



EQUIPMENT AND MANPOWER REQUIREMENT
FOR
PROPOSED NALA QUARRY PROJECT
(Dodoma Region, Tanzania)

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Prepared for
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Chapter One

1 NALA QUARRY PROJECT

1.1 Project rationale

The proposed quarry project is located in Sebu village, Northwest of Dodoma city in the Dodoma Region, Tanzania. Dodoma, the new national capital of the United Republic of Tanzania is located in the centre of the country 453 km west of the former capital at Dar es Salaam. The project area is reached by a paved road of approximately 3.3 km from Nala Centre which is about 21.3km from Dodoma City Centre along Dodoma-Singida Road.

Because of government commitments to shift its headquarter from Dar es Salaam to Dodoma the demand for building materials is likely to increase as a consequence of trends such as construction of government offices, staffs accommodation, road networks, recreation centres, health centres and schools. The shortest distance travelled from the aggregate extraction place /the crusher to market will make the project competitive in terms of price per cubic metre of aggregates. This will make aggregates more affordable to the customers compared to other area. This make guarantee of doing business in big scale with sustainable long-term profitability.

1.2 Project History

The interest to start a quarry and aggregate production in the proposed area comes after two feasibility studies conducted in the area. First, the geological investigations were performed by the Geological Survey of Tanzania. The investigation indicates the potential of the area for the establishment of quarry and aggregate production and other building materials.

Another study deployed using seismic refraction method was done by RRIB International Limited to detect the geological interface between layers of rock, determine overburden thickness, geophysical properties of bedrock and rock type. The result obtained established the potential of the area for quarry mining with both granite rocks outcrops and underlying granite rock mass with shallow overburden of 2-2.5m. Figure 1 is a plot of tomography showing granite rock mass of the area. Key; 361- overburden, 2125-Possible granite rock mass, 31885-inconclusive depth of granite rock mass.

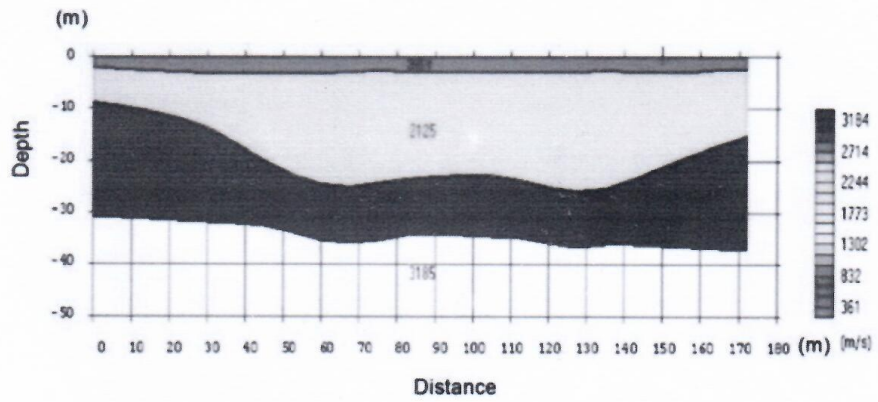


Figure 1 Plotrefa tomography showing granite rock mass of the area

(Source: Seismic Refraction Report, RRIB international limited, April 2018)

1.3 Project boundaries

The project area covers seven Primary Mining Licenses (PMLs) with an area of approximately 33.05 hectares. The boundary of each PML is defined by geographical coordinates as indicated in Table 1 below.

Table 1 Location of the concessions in the project area

Code	Order	Latitude Degrees	Latitude Minutes	Latitude Seconds	Longitude Degrees	Longitude Minutes	Longitude Seconds	Area
PML007418CZ	1	-6	5	55.2	35	35	0.4	4.95 ha
	2	-6	5	45.5	35	35	0.4	
	3	-6	5	45.5	35	35	5	
	4	-6	5	55.2	35	35	5	
PML007419CZ	1	-6	5	55.2	35	34	38.8	4.95 ha
	2	-6	5	45.5	35	34	38.8	
	3	-6	5	45.5	35	34	44.2	
	4	-6	5	55.2	35	34	44.2	
PML007417	1	-6	5	55.2	35	34	0.4	4.95 ha
	2	-6	5	55.2	35	34	55	
	3	-6	5	45.5	35	34	55	
	4	-6	5	45.5	35	34	0.4	
PML007420CZ1	1	-6	5	55.2	35	34	38.8	4.22 ha
	2	-6	5	45.5	35	34	38.8	
	3	-6	5	45.5	35	34	34	
	4	-6	5	55.2	35	34	34	
PML007416CZ	1	-6	5	55.2	35	34	49.6	4.95 ha
	2	-6	5	45.5	35	34	49.6	
	3	-6	5	45.5	35	34	55	
	4	-6	5	55.2	35	34	55	
PML007415CZ	1	-6	5	55.2	35	34	49.6	4.40 ha
	2	-6	5	45.5	35	34	49.6	
	3	-6	5	45.5	35	34	44.2	
	4	-6	5	55.2	35	34	44.2	
PML007421CZ	1	-6	5	15.7	35	34	41.4	4.63 ha
	2	-6	5	21.6	35	34	42	
	3	-6	5	21.6	35	34	50	
	4	-6	5	15.7	35	34	50	

1.4 Project Concept

This project aims to supply and/or sale aggregates to different customers in the construction sector. Before we start operating a quarry, there will be the opening up of a road to the quarry pit followed drilling and blasting to get granite rocks. This will be crushed using fixed crusher located at a distance of 0.5km from the pit. The aggregates will be supplied to different customers to support fast development

and construction needs of Dodoma city which is in high demand of construction materials for buildings and roads, hardcore and gabion as part of the foundation.

The proposed project will be implemented into phases:

- The first phase will initiate the project and establish the market demand. This process will start with 39 employees with key mining and crushing equipment as outlined in Chapter Two and Three of this report. Phase one will be operating an 8-hours shift system. The shift work will be performed in by rotating two shifts per day i.e. day and night shifts to complete a total of 16 hours of the day, for 22 days in a month.
- The second phase will be expanding the project by increasing the number of employees and production rate by securing big contracts, improve productivity by changing an 8-hours shift to 12-hours shift by rotating the two shifts i.e. day and night shifts with a total of 24 hours per day, for 26 days in a month. Where necessary procurement of additional equipment, machine and capital investment will be required to boost the project. The investors are willing to invest with confidence of return on investment and profitability of the project for the interest of shareholders.

The next three chapter highlighted the minimum requirement to start the project in terms of equipment and work force. Procurement of mining and crushing equipment are vital important for starting the proposed project.

Chapter Two

2 MINING OPERATIONS

2.1 Mining strategy and objective

The mining strategy will largely depend on the available customer's orders to find out whether the materials supplied will be used as hardcore, gabion or foundation stones.

2.2 Equipment Requirements

The proposed project will start with a minimum list of equipment of reasonable size as tabulated in Table 2 below, and grow bigger when needs arise following an expansion in aggregates demand.

Table 2 List of Mining Equipment for Nala quarry project

Equipment Type	Model/Capacity	No. of Unit	Allocated activities
Excavator	<ul style="list-style-type: none"> • Tata Hitachi Excavator • ZAXIS 370LCH • Crawler Excavator • 35ton • 1.3-2.1m³Bucket capacity 	2	Material handling, Loading, Rock breaker, Digging of trenches
Dozer	<ul style="list-style-type: none"> • Caterpillar • D6R XL-Series III • Track-Type Tractor 	2	Waste dump, Quarry Area, Stockpile levelling, Access road construction and overburden stripping
Motor Grader	<ul style="list-style-type: none"> • 280HP 	1	Grading roads/levelling stockpile
Wheel loader	<ul style="list-style-type: none"> • Tata Hitachi • TL360Z • 12ton • 1.5-3m³ bucket capacity 	2	Feeding crusher, stockpile management and Loading operations
Dump trucks	<ul style="list-style-type: none"> • CUMZININS Tipper Truck • 25-50 ton 	15	Hauling Material
Drill rig	<ul style="list-style-type: none"> • Atlas Copco model ROC 742 HC01 • Diesel engine, 170Hp, 150 rpm and • feed force of 20KN • 17m³/min 	2	Drilling operations
Water Bowser	<ul style="list-style-type: none"> • FAW Truck • 10,000 Litre Tank 	3	Dust suppression, collecting drinking water
Service Truck	<ul style="list-style-type: none"> • Toyota Land Cruiser • 4WD 	4	Finance Manager(1unit), Shift supervision(1 unit), Survey(1 unit), Geology, Operations(1unit)
Rock Breaker	<ul style="list-style-type: none"> • 145 HP 	4	Breaking rocks

Compressor	• Atlas Copco XAS 186	3	For Jack Hammers
Jack Hammer	• Digger Y24 and Y28	6	Drilling
Welding/Gas Machine	•	3	Welding/cutting
Mine Tents	• Normal size	6	Shelter
Motorcycle	• Sunlag/Boxer	6	Transportation
Container	• 20 feet(4unit);40feet(4unit)	8	Stores/office/Workshop
Communication	• Radio call	10	communication
Fuel truck	• Canter 3.5ton	1	Fuel transportation
Lighting Tower	•	4	
Toolbox spanner	<ul style="list-style-type: none"> • Complete set including • Chain Blocks • Big Hammer • Wire rope big size &small size heavy duty • Jack 		
Fire Fighting Equip			
Staff Bus	• Min Bus	1	Employees' transport
Generator	• 110KVA	2	Standby generator

2.3 QUARRY INFRASTRUCTURE AND SUPPORT FACILITIES

2.3.1 General Overview

In order to save cost of construction and vibration damage caused by blasting due to proximity of the quarry and the crusher, the proposed project will use six containers to support different facilities (see Table 3 for more details). The flexibility of using these infrastructures (containers) will save both the cost of mining and hauling of materials especially when the quarry will be required to move to another location.

Table 3 List of containers required for Nala quarry project

Container	Unit	Detail/Usage
40 feet	1	Crusher Store <ul style="list-style-type: none"> • Conveyor belt • Roller • Motors • Angle line • Bolts and Nuts
40 feet	1	Lubricant store <ul style="list-style-type: none"> • Hydraulic oil • Gear oil • Engine oil

		<ul style="list-style-type: none"> • Brake fluid • Machine spare parts
20 feet	1	Mine site office <ul style="list-style-type: none"> • Site in charge • Site Foreman • Document store
20 feet	1	Safety and Training office including <ul style="list-style-type: none"> • First aid station
20 feet	1	Explosive store
40 feet	1	<ul style="list-style-type: none"> • Mess/Kitchen with • 4 tables • 16 chairs • Water dispenser • Deep freezer • Gas cooker

2.3.2 Office Facility

There will be the main office in Dodoma Region headed by the Finance Manager and one secretary. The Finance Manager will be responsible for finance, accounting, administration, marketing and sales. At the Mine site one temporary container of 20 feet will be required for site in-charge site foreman, safety and training officer.

2.3.3 Workshop Facility Area

The workshop will be constructed surrounded by three containers and fenced by a wire mesh. All quarry machines and dumps will move from the quarry and park at the workshop area (when not operational) to avoid/reduce the risk of fuel theft, vandalism of machine parts and reduce the cost of employing large number of security guards.

2.3.4 Fuel Storage Facility

At the beginning the fuel will be stored in 200 litres drum and all machines and trucks will be refuelled at workshop area. With regards to long-term planning, as operation expand and became aware of the fuel consumption, the storage tanks of minimum 30,000 litre and dispensing pump will be required.

2.3.5 Camp Accommodation

Every employee will be required to find his/her own accommodation on a nearby village. The company will use company min bus to transport employees to/from the working place.

2.3.6 Communication

Six radio call systems will be required at the beginning of the project for communication purposes. The use of radio call will simplify communication between the following points: Dodoma main office – 2, Quarry -2, Control room-2, Security-2, Crusher operator-2.

2.3.7 Transportation

Employees' transportation to/from the work place will be provided by company using a company mini bus. Both shifts day and night will start at 6.00 O'clock.

2.3.8 Explosives Magazine

At the beginning of the project one container of 20 ft will be required to store explosive accessories. In addition to this, (1X1m) one by one metre detonator concrete strong room will be constructed to store detonators.

2.3.9 Food Facility

There will be one container of 40 feet that will used as kitchen and canteen for employees. For day shift, employees will be provided with breakfast and lunch while for the night shift, employees will be provided with dinner and breakfast.

Chapter Three

3 CRUSHING OPERATION

3.1 Crushing strategy and objective

The strategy is to crush and stock 40mm of aggregates product in large amount and make it readily available for customers when required. The emphasis is on 40mm aggregates because the rest of the sizes including 20mm, 13mm and chipping (0.5mm) aggregates can be obtained easily by adjusting the cone crush and fed 40mm aggregates particle size into a cone crusher. This will be followed by the screening process to get the required material for sales.

3.2 Crusher specification

- Feed rate -120 tonnes per hour
- Driven by 3 phase power supply

3.3 Design parameter

Table 4 List of design of parameter for Nala quarry project

Description	Unit	Output
Feed rate	tonne/hour	120
shift	Hour	8
Day	Hour	16
Month	Day	22
loose density of aggregates	Tonne/m ³	1.78
Production(t)/shift	tonne/shift	960
Production(t)/day	tonne/day	1,920
Production(t)/month	tonne/month	42,240
Production(m3)/month	Cubic metre/ month	75,187
Price	Tsh/m3	30,000
Revenue per month	Tsh	2,255,616,000

3.3.1 Crusher equipment

Table 5. List of crusher equipment required for Nala Quarry Project

Items required for crushing operation	Quantity
Crusher hopper	1
Feeder	1
Jaw crusher	1
Main Conveyor belt	1
Cone crusher	1
Conveyor No.2	1
Conveyor No.3	1
Conveyor No.4	1
Conveyor No.5	1
Return conveyor	1
Screens	1

3.4 Crusher Location

The crusher will be located 500 m from the quarry.

3.5 Crushed Product Specifications

Specifications of the crushed products will greatly depend on customer requirements (as per information contained in the supply contracts) depending on their usage e.g. for house building or road constructions.

3.6 Standard Specifications for Building Materials

The crusher setup will accommodate Building and/or Construction Industry Standards as outlined on Table 6 below.

Table 6 Standard specification for building materials

Material	Size Specification
Aggregates	1/2 inch
Aggregates	3/4 inch
Aggregates	Chipping
Aggregates	Dust

3.6.1 Standard Specifications for Road Construction Materials

The Cone crusher will be adjusted when road construction material is required as outlines in Table 7 below.

Table 7 Standard specification for road construction materials

Material	Size Specification
Aggregates	40mm
Aggregates	20mm
Aggregates	13mm
Aggregates	chipping

Chapter Four

4 MANPOWER REQUIREMENTS

4.1 Introduction

The project aims to employ locals and only use expatriates to provide expertise that is not readily available locally. The number of staff will increase progressively as business expand and grow bigger based on product requirements from our customers. To start with the company plan to employ a total of 39 employees in mining, crushing, maintenance, safety and camp services.

4.2 Staff requirements

Table 8 List of staff manpower requirement for Nala proposed Project

Department	Item	Quantity
Administration	Finance Manager and Admin	1
	Office Secretary	1
Mining	Excavator operator	2
	Dozer Operator	1
	Drilling operator	1
	Dump Truck	2
	Blaster	1
	Drilling Operator Assistance	1
	Foreman/Mining Engineer	1
	Foreman Assistant	1
Crusher	Crusher operators	2
	Crusher operators Assistants	2
	Control room operator	2
	Wheel loader	2
	Boiler maker(Gas/Electrician)	1
	Foreman/Process Engineer	1
	Foreman Assistant	1
Maintenance	Heavy Mechanic	1
	Auto mechanics	1
	Electricians	1

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	Dump Truck	2
	Blaster	1
	Drilling Operator Assistance	1
	Foreman/Mining Engineer	1
	Foreman Assistant	1
Crusher	Crusher operators	2
	Crusher operators Assistants	2
	Control room operator	2
	Wheel loader	2
	Boiler maker(Gas/Electrician)	1
	Foreman/Process Engineer	1
	Foreman Assistant	1
Maintenance	Heavy Mechanic	1
	Auto mechanics	1
	Electricians	1

Safety	Safety officer Training/Nurse/First Aider	1
Security	Supervisor Security officers Store man	1 5 1
Camp/Kitchen	Cooker	4
Total labour		39

4.3 Number of Employees Planned

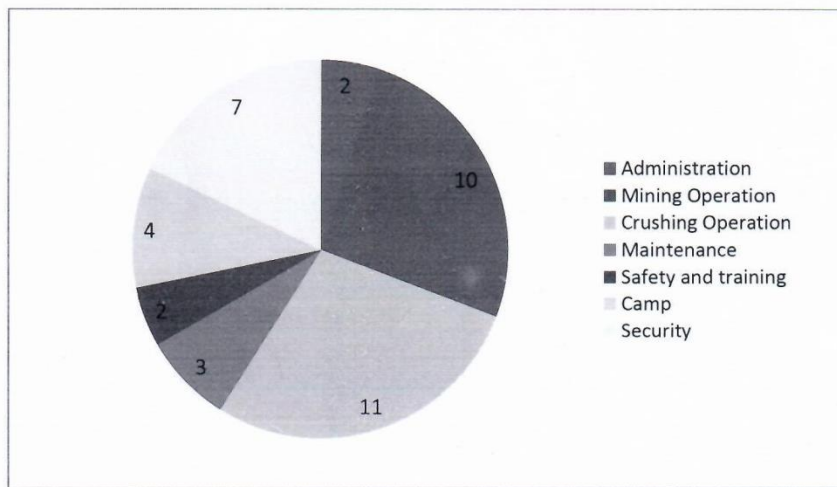


Figure 2 Number of employees planned for each sector/section

4.4 Employment

The employment plan for this project will be to employ local villagers surrounding the project for positions that they qualify. If there will be no qualified candidate within the local village the position will be made open and will be filled by employees from outside the village for specialized tasks (such as equipment operators).

4.5 Training

The company recognizes that training is critical to its long-term success and for this reason, the company planned to employed experienced safety and training officer before starting operations. Initial training will focus on mining, transportation of material and crushing operations. This will include 'hands on' practical sessions and classroom training that will include job specific elements, safety and environmental elements, and company policy elements.

4.6 Organization Management Structure

The Finance Manager will head the project assisted by crusher foreman and quarry foreman. The Finance Manager will be the overall in- charge of various activities including finance, accounting marketing and administration.

Site in-charge will be responsible for crushing aggregates, planning, operations, safety, environment, finance, administration and overall mine management. On the other hand, Quarry foreman will be responsible for quarry mining activities including drilling, blasting and transportation of material from the pit to the mine. Figure 2 below present the proposed organization chart.

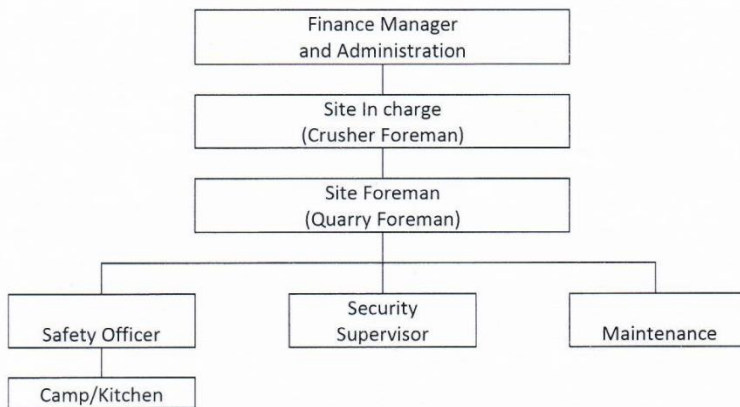


Figure 3 Proposed organization structure for Nala Quarry project

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