with neighboring community/residents, key stakeholders, an n d the proponent. Each respondent filled in the questionnaire on issues relating to awareness about the proposed Mashujaa Q&M limestone mine project, benefits of the project, and whether the project will cause any negative impacts on the following; residents, natural ecology of the area, topography, and geology of the area, recreational and leisure facilities, public health, and safety, effect on water resources and quality, effect on the soils and effect on infrastructure. The copies of those who participated are attached to the annexed page. Moreover, some environmental issues were raised as issues or concerns. These include;

The consultation, stakeholder engagement, and interviews led to the following conclusions.

(i) The proposed Mashujaa Q & M limestone mine project is on a limestone mineral-bearing zone by the Ministry of Petroleum and Mining. There is no human settlement on the project site. The land is not suitable for agriculture and is on maximum nonproductive hence this is best suitable for mining

activity. The project is on private land bought by the proponent at Chasimba Sub-location in Kilifi South Sub-County. The mining technology is a semi-mechanized open pit/open cast mining. Some of the existing industries operating in the neighborhood are; Manganese ore artisanal mines at Galanema, river sands extractions at Kizingo, National Cement Company Limited, ballast stone production, and Mombasa cement at Vipingo area, as shown in the pictures below. Therefore, putting up a limestone mine project will fully maximize the site's potential and was accepted by interested and affected parties (i.e., all the respondents).

(ii) The proposed Mashujaa Q & M limestone mine project will offer employment to area residents. There will be an increase in the exploitation of limestone ore mining that ensures the supply of readily available raw materials for different industrial purposes.

(iii) No significant negative impacts were envisaged from the proposed project activities that cannot be mitigated through the proposed mitigation measure outlined in the report.

Mashujaa Q & M PLC is willing to comply with recommendations and guidelines of the ESIA report about mitigation of significant environmental impacts.

5.4 Questionnaire survey

The detailed questionnaire survey targeted reaching out to the key stakeholders at the grass root. This included political leaders, local administration, community-based organizations, local learning institutions, local faith-based institutions, local medical institutions, opinion leaders, and the business community. The questionnaire is attached at the back of the report appendices. The experts analyzed a summary of all the diverse stakeholders' responses and all the impacts assessed scientifically.

5.5 Focused Group Meetings held at Chasimba Sub-Location

There has been ongoing consultation, stakeholder engagement, and public participation since 2019. The focused group discussions and Barraza were held on 2nd - 3rd November 2021, 1st - 2nd of December 2021, 27th -28th January 2022. The information gathered was subsequently synthesized and incorporated in the Environmental and Social Impact Assessment Project Report.

Figure 34: *The community of Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County during the Public Participation focused group meetings.*

Figure 35: *The community Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County during the public participation meetings.*

Figure 36: *The stakeholder engagement meeting at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County during the focused group meetings.*

Figure 37: *The stakeholder engagement meeting at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County during the focused group meetings.*

5.6 Major Environmental Concerns Raised and their Analyses

5.6.1 Dust Generation

The people expressed concern over the possibility of generating a large amount of dust within the project site and surrounding areas due to mine development, limestone mining activities, construction works, and transportation of limestone ore. Mashujaa Q & M PLC will minimize dust levels through the proposed mitigation measures against dust and particular mater.

5.6.2 Soil and Water Pollution

There was concern over the pollution of topsoil and groundwater. The limestone mining activities will be virtually free of water pollution as no effluents are involved in the process.

5.6.3 Noise and Ground Vibration

There was concern over the possibility of high noise and vibration levels in the project site due to the open pit/open cast mining activities, blasting, and construction work. The sources of noise pollution will include; haulage vehicles, mining equipment and machinery (dozer, dumper, drill, sprinkler), and blasting. However, Mashujaa Q & M PLC will take appropriate steps to minimize noise impacts, including provision protective equipment to mine workers, planning and minimizing the frequency of materials loading, haulage, transport to the market, and ensuring all equipment is well maintained.

5.6.4 Impacts on Ecology

There was a concern over the proposed Mashujaa Q & M limestone mine project and its impact on the Flora and fauna wildlife in the area. There was concern on clearing of vegetation and loss displacement of biodiversity. The Proponent has planned to establish plans and mechanisms to combat any harmful impact on the ecosystem. Another concern raised was the presence of some monkeys in part of the land. However, after further discussion, experts informed the stakeholders that Mashujaa Q & M PLC would carry out mining activities only on the mineral-rich land. However, plans are to relocate any affected monkey to Arabuko-Sokoke Forest Reserve. The proposed Mashujaa Q & M limestone mine project is on a limestone mineral-bearing zone by the Ministry of Petroleum and Mining. There is no human settlement on the project site. The land is not suitable for agriculture, on maximum nonproductive hence this is best suitable for mining activity. In conclusion, the project poses no significant impact on Flora and fauna.

5.6.5 Water shortage

There was concern over the prevailing water condition within the area. Mashujaa Q & M PLC was requested to ensure the availability of an alternative source of water installation of enough water storage tanks as a backup system due to water shortage problems. The investor has committed to liaising with **Kilifi-Mariakani Water & Sewerage Co. Ltd. (KIMAWASCO)** for public water services. Rainwater will be harvested and stored in the tanks. Nevertheless, there are also plans to buy water from other water supply companies in the area.

Backup storage tanks will be installed on the site to provide an emergency water supply when in scarcity.

5.6.6 Sanitation and Wastewater Management

There was concern about how the Mashujaa Q & M limestone mine project will ensure wastewater management in the area. Sanitary wastewater includes domestic sewage, food service, and laundry facilities serving site employees. Recommended sanitary wastewater management strategies include; Segregation of wastewater streams to ensure compatibility with the selected treatment option (e.g., a bio-septic system that can only accept domestic sewage. Sewage from the office blocks will be connected to either a bio septic system or land used as part of the treatment system, treatment to meet Environmental Management and Coordination (Water Quality) Regulations, 2006, standards for sanitary wastewater discharges. Priority will be recycling treated wastewater.

5.7 Positive Impacts Raised Employment Opportunities

The persons interviewed were positive that during its development and operations, the proposed Mashujaa Q & M limestone mine project would create numerous employment opportunities for the residents, most of them being jobless youth.

5.7.1 Increase in the supply of limestone as an industrial raw material

Limestone is a common type of sedimentary carbonate rock. Limestone has numerous uses; it is an essential component of concrete Portland cement, it is a source of lime (calcium oxide) for industrial steel manufacturing, used as an aggregate for the base of roads, as white pigment or filler in products such as toothpaste or paints, and as a soil conditioner. An increase in the exploitation of limestone ore mining will lead to the supply of readily available raw materials for different industrial manufacturing companies. Building contractors will have competitive prices for cement purchases. The cement wills also find their way into constructing affordable houses in Kenya, One of the Big four agendas. Activities such as raw material

and cement importation will also reduce and, therefore, improve the country's gross domestic product and GDP.

5.7.2 Increased revenue to the government

The proposed Mashujaa Q & M limestone mine project will mine limestone for commercial purposes. This will create profit for the company and revenue for the government via taxes, cess fees, and royalties.

Vision 2030

Vision 2030 was launched in 2008 as Kenya‟s development blueprint by the year 2030. Its goal is to Make Kenya a newly industrializing, “middle-income country providing a high-quality life for all its citizens by the year 2030”. Different stakeholders agreed that the establishment of industries is key for the country to achieve the vision 2030. The mine project as an industry will create job opportunities and therefore upgrade the living standards of the citizens.

Support of the Local Businesses in the Chasimba area

The Services offered by the business people at the Chasimba area, such as transporters, will be required to cater for day-to-day activities and operation of the Mashujaa Q & M limestone mine project. That will contribute to the growth and development of such businesses. There will also be investments in housing to cater for the increased workforce, hospitals, schools, shops, among others.

5.7.3 High demand for input to support mining activities

Opencast/Open Pit mining activities depend on various raw material inputs bought from other industries. The proposed limestone project will increase the demand for the input material. This is an opportunity for the existing and new industries.

5.7.4 Corporate social responsibility

Mashujaa Q & M PLC has corporate social responsibility in helping to alleviate some of the challenges faced by the community living at Chasimba rea. The company will develop a safe drinking water facility for the people during the dry season. Some of the open pits will be converted to a water reservoir for the communities in the area. The water reservoir will serve for irrigation and pisciculture purposes. The company will also grant educational sponsorship for the community in the Chasimba area

CHAPTER 6: POTENTIAL ENVIRONMENTAL IMPACTS

6.1 Introduction

This chapter outlines the potential negative and positive impacts associated with the proposed Mashujaa Q&M Limestone Mine Site at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County, and on GPS. Coordinates Latitude: (30 44' 32.5" S), Longitude: (390 42' 06.4''E). The impacts will be related to activities carried out during the mine development phase of the proposed project and the operational/mining phase of the project, which will be associated with the limestone mining/quarrying activities carried out by the proponent. In addition, the decommissioning phase/ mine closure impacts of the project are, discussed. The project's impacts during each life cycle phase (Mine site development, mineral exploitation, and decommissioning) can be categorized into impacts on the biophysical environment, health and safety, and socio-economic impacts.

The mining and allied activities as proposed in the project area which influences the environmental attributes include:

- Site preparation
- Limestone ore excavation/mining
- Construction of access and haulage road
- Drilling & blasting
- Loading & transportation of limestone ore and wastes
- Processing & sizing of limestone
- Disposal of overburden/waste etc.
- Stockpiling of low-grade limestone ore.

6.2 Potential negative impacts;

- Impact on Land and Environment (land contamination)
- Increased Air Pollution
  - Dust Emissions-Particulate Matter (PM)
  - Gaseous emissions
  - Noise pollution and Vibration disturbance
- Occupational Injuries and or Accidents

- Solid Waste Related Pollution
- Impact On Water Environment
- Impact Social Economic Environment
- Impact On Biological Environment
- Negative Impacts on Local Flora and Fauna
- Negative Impacts on Avifauna
- Increased Energy Resource Utilization

6.3 Quantification of the Magnitude of Impacts

The experts assessed the magnitude and significance of impacts based on the following factors:

- Location or extent: The area/volume covered
- Timing: Whether immediate or delayed
- Duration: Short term, long term, intermittent or continuous
- Reversibility of irreversibility
- Likelihood: Probability of the impact taking place
- Significance: Whether it is local, regional, or global

From the observation, expert knowledge based on the magnitude of the predicted impacts was relied upon. The scale applied to analyze the impacts is shown in the table below.

6.4 Impact identification

The International Finance Corporation Performance Standard 1 paragraph 7 emphasizes the process of identifying environmental risks and impacts. The project's type, scale, and location guided the scope of the impact identification. The experts considered the direct and indirect project-related impacts on biodiversity and ecosystem services and residual impacts during the assessment of impacts according to the IFC Performance Standard 6 paragraph 6. Project components potentially impact the environment by altering terrestrial coastal habitats. The ESIA study was confined within the scope affected by the project.

An ecological Risk Assessment Matrix developed by Kurrent Technologies Ltd 2012 was used to assess the project's impacts on biodiversity. The **extent** of impact can be limited to the project site and a specific activity at a particular period or effect beyond the project site. **The duration** in which the impact takes place is also

considered in evaluating the impact. The period can be specific to certain activities or related to the project development's occupancy period. Thus, an impact can be viewed as a short, medium, long term impact or permanent in terms of duration. The impact can affect biodiversity partially or completely. For instance, the impact can destroy only a small part of the habitat, ecological processes, or a small population of species. Thus, **the magnitude** of an impact was evaluated as the proportion of the environmental entity affected. The impact's probability was derived from the frequency of the activity and frequency of impacts. The experts used the four characteristics described above to synthesize the significance of the impact. See below the scale of the risk assessment matrix.

Figure 38: *An ecological Risk Assessment Matrix*

EXTENT

Localized (At localized scale and a few hectares in extent)	1
Study area (The proposed site and its immediate environs)	2
Regional (District and provincial level)	3
National (Country)	4
International (Beyond Kenya)	5

MAGNITUDE

Small and will have no effect on the environment	0
Minor and will not result in an impact on the processes	2
Low and will cause a slight impact on the processes	4
Moderate and will result in process continuing but in a modified way	6
High (processes are altered to the extent that they temporarily cease)	8
Very high and results in complete destruction of patterns and permanent cessation of the processes	10

DURATION	
Very short (0 – 1 Years)	1
Short (1 – 5 Years)	2
Medium term (5 – 15 years)	3

PROBABILITY	
Highly improbable (<20% chance of occurring)	1
Improbable (20 – 40% chance of occurring)	2
Probable (40% - 70% chance of	3

		occurring)	
Long term (>15 years)	4	Highly probable (>70% - 90% chance of occurring)	4
Permanent	5	Definite (>90% chance of occurring)	5

	CONSEQUENCE= (Extent + Duration + Magnitude)																			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
ROBABILITY **1**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
3	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
4	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80
5	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100

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Figure 39: *Method used to determine the environmental risk: Risk = (Extent + Duration + Magnitude) x Probability.*

Low	<30	Where this impact would not have a direct influence on the decision to develop in the area
Medium	30-60	Where the impact could influence the decision to develop in the area unless it is effectively mitigated
High	>60	Where the impact must have an influence on the decision process to develop in the area

Figure 40: *Confidence of assessment table*

The degree of confidence in predictions as per the available information, Kurrent Technologies Ltd. judgment and/or specialist knowledge	Low
	Medium
	High

Table 13; ***Levels of Scale used in the Analysis of Impacts***

Value	Description	Scale Description
0	No impact	This means that to the best knowledge of the expert, the particular activity/action will not have any known impact on the environment. Such an impact will not in any way affect the normalfunctioning of either the human or the natural systems and does not therefore warrant any mitigation.
1	Minimalimpact	Any activity with little impact on the environment calls for preventive measures, which are usually inexpensive and manageable. Such activities have minimum impacts on either natural or human environment or both.
2	Moderateimpact	A moderate impact will have localized effect on the environment.If the effect is negative and cumulative, action in form of mitigation measures needs to be put in place to ensure that it doesn't become permanent and /or irreversible.
3	High impact	An impact is high if it affects a relatively high area (spatial), several biological resources (severity) and/or the effect is felt for a relatively long period (temporal) e.g. more than one year. In casethe effect is negative, such an impact needs to be given timely consideration and proper mitigation measures put in place to prevent further direct, indirect or cumulative adverse effects.

Value	Description	Scale Description
4	Very highimpacts	Such an activity rates highly in all aspects used in the scale i.e., temporal, spatial and severity. If negative, it is expected to affect a huge population of plants and animals, biodiversity in general and a large area of the geophysical environment, usually having trans-boundary consequences. Urgent and specialized mitigation measures are needed. It is the experts' opinion that any project with very high negative impacts **MUST** be suspended until sufficient effective mitigation measures are put in place.
5	Not known	There are activities for which impacts are not yet known e.g. some chemicals are suspected to produce carcinogenic effectsbut this has not yet been confirmed.

Potential Negative Impacts of the Project

Potential negative impacts that may result from the implementation of the proposed Mashujaa Q&M Limestone Mine Site: -

- Impact on Land and Environment (land contamination)
- Increased Air Pollution
  - Dust Emissions-Particulate Matter (PM)
  - Gaseous emissions
  - Noise pollution and Vibration disturbance
- Occupational Injuries and or Accidents
- Solid Waste Related Pollution
- Impact On Water Environment
- Impact Social Economic Environment
- Impact On Biological Environment
- Negative Impacts on Local Flora and Fauna

- Negative Impacts on Avifauna

6.5 IMPACT OF MINING ON LAND ENVIRONMENT

6.5.1 Impact on land topography

The impact on the topography is in the form of changing landscape due to the mining activities in the form of digging, leveling of lands & dumping of mine waste. Due to mining activity within the mine block area, there will be topographical changes. The project location site is at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County, off Kilfi-Kaloleni Road.

The Geology and topography of the mineral-rich ore land are inaccessible and not suitable for agriculture and human settlements. The site is on an area with an approximate altitude (150M-20M). The land terrain slopes towards the southeastern side while the general attitude on the globe lowers southwards. The site's topography has an approximate 40-meter-deep rocky valley at the center area that flows gently towards the southeastern side. Impact on topography can be categorized as follows;

Impacts due to development of mine & open pit excavation and extraction of limestone

- Alteration of relief and altitude of the mine area
- The land-use pattern changes due to land use for mining, dumping, and other mining and associated activities.
- The drainage pattern on the surface changes due to the alterations in the surface topography due to mining and associated activities.

6.5.2 Impact on drainage

Mine excavation may affect the underground water table depending on its particular level during dry and rainy seasons. There is a chance that during the rainy season, the runoff water may find access to some of the open pits in the mine area.

Therefore, it is proposed to keep diesel-operated pumps at each active mine site, particularly during the rainy season, to draw out the accumulated water from the open-pit mine.

The water so discharged will be routed to the natural drainage through drains and settling pits. Also, it is proposed to have a peripheral drain around each pit to restrict the surface runoff into the mine area. The water so discharged will be routed to the natural drainage through drains and settling pits.

6.5.3 Impact on Land environment and Land use

Mining operations involve the development of benches, access roads, haul roads, drilling, blasting, excavation, and transport and handling of product and waste materials. These activities have a significant impact on the land use pattern of the mine area. Mining activities will change the land use pattern of the buffer zone. The site area is in the limestone mining zone under the Ministry of Petroleum and Mining. This will have changed to mine reclaimed land with artificial vegetation and landscaping. The reclaimed land can therefore serve as an ecotourism destination.

The impact on agricultural land is negligible. Most of the land is rocky with limestone-bearing ore. The land is not suitable for agriculture. There will be no deforestation activity within the mine site. There will be a plantation in the ore-bearing mine site boundary and reclaimed area to increase the vegetation.

However, some of the identified sources that may affect the surrounding agricultural and vegetation land are as below;

- Change in land use due to mining, dumping of waste.
- Buffer zone will not be affected as the mining operations are confined only to the surveyed limestone ore-bearing land.
- Drainage from the waste dump and contaminated water from the mines may affect the topsoil's land-use characteristics.
- Degradation of vegetation in the mine area due to limestone extraction, dumping, and transportation.

The tentative area for Mashujaa Q &M Limestone Mine Site is 213.7 Ha.

6.5.4 Impact of Solid Waste Generation

The project has the potential of solid waste generated from the mining operations. Sources of solid waste in the proposed Mashujaa Q & M limestone mine site can be of three categories: mining **waste**, **office, and domestic waste**.

The latter, domestic waste includes waste from the canteen and other eating places within the plant and waste from dwelling houses of staff such waste include food left offers, wastepaper. Office waste includes wastepaper, electronic waste, and sweepings.

"**Mining waste**" means all solid, semisolid, and liquid waste materials from the extraction, beneficiation, and processing of ores and minerals. Another potential waste collected during the mine operation phase is generated from mining equipment (e.g., used oil and scrap metal).

The stratigraphy of the mine site area is partly covered with topsoil mixed with rock boulders/pebbles followed by intact limestone ore deposits. The soil to be generated will be stacked in the earmarked temporary soil stack and utilized for the plantation purpose to be undertaken around the respective mine site area. Moreover, as envisaged, waste generated during mining will be utilized by the respective proponent to make mine roads and allied infrastructures.

Large quantities of topsoil mixed with boulders and pebbles are envisaged to be generated during the commencement of mine development and mining operation. It is proposed to store this topsoil in the earmarked site and will be utilized for nearby avenue plantation purposes after it is separated from the mixed rock boulders and pebbles. It will not be possible to separate the total waste from the suitable limestone ore. Waste rocks and overburden will make mine roads and allied infrastructures. If required, MAshujaa Q & M PLC will sell the portion of the soil, pebbles, and rock boulders unsuitable for plantation and the wastes to intending users for construction purposes after obtaining permission from government authorities.

Impact of Mining Activity on the Fertility Status of the Soil

The fertility status of the soil nearby the mine site area may be affected due to extra dust deposition on the soil. This dust will be settled on the topsoil, resulting in a decrease in soil fertility and a decrease in crop production.

6.6 AIR POLLUTION

The impact on the air environment due to the mining and allied activities arises during the mine development and mining processes. The excavation/removal of topsoil and dumping of overburden (topsoil and host rock) generates fugitive dust in that area. Mining operations are carried out by open pit/opencast semi-mechanized methods generating dust particles due to various activities like excavation, loading, handling of minerals, and transportation. The air quality in the mining areas depends upon the nature and concentration of emissions and meteorological conditions. The major air pollutants due to mining activities include: -

- Particulate matter (dust) of various sizes.
- Gases, such as sulfur dioxide, nitrogen oxides, carbon monoxide from machine & vehicular emission.

Dust is the single air pollutant observed in open cast mines. Diesel operating drilling machines, blasting, and movement of machinery/ vehicles produce NO_x, SO_2, and CO, usually at low levels.

6.6.1 Dust Emissions-Particulate Matter (PM)

Dust is made of fine particles of solid matter on earth; it generally consists of particles in the atmosphere from various sources such as soil lifted by the wind, and aeolian process, volcanic eruptions, and pollution.

Dust is a significant consideration from its nuisance effect on the surrounding atmosphere. Dust is produced in almost all mining activities, surface and underground mining methods: separate particles and particle aggregates-from ultra-microscopic particles to those visible with the naked eye-have various shapes and compositions. In most cases, dust is formed due to the dispersion of solid bodies. It consists of particles that range from 10-7 to 10-4 microns and that carry an electrical charge or are electrically neutral. Dust concentration, or dust content, is expressed by the number of particles or their total weight per unit volume of gas (air). Dust is unstable; its particles adhere to Brownian motion or sedimentation. These particles are truly very small, usually between 0.1 and 1.0 micrometers.

Dust can be of significant nuance surrounding the land user and potential health risk in some circumstances. The generation of fugitive dust during the mining activity will have some impact on the existing vegetation as well as nearby area. The dust may settle on the leaf surface, decreasing evapotranspiration. This may also decrease the process of photosynthesis due to the plugging of the chlorophyll on the leaf surface by the dust. The most significant air pollutant from mining is particulate matter, which will be dispersed in the ambient air and thereby negatively affect the ambient air quality in the vicinity of the mine. Non-point sources are the major contributors to air pollution during mining operations (which cause fugitive emissions). This section describes the potential air quality impacts of the proposed mining activities. Transportation of final products, activities such as loading and unloading products by the front end loaders, dumpers, shovel, and transport of limestone ore from the mining site to the final point will involve heavy vehicles. The dust will be generated during transportation, affecting the localities adjacent to the transport route.

The source of pollution is being given in the table below.

Table 14: *Sources of Air Pollution*

Activities	Air Pollutants
Loading & Unloading	PM10, PM 2.5
Haul Road	PM10, PM 2.5
Transportation	PM10, PM 2.5, SO2, NOx, CO
Mine waste / Top soil handling	PM10, PM 2.5
Drilling	PM10, PM 2.5
Blasting	PM10, PM 2.5, SO2, Nox

6.6.2 Health Effects of E4xposure to Dust-Particulate Matter (PM)

Environmental and occupational pollution has been a major cause of morbidity and mortality. The incidence of occupational disease is increasing worldwide, especially in developing countries, due to the lack of proper quality control documentation and the practical approach to this mammoth problem. The dust produced by mining and mineral ore beneficiation industries causes various types of pathogenesis. Unhygienic dust exposure is linked with an increased risk of chronic obstructive pulmonary diseases. In this vista, mineworkers may also be exposed to numerous occupational hazards, and these materials are the major culprits in mortality and morbidity.

Respiratory diseases associated with inhalation of airborne dust are the most vital group of occupational diseases. Previous study subjects with chronic obstructive pulmonary disease advocate that workplace exposures are powerfully linked with an increased risk of chronic obstructive pulmonary disease. Chronic respiratory diseases account for a public health challenge in industrialized and developing countries because of their health and economic impacts.

Mining dust constitutes numerous materials, including calcium oxide, silicon oxide, aluminum trioxide, ferric oxide, magnesium oxide, sand, and other impurities. The mine dust or its constituents causes pathogenesis of various lung diseases, including chronic bronchitis, asthma, lung cancer, pneumonia, and tuberculosis. Several studies based on workers have reported an increased prevalence of mechanical trauma

and oral mucosal inflammation in all workers exposed to mine dust. Other researchers have established an increased prevalence of respiratory symptoms and reduced lung function indices among workers. There are also other health complications caused by prolonged exposure to mine dust; cough complications of asthma, lung infections, skin allergy, back pain, and chest tightness.

In conclusion, mine dust particle exposure or inhalation causes respiratory complications, and its accumulation in the lung causes epithelial damage and causes inflammation.

Diseases and illnesses associated with potential negative impacts of exposure to dust and other Particulate Matter would include:

- Epithelial damage and body inflammation
- Respiratory complications including lung infections
- Skin allergy
- Coughing
- Eye damage
- Asthma attacks
- Eye damage
- Irritation of the eyes

6.6.3 Gaseous Emissions

The main sources of gaseous emissions are emitted from heavy diesel-powered vehicles that extract and transport ore, usually at a low level. Gas emissions from combustion

of fuels in other stationery, mobile sources, and blasting operations. Gases produced from the limestone mining process include carbon monoxide-CO, nitrogen oxides-NOx, sulfur dioxide-SOx, carbon dioxide – CO_2.

6.6.4 Potential negative impacts of NOx

- Formation acid rain which may negatively affect plant and animal life;
- Visibility impairment through the formation of brown cities;
- Eutrophication, that is, explosive algae growth which can deplete oxygen in water bodies;
- It contributes to global warming;

• Respiratory illness in young children and harm lung function in adults

6.6.5 Potential negative impacts of SOx

• Pollution of the upper atmosphere that results in the formation of smog,

• Acid rain effect on the plant, wildlife, and property;

• Precursor of fine particulate soot, which poses a significant health threat;

• Respiratory illness

6.6.6 Potential negative impacts of CO and CO2

• CO2 contributes to the formation of smog, ground-level ozone, which can trigger serious respiratory problems;

• Greenhouse gas hence contributing to global warming;

• Formation of acid rain potentially damaging to plants, animals, and property;

• Harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and tissues;

• Central Nervous System Effects

6.7 Increased Noise disturbance

Noise pollution is the unwanted or excessive sound that can have deleterious effects on human health, wildlife, and environmental quality. Noise pollution is commonly generated in mining, industrial facilities, and other workplaces, but it also comes from the highway, railway, airplane traffic, and outdoor construction activities.

Measuring and Perceiving Loudness

Sound waves are vibrations of air molecules carried from a noise source to the ear. Sound is typically described in terms of the loudness (amplitude) and the pitch (frequency) of the wave. Loudness (also called sound pressure level or SPL) is measured in logarithmic units called decibels (dB). The normal human ear can detect sounds that range between 0 dB (hearing threshold) and about 140 dB, with sounds between 120dB and 140 dB causing pain (pain threshold). The ambient SPL in a library is about 35 dB, while that inside a

moving bus or subway train is roughly 85 dB; building construction activities can generate SPLs as high as 105 dB at the source. SPLs decrease with distance from the source.

The rate at which sound energy is transmitted, called sound intensity, is proportional to the square of the SPL. Because of the logarithmic nature of the decibel scale, an increase of 10 dB represents a 10-fold increase in sound intensity, an increase of 20 dB represents a 100-fold increase in intensity, and a 30-dB increase represents a 1,000-fold increase in intensity. When sound intensity is doubled, on the other hand, the SPL increases by only 3 dB. For example, if a construction drill causes a noise level of about 90 dB, then two identical drills operating side by side will cause a noise level of 93 dB. On the other hand, when two sounds that differ by more than 15 dB in SPL are combined, the weaker sound is masked (or drowned out) by, the louder sound. For example, if an 80-dB drill is operating next to a 95-dB dozer at a construction site, the combined SPL of those two sources will be measured as 95 dB; the less intense sound from the compressor will not be noticeable. The frequency of a sound wave is expressed in cycles per second (cps), but hertz (Hz) is more commonly used (1 cps = 1 Hz). The human eardrum is a very sensitive organ with a large dynamic range, being able to detect sounds at frequencies as low as 20 Hz (a very low pitch) up to about 20,000 Hz (a very high pitch). The pitch of a human voice in normal conversation occurs at frequencies between 250 Hz and 2,000 Hz.

Precise measurement and scientific description of sound levels differ from most subjective perceptions and opinions about sound. Subjective human responses to noise depend on both pitch and loudness. People with normal hearing generally perceive high-frequency sounds to be louder than low-frequency sounds of the same amplitude. For this reason, electronic sound-level meters used to measure noise levels take into account the variations of perceived loudness with pitch. Frequency filters in the meters serve to match meter readings with the sensitivity of the human ear and the relative loudness of various sounds. The so-called A-weighted filter, for example, is commonly used for measuring ambient community noise. SPL measurements made with this filter are expressed as A-weighted decibels or dBA. Most people perceive and describe a 6- to 10-dBA increase in an SPL reading to be a doubling of "loudness." Another system, the C-weighted (dBC) scale, is sometimes used for impact noise levels, such as gunfire, and tends to be more accurate than dBA for the perceived loudness of sounds with low-frequency components.

Noise levels generally vary with time, so noise measurement data are reported as time-averaged values to express overall noise levels. There are several ways to do this. For example, the results of a set of repeated sound-level measurements may be reported as L90 = 75 dBA, meaning that the levels were equal to or higher

than 75 dBA for 90 percent of the time. Another unit, called equivalent sound levels (Leq), can express an average SPL over any period of interest, such as an eight-hour workday. (Leq is a logarithmic average rather than arithmetic average, so loud events prevail in the overall result.) A unit called day-night sound level (DNL or Ldn) accounts that people are more sensitive to noise during the night, so a 10-dBA penalty is added to SPL values measured between 10 PM and 7 AM. DNL measurements are very useful for describing overall community exposure to aircraft noise.

6.7.1 Sources of Noise Generation

Different activities in mining such as blasting, drilling, loading, hauling, ore handling, mining lead to the generation of noise. The various noise sources mentioned above shall only be periodical and are limited to a fixed period of operation only. In addition to this, the transportation of limestone ore might have a little effect on the noise level. Notably, noise is generated by different machinery; dozer, dumper, drill, sprinkler, blasting operation.

Work zone noise levels in the mining area are expected to increase marginally due to drilling, blasting, excavation, transportation, and limestone ore handling. It is expected that the generated noise will be contained within the active mine area, and there will be no profound effect of noise on the buffer zone. It is further expected that the ambient noise levels within the proposed limestone mine site will conform to noise regulation standards.

Noise is more than a mere nuisance. At certain levels and durations of exposure, it can cause physical damage to the eardrum and the sensitive hair cells of the inner ear and result in temporary or permanent hearing loss, known as noise-induced hearing loss. Hearing loss does not usually occur at SPLs below 80 dBA (eight-hour exposure levels are best kept below 85 dBA), but most people repeatedly exposed to more than 105 dBA will have permanent hearing loss to some extent. In addition to causing hearing loss, excessive noise exposure can raise blood pressure and pulse rates, cause irritability, anxiety, and mental fatigue, and interfere with sleep, recreation, and personal communication. Children living in areas with high levels of noise pollution may suffer from stress and other problems, such as impairments in memory and attention span. Noise pollution control is therefore important in the workplace and the community.

Noise pollution also impacts wildlife. A wide range of animals, including insects, frogs, birds, and bats, rely on sound for various reasons. Noise pollution can interfere with an animal's ability to attract a mate,

communicate, navigate, find food, or avoid predators and thus can even be an existential threat to vulnerable organisms.

6.7.2 Health impacts associated with potential negative impacts of noise

- Hearing loss
- High blood pressure
- High pulse rate
- Irritability
- Anxiety
- Mental fatigue
- Interfere with sleep and personal communication
- Fatigue, headache, nervousness

6.8 Impact of Blasting

The loosening of rock mass will be done by drilling and blasting. Drilling will be done either by wagon drill or jackhammer taking into consideration the bench height varying from 3 meters to 6m.

Noise due to blasting is site-specific and depends on the type, quantity of explosives, dimension of drill holes, degree of compaction of explosive in the hole and rock. Blasting will be performed during the daytime. Shot hole drilling & blasting will be in practice so that the effect of blasting in terms of fly rock and maximum ground vibration will be negligible. The noise produced by blasting would be for an extremely short duration of around 0.5 seconds, though with high intensity. The blasting operations will be conducted in the daytime only as per the mining schedule by a licensed blaster and explosives manager. Time of blasting will be fixed during the day with prior intimation to the villagers for taking shelter. The practice of regularly wetting the blasting ground and spraying water over the blasted material will be adopted to control air pollution. The proposal is to adopt wet drilling on the benches.

6.9 Ground Vibration

Ground vibrations are generated by traveling a shock wave into the rock mass and quickly attenuating. Vibrations are associated with many types of equipment used in mining operations, but blasting is considered the major source. Vibration has affected the stability of infrastructures, buildings, and homes of people living near large-scale open-pit mining operations. Shocks and vibrations resulting from blasting in connection with

mining can lead to noise, dust, and collapse of structures in surrounding inhabited areas. The animal life, on which the local population may depend, might also be disturbed."

There are four parameters used to define the ground vibration, namely:

- Particle displacement - the distance that a particle moves before returning to its original positions (mm)
- Particle velocity – the rate of change of particle displacement (mm/s)
- Particle acceleration – the rate at which particle velocity changes (mm/s) or acceleration due to the earth's gravity (g).
- Frequency – the number of oscillations per second of a particle, Hertz (Hz)

However, in all standards, the most measured parameter is peak particle velocity (Vmax)

Vibrations and air overpressure are monitored in trial blasts to generate sufficient statistical data that could not be used for ascertaining site constants. The site characterization or attenuation relation is obtained by regression analysis of scaled distance (distance of blast from monitoring site divided by the square root maximum charge per delay) and peak particle velocity.

In this manner, a predictor equation is obtained, which can be used for fixing of maximum charge per delay to some degree of reliability according to existing regulations.

$V_{max} = K (D/Q^{-½}) \alpha$

Where,

Vmax = Peak particle velocity

K & α = Site constants

D = Distance of the structure from the blast

Q = maximum charge per delay

6.10 WATER ENVIRONMENT

6.11 Impact on Water Quality-Surface and underground water

Mine excavation may affect the underground water table depending on its particular level during dry and rainy seasons. There is a chance that during the rainy season, the runoff water may find access to some of the open pits in the mine area. Therefore, it is proposed to keep diesel-operated pumps at each active mine site, particularly during the rainy season, to draw out the accumulated water from the open-pit mine. The water discharged will be routed to the natural drainage through drains and settling pits. Also, it is proposed to have a peripheral drain around each pit to restrict the surface runoff into the mine area. The discharged water will be routed to the natural drainage through drains and settling pits. The proponent's objective is to prevent any surface and underground water contamination.

6.11.1 Impacts on Water Regime

The water regime will have no impact as no permanent or seasonal rivers pass on the proposed limestone mine site.

6.12 Waste Water-Related Pollution and Sanitation

There will be no wastewater generated due to the mining activity

Liquid waste generated from the proposed limestone mine project includes sanitary wastewater, stormwater, and waste oil. Wastewater is also generated from cleaning floors and other surfaces and tools and equipment cleaning such as motor vehicles.

Waste oil is generated from servicing of machines and equipment. Handling of the waste oil includes water separation for reuse, selling to recyclers, and burning in incinerators.

6.12.1 Potential negative impacts of wastewater generation include:

- Odor from untreated contaminated wastewater;
- Water scarcity due to high use;
- Water contamination due to high dissolved solids and other contaminants;
- Contamination of groundwater if untreated contaminated wastewater is discharged into the environment;

- Degradation of the quality of water of the receiving water body if contaminated wastewater is discharged into the aquatic environment before treatment;
- Contamination of soils if contaminated wastewater is discharged into the ground
- Occupational injuries and or accidents

6.13 Impact on Occupational Health

The process of excavation/quarrying leads to some health hazards. The most significant occupational health impacts are noise-induced hearing loss, vibrations, physical hazards, and occupational lung disease due to inhalation of dust. As the mining involves excavation of limestone, there may be the possibility of silicosis, Tuberculosis, pulmonary and lungs disease.

The most significant occupational health and safety impacts occurring during the mine development and exploitation phase are; dust, heat, noise and vibrations, physical hazards, chemical hazards, and other mining hygiene issues.

I. **Noise and Vibrations**

Ore loading, hauling, ore handling, blasting, drilling are the main sources of noise and vibrations in open cast mining.

Precautionary measures against noise pollution are proposed to be taken as follows:

- Choosing quieter machinery provided with efficient silencers;
- Confining noise by isolating the source
- Development of green belt in the mine site buffer zone, which acts as a barrier for noise abatement.
- The noise generating machinery will be properly maintained
- The workers will be provided with proper PPEs to minimize the occupational exposures to noise

II. **Physical hazards**

Injuries during mining operations are typically related to slips, trips, and falls contact with falling/moving objects, and lifting / over-exertion. Other injuries may occur due to contact with, or capture in, moving mining machinery (e.g., dump trucks, front loaders). Activities related to mining equipment maintenance represent a significant source of exposure to physical hazards.

III. **Dust**

Exposure to fine particulates is associated with work in most dust-generating stages of the open pit/open cast mining. Exposure to active mine dust is a relevant potential hazard in limestone mining.

6.14 SOCIO-ECONOMIC IMPACTS

6.15 Impact on Socioeconomic Conditions

The proposed mine site area has steep, random, and rocky slopes. There is no human settlement on the proposed mine site area. The Geology and topography of the mineral-rich ore land are inaccessible and not suitable for agriculture and human settlements. The mine site area is non-forest land, and the project does not involve any loss of agricultural land. The vegetation on the site is scattered shrubs, cashew trees (Anacardium occidentale), and coconut trees (Cocos Nucifera). Commencement of mining activity will be beneficial to the socioeconomic environment.

The details of the impact on the socioeconomic environment are as below:

6.15.1 Displacement of the people

The project does not involve any displacement of the people from the proposed limestone mine site at Chasimba Sub-Location. The site area is devoid of any human habitation.

6.15.2 Loss of livelihood

As the area is a non-forest land with steep, rugged ore-bearing rocks and devoid of any grazing or agricultural activities, the impact on the livelihood dependency will be minimal. The mining operation will not affect the cropping pattern and crop productivity as the mine area does not include any agricultural land. The mine storage water may be utilized for agriculture by the nearby area if the proponent and the community make proper arrangements. Rather the project will create a livelihood for the local people in the mines as skilled, Semiskilled and unskilled labor. Further, the mine will also create indirect business opportunities for Transportation worker, and small business development near the mine area.

6.15.3 Changes in population dynamics

Invariably all the managerial, skilled, and semi-skilled workforce required for mining and Associated activities come from both the local area and outside the locality. A highly trained workforce is usually not available in the local population. In addition, people come to the mining areas for trade. Thus, the population

dynamics of the area will undergo a major change over the years. Interaction of traders and business people will help alleviate the economy of the Chasimba area and Kilifi County.

6.15.4 Health impacts

The health status of the people working in the lease area and also in the buffer zone will be affected mainly due to dust emission from the mining operation, loading, and transportation,

Noise generation due to mining and blasting operation, vibration due to drilling and blasting. The mines workers will be provided with dust masks, earmuffs, and earplugs. There is also the risk of spreading Covid-19 as the workers, traders, and business people interact in the area.

Further, a centralized first aid center will be developed for the mine site with all the facilities for the workers. Initial health checkups and periodical health checkups will be conducted for the mines workers. Further, there will be a proposal for organizing a health checkup camp for the nearby villagers and they will be provided with medicines free of cost. There will be water sprinkling along the transportation route that passes through the villages

6.15.5 Infrastructure facilities

There will be the development of infrastructure facilities due to the mining operation in the area. This includes internal village road development and maintenance, provision of safe drinking water for the local people and mines workers, infrastructure and other development of the nearby Schools etc.

6.15.6 Employment opportunities

The mining and associated activities offer opportunities for employment to eligible people from the local population. The project will create direct and indirect employment opportunities.

6.15.7 Mitigation measures

The following socioeconomic activities are proposed to be conducted by the proponent as per the need assessment survey carried out during the primary data collections.

- The mining activity will create employment opportunities for skilled workers, semi-skilled and unskilled workers.
- The labor force for the mine will be hired from a nearby locality.
- First aid facility will be provided to the local people at the doorstep.

- Safe drinking water facilities will be provided during the dry season.
- The proponent will undertake all the necessary pollution control measures to minimize the pollution during the mining operation

6.16 Transportation

There will be the transportation of limestone from the mine area to the sizing and storage area.

Considering the average annual production of **Limestone:** There will be moving around trucks/ tippers per day to transport the limestone. This will create additional traffic.

Load to the Kilifi- Kaloleni road and additional emissions due to vehicular movement.

6.17 BIOLOGICAL ENVIRONMENT

6.18 Impact of the Mining Activity on Biological Environment

The mining site area does not include any forest land. The existing vegetation within the mining license area includes few trees and scrub vegetation which is sparsely scattered. The vegetation on the site is scattered shrubs, cashew trees (Anacardium, Occidentale), and coconut trees (Cocos nucifera). The vegetation's impact is very low and does not amount to deforestation activity.

There is a low number of monkeys living on the outskirts of the proposed site area. However, there is no fauna/wildlife threatened by the project. The site has the presence of some insects such as ants, butterflies, mosquitoes, and birds.

The transportation of limestone and dump waste may create dust pollution, creating loss of biodiversity of the area.

Dust in the atmosphere, contributed by mining and associated activities, when deposited on the leaves of the plants in the surrounding areas, may retard their growth.

Noise and vibrations due to the blasting and operation of the machines drive away from the wild animals and birds from the nearby habitats.

The growth of vegetation and agriculture in and around the mine site.

The mine area and its buffer zone are devoid of any eco-sensitive area. So the impact on biodiversity and wildlife is minimal.

6.18.1 Negative impacts on local flora

The proposed Mashujaa Q& M limestone mine site will directly negatively impact the few local vegetation (scattered shrubs, cashew tree- Anacardium occidentale, and coconut tree -Cocos nucifera). This is because some of the vegetation on site will have to be cleared to pave the way for the mine development, office building, other associated components.

The potential negative impact of vegetation clearance will include the following:

- Reduction in local greenery.
- Diminishing of local carbon sink resulting in reduced area capacity of carbon sequestration;
- Overall reduction of flora in the area and overall loss and reduction of ecological and economic services derived from the lost vegetation;

6.18.2 Potential Negative impacts on local fauna

Based on the knowledge on hazards, ecological hazards in the terrestrial ecosystem can be coined to be any biological, chemical, mechanical, environmental, or physical agent that is likely to cause harm to other organisms and damage to habitats and ecological processes in the environment in the absence of their control. Potential risks that would likely occur when the mine project is implemented include destruction of;

- Foraging areas for insect pollinators
- Ecological life cycles of insects and butterflies

Notably, observation from site investigation revealed the presence of small insects, butterflies, and birds in the site area. There are a low number of monkeys living on the outskirts of the proposed site area. However, fauna diversity and population in the area are low. Due to the low population of this group in the area, chances of interference would also be below.

The clearance of vegetation for limestone mine development can reduce the foraging area for insect pollinators such as butterflies and bees. Insect pollinators rely on the vegetation for food nectars and fruit juice. Development activities normally take up more areas from the natural habitats that serve these tasks on various ecological services, including foraging. When these areas are continuously reduced, the insect pollinators are left with small areas, affecting their population with little resources. However, most insect

pollinators tend to local movements for foraging and breeding. This ecological behavior provides them with the capacity for resilience.

6.18.3 Negative Impacts on Avifauna

The implementation of the proposed project will lead to negative impacts on avifauna in the area. The project can potentially affect the avifauna of the project area from the associated mine development activities. This is mainly through ecological disturbance leading to displacement or exclusion of birds. There will be the complete annihilation of their habitats for some species. This is because the mining activities are likely to cause site-specific negative impacts on the biophysical environment of the project area, which will affect avifauna in various ways, including increased pressure and loss of habitat and essential resources for food and nesting for birds.

The following are the potential impacts on avifauna at the proposed site.

- The impacts of direct habitat loss due to annihilation of the species habitats.
- The impacts of habitat modification due to changes in land management.
- The impacts of indirect habitat loss due to the displacement of birds as a result of mine development, mineral extraction, and maintenance activities,

As a wintering/feeding ground for some migrants, it is also possible that the species will have to find alternative sites. The effects of the proposed limestone mining project on birds are highly variable and will depend on a wide range of factors, including:

- Specification of the limestone mine development – how expanse and level of the transformation,
- Topography of the surrounding land,
- Habitats affected
- Number and species of birds present.
- Land uses within the surrounding matrix and availability of alternative sites for these species.

6.18.4 Loss of avifauna habitats

Potential negative impacts on avifauna population were quantitatively assessed against the set criteria. Activities associated with the project during the development and mining phase will involve; the movement of works of project components. Bird habitats are expected to be affected through various processes and activities, including: -

- Mine development, including construction activities, will destroy bird habitats at the mine sites;
- Equipment activity at the proposed project site may result in trampling on habitats of ground-dwelling birds, including bird nests;
- Project implementation may result in bird habitat fragmentation making the habitat less attractive to the bird;
- Disturbance of birds may occur during all phases of the project due to increased on-site human activities during mine development and mining activities.

Table 15: *Impact analysis for avifauna habitat loss*

Unmitigated impacts on Avifauna habitat loss	
Extent of impact	1
Magnitude of impact	1
Duration of impact	5
Probability of impact	5
Risk = (Extent + Duration + Magnitude) x Probability	35
Confidence of Assessment	High (70)

6.19 Habitat modification from associated project activities

Implementation of the proposed project may modify habitats for avifauna at the proposed project site and its environs. Vegetation clearance to pave the way for project implementation will destroy bird feeding grounds bird nesting ground and completely interfere with the birds' daily routine. The results of habitat modification to local avifauna will include:

- Disruption of breeding patterns will result in diminished bird population
- Migration and relocation of the affected bird species from the area which will affect the local food chain;
- Loss of ecological services associated with birds such as pollination;

- Destruction of the migration route for migrant bird species;
- Destruction of foraging grounds of resident species

6.20 Green Belt Plan

Greenbelt is an important sink of air pollutants and noise. Green cover in mining areas helps reduce pollution levels and improves the ecological conditions, and prevents soil erosion to a great extent. It further improves the aesthetics and beneficially influences the microclimate of the surrounding. However, the green belts of the proposed mine site area will include the local species suitable for the area. Plant species selected for the greenbelt have rapid growth, evergreen, large crown volume, and small/pendulous leaves with a smooth surface. A combination of different plant species is sought while selecting trees for vegetation cover. Greenbelt should be developed in the following areas:

- Along the proposed limestone mine boundary
- Along the side of major access roads
- On backfill areas

The species of the plantation should be selected considering the soil quality, place of the plantation, chances of survival, commercial value. Only indigenous species will be planted. Mixed plantation should be done, keeping the optimum spacing between the sapling.

6.21 ENVIRONMENTAL MITIGATION MEASURES

6.22 Proposed measures to mitigate impacts on land topography

- Backfill the open pits –waste dump, overburden, and topsoil.
- Revegetate the land with indigenous plant species
- Continuous mine rehabilitation
- Provide measures for long-term runoff and erosion control
- Landscaping to leave a final landform visually compatible with the surrounding natural landscapes.
- Provide a buffer zone between the site, road, and human settlements

6.23 Proposed measures to mitigate impacts on drainage

- The dump slope will have a retaining wall and garland drain to arrest the wash off from the dumps.
- Garland drains will be connected to the settling tank, and settled water will be transferred to the water reservoir and used for green belt development and dust suppression.
- As there is no natural permanent or seasonal river passing through the project area, there will be no diversion of the drainage pattern of the area.
- Runoff from areas should be minimized (e.g., by minimizing the area of impervious surfaces)
- Oil-water separators and grease traps should be installed and maintained as appropriate at refueling facilities, workshops, parking areas, fuel storage, and containment areas.

6.24 Proposed measures to mitigate impacts on drainage

- The dump slope will have a retaining wall and garland drain to arrest the wash off from the dumps
- Garland will be connected to the settling tank, and settled water will be transferred to the water reservoir and used for green belt development and dust suppression
- As there is no natural permanent or season river passing through the project area, there will be no diversion of the drainage pattern of the area
- Minimize surface runoff (e.g. by minimizing the area of impervious surfaces)
- Oil water separators and grease traps should be installed and maintained as appropriate at refueling facilities, workshops, parking areas, fuel storage and containment areas

6.25 Proposed measures to mitigate impacts on the land environment and land use

- The mine site's open pits will be backfilled and leveled with fertile soils.
- The reclaimed land will be planted with vegetation.
- Part of the mine area will be converted to a water reservoir for the communities in the area. The water reservoir will be utilized for irrigation and pisciculture purposes.
- Waste dumping will be temporary and utilized to construct and improve external and internal roads within the mine site area.
- Plantation of local species will be undertaken in the safety zone of the surrounding mining area. Soil and compost manure will be utilized for the growth & nourishment of trees.

- The Proponent will take utmost care to ensure the survival & growth of existing trees in the area and plant drought-resistant & fast-growing trees in the no-tree land to form a wide green belt all around the mine area.
- Planting of trees will commence during the onset of the mine operation.

6.26 Proposed measures to mitigate impacts of solid waste generation

It is proposed to store the topsoil in the earmarked site and utilize it for plantation purposes after separating from the mixed rock boulders and pebbles.

- The portion of soil and any overburden unsuitable for plantation will be sold out to intending users for construction purposes with county government authorities' permission.
- The Proponent will utilize waste generated during mining to make mine roads and allied infrastructures.
- Dump slope will be provided with retaining wall and garland drain to prevent the wash off.
- Maintain a stable dump slope angle with horizontal
- During the mine development phase, Mashujaa Q & M PLC will utilize the waste generated for road construction and leveling of ground area for site structures.
- Recycle and reuse where applicable
- Segregate for appropriate disposal
- Mine design improvement to minimize waste generations
- Material substitution to minimize waste generation
- Technological improvement to minimize waste generation
- Sorting of waste at source
- Waste disposal as provided for in the Environmental Management and Coordination (Waste Management) Regulations, 2006.
- The Proponent may return absolute electronic equipment and other electronic waste to manufacturers for safe disposal.
- Establishing waste management priorities at the outset of activities based on an understanding of potential Environmental, Health, and Safety (EHS) risks and impacts and considering waste generation and its consequences;

- Establishing a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal, and finally disposal of wastes;
- Avoiding or minimizing the generation of waste materials, as far as practicable;
- Where waste generation cannot be avoided but has been minimized, recovering and reusing waste;
- Where waste cannot be recovered or reused, treated, destroyed, and disposing of it in an environmentally sound manner;
- Establishment of priorities based on a risk analysis that takes into account the potential EHS risks during the waste cycle and the availability of infrastructure to manage the waste in an environmentally sound manner;
- Definition of opportunities for source reduction, as well as reuse and recycling;
- Definition of procedures and operational controls for onsite storage;
- Definition of options / procedures / operational controls for treatment and final disposal.

6.27 Proposed measures to mitigate impacts of mining activity on the fertility status of the soil

- Garland drain and retaining wall will be constructed in the waste dump and mineral stack slope. So the surface runoff from the dump will be passed through the garland drain and settled in a settling pit before discharging outside. This is to minimize soil erosion or deposition of contaminants on agricultural land.
- The topsoil generated during the mining activity will be used for plantation on the rehabilitated land.
- The workers in the mines are from the nearby areas, so there will be no residential colony.
- Development within the mine area. This results in a very small generation of domestic solid waste.
- Plant vegetation on bare land
- Paving walkways
- Provide measures for long-term runoff and erosion control
- Install cut-off drains; exit drains to direct water from the site, reduce flow velocities, and sediment traps to minimize sediment discharge from the site.
- Provide a buffer zone between the site, road, and homesteads
- Sanitation waste will be connected to the bio septic tank.

6.28 Proposed measures to mitigate impacts against Particulate Matter (PM)

- Water sprinkling on the mining site, dumping area, and haul road during dry wind, using a water tanker.
- Dust emissions due to vehicles can be minimized by avoiding spillage from the loaded trucks.
- Workers to be provided with PPEs
- Water sprinkling on the topsoil and overburden dump to minimize wind erosion.
- Trees can act as efficient biological filters. A systematic and planned greenbelt development reduces fugitive dust, checks runoff, and enhances the aesthetic beauty of an area.
- There is the proposal of a proper green belt along the boundary for reduction of dust and noise emission from the lease area.
- Plant dust catching species
- Plantation will be provided in the dump slope
- Safety shelter will be constructed within the mine area.
- Wet drilling and blasting will be carried out
- All trucks and machinery should be in good serviceable condition
- Design and maintain safe systems of work and pollution prevention measures
- Comply with Air Quality Regulations (2014) and Public Health Act.
- Minimize dust through strict enforcement of onsite speed controls
- Ventilation at the workplace to be sufficient

6.29 Proposed measures to mitigate against SOx, NOx, CO, CO_2

- Vehicular emission of particulates, SO2, NOx, hydrocarbons can be minimized by proper maintenance of vehicles and other oil-operated equipment. Unroadworthy vehicles not be allowed into the mine area.
- Suitable green belt development and mining of limestone
- Mining equipment and machinery should be in good serviceable condition

6.30 Proposed mitigation measures of increased noise

- Development of green belt in the mine site buffer zone, which acts as a barrier for noise reduction.
- The noise generating machinery will be properly maintained

- Mashujaa Q & M PLC will provide the workers with proper PPEs to minimize occupational noise exposure.
- Developing and implementing an effective noise control and hearing conservation program
- Fitting noise machines with noise reduction devices
- Posting notices and signs in noisy areas
- Educating all workers on the importance of making correct use of PPE provided to protect them against high noise levels
- Carrying out an audiometric test by a designated medical practitioner to all workers exposed to noise levels above 85dB(A);

6.31 Proposed mitigation measures against the impact on water quality

- The mining method to use is Opencast/open pit. There will be no wastewater generated due to the mining activity. The generated domestic effluents will be discharged to soak pits through the bio septic tank.
- Mining activities will be restricted to the layer above the groundwater table.
- Construct garland drains, settling tank, and check dam in the mining area.
- The garland drains will be connected to the settling tank, and after settling, the water will be discharged to the natural drainage.
- Convert some of the open pits to the rainwater storage tank.
- The rainwater stored in the pit will be utilized for plantation and dust suppression.
- Mining activities will be restricted to the layer above the groundwater table.
- Runoff water/stormwater during rains to be desilted and discharged.
- Reclaimed pits will be stabilized with plantation wherever possible, and other areas will be converted to a water reservoir.
- Oil water separators and grease traps should be installed and maintained as appropriate at refueling facilities, workshops, parking areas, fuel storage, and containment areas
- Treatment to meet national standards for sanitary wastewater discharge.
- Ensure regular monitoring of the sewage sanitation system
- Sanitary wastewater includes domestic sewage, food service, and laundry facilities serving site employees. Recommended sanitary wastewater management strategies include:

- Segregation and pre-treatment of oil and grease containing effluents (e.g., use of a grease trap) before discharge into the environment;
- Treatment to meet national standards for sanitary wastewater discharges;
- Sewage from the office blocks to be discharged to either a bio septic system or where land is used as part of the treatment system, treatment to meet Environmental Management and Coordination (Water Quality) Regulations, 2006, standards for sanitary wastewater discharges.

Notably, minimal wastewater is expected to be generated from the project activities during the mine development. The wastewater from construction activities will be used for dust control as the project is accessed via a marram road. The proponent will install sanitary facilities (toilets) used by the workers while on duty. The proponent will also establish a bio septic tank fitted with three bio compartments tanks to handle the wastewater generated within the facility during the operation stage. The raw wastewater from the toilets and sinks will be received in the first compartment. The solids will settle in the tank, and anaerobic digestion will occur naturally. The water will flow into the second compartment as the tank fills, where more settling and digestion is expected. Partial aeration is anticipated in this compartment before the water flows into the last tank. The water is expected to be suitable for reuse within the project site for lawn watering or dust control in this tank.

Sludge from sanitary wastewater treatment systems should be disposed of in compliance with Environmental Management and Coordination (Water Quality) Regulations, 2006.

6.32 Storm water (surface water) management

Storm water includes any surface runoff and flows resulting from precipitation, drainage, or other sources. Typically, storm water runoff contains suspended sediments, metals, petroleum hydrocarbons, Polycyclic Aromatic Hydrocarbons (PAHs), coliform, etc. Rapid runoff, even of uncontaminated storm water, also degrades the quality of the receiving water by eroding stream beds and banks. To reduce the need for storm water treatment, the following principles should be applied:

- Storm water should be separated from sanitary wastewater and wastewater streams to reduce the volume of wastewater to be treated prior to discharge;
- Surface runoff from mine machine areas or potential sources of contamination should be prevented;
- Where this approach is not practical, runoff from storage areas should be segregated from potentially less contaminated runoff;

- Runoff from areas without potential sources of contamination should be minimized (e.g., by reducing the extent of impervious surfaces), and the peak discharge rate should be reduced (e.g., by using vegetated swales and retention ponds);
- Where storm water treatment is deemed necessary to protect the quality of receiving water bodies, priority should be given to managing and treating the first flush of storm water runoff where the majority of potential contaminants tend to be present;
- When water quality criteria allow, storm water should be managed as a resource, either for groundwater recharge or for meeting water needs at the facility;
- Oil-water separators and grease traps should be installed and maintained as appropriate at refueling facilities, workshops, parking areas, fuel storage, and containment areas;
- Sludge from storm water catchments or collection and treatment systems may contain elevated levels of pollutants and should be disposed of in compliance with the Environmental Management and Coordination (Water Quality) Regulations, 2006

6.33 Proposed mitigation measures of occupational injuries and accidents

- All the mines workers will be provided with personal protective equipment like nose mask, earmuff, helmet, goggles, etc., to address residual exposures following the adoption of the engineering controls.
- Development of green belt in the mine site buffer zone, which acts as a barrier for noise reduction.
- The noise generating machinery will be properly maintained
- Medical examination of employees at the initial stage and periodically, shall be done by a team of qualified medical officers provided by the project proponent.
- Regular medical checkup camps shall also be arranged for detection of occupational diseases and minor diseases in the nearby settlements.
- Free checkup and medicine for treatment for their acute and chronic illness shall be provided.
- Education and training arrangement for the mines workers about the safety and various
- occupational health risks related to mining operation
- Control of dust through the implementation of good housekeeping and maintenance;
- Use mobile vacuum cleaning systems to prevent dust buildup on paved areas.
- Recommended prevention and control techniques against exposure to heat include the following:
- Shielding surfaces where workers' proximity and close contact with hot equipment is expected;

- Using personal protective equipment (PPE), as needed (e.g., insulated gloves and shoes);
- Minimizing the work time required in high-temperature environments by implementing shorter shifts at these locations;
- Making available and using, as needed, air- or oxygen supplied respirators;
- They are implementing specific personal protection safety procedures in the process to avoid potential exposure to exothermic reactions.

6.34 Socio-Economic Impact

The proposed mine site area has steep, random, and rocky slopes. There is no human settlement on the proposed mine site area. The Geology and topography of the mineral-rich ore land are inaccessible and not suitable for agriculture and human settlements. The mine site area is non-forest land, and the project does not involve any loss of agricultural land. The vegetation on the site is scattered shrubs, cashew trees (Anacardium occidentale), and coconut trees (Cocos nucifera). Commencement of mining activity will be beneficial to the socioeconomic environment.

The details of the impact on the socioeconomic environment are as below:

6.34.1 Displacement of the people

The project does not involve any displacement of the people from the proposed limestone mine site at Chasimba Sub-Location. The mine site area is devoid of any human habitation.

6.34.2 Loss of livelihood

As the area is a non-forest land with steep, rugged ore-bearing rocks and devoid of any grazing or agricultural activities, the impact on the livelihood dependency will be minimal. The mining operation will not affect the cropping pattern and crop productivity as the mine area does not include any agricultural land. The mine storage water may be utilized for agriculture by the nearby area if the proponent and the community make the proper arrangement.

Instead, the project will create a livelihood for the local people in the mines as skilled, semiskilled, and unskilled labor. Further, the mine will also create indirect business opportunities for transportation workers and small business development near the mine area.

6.34.3 Changes in population dynamics

Invariably all the managerial, skilled, and semiskilled workforce required for mining and associated activities comes from the local area and outside the locality. A highly trained workforce is usually not available in the local population. In addition, people come to the mining areas for trade, etc. Thus, the population dynamics of the site will undergo a significant change over the years. Interaction of traders and business people will help alleviate the economy of the Chasimba area and Kilifi County.

6.34.4 Health impacts

The people working in the mine area and the buffer zone will be affected mainly due to dust emission from the mining operation, loading, transportation, noise generation due to mining and blasting process, vibration due to drilling and blasting, etc.

The mines workers will be provided with dust masks, ear muffs, and earplugs. There is also the risk of spreading Covid-19 as the workers, traders, and business people interact in the area.

Further, a centralized first aid center will be developed for the mine site with all the facilities for the workers.

Initial and periodical health checkups will be conducted for the mines workers.

Further, there will be a proposal for organizing a health checkup camp for the nearby villagers, and they will be provided with medicines at free of cost. There will be water sprinkling along the transportation route that passes through the villages.

6.34.5 Infrastructure facilities

There will be the development of infrastructure facilities due to the mining operation in the area. This includes internal village road development and maintenance, safe drinking water for the local people and mines workers, infrastructure and other development of nearby schools, etc.

6.34.6 Employment opportunities

The mining and associated activities offer employment opportunities to the eligible people from the local population. The project will create direct and indirect employment opportunity

Mitigation measure

As per the need assessment survey carried out during the primary data collections, the following socioeconomic activities are proposed to be conducted by the proponent:

- The mining activity will create employment opportunities for skilled workers, Semi-skilled and Unskilled.
- The labor force for the mine will be hired from a nearby locality.
- First aid facility will be provided to the local people at the doorstep.
- Safe drinking water facilities will be provided to the people during the dry season.
- The proponent will undertake all the necessary pollution control measures to minimize the pollution during the mining operation.

6.35 Transportation

There will be the transportation of limestone from the mine area to the sizing and storage area. Considering the average annual production of limestone, there will be movement of around trucks/ tippers per day to transport the limestone. This will create additional traffic load to the Kilifi- Kaloleni road and other vehicular movement emissions.

CHAPTER 7: PROJECT ALTERNATIVES AND UNCERTAINTIES

In terms of the EIA Regulations, feasible alternatives must be considered as part of the environmental investigations. An option concerning a proposed activity refers to the different means of meeting the general purpose and requirements of the action, which may include alternatives to:

- The property on which or location where it is proposed to undertake the activity;
- The type of activity to be conducted;
- The design or layout of the activity;
- The technology to be used in the activity; and
- The operational aspects of the activity.

All identified feasible alternatives must be evaluated in terms of social, biophysical, economic, and technical factors.

The Proponent will operate the project on the private land bought at Chasimba Sub-location in Kilifi South Sub-County. The mining technology is a semi-mechanized open pit/open cast mining. The mining project is on a limestone mineral-bearing zone by the Ministry of Petroleum and Mining. There is no human settlement on the project site. The land is not suitable for agriculture& on the maximum nonproductive ground; hence this is best suitable for mining activity.

7.1 Zero Option, No Project or Do-Nothing Alternative

The do-nothing option would entail not using the site and maintaining the site as-is. Looking at professional perspectives, this is not a viable option as the site is within a zone area that harbors commercially viable limestone ore. Nevertheless, mining is a potential source of economic development in Kilifi South Sub-county; as discussed in the report, there is another active mining operation in Kilifi County that has positively impacted the economy of Kilifi county. In that case, both the positive and negative impacts of the project would not occur. The more significant impact of not proceeding would be the loss of expected benefits. By not developing the site, the site will be anomalous in the context of the mineral it harbors, the potential of the land as a source of mineral extraction, and some of the direct and indirect socio-economic benefits such as job creation to the youth, revenue to the government, availability of limestone as an industrial raw material for construction cement, etc.) will not materialize. From an ecological perspective, the site is within a limestone ore zone (Ministry of Petroleum and Mining) whose geology and topography are not favorable for human settlements and agriculture. There exist other mineral extraction operations in the neighborhood that have positively impacted the economy of Chasimba Location and Kilifi County. The ecological linkages

between the proposed mining site and the surrounding natural areas will be better maintained by increasing project development in the surrounding neighborhood. Not developing the site will leave the site lying idle and unutilized, resulting in the underdevelopment of the area.

7.2 Layout Alternatives

The layout alternatives have been investigated and assessed within the Environmental and Social Impact Assessment Phase. These are detailed in the report as the Preferred Layout, with the Alternative Layout being the second option. Both options were reviewed, considering the layout for the proposed Mashujaa Q&M PLC Limestone Mine Site development. Due to the vast mineral ore availability, mine life, surrounding access roads, accessibility, and convenience of the proposed site, the alternative (non-preferred) layout was an infeasible option for the proposed site.

The preferred layout was deemed feasible. It has good support from the community and any other project-affected persons. This alternative will provide positive benefits to Mashujaa Q&M PLC, the immediate community residents of Kilifi South Sub-County, and the government of Kenya (Tax revenue, job creation availability of limestone as a raw material for industrial Portland cement manufacturing). The mining technology is a semi-mechanized open pit/open cast mining. The mining project is on a limestone mineral-bearing zone by the Ministry of Petroleum and Mining. There is no human settlement on the project site. The land is not suitable for agriculture & on the maximum nonproductive ground; hence this is best suitable for mining activity.

7.3 The Proposed Project with Technological Modifications

Every technology can be improved or enhanced to improve its environmental sustainability. The proponent confirms that in case of any emerging issues regarding the current technology used to extract the mineral ore, then any sound technological modification will be implemented. Nevertheless, the mining technology employed to extract limestone ore, open-pit mining method, shall be adopting a state-of-art technology, with minimal or no pollutants ensuring environmental sustainability. A very substantial part of the Project Cost shall be earmarked for pollution control devices to ensure negligible dust emission and build this project a model unit from environmental protection and pollution control point of view.

CHAPTER 8: ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

8.1 Introduction

This chapter presents the Environmental and Social Management Plan (ESMP) that will need to be implemented by the proponent to prevent or reduce significant adverse impacts to acceptable levels. The purpose of the Environmental and Social Management Plan is to address the proposed project's impacts. The experts considered the project components and support infrastructure when developing this ESMP. The experts have outlined the Environmental management plans for all project phases to cover: -

- Mineral Prospecting and Exploration Phase
- Mine/quarry development (Design and Construction Phase)
- Ore Exploitation and Beneficiation (Operation Phase)
- Mine Closure and Rehabilitation Plans (Decommissioning Phase)

The following ESMP tables form the core of this ESMP for the development, operational, mine closure, and rehabilitation phases of the proposed Mashujaa Q&M Limestone Mine Site. The following tables detail all necessary mitigation measures and the person responsible for implementing and monitoring such actions. The tables will be used as a checklist on site. Due to the magnitude of the project, compliance with the ESMP must be monitored periodically, and reports prepared and provided at monthly site meetings during the development phase and quarterly during the operations and maintenance period as required in EMCA 1999. Annual audits will be conducted during the development, operation, and maintenance phases.

8.2 Cost of Implementation the ESMPs

For effective implementation of the ESMPs, the project must establish an environment, health, and safety (EHS) unit responsible for Project Environmental Monitoring and Evaluation to ensure compliance to NEMA and international standards and practices. The project proponent will be responsible for all costs of implementing the project's EIA license conditions, including the ESMPs and the actual costs of public involvement in the ESIAS process. Hence all charges proposed in the ESMPs below will be incurred by the project proponent. The costs outlined are current costs mainly for project environmental monitoring and evaluation to ensure compliance to NEMA and international standards and practices. An increase to cover annual inflation should be applied to estimate future costs. The costs for actual activities should be included in the main bill of project quantities.

The proponent will incorporate mitigation measures into the proposed Mashujaa Q&M Limestone Mine Site activities and will ensure that mitigation measures highlighted in this report are implemented. Once the project becomes operational, the Health and Safety issues and environmental considerations will be handled by the proponent. The proposed project should be implemented to include the problems of environmental concerns and issues affecting the project, implementation of the environmental management plan, project management, health risks, and prevention. Others include the following:

- Organizational practices.
- Project management.
- Socio-economic issues relating to access and use of the road and natural resources.
- Financial management.

8.3

8.4 ESMP TABLE

TABLE 16: PRE-CONSTRUCTION (MINE DESIGN & PLANING), CONSTRUCTION & OPERATION (MINE DEVELOPMENT & EXPLOITATION), MINE CLOSURE & REHABILITATION PLAN (DECCOMISIONING) PHASES AND, ENVIRONMENTAL ANAGEMENT/MONITORING PLAN (ESMP)

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
IMPACT ON LAND, SOIL & NATURAL RESOURCES							
Impacts On Land Topography	Impacts due to development of mine, open pit excavation and extraction of limestone •Alteration of relief and altitude of the mine area •The land-use pattern undergoes a change due to the use of the land for mining, dumping, and other mining and associated activities. The drainage pattern on the surface undergoes a change due to the alterations in the surface topography due to mining and associated activities •Soil erosion,	•Backfill the open pits – waste dump, overburden, and topsoil. •Revegetate the land with indigenous plant species •Provide measures for long-term run-off and erosion control •Reuse topsoil in landscaping to leave a final landform visually compatible with the surrounding natural landscapes •Provide for a buffer zone between the site, road, and human settlements •Continuous mine rehabilitation	•Regular checking and monitoring of land topographical features, altitude and relief of the mine site area •Monitor on the change of land use patterns •Checking and monitor on the state of soil erosion	•Proponent; Mashujaa Q&M PLC	Construction Operation and Decommissioning	•Annual environmental audits •Public complains	200,000 Per year.

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
	•loss of biodiversity •land degradation •Loss of terrestrial vegetation •Impact on natural resources	•Implement the progressive rehabilitation plans as guided by the Kilifi County Environment Committee and NEMA •Plant vegetation on bare land •Paving walkways •install cut-off drains, exit drains to direct water from the site, reduce flow velocities, and sediment traps to minimize sediment discharge from the site •Provide measures for long-term run-off and erosion control •Provide for a buffer zone between the site, road, and homesteads •Compliance to Forest Conservation and Management Act and the Wildlife Conservation and Management Act, Water Act 2016, and related regulations •Landscaping Educating all workers on importance of making correct use of PPE provided					

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
		to protect them against high noise levels.					

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
Impacts On Drainage	•Mine excavation may affect underground water table depending on its particular level during dry and rainy season. •There is chance that during rainy season, the run-off water may find access to some of the open pits in the mine area •Diversion of the natural drainage patterns in the area	•The dump slope will have a retaining wall and garland drain to arrest the wash off from the dumps •Garland drains will be connected to the settling tank, and settled water will be transferred to the water reservoir and used for green belt development and dust suppression •As there is no natural permanent or season river passing through the project area there will be no diversion of the drainage pattern of the area •Runoff from areas should be minimized (e.g. by minimizing the area of impermeable surfaces) •Oil water separators and grease traps should be installed and maintained as appropriate at refueling facilities, workshops, parking areas, fuel storage and containment areas	• Regular checking and monitoring of the natural drainage patterns of the area • Regular checking and monitoring of the open pit excavations and the level of ground water table	•Proponent; Mashujaa Q&M PLC	Construction Operation and Decommissioning	•Annual environmental audits •Public complains	200,000 Per year

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
Land Environment and Land Use	•Change in land use due to mining, dumping of waste. •Buffer zone will not be affected as the mining operations are confined only to the surveyed limestone ore bearing land. •General land degradation •Drainage from the waste dump and contaminated water from the mines that may affect the characteristic of the top soil •Loss of biodiversity the land use. •Degradation of vegetation and other natural resources in the mine area due to limestone extraction, dumping and transportation. •Impacts of oil erosion	•The mine site open pits will be backfilled and leveled with fertile soils •The reclaimed land will be planted with vegetation. •Part of the mine area will be converted to a water reservoir for the communities in the area. The water reservoir will be utilized for irrigation and pisciculture purpose •Waste dumping will be temporary and utilized to construct and improve external and internal roads within the mine site area. •Plantation of local species will be undertaken in the surrounding safety zone in the mining area. Soil and compost manure will be utilized for the growth & nourishment of trees. •Utmost care will be taken to ensure the survival & growth of existing trees in the area, and drought-resistant &fast growing trees will be planted in the no-tree land to form a comprehensive green belt	•Regular checking and monitoring of soil qualities •Checking and monitor on the loss of vegetation & biodiversity •Monitor change in land use patterns •Presence of exposed roots •Brown or colored water	Proponent; Mashujaa Q&M PLC	**Time Frame** Construction Operation and Decommissioning	•Annual environmental audits •Public complains	250,000 Per Year

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
		all around the mine area of the •Planting of trees will commence during the onset of mine operation •install cut-off drains, exit drains to direct water from the site, reduce flow velocities, and sediment traps to minimize sediment discharge from the site. •Provide measures for long-term run-off and erosion control •Provide for a buffer zone between the site, road, and homesteads •Avoid impact on terrestrial and aquatic biodiversity •Compliance to Forest Conservation and Management Act and the Wildlife Conservation and Management Act, Water Act 2016, and related regulations. • Implement the progressive rehabilitation plans guided by the Kilifi County Environment Committee and NEMA.					

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
		•Landscaping leaves a final landform visually compatible with the surrounding natural landscapes. Educating all workers on the importance of correctly using PPE provided to protect them against high noise levels.					
Fertility Status Of The Soil	•Dust deposition on the top soil •Decrease in soil fertility •Decrease in crop production	•Garland drain and retaining wall will be constructed in the waste dump and mineral stack slope. So the surface runoff from the dump will be passed through the garland drain and settled in a settling pit before discharging outside. This is to minimize soil erosion or	•Regular checking and monitoring of the top soil qualities •Checking and monitor on the loss of vegetation & biodiversity •Monitor crop production	Proponent; Mashujaa Q&M PLC	**Time Frame** Construction Operation and Decommissioning	•Annual environmental audits •Public complains	100,000 Per Year

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
		deposition of the contaminants on the agricultural land. •The topsoil generated during the mining activity will be used for plantation on the rehabilitated land. •The workers in the mines are from the nearby areas, so there will be no residential colony development within the mine area. This results in a minimal generation of domestic solid waste. •Plant vegetation on bare land •Paving walkways •Provide measures for long-term runoff and erosion control •Install cut-off drains, exit drains to direct water from the site and reduce flow velocities, and by sediment traps to minimize sediment discharge from the site •Provide for a buffer zone between the site, road, and homesteads					

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
		•Sanitation waste will be connected to the bio septic tank.					
AIR POLLUTION							
Dust Pollution-Particulate Matter (PM)	Occupation illness; lung infection, itching skin, eye irritation, coughing, to workers and other people exposed to the mine dust; Reduced visibility; Chocking of plants	•Water sprinkling on mining site, dumping area, and haul road during dry wind periods using a water tanker •Dust emissions due to vehicles can be minimized by avoiding spillage from the loaded trucks. •Workers to be provided with PPE Enforcement of onsite speed limits •Water sprinkling on the topsoil and overburden dump to minimize wind erosion. •Trees can act as efficient biological filters. A systematic and planned greenbelt development not only reduces the fugitive dust but also checks runoff	Using NEMA accredited laboratories to measure dust pollution and monitoring Ensure Quarterly Air Quality Monitoring are carried to meet the required standards Results of periodic dust surveys within the production line, packaging line and the neighborhood of the facility to determine dust levels from time to time Medical surveillance Results of medical tests of workers likely to be exposed to cement dust Compliance with	Proponent; Mashujaa Q&M PLC County Occupational Safety and Health Officer; County Environmental Officer	**Time Frame** Construction Operation and Decommissioning **Frequency** Quarterly Impromptu inspections	Air quality reports Environmental Audits Reports Medical surveillance reports Number of complaints (workers & neighbors)	600,000 Per Year

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
		and enhances the aesthetic beauty of an area •There is the proposal of a proper green belt along the boundary for the reduction of dust and noise emission from the lease area •Plant dust catching species •Plantation will be provided in the dump slope •Safety shelter will be constructed within mine area •Wet drilling and blasting will be carried out •All trucks and machinery should be in good serviceable condition •Design and maintain safe systems of work and pollution prevention measures •Comply with Air Quality Regulations (2014) and Public Health Act provisions. •Minimize dust through strict enforcement of onsite speed controls •Ventilation at the workplace to be sufficient	International and national ambient air quality, emission standards				

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
Gas Pollutants-CO emission	•Harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and tissues; Central Nervous System Effects •CO contributes to the formation of smog, ground-level ozone, which can trigger serious respiratory problems; •Greenhouse gas hence contribution to global warming; •Formation of acid rain potentially damaging to plants, animals and property;	•Good combustion practice, excess air (increase), •Proper maintenance of vehicles and other oil - operated equipment. •Un road worthy vehicle not be allowed in to mine area	•Using NEMA accredited laboratories to measure emission standards •Ensure Quarterly Air Quality Monitoring are carried to meet the required standards •Adopting Direct Control Carbon monoxide (CO) Monitor. •Compliance with International and national ambient air quality, emission standards and meeting of CO air quality index •Continuous checking of improved mining technology	Proponent; Mashujaa Q&M PLC	**Time Frame** Construction Operation and Decommissioning **Frequency** Quarterly Impromptu inspections	Air quality reports Environmental audit reports Number of complaints (workers & neighbours).	200,000 Per year

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
Gas Pollutants-CO_2 Emission	•Formation of acid rain, weak carbonic acid; •Greenhouse gas hence contribution to global warming; •Formation of acid rain potentially damaging to plants, animals and property;	•Switch to clean energy •Suitable green belt development and production of cement	•Using NEMA accredited laboratories to measure emission standards •Ensure Quarterly Air Quality Monitoring are carried to meet the required standards •Adopting Direct Control Carbon monoxide (CO) Monitor. •Compliance with International and national ambient air quality, emission standards and meeting of CO2 air quality index •Continuous checking of improved mining technology	Proponent; Mashujaa Q&M PLC County Occupational Safety and Health Officer; County Environmental Officer	**Time Frame** Construction Operation and Decommissioning **Frequency** Quarterly Impromptu inspections	Air quality reports Environmental audit Reports Number of complaints (workers & neighbours)	200,000 Per year
Vehicular & equipment emission of particulates SOx, NOx, CO,	•Formation acid rain which may negatively affect plant and animal life and property •Visibility impairment through formation of brown cities; •Eutrophication that is, explosive algae growth	•Proper maintenance of vehicles and other oil-operated equipment. Roadworthy vehicles not be allowed into the mine area •Suitable green belt development and mining of limestone	•Using NEMA accredited laboratories to measure emission standards •Ensure Quarterly Air Quality Monitoring are carried to meet the required •standards	•Proponent; Mashujaa Q&M PLC •County Occupational Safety and Health Officer;	**Time Frame** Construction Operation and Decommissioning **Frequency**	Air quality reports Environmental audit Reports	200,000 Per year

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
	which can deplete oxygen in water bodies; •It contributes to global warming; •Respiratory illness in young children and harm lung function in adults •Pollution of upper atmosphere that result in the formation of smog, •Precursor of fine particulate soot, which poses a significant health threat;	•Mining equipment and machinery should be in good serviceable condition	•Monitoring of atmospheric SO2 using UV fluorescence or other sensors; •Measurement of emission standards •Compliance with International and national ambient air quality, emission standards and meeting of SO_x, NO_x air quality index	•County Environmental Officer	Quarterly Impromptu inspections	Number of complaints (workers & neighbours)	
Increased Noise pollution	Noise induced hearing loss Poor concentration at the workplace Reduced productivity	•Development of green belt in the mine site buffer zone, which acts as a barrier for noise reduction. •The noise generating machineries will be properly maintained •Choosing quieter machinery provided with efficient silencers •Confining noise by isolating the source •The workers will be provided with proper PPEs to minimize occupational noise exposure.	Ensure Quarterly Noise Survey and Monitoring are carried to meet the required standards Using NEMA accredited laboratories to measure Noise level and Monitoring Reduction of noise levels at the workplace to the stipulated legal limits Audiometric test for workers exposed to high noise levels	Proponent; Mashujaa Q&M PLC County Occupational Safety and Health Officer; County Environmental Officer	**Time Frame** Construction Operation and Decommissioning **Frequency** Quarterly Inspections	Noise survey reports Environmental audit Periods Number of complaints (workers & neighbor). Number of training reports	150,000 Per year

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
		•Developing and implementing an effective noise control and hearing conservation program •Fitting noise machines with noise reduction devices •Posting notices and signs in noisy areas •Educating all workers on the importance of making correct use of PPE provided to protect them against high noise levels •Carrying out an audiometric test by a designated medical practitioner to all workers exposed to noise levels above 85dB(A);					
SURFACE AND UNDERGROUND WATER POLLUTION							
Impact On Water Quality- Surface & underground water quality	Contaminate surface underground water loss of biotic factors	• Ensure no modifications of watercourses occur in the mining area •The mining method to use is Opencast/open pit. There will be no wastewater generated due to the mining activity. The domestic effluents being generated will be discharged to soak pits through bio septic tank	•Ensure sanitation standard system are put in place Using NEMA accredited laboratories to measure water quality and monitoring	Proponent; Mashujaa Q&M PLC	**Time Frame** Construction Operation and Decommissioning	Annual Environmental audits Annual Environmental audits Public complains	300,000 Per year

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
		•Mining activities will be restricted to the layer above the groundwater table •Construct garland drains, settling tank, and check dam in the mining area •The garland drains will be connected to the settling tank, and after settling, the water will be discharged to the natural drainage. •Convert some of the open pits to rainwater storage tank •The rain water stored in the pit will be utilized for plantation as well as dust suppression. •Mining activities will be restricted to the layer above the groundwater table. •Run-off water/stormwater during rains to be desilted and discharged •Reclaimed pits will be stabilized with plantation where ever possible, and other areas will be converted to the water reservoir •Oil water separators and grease traps should be					

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
		installed and maintained as appropriate at refueling facilities, workshops, parking areas, fuel storage, and containment areas •Treatment to meet national standards for sanitary wastewater discharge •Ensure regular monitoring of the sewage sanitation system • Water containing hazardous pollutants as fuel should be discharged into conservancy tank for removal from site by licensed hazardous waste handlers. • Comply with the provisions of water quality regulations (2006) as regards wastewater management and the Water Act 2016 and the Public Health act					
SOCIAL IMPACTS							
Social impacts	•Transmission of diseases •Social displacement •Loss of cultural values	• Compliance to provisions of public health act • Create awareness on communicable diseases among workers and area residents and ensure regular	Public health awareness Health policy report Community grievances mechanism Provide security personnel	Proponent; Mashujaa Q&M PLC	**Time Frame** Construction Operation and	Annual Environmental audits	200,000 Per year

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
		health and medical camps are carried out • Provide equal opportunities for all without discrimination and respect local culture • Create awareness on drugs and substance abuse • Avoid physical and economic displacement or keep them at minimum wherever unavoidable formulate and ensure resettlement action plan implementation • Have a gender mainstreaming policy at work place • Have trained security personnel to man the site • Formulate a community grievances/complaints redress and liaison committee			Decommissioning		
OCCUPATIONAL SAFETY AND HEALTH IMPACTS							

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
Occupational Injuries and Accidents	**Physical Hazards** Slip; Trips; Falls; Contact with falling/moving parts **Health and Safety** Sickness Disease/ill health Physical burns Noise and vibrations	•All the mines workers will be provided with personal protective equipment like nose mask, ear muff, helmet, goggles etc. to address residual exposures following the adoption of the engineering controls •Display safety signs on mine site •Regular inspection of mining equipment and vehicles •Provide workers with insurance covers •Appoint safety supervisor	•Physical checking/inspection on of all workplaces at short intervals •Prepare a health & safety policy for the company operations conduct occupation safety and health audits to ascertain safety measures at the workplace Ensure safety signs are placed in all potential danger zones	Proponent; Mashujaa Q&M PLC Workers Proponent; Mashujaa Q&M PLC workers Proponent; Mashujaa Q&M PLC County Occupational	**Time Frame** Construction Operation and Decommissioning **Frequency** On need basis **Frequency** Quarterly	Number of accidents Health & safety Policy Training and sensitization reports	5,000,000 Per year

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
	Noise induced hearing loss Poor concentration at workplace Reduced production **Fire hazards** Physical burns of workers exposed to fire Burning and damage to mining equipment and mine structure **Heat** Physical burns of workers exposed to heat; Burning and damage to process equipment **Dust exposure** Lung infection; Itching skin Eye irritation	•Development of green belt in the mine site buffer zone which acts as a barrier for noise abatement. •The noise generating machineries will be properly maintained •Medical examination of employees at the initial stage and periodically, shall be done by a team of qualified medical officers provided by the project proponent. •Regular medical checkup camps shall also be arranged for detection of occupational diseases and minor disease in the nearby settlements. •Free checkup and medicine for treatment for their acute and chronic illness shall be provided •Education and training arrangement for the mines workers about the safety and various occupational health risks related to mining operation •Control of dust through implementation of good	The company to have an emergency response protocol Ensure Periodic Heat Measurement at the workplaces Ensure Quarterly Dust Survey and Monitoring are carried to meet the required standards Visual observations Using NEMA accredited laboratories to measure dust pollution and monitoring Results of periodic dust surveys within the production line, packaging line and the neighbourhood of the facility to determine dust levels from time to time Medical examination of workers exposed to dust Compliance with International and national ambient air quality, emission standards	Safety and Health Officer;	Annually Impromptu inspections	Number of accidents Number of complaints (workers & neighbours) Annual safety audits Noise survey reports Air quality reports Training and sensitization reports Heat measurement report data	

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
	Coughing, to workers and other people exposed to the mine dust.	housekeeping and maintenance •Use of mobile vacuum cleaning systems to prevent dust buildup on paved areas •Recommended prevention and control techniques against exposure to heat include the following: •Shielding surfaces where workers' proximity and close contact with hot equipment is expected; •Using personal protective equipment (PPE), as needed (e.g., insulated gloves and shoes); •Minimizing the work time required in high-temperature environments by implementing shorter shifts at these locations; •Making available and using, as needed, air- or oxygen supplied respirators •Implementing specific personal protection safety procedures in the process to avoid potential exposure to exothermic reactions •Ensure surfaces are not slippery;	Spot checks at workplace on appropriate handling of equipment Company health safety policy Medical examination of workers exposed to dust Ensure safety signs are placed in all potential danger zones Ensure Quarterly Noise Survey and Monitoring are carried to meet the required standards Using NEMA accredited laboratories to measure Noise level and Monitoring Reduction of noise levels at the workplace to the stipulated legal limits Audiometric test for workers exposed to high noise levels				

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
		•Clearly mark all uneven surfaces; •Guarding of machine moving parts; •Provide and mark safe passages and exits •Minimizing the work time required in high temperature environments by implementing shorter shifts •Use of air- or oxygen supplied respirators •Good housekeeping and maintenance •Medical examination of exposed Workers •Appropriate handling as per material safety data sheets •Training and sensitization •Use of silencers for fans •Noise barriers •Developing and implementing an effective noise control and hearing conservation programme •Carrying out periodic noise measurements					

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
		•Fitting noise machines with noise reduction devices •Providing suitable hearing protection to all workers exposed to noise levels above 85dB(A); •Posting notices and signs in noisy areas •Carrying out audiometric test by a designated medical •practitioner to all workers exposed to noise levels above 85dB(A); •Educating all workers on importance of making correct use of PPE provided to protect them against high noise levels •Install proper firefighting equipment during operation •Avoid storage of flammable materials near possible fire source •Sensitize workers on fire safety					

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
SOLID WASTE RELATED POLLUTION							
solid waste management and disposal	Loss in ore production Air pollution especially from waste dust Skin irritation when in contact Water pollution Irritation of eyes Chocking of plants	•It is proposed to store the top-soil in the earmarked site and will be utilized for plantation purpose after separated out from the mixed rock boulders and pebbles. •The portion of soil and any overburden unsuitable for plantation will be sold out to intending users for construction purpose with permission from county government authorities. •Waste generated during mining which will be utilized by the proponent for making of mine road and allied infrastructures •Dump slope will be provided with retaining wall and garland drain to prevent the wash-off. •Maintain a stable dump slope angle with horizontal •During mine development phase the waste generated will be utilized completely for road construction and	Monitoring quantity of mine waste or tailings generated mine waste records.	Proponent; Mashujaa Q&M PLC County Environmental Officer County Occupational Safety and Health Officer;	Construction Operation and Decommissioning **Frequency** Quarterly Annually Impromptu inspections	Annual Environmental audits Waste records Waste handlers permits from the authority	2,000,000 Per year

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
		leveling of ground area for site structures •Contract a licensed waste collection and disposal company •Provide proper sanitary facilities for the workers Raise awareness on waste management •Mine design improvement to minimize waste generations •Sorting of waste at source •Recycle and reuse where applicable •Segregate for appropriate disposal •Material substitution to minimize waste generation •Technological improvement to minimize wastegeneration					

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
Domestic waste management and disposal	Odor from decomposing food leftovers Blockage of drainage system	Waste disposal as provided for in the Environmental Management and Coordination (Waste Management) Regulations,2006.	Regular checking and monitoring of waste handling areas Waste disposal records.	Proponent; Mashujaa Q&M PLC County Environmental Officer	Construction Operation and Decommissioning **Frequency** Quarterly Annually Impromptu inspections	Annual Environmental audits Waste records Waste handlers permits from the authority	100,000 per year
Office waste management and disposal	**Some electronic office waste such as used toner cartridges and absolute office electronic equipment contains hazardous substances**	•Waste disposal as provided for in the Environmental Management and Coordination (Waste Management) Regulations,2006. •Absolute electronic equipment and other electronic waste to be returned to manufacturers for safe disposal	Waste disposal records. Regular checking and monitoring of office waste	Proponent; Mashujaa Q&M PLC District Environmental Officer	Construction Operation and Decommissioning Frequency Quarterly Annually Impromptu inspections	Annual Environmental audits Waste records Waste handlers permits from the authority	100,000 per year
WASTE WATER RELATED POLLUTION							

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
Sanitary Wastewater	Contamination of soils and groundwater Odor	•Treatment to meet national standards for sanitary wastewater discharge •Segregation of wastewater streams •Ensure regular monitoring of the sewage sanitation system	Using NEMA accredited laboratories to measure water quality and monitoring Sampling and testing for conformity with water quality standards before discharge Ensure regular monitoring of the sanitary water discharged from the project to ensure conformity with rules and standards stipulated	Proponent; Mashujaa Q&M PLC County Occupational Safety and Health Officer; County Environmental Officer	Construction Operation and Decommissioning **Frequency** Quarterly Annually Impromptu inspections	Annual Environmental audits Water quality reports Waste records	200,000 per year
Storm Water	Degradation of the quality of water of the receiving water body Contamination of soils Soil Erosion	Runoff from areas without potential sources of contamination should be minimized (e.g. by minimizing the area of impermeable surfaces) and the peak discharge rate should be reduced (e.g. by using vegetated swales and retention ponds); Oil water separators and grease traps should be installed and maintained as appropriate at refueling facilities, workshops, parking areas,	Ensure storm water drainage channels are constructed and cleaned/desilted regularly Ensure runoff from uncontaminated sources are minimized Ensure installation and maintenance of oils & grease traps	Proponent Proponent; Mashujaa Q&M PLC County Environmental Officer	Mitigation measures Construction Operation and Decommissioning F**requency** Quarterly Annually Impromptu inspections	Blocked storm drains Status of grease and oil traps	200,000 per year

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
		fuel storage and containment areas					
ENERGY CONSUMPTION							
Energy Resource Utilization	•Negatively impacts on these natural resources and their sustainability •Energy Scarcity	•Switch off electrical equipment, appliances and lights when not being used •Raise awareness on energy conservation •Install occupation sensing lighting at various locations such as storage areas which are not in use all the time •Install energy saving fluorescent tubes at all lighting points within the plant instead of bulbs which consume higher electric energy	Energy consumption records. Regular checking and monitoring of all energy consumption gadgets	Proponent Mashujaa Q&M PLC,	Construction Operation and Decommissioning **Frequency** Quarterly Annually Impromptu inspections of the project	Energy Audits Reports Energy consumption records Energy bill	
INCREASED VEHICULAR TRAFFIC							
Parking of lorries outside the mine site area	•Inconvenience to other motorists and other road users	•Provide sufficient space for internal parking of lorries awaiting to deliver mine material or to load mine material	Checking of available space provided for parking of lorries within the mine site	Proponent Mashujaa Q&M PLC,	Construction Operation and Decommissioning **Frequency** On need be basis Weekly	Number of complaints (Drivers & neighbours	
Increased vehicular trafficalong	Potential delays at the junction as traffic enters and exits the highway;	Liaise with Kenya National Highway Authority to ensure that appropriate road	Records of traffic number in and out of the project site	Proponent Mashujaa Q&M PLC,	Construction Operation and	Number of complaints (Drivers &	

ACTIVITY	POTENTIAL ENVIRONMENTAL &HEALTH IMPACT	PROPOSED MITIGATION MEASURES	MONITORING	RESPONSIBLE PARTY	TIME FRAME & FREQUENCY	MONITORING INDICATORS	COST (KSH)
Kilifi-Kaloleni Roads	•More traffic on the said road may translate to increased use of the road and hence increased wear and tear •Likelihood of accidents, incidents and mere misses at the said turnoff from the highway	•Ensure signs before the exit/entry junction area are erected Drivers to strictly observe the Highway Code Speed limits to be strictly observed	Flow of traffic in and out of the plant during construction phase Record of vehicular accidents and incidents		Decommissioning **Frequency** On need be basis	neighbours)	
SECURITY							
security	•Loss of mine of mine equipment/machinery •Safety concerns for the workers	•Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the mine site	Records from lost items Complaints from workers and neighbors			• Number of complaints from workers and neighbors •Number of lost items	600,000 per year

8.5 Community basic grievance and redress mechanism

Community grievances that may arise from the implementation of the proposed project can be addressed through existing community leadership structures in place from the grassroots level of Nyumba Kumi through to the Deputy County Commissioner and or from the grassroots (Ward) political leadership representation (Member of County Assembly) through to the County Assembly.

8.6 Combined Administrative and political leadership route

The aggrieved community member can register the grievances to the Chair Person of their Nyumba Kumi, who will intern notify the Mzee Wa Mtaa for that cluster of Nyumba Kumi on the matter; the two of them, together with the aggrieved person, can hold a joint discussion to address the issues and concerns raised. These issues can be resolved at this level. However, if the problems are not resolved at this level, the matter moves to the next level where the Mzee Wa Mtaa reports it to the area Assistant Chief, who will inform the area chief and the local Ward Representative (Member of County Assembly). All these parties can have communal seating and discuss the matter to resolve the issue. The Area Chief can call a Chief ‘s Baraza to include more community members to discuss the matter and develop a solution.

However, if no solution is reached, the Area Chief can report the matter to the Assistant County Commissioner. The Assistant County Commissioner will, in turn, report the issue to the Deputy County Commissioner and the County Executive Member Water, Forestry, Environment, and Natural Resources. Together with the aggrieved person, all these parties can have communal seating to address the complaint to reach an amicable solution. Suppose the matter is not resolved at this level. In that case, the Deputy County Commissioner and the County Executive Member Water, Forestry, Environment, and Natural Resources can report the issue to the County Commissioner and the Chair Person County Environmental Committee respectively for redress.

8.7 Grievance Redress Mechanism

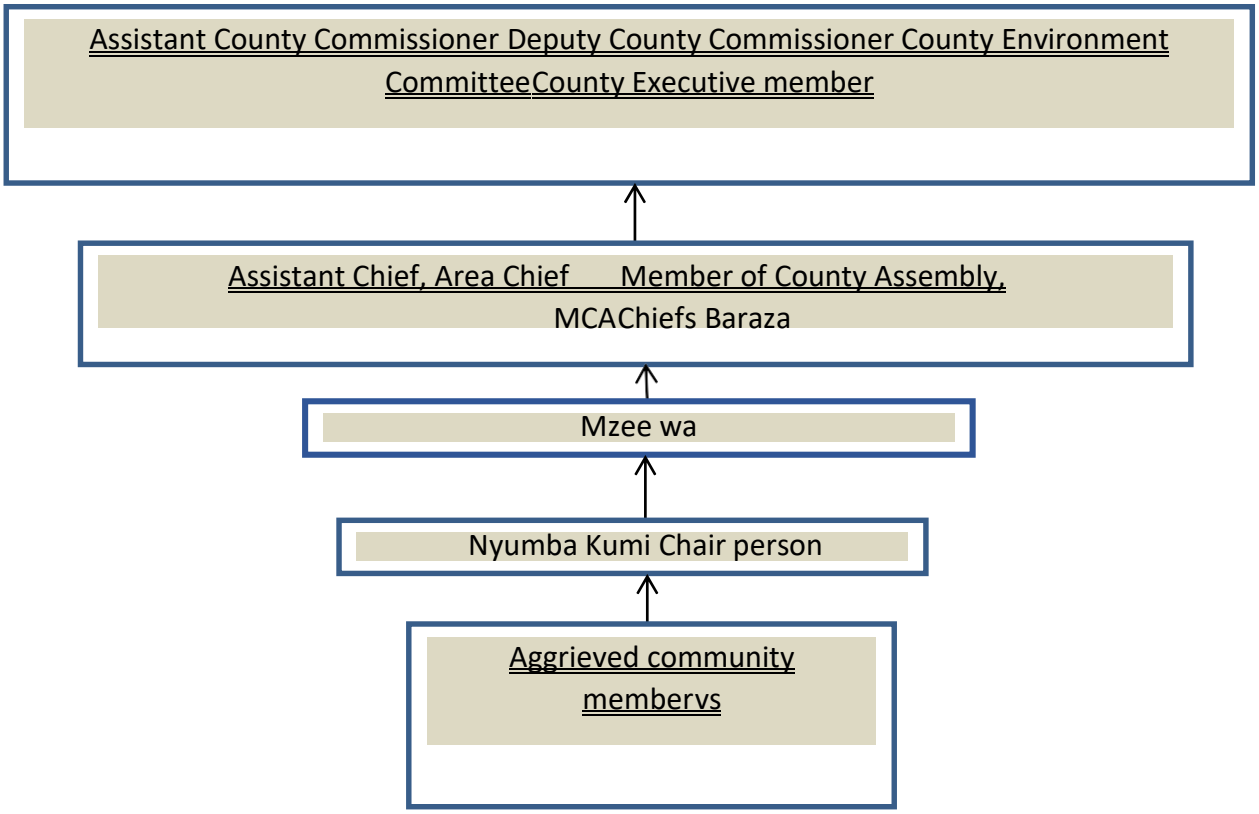


Figure 41: *Flow chart of proposed community basic grievance redress mechanism.*

8.8 Mine Closure and Rehabilitation Plans (Decommissioning Phase)

In addition to the mitigation measures provided in the above tables, it is necessary to outline some basic mitigation measures that will be required to be undertaken once all operational activities of the proposed mine/quarry development have ceased (end of mine life).

Appropriate vegetation and crops are re-planted in open spaces (landscaping).

All solid waste is collected and disposed of appropriately by licensed garbage handlers.

The proponent will ensure restoration of all excavated sites to near the state in which they were before the project commenced its operation according to EMCA‟s section 108.

The necessary objectives, mitigation measures, allocation of responsibilities, time frames, and costs about prevention, minimization, and monitoring of all potential impacts of the mine closure and rehabilitation plans

(decommissioning phase) of the proposed Mashujaa Q&M Limestone Mine Site project are outlined in Table below.

Table 17: *Environmental Management/Monitoring Plan for The Mine Closure and Rehabilitation (Decommissioning phase) of the proposed Mashujaa Q&M Limestone Mine Site*

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Time Frame**	**Cost (KShs.)**
demolition of all surface mine structure & solid` waste management				
Demolition of all surface mine structure & other solid wastes	All surface mine structures, mine equipment and machinery, ventilation systems, air conditioning and equipment that will not be used for other purposes must be removed and recycled/reused as far as possible All mine site structure foundations must be removed and recycled, reused or disposed of at a licensed disposal site Where recycling/reuse of the mine equipment and machinery, ventilation systems, air conditioning equipment, structures, and other demolition waste is not possible, the materials should be collected by a licensed waste disposal site Donate reusable demolition waste to charitable organizations, individuals and institutions	Mashujaa Q&M PLC	One-off	5,000,000

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (KShs.)
Rehabilitation of mine site (land reclamation, backfilling and re-vegetation process)				
Site degradation (land dereliction)	At the end of the mining operations, all solid wastes generated will be used in back filling of quarry pits in order to bring back original contour of the terrain as for as possible. The separately stacked top soil will be used to spread over on the compacted back filled area in order to facilitate the re-vegetation process. Outsourcing extra back filling rock debris, fertile soils, contract services of compacting and spreading solid waste rocks Implement an appropriate re-vegetation programme to restore the site to its original status Consider use of indigenous plant species in re-vegetation Part of the mine area will be converted to a water reservoir for the communities in the area. The water reservoir will be utilized for irrigation and pisciculture purpose	Mashujaa Q&M PLC	One-off	20,000,000

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Time Frame**	**Cost (KShs.)**
	Utmost care will be taken to ensure the survival & growth of existing trees in the area and drought resistant &fast growing trees will be planted in the no-tree land to form a comprehensive green belt all around the mine area of the			

8.9 CONCLUSION AND RECOMMENDATION

The community and stakeholders at the Chasimba area have supported the proposed limestone mining project. Limestone is a common type of sedimentary carbonate rock. Limestone has numerous uses. It is an essential component of concrete Portland cement; it is a lime (calcium oxide) source for industrial steel manufacturing. It is used as an aggregate for the base of roads, as white pigment or filler in products such as toothpaste or paints, and as a soil conditioner. An increase in the exploitation of limestone ore mining will lead to the supply of readily available raw materials for different industrial manufacturing companies. The mine development is a critical project in line with the pillars of vision 2030 and the Kenyan Government Big Four Agenda, more so the affordable housing. The investors have committed to developing sustainable limestone mine/quarry projects with reduced environmental impacts.

During the preparation and assessment of this report, most of the negative impacts on the environment are rated low and short term with no significant effect as the project will be mining and sizing limestone ore for commercial or industrial use. The positive impacts are highly rated and will benefit all stakeholders and the area residents. The proponent will adhere to the prudent implementation of the environmental management plan. The company has qualified and adequate personnel to establish the limestone mine project as proposed and have sufficient safety and health mitigation measures as part of the relevant statutory requirements.

8.10 Recommendations

We highly recommend developing the proposed Mashujaa Q& M limestone mine project. The project should be licensed subject to annual environmental audits once commissioned. Notably, this is to ensure it complies with the Environmental Management and Coordination Act of 1999 and the Environmental Impact Assessment and Audit regulations 2003 (amendments), the Environmental (Impact assessment / Audit) (Amended) Regulations, 2019 Gazetted on 30th April 2019 under Legal Notice No. 31 and 32.

Following the above conclusions, the proponent shall ensure the prevention and mitigation of adverse impacts from the proposed project.

CHAPTER 9: AUXILIARY INFORMATION

9.1 Project cost

The project is estimated to cost Ksh1,500,000.00 (One billion and five hundred million Kenya Shillings).

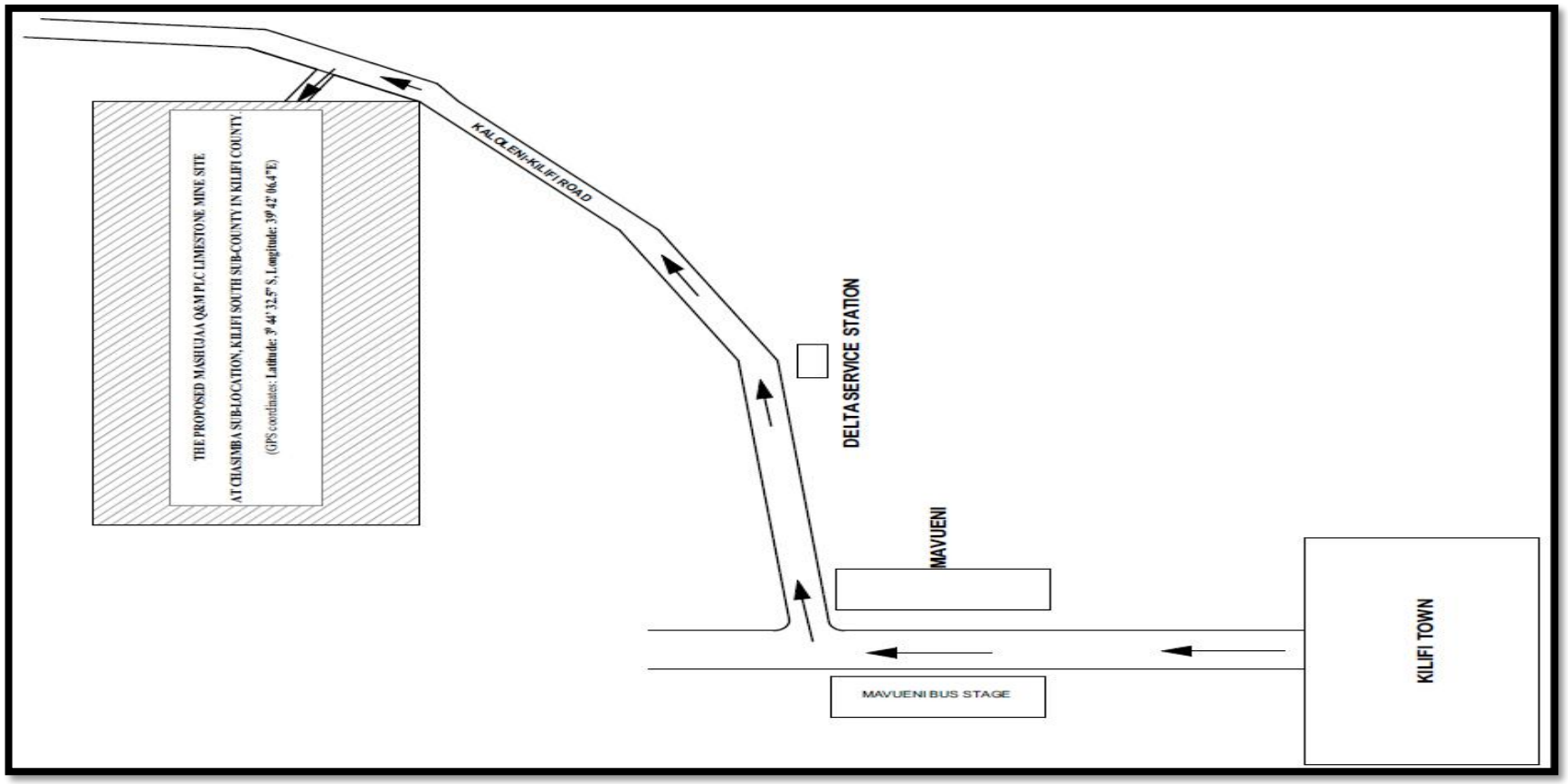
9.2 Photo Inventory

9.2.1 Map for the proposed site area.

Figure 4: *A map depicting the neighboring character.*

9.2.2 A Sketch Map to the Proposed Site

Figure 17: *A Sketch Map to the Proposed Site.*



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9.2.3 Photo gallery

Figure 1: *Proposed site area at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County*.

Figure 2: *Proposed site area at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County*.

Figure 3*: A photo image showing the mineral ore-bearing rock outcrop at the proposed site in Chasimba Sub-Location*.

Figure 15: *Kilifi-Kaloleni Road*

Figure 3: *Access road to the proposed site at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County.*

Figure 34: *The community of Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County during the Public Participation focused group meetings.*

Figure 35: *The community at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County during the public participation meetings.*

Figure 36: *The stakeholder engagement meeting at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County during the focused group meetings.*

Figure 37: *The stakeholder engagement meeting at Chasimba Sub-Location, Kilifi South Sub-County in Kilifi County during the focused group meetings.*

9.3 REFERENCES

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Article (New Technology in Opencast Mining) - Published in Scuim'99 of MGMI.

APPENDICES

1. Soil Assay Report.
2. Rock Assay Report
3. Baseline Data Report.
4. Expert Practicing license.
5. Public Participation Forms.
6. Copy minutes for the meetings and attendance list.
7. Copy of Design layout for the proposed Cement Grinding Plant
8. Certificate of Incorporation.
9. KRA Pin Certificate for the Company.
10. Copy of CR12.
11. NEMA TOR Approval Letter to Undertake the full ESIAS report.
12. Copy of land ownership documents.
13. Kenya Revenue Authority pin certificate