FEASIBILITY REPORT

MNGAMA RIDGE MWATATE AREA

VINCENT MAKAU MINES

Contents

ABSTRACT

The report describes an area *of* approximately 1,285 square miles in south-eastern Kenya between meridians *38°* 00' and 38° 30' East, bounded in the north by the Voi- Taveta Moshi railway and in the south by the Tanganyika border.

Two main topographical divisions are recognized:

(1) the almost featureless peneplain covering the western, southwestern and southern parts of the area and

(2) the hilly area in the north-east. Lesser units
are the escarpment running south from Kinjaro hill to the Tanganyika border and the group of hills in the extreme south-east.

The rocks of the area fall into three groups:

(l) Metamorphic rocks of the Basement System, mainly paragneisses of psammitic origin, with strongly developed crystalline limestones and local occurrences of graphitic gneisses and schists:

(2) a major meta-doleritic intrusive into the Basement System in the south-east:

(3) Pleistocene and Recent deposits,mainly sandy soils, with areas of black cotton soils and secondary superficial limestones *(kunkar).*

The petrography of the various rock types is described and the metamorphism, granitization and structure of the Basement System are discussed.

INTRODUCTION

The area described in the present report is approximately 1,285 square miles in extent and lies between the meridians 38° 00' and 38° 30' East, being bounded on the north by the Voi- Taveta-Moshi railway and on the south by the Tanganyika border. The railway between Voi river and Bura marks the southern limit of the Taita hills, a block of country about 150 square miles in area whose peaks rise above 7,000 feet.

The area can be divided into two major units, the almost featureless plain which extends into the area from the west and south, and the hilly area to the north-east, which is essentially a series of ridges trending just west of north. Plate I gives a view of the valley of the Mwatate river which follows a roughly north-south fault between two such ridges. Other minor units are the marked escarpment running south from Kinjaro towards the Tanganyika border and the group of hills in the extreme south-east

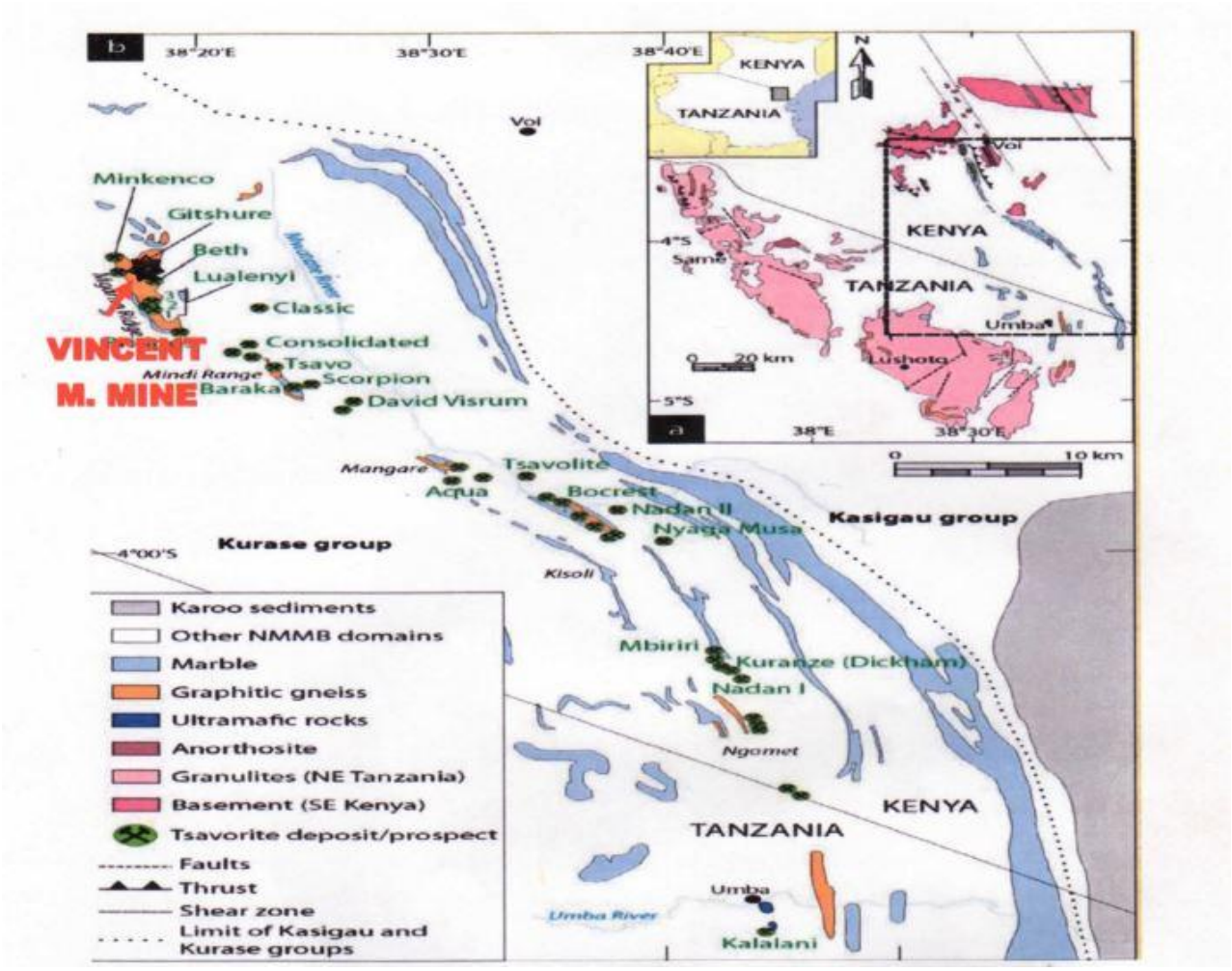
The coordinates are

a)3032’15.1” S 38O18’42.1" E

b)3032’16.3”S 38O 18’47.O" E

C) 3032’22.4”S 380 18,42.2,, E

d)3O32’21.8” S 38018’37.7” E



SUMMARY OF GEOLOGY

The consolidated rocks of the area are wholly members of the Basement System, which is assumed to be of Archaean age, together with a doleritic intrusion and other minor intrusions. They are for the most part covered by unconsolidated superficial deposits of Pleistocene to Recent age.

Basement System

The rocks of the Basement System in the area mapped consist of a succession of paragneisses, some of which are granitoid in composition and appearance and sometimes contain biotite or hornblende, crystalline limestones, graphitic gneisses and lesser amounts of felspathic quartzites, plagioclase amphibolites

and calc-silicate rocks. They closely resemble rocks in many other parts of Kenya that are assigned to the Basement System.

The granitoid gneisses, consisting of little more than quartz and felspar, form the most prominent features of the area, Mgama ridge and Mairimba hill south-east of the ridge.
They are associated in the Mgama ridge with quartzo-felspathic gneisses of very similar composition but with much finer and more regular grain size, and minor felspathic quartzites.
Biotite gneisses form the bulk of the other exposures, and generally give rise to much less prominent features. In a few exposures, e.g. at Sembi and Kambanga, the biotite gneisses are markedly porphyroblastic: elsewhere, as at Pusa and the Naoni-Mkengereni ridge, they contain well-defined bands relatively rich in garnet. The biotite gneisses are frequently well-banded on a small scale.

BRIEF DESCRIPTION OF NATURE OF THE PROJECT.

Methodology

Geophysical investigation utilizes the measurements of physical quantities that are made at or above the ground surface and are used to investigate concealed geology. Proton magnetometer was used in this investigation. The subsurface structures in a part of the southern part of Mngama area were estimated by the interpretation of ground magnetic data. Magnetic survey was used to delineate magnetic lineaments, analyze its relationship to tectonic fabric and estimate the depth of perturbing body source. Mining operations is by way of mechanized opencast method with drilling & Without blasting complying with all the statutory requirements. Out of the entire land area of 220 acres., about 170 acres is mineralized.

Total intensity magnetic field measurements were carried out with MP2 SCINTREX proton precession magnetometer made by Scintrex Company of Canada with one nanoTesla (nT) sensitivity (Figure 3). The same magnetometer was used for base station recordings to apply the diurnal variation correction as well as taking field measurements. Magnetic surveys are based on the premise that a target is limited in space and has a different physical property (e.g. magnetic susceptibility), from the surrounding formation.

Unlike gravity surveying, however, the variation in magnetic susceptibility for various rock types is orders of magnitude greater than the variation in density for the same rock types. Thus, even knowing the types of rocks in a specific area does not provide sufficient information to constrain susceptibilities. Like density contrast, variations in susceptibility trade off strongly with other model parameters. Therefore, if susceptibility, or other model parameters, cannot be

constrained from different observations, it is difficult to make quantitative estimates of the geologic structure based on magnetic observations alone.

In a particular survey, additional constraints were applied that allowed the magnetic observations to be used in a quantitative fashion. This information was derived from other separate data sets, for example, formation layering from geological mapping. The general trend of the rock units was in the northwest direction.

A magnetic survey was designed to estimate the spatial extent of the structure and its susceptibility by in-lab forward modeling. In planning the magnetic survey, the noise was predicted from sources not of interest in the survey, estimated the standard deviation of the random (operator and instrument) noise, calculated the shape of the signal (the theoretical anomaly produced by the assumed source), then decided whether the signal generated by the target of interest was above the noise level that allowed a meaningful interpretation to be conducted.

The Magnetic survey orientation in Mngama area was in the northeast-southwest profile across the general strike of the rock units in the area. Survey was carried out at an interval of 20 m along each profile and 250 m from one profile to the next. MP2 SINTREX proton precession magnetometer was used to carry out the survey (Figure 4). Readings taken included position coordinates altitude, time and magnetic variations in nano-Tesla (nT).

The map showing the location where ground magnetic survey was taken.

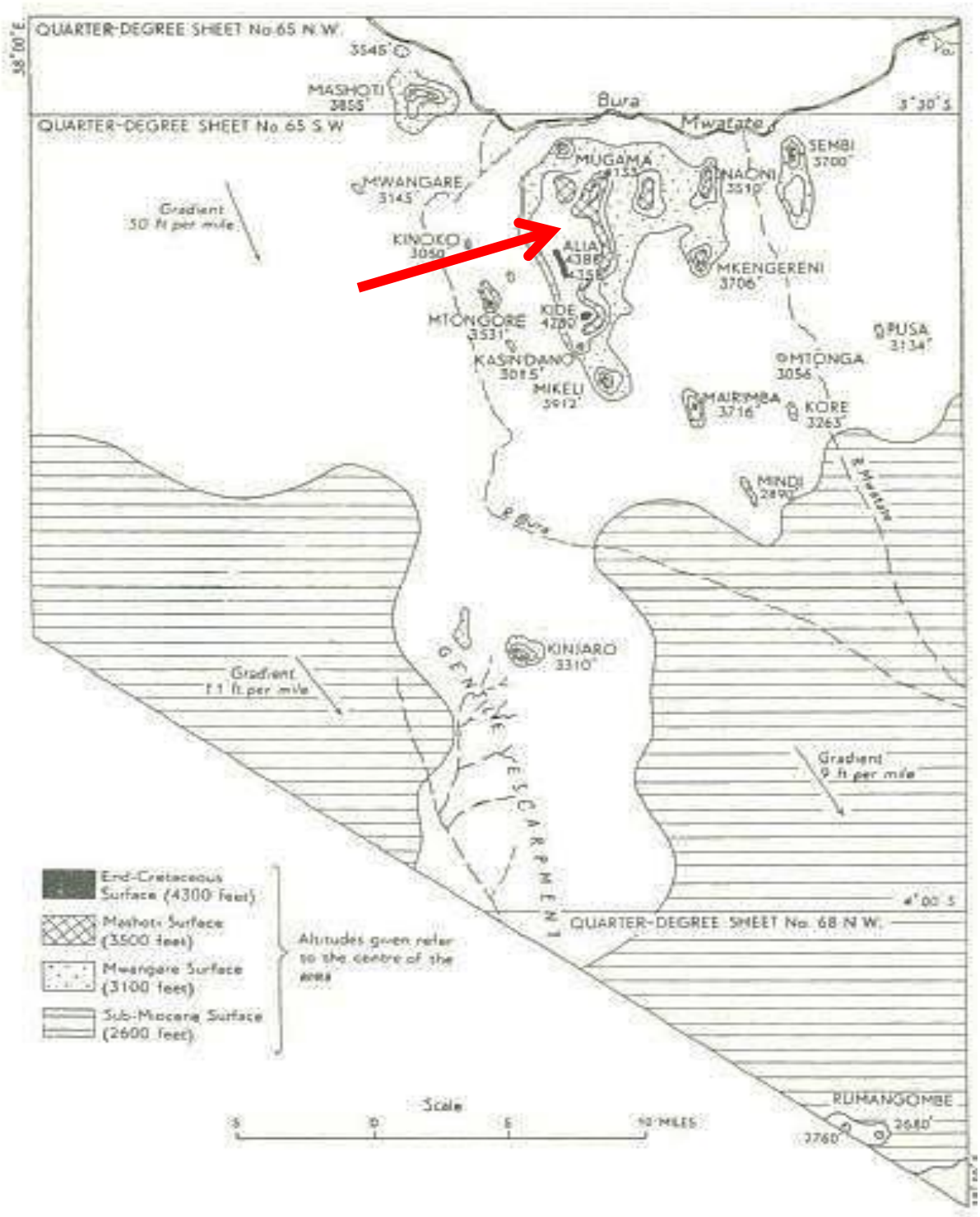
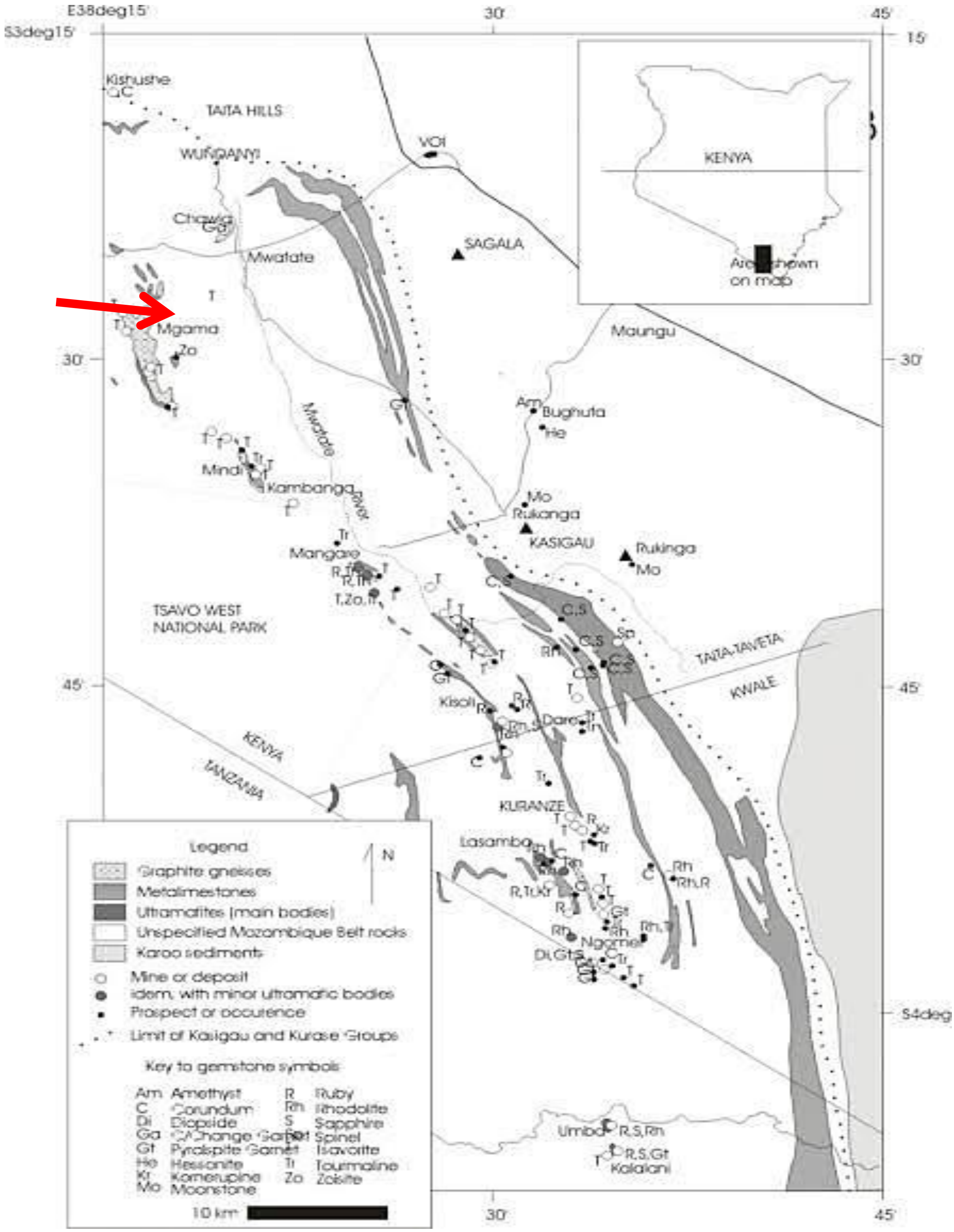


Fig. 1—Phisiographical sketch-map of the area south of the Taita hills.



E38deg15'
30'
45'
S3deg15'
15'
30'
45'
S4deg
Kishushe
TAITA HILLS
WUNDANYI
VOI
Chawia
Mwatate
SAGALA
KENYA
on map
Mgama
Zo
Maungu
Bughuta
Mindi
Kambanga
Mo
Rukanga
KASIGAU
Rukinga
Mangare
TSAVO WEST
NATIONAL PARK
TAITA-TAVETA
KWALE
KENYA
TANZANIA
Kisoli
KURANZE
Lasambo
Ngome
Umba
Kalalani
Legend
N
Graphite gneisses
Metalimestones
Ultramafites (main bodies)
Unspecified Mozambique Belt rocks
Karoo sediments
Mine or deposit
idem, with minor ultramafic bodies
Prospect or occurence
Limit of Kasigau and Kurase Groups
Key to gemstone symbols
Am Amethyst
C Corundum
Di Diopside
Ga Change Garnet
Gt Pyralspite Garnet
He Hessonite
Kr Kornerupine
Mo Moonstone
R Ruby
Rh Rhodolite
S Sapphire
Sp Spinel
Ts Tsavorite
Tr Tourmaline
Zo Zoisite
10 km

Geochemical Investigations

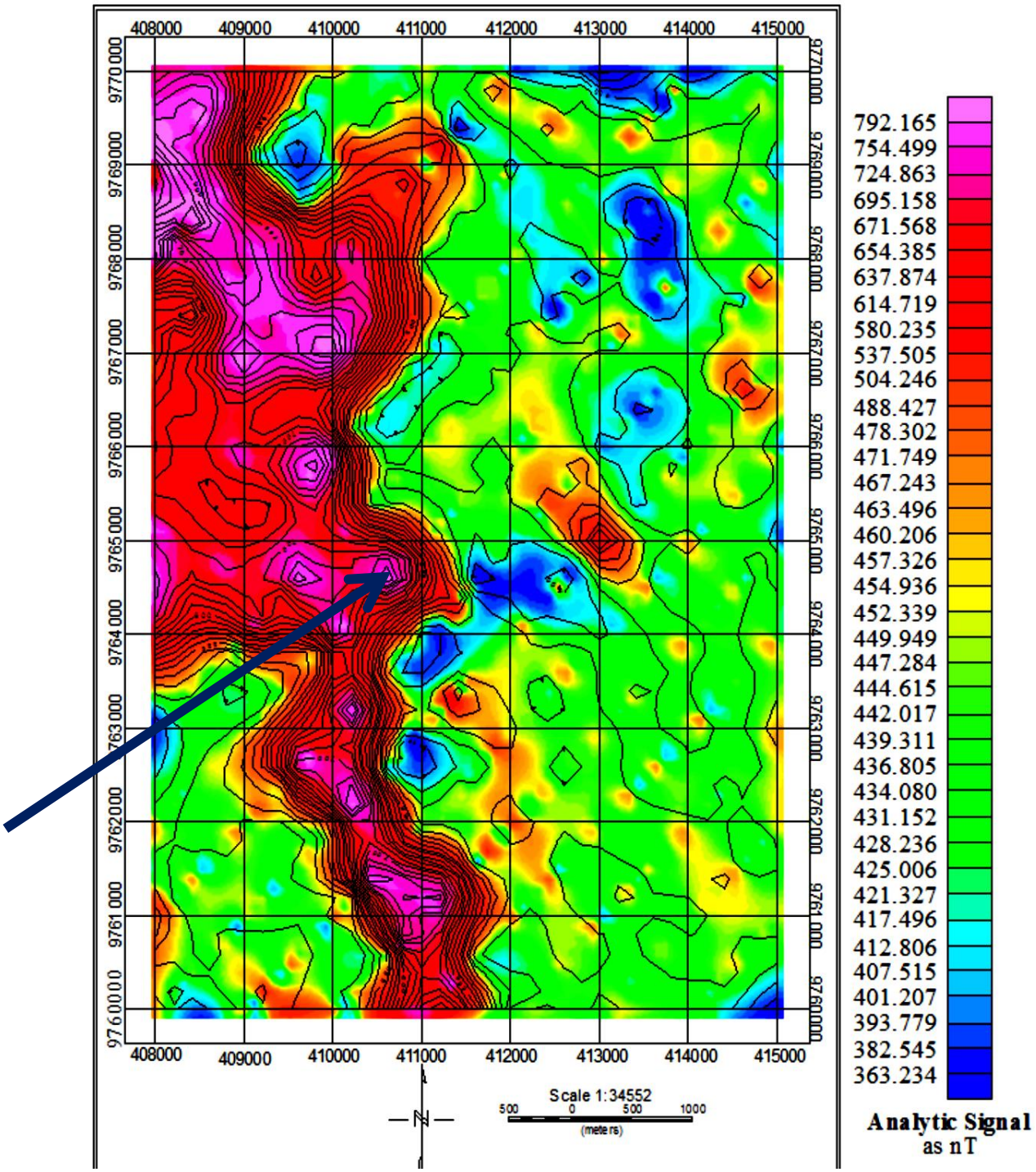
Geochemical investigations were carried out to establish the chemical composition of the geological material that was anomalous. Geochemical survey involved fieldwork and the samples collected were analyzed using a variety of analytical techniques. Amongst the instrumental methods used in analysis included atomic absorption spectrometry (AAS) and X-ray fluorescence (XRF). Detailed identification of individual minerals was undertaken by using a polarizing microscope

Results and Discussion

The results obtained were used to delineate the iron mineralized zone. Both 3D Euler deconvolution and 2D Euler deconvolution were used to synthesize the results. 3D Euler deconvolution utilizes XYZ (X = length along X axis, Y = length along Y axis, Z = length along the Z axis) values to provide the subsurface geophysical information. 2D data interpretation gave information along designated profiles and the depth. The obtained values were corrected for the normal gradient of the earth's magnetic field (IGRF); the corrected magnetic values were plotted using Euler 2D and Oasis Montaj

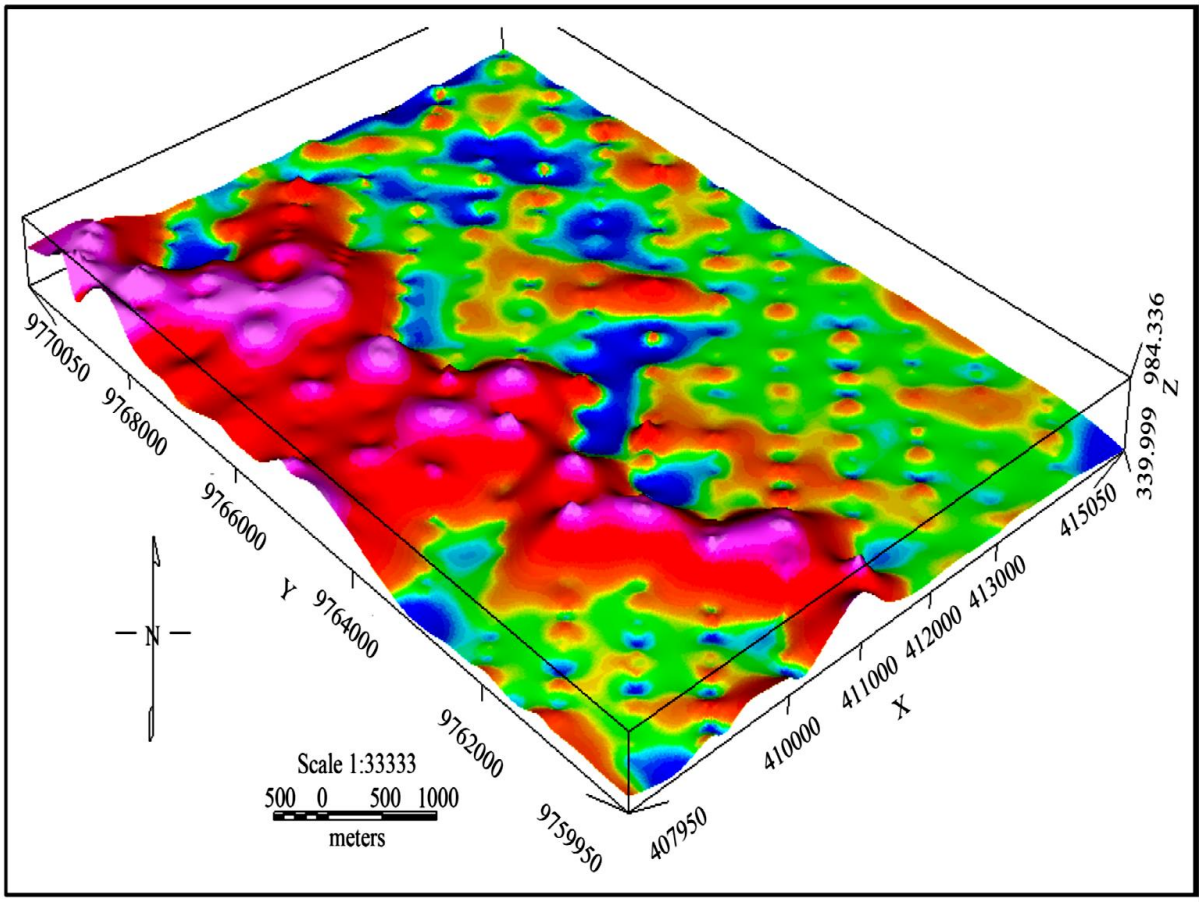
Delineation of the Shear Zone Using Euler Convolution

The high anomalous values plot on the western part of the area of survey



The contour map showing the trend of Iron ore mineralization in Mgama area.

The boundary of the iron rich rocks is marked by the tightly spaced contours on the western part of the research area.



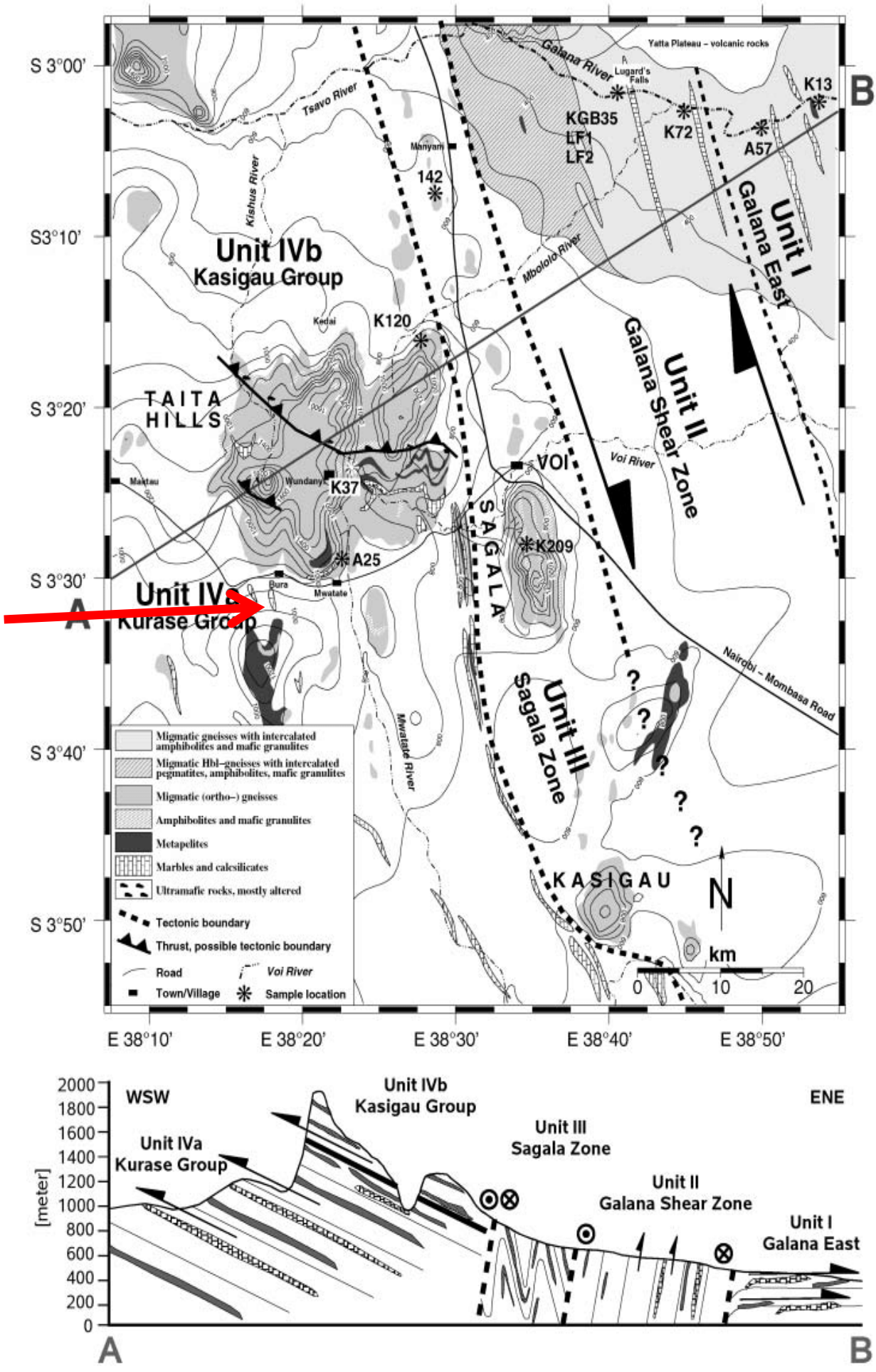
The 3D figure showing the trend of Iron ore mineralization in Mgama area in 3D. The boundary of the iron rich rocks is marked by the red colour. The linear trend which is in the north-south direction. This trend shows that the geological body/structure having anomalous values occurs closer to the surface trending in the north-south direction. The high anomalous values range from 550 nT - 1000 nT.

Field Proving with Laboratory Investigations

Extensive geological, field proving and geochemical investigations were carried out for the areas with anomalous values and delineated in the studied gneisses by the magnetic survey. During the field works, the geochemical investigations revealed that the Fe2O3 was relatively high in the sheared gneisses.

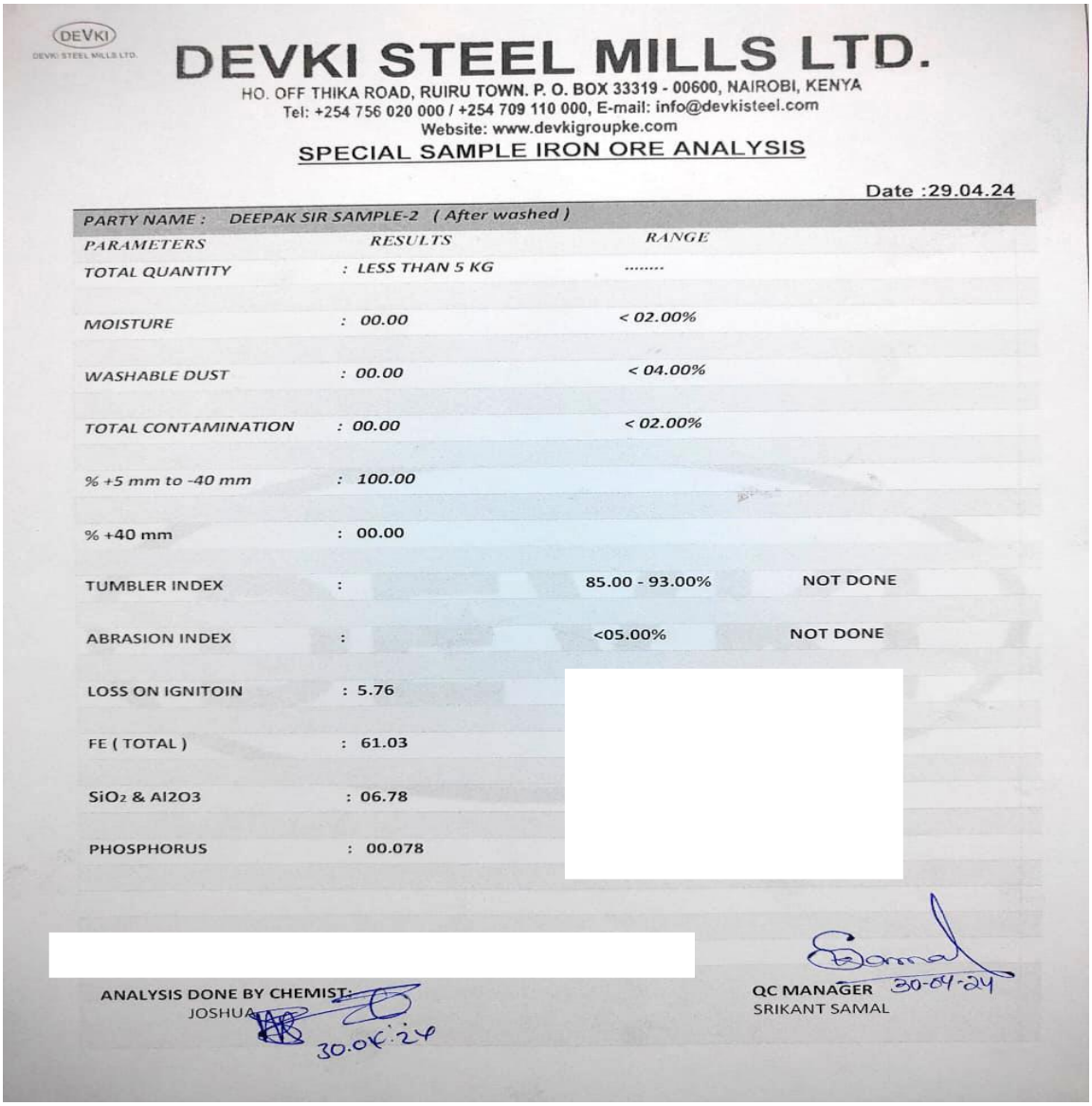
The mineralized zones were found to be mainly connected or hosted by the hornblende gneisses that followed the direction of the strong and nearly vertical shear zone striking N380W-S350E in the western part of Mgama town.

As shown below:


S 3°00'
S3°10'
S 3°20'
S 3°30'
S 3°40'
S 3°50'
E 38°10'
E 38°20'
E 38°30'
E 38°40'
E 38°50'
A
B
Yatta Plateau – volcanic rocks
Galana River
Lugard's Falls
Tsavo River
Kishus River
Manyam
142
KGB35
LF1
LF2
K72
K13
A57
Unit I
Galana East
Mbololo River
Unit IVb
Kasigau Group
Kedai
K120
TAITA
HILLS
Unit II
Galana Shear Zone
Voi River
VOI
Maktau
Wundanyi
K37
SAGALA
K209
A25
Bura
Mwatate
Unit IVa
Kurase Group
Nairobi – Mombasa Road
Unit III
Sagala Zone
Mwatate River
KASIGAU
N
km
0
10
20
Migmatic gneisses with intercalated amphibolites and mafic granulites
Migmatic Hbl–gneisses with intercalated pegmatites, amphibolites, mafic granulites
Migmatic (ortho–) gneisses
Amphibolites and mafic granulites
Metapelites
Marbles and calcsilicates
Ultramafic rocks, mostly altered
Tectonic boundary
Thrust, possible tectonic boundary
Road
Town/Village
Voi River
Sample location

[meter]
2000
1800
1600
1400
1200
1000
800
600
400
200
0
WSW
ENE
Unit IVb
Kasigau Group
Unit IVa
Kurase Group
Unit III
Sagala Zone
Unit II
Galana Shear Zone
Unit I
Galana East
A
B

Chemical analysis of the samples that proved to be Hematite.



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HO. OFF THIKA ROAD, RUIRU TOWN. P. O. BOX 33319 - 00600, NAIROBI, KENYA
Tel: +254 756 020 000 / +254 709 110 000, E-mail: info@devkisteel.com
Website: www.devkigroupke.com

SPECIAL SAMPLE IRON ORE ANALYSIS

Date :29.04.24

PARTY NAME : DEEPAK SIR SAMPLE-2 (After washed)

PARAMETERS	RESULTS	RANGE	
TOTAL QUANTITY	: LESS THAN 5 KG	.....	
MOISTURE	: 00.00	< 02.00%	
WASHABLE DUST	: 00.00	< 04.00%	
TOTAL CONTAMINATION	: 00.00	< 02.00%	
% +5 mm to -40 mm	: 100.00		
% +40 mm	: 00.00		
TUMBLER INDEX	:	85.00 - 93.00%	NOT DONE
ABRASION INDEX	:	<05.00%	NOT DONE
LOSS ON IGNITOIN	: 5.76		
FE (TOTAL)	: 61.03		
SiO_2 & Al_2O_3	: 06.78		
PHOSPHORUS	: 00.078		

ANALYSIS DONE BY CHEMIST:
JOSHUA 30.04.24

QC MANAGER 30-04-24
SRIKANT SAMAL

Sample	Fe	SiO2	Al2O3	P	S	TiO2	CaO	MnO	MgO	K2O	Na2O	Cr2O3	As2O3	PbO	V2O5	CuO	ZnO	NiO	Cl	LOI
Kasigau Sample	58.59325	6.255	2.061	0.013529	0.002403	4.075	0.217	0.437	0.282	0.036	0.148	<Det	0.033	<Det	0.253	0.001	0.085	0.016	0.002	-1.14004
Pit Sample_1	57.06166	4.305	1.144	0.085538	0.181422	0.069	0.118	0.114	0.117	0.055	0.123	<Det	0.038	<Det	0.054	0.005	0.015	<Det	0.001	10.0556
Pit Sample_2	62.63308	1.731	2.49	0.008292	0.010813	3.416	0.121	0.306	0.908	0.153	0.183	0.24	0.024	<Det	0.116	0.003	0.042	0.044	0.004	-1.9477
Pit Sample_3	62.85867	1.367	2.174	0.006983	0.004806	3.16	0.052	0.316	0.582	0.052	0.161	0.273	0.026	<Det	0.12	0.001	0.04	0.01	0.003	-0.85060
Pit Sample_4	52.34239	9.427	2.463	0.094703	0.148982	0.135	0.653	1.869	0.175	0.028	0.081	<Det	0.073	<Det	0.054	0.008	0.011	<Det	0.007	8.35614
Pit Sample 5	18.69768	41.05	9.15	0.034914	0.044855	2.075	6.242	6.587	6.822	0.14	0.186	0.002	0.144	<Det	0.154	0.056	0.012	<Det	0.002	0.94550

Spectrolab Australia Lab - Test Results for Mwachabo Pits & Kasigau Block

THE MINING LAND

is already been explored by drilling of boreholes with cumulative depth of 1261m. We have proposed 3 no of boreholes for further augmentation of mineral reserves & resources during the Plan Period. Based on the exploration results further drilling will be planned. Reserves have been updated after incorporating data of already drilled core boreholes and recently updated geological plan.

The total Mineral Resources estimated as on 01.01.2012 is **22.205 Million Tonnes**. With the rate of production of 1.1.MTPA, the expected life of the mine will be 21yrs.The life of the mine may get extend with the increase in resources by future exploration to be carried out. The overall ore to waste ratio is about 1:2.4.

The mining operations

is fully mechanized with the use of Heavy earth moving machineries like Rippers and Dozers, shovels, dumpers, wheel loaders, and tippers. The mining operation is carried out in two shifts. Rippers and Dozers are being used for ripping of hard material and wheel loaders are used for loading and levelling. The excavation is done by hydraulic excavators bucket capacity of 2.45 cubic meter and hauling by 25 to 35 Tonnes capacity dumpers and 10 tonner tippers.

Water tankers of capacity of 8000 to 10,000 liters are used for dust suppression. Mombasa Port is at a distance of about 180km by road from the land boundary. Finished product(Lumps & Fines)/ROM is sold to the domestic buyer for further export or domestic consumption. The ore transportation by the buyer is being done by tippers with the capacity of 10Tonnes as well by dumpers with higher capacity.

As per the recommendations in the geotechnical slope stability that mine will be worked by forming systematic benches in ore and overburden maintaining a maximum optimum pit slope 26° /30°

The height of the benches maintained will be 4 meters and width will vary between 7 to 12 meters. Based on size and capacity of the machinery, mine approach road and mine haulage road with a width of 12 meters and with an average gradient of 1:14 will be maintained.

The mining operations will be carried out in two shifts during the plan period , mining activities will be confined carried out in the existing working pit upto -45m RL. As per the recommendations in the geotechnical slope stability study, the ultimate working pit limit will be in existing pit with lateral expansion upto Pit level -68m RL

The waste dumps;

Within the Mining area will occupy about 7Ha. area.

During the plan period the 1.8 Million Tonnes of waste will be generated which will be dumped extending the existing dumps. During the next five years plan period, the rejection will be dumped extending existing dumps as well as in the area annexed for dumping.

Each stage will be of 9meter height and width of 8meter, overall dump slope of 25° will be maintained. There is no change proposed in mining methodology. Heavy earth moving machineries like shovels, dumpers, wheel loaders, tippers along with Rippers and Dozers will be used.

Present existing Land use and Proposed Land use at the end of the Plan period is as given below in Table No.1.

Table No.1

Land Use Pattern

Sr. No	Land Use Category	Present land use As on 01-12-2011 (area in Ha)	Land use at the End of Plan Period. As on 31-03-2021 (area in Ha
1	Area under Mining (Open Pit Area)		
2	Waste dump site		
3	Backfilling		
4	Mineral Storage		
5	Infrastructure (workshop, administrative building etc.)		
6	Roads		
7	Others: environmental protection areas		
8	In utilized areas		

The land use shown above is planned considering the available reserves.

The future land use will be planned considering the results of the exploration.

At the conceptual plan period

it is proposed to reclaim and restore the mined out land with backfilling and afforestation of the suitable local fruit bearing species. The Environmental Protective Measures like rubble wall, Series of settling tanks,trenches etc. will be undertaken. The part of the open pit will be kept as water reservoir as a source of water for the Villagers for drinking as well agriculture purpose. This enhancement is considered expedient because of increase in operating cost and changes occurring in the business environment.

By enhancement of the production capacity the overall cost of the said mine will be reduced and thus, the resources will be optimized.

Opencast mechanized mining

method is adopted for the purpose of exploitation of mineral. The mining operations are fully mechanized by deploying Heavy Earth Moving Machineries like Rippers and Dozers, shovels, dumpers, wheel loaders, and tippers. As the ore body is consistent at Mngama mine, there is less probability of the ore getting mixed with the overburden or inter-burden while mining. No processing loss, as Iron ore produced is dry screened by deploying mobile dry screening plants and products are lumps(+10/40mm),and fines (-10mm), and hence the ore recovery is considered as 100%.

environmental protective measures

including dust suppression, water treatment, water conservation, soil conservation and afforestation are being undertaken to mitigate with the impacts caused by mining activities. Modern techniques in pit dewatering, dust suppression, waste management, afforestation, backfilling, and land mitigation are carried out.

ASSESSMENT OF THE ECONOMIC VIABILITY

for this mine with a production target of 1.1Million Tonnes per annum of iron ore is done and is found to be highly remunerative

There will be maximum demand for iron ore in foreign as well as in domestic market. The project proponent wishes to contribute to socioeconomic upliftment of the area. The Workers and surrounding villagers are not exposed to any extreme or hazardous environment.

This project contributes to the Taita Taveta County Government with Royalty and other taxes and to the Central Government with income tax and export duty, etc. The rapid expansion of the steel sector is resulted into increase in domestic demand for iron ore. The lessee has planned to contribute to meet this demand to the extent possible. This will add to the overall economic growth of the region and the country and thereby reduce the demand & supply gap in the country.

NEED FOR THE PROJECT AND ITS IMPORTANCE TO THE COUNTRY AND OR REGION.

For the present project area, the main revenue generating resources are agriculture and iron ore mining. The Mwatate area will get revenue in terms of taxes and royalty, KRA and the country will be benefited in terms of income tax and export duty and KPA. This will definitely improve the socioeconomics of the region and the country.

This mine shall provide employment for about 300 people by both direct employment which include mine officials, skilled, semi skilled and unskilled labour and indirect employment, in contractual works for the local villagers. The lessee shall extend social benefits like drinking water health care measure, educational benefits to the neighbouring villagers in addition to his own employees. Further, this project is expected to yield a positive impact on the socio-economic environment of the region. It helps in sustainable development of this area including further development of physical infrastructural facilities.

The existence of this mine will boost the economy of the Mwatate and improve socio-economic status of the region. The current mining capacity of iron ore in the country is around 10 Million Tonnes. This capacity can be enhanced, through consolidation of leases, increase in mechanized mines in Mngama and other Mwatate and improvement in the operating practices of existing mines.

SIZE OR MAGNITUDE OF OPERATION

Based on the present geological mapping and exposed geology and considering nos. of boreholes drilled with cumulative depth of 1261m, the reserves has been estimated 22.205 million MT which likely to be enhanced with the additional exploration proposed in the Mining Plan.

With the rate of production of 1.1.MTPA the expected life of the mine will be 21yrs.The life of the mine may get extend with the increase in resources by future exploration to be carried out. The ore to waste/overburden ratio will be maintained as 1:1.12 for the first year and thereafter overall ratio will be maintained as 1:2.4

ENVIRONMENTAL PROTECTION

Mining activities such as excavation, loading, unloading and haulage of ore and waste, lead to the generation of dust. Expected total handling shall be about 3.26 Million Tonnes per Annum. Considering the quantum of work and adopted environmental protective measures, the concentration of air pollutants level projected at any one time, shall be within the permissible limits.

The following preventive measures are being undertaken and will be continued.

1. Regular water spraying by water tankers on mine haul roads and other dust prone area.
2. Development of plantation along the roads, dead slope of waste dumps,

around the building etc.

3. Prevent overloading of ore carrying tippers to avoid spillage on the road. Also transport tippers are ensured covered with tarpaulin, free board is maintained above the line and the leak proof tailgate is provided.

4. The regular Air quality is monitored as per the NEMA and Climate Control guidelines.

5. Regular check and maintenance of mining machinery and equipment as per manufactures norms with regular Pollution Under Control Certificate (PUC) for transport vehicles from NTSA

6. Having plantation and the of state art of machinery, enclosure to the mobile screening plants, reduces the noise pollution. Drilling and blasting operations are replaced with ripper and dozer.

Drilling & blasting operation is replaced with Ripper and Dozer to avoid noise pollution and the blast induced ground vibrations. The state of art of machinery is used for the mining operations.

7. The regular maintenance of the machinery is of electrical and two diesel pump of 500 m3 /hr capacity each pumps to enable to work below the ground water level. The pit acts as ground water recharge pit and also
used to supply the water to the villagers.

On request of the villagers and the Village Chief, water from the pits is pumped out and supplied during the fair season to the farmers for agriculture and to the villagers for drinking purpose. The miner has to set up the State of art water
treatment plant outside the mining landarea to treat the pit water and to supply safe drinking water to the villagers. The part of accumulated water also used for dust suppression and ground water recharge purpose.

Balance pumped out water is let out into the natural drain after passing through the series of settling tanks. Lime and flocculants are added in the settling tanks at regular intervals. By adopting the above precautionary measures, majority of silt is settled/arrested in the settling ponds and clean water is discharged from the mine.

The discharged water quality is monitored regularly. All the parameters are found well within the permissible limits as per the EPA NEMA standards.

Raw material required along with estimated quantity, likely source, marketing area of final product/s, Mode of transport of raw Material and Finished Product

Project involves extraction of iron ore and no raw material is required. Run of Mine (ROM) is subjected to dry processing and only finished product is transported to Mombasa port located at a distance of about 180 Km by road with the help of tippers having 25 Tonne capacity. Further it is sold to local buyers or exported to Japan, China and other prospective buyers with grades as desired by the buyers.

Resource optimization/ recycling and reuse envisaged in the project, ifany, should be briefly outlined.

As the ore body is consistent at Mngama mine, there is less probability of the ore getting mixed with the overburden or inter-burden while mining. No processing loss, as Iron ore produced is dry screened by deploying mobile dry screening plants and product is lumps(+10/40mm) , and fines (-10mm). Hence, the ore recovery is considered as 100%.

Availability of water its source, Energy/ power requirement and source should be given.

There are no perennial water streams or streams existing within the project area. The total rain water is allowed to collect in the pit and same is pumped out and used for mining operations such as dust suppression, afforestation and other auxiliary activities. The machinery used in the mine is run by diesel. About 13 KL of HSD per day is required. Diesel Fuel is used by Heavy Earth Moving Machineries,like excavator, loader and transport vehicles etc. DG sets are used for Mine office. Solar lights are used for street lighting near the office and workshop premises.

SITE ANALYSIS

(i) Connectivity.

The mine is well connected by road and railway. Voi located at about 20km distance in South East direction and is connected to Arusha – Nairobi Road. The nearest Railway Station is VOI Road located a distance of 20Km and the nearest airport is Ikanga Airstrip at a distance of 30 Km from the Mining area. Mombasa port is located at about 180 km in SSE direction from the Mine Boundary.

(ii) **Land Form, Land use and Land ownership.**

Most of the area is already broken up and utilized for mining and allied activities.Present existing Land use is already furnished under item 2 (ii). Major portion of the mine area is to be taken on landsurface right holders and the remaining area required for plan period and the conceptual period is in process.

(iii) **Topography (along with map)**.

The Mwatate Mngama Bura area in Kenya is characterized by a diverse topography. Here's a detailed description:

- Elevation: The region's elevation varies, with the average elevation of Kenya being around 2,352 feet. The minimum elevation is at sea level, while the maximum can reach up to 18,694 feet.

- The terrain in the Mwatate sub-county, where Mngama Bura is located, includes grassy fields, swamps, acacia forests on the plains, and dense patches of forest surrounded by semi-terraced farms on steep hillsides

- Climate The climate is influenced by proximity to the ocean, varying from hot and dry in the lowlands to cooler and more rainfall in the hills

- Agriculture: The area's agriculture reflects its topography, with crops like corn and beans grown extensively. In drier areas, millet is preferred for its drought resistance, while rice is cultivated in swampy regions. The cooler hillsides support banana groves, and irrigated lands produce vegetables like tomatoes, cabbages, and green peppers, primarily marketed in Mombasa

This varied topography supports a range of agricultural activities and has a significant impact on the local climate and way of life.

Soil classification

Geology and soils The Taita hills complex rises above the erosional plains of the lowlands with small inselbergs. Volcanic foothills and lava flows occur in Taveta. Three major blocks constitute the Taita hills– the Sagalla, Taita and Kasigau. The Taita hills are block-faulted basement (crystalline) rocks in the Mozambique belt composed of Precambrian paragneisses from metamorphosed pelitic arenaceous and calcareous sediments from about 290 to 180 million years ago. Technically, the folded lineaments trend N-S and therefore the Taita hills are related to the evolution of the East African Rift system. They belong to the chain of Block Mountains referred to as the eastern arc mountains. The Taita hills are the northern outliers of the system stretching southward to Pare, Usambara, and Uluguru, Ukaguru, Udzungwa and Mahenge range of mountains in Tanzania. Industrial minerals such as graphite, asbestos, iron ore, gemstones and others are found in the hills and in the surrounding lowlands.

The lowlands are characterized by erosional and sedimentary plains. They are occasionally interrupted by residual hills and inselbergs and pedimental slopes. The extensive plateau gently slopes coast-wards ranging between 1000m and 300m a.s.l. It is underlain by the Precambrian basements system of rocks consisting mainly of crystalline limestones, gneisses and schists. The plateau surface is an erosion surface covered by recent and Pleistocene weathered soil and calcareous crustal deposits

(vii) Climatic data from secondary sources,

The district's yearly temperature is 26.66ºC (79.99ºF) and it is 4.16% higher than Kenya's averages. Mwatate typically receives about 151.44 millimeters

(5.96 inches) of precipitation and has 166.54 rainy days (45.63% of the time) annually.

The county is largely an ASAL region and is heavily impacted by Climate Change largely by way of prolonged drought, flush floods and the perennial human wildlife conflict.

Droughts, occasioned by consecutive failed rainy seasons, have resulted in failed crop seasons, threatening food security and contributing to high poverty levels.

Increasing human-wildlife conflict has been attributed to climate change as wildlife encroach on community areas in search for water, leading to damage of property and loss of life.

The worst affected wards are Sagalla, Ngolia, Kasighau, Bura, Chawia and Mwatate. Others are Mata and Challa wards.

Climate Change has severely affected crop and livestock production in the region, with an estimated 170,000 people still being food stressed

Social Infrastructure available.

There exists no human settlement within the core zone i.e., mining land area. Within the buffer zone of 10 km radius around this mining lease, there are 2 Census towns and 9 villages with a total population around 12,000 as per census of 2009

The infrastructure and amenities available in the study area denotes the economic well being of the region. It is observed that few infrastructure facilities are available in the project study area, which consists of education,

health care,drinking water facilities, communications, transportation, etc. A review of infrastructure facilities available in the area has been done based on the field visit observations and available secondary data. The infrastructure facilities available in about 15 villages and 2 census towns are covered within the study area

Educational Facilities

In all the Village Mngama education facilities are available upto secondary School. For higher education the students of this area go to Voi, Mwatate and Wundanyi

Health Facilities in rural area

The types of health facilities includes, hospitals, dispensaries and clinics are available in the study area. There are number of private practitioners to meet the requirement in the Bura villages. Apart from medical and health care rendered to the mine workers, there is also a Govt. Hospital at Mwatate to meet the medical requirement of miner workers, staff and buffer zone villages. Overall, one primary health center, one Primary Health Sub Centre, one Maternity and Child Welfare Centre, two Dispensaries, one Hospital Alternative Medicine one Veterinary Hospital exist in 0-10 km study area.

Drinking Water Supply:- In the villages seasonal rivers in Bura are situated from where potable water drawn. Some of the villages have public water supply. As the delivery capacity of 12, 00,000 litres of water per day.

Transport Facilities

All the villages in the buffer zone are well connected by murram roads and motorbike bodaboda transport facility.

Post and Telephone facilities

Postal and telephone facilities are available in major villages where as other small villages have only postal facilities.

Electrification

Almost all villages in the study were not electrified. Electricity was not supplied for domestic, agricultural and public lighting purposes. Subsequently the electric connections have been given to main villages only.

Marketing Facility:-

All the villagers and village Mwatate have regular marketing facilities. But the villagers for their marketing go to the nearest town such as Bura, Mwatate and Manoa. The job opportunity in this area is mainly increased by the new mining projects that are going to come up. The increase in production will further increases the job opportunities for different categories of workers and technicians.

(ix) **Cultivation**

Entire mining land area is a private land and most of the area is utilized for mining and allied activities. Shrubs and bushes grow sparsely on the unutilized areas. In and around the buffer zone there are a few other mining leases. the villagers are mainly cultivators, agricultural labourers, household industry and other workers. The villagers depend upon agriculture, the arched consists of maize, vegetables & Sweet potato. As these areas are adjacent to perennial water courses and also the TAVEVO authority is supplying the water for irrigation to the nearby villages through

PWD, the productivity and their yield are very excellent. The main occupation is agriculture . Additionally, many people depend upon mining and related

activities such as transportation of ores and waste. The main workers are cultivators, agricultural labourers, household industry and other workers forming 13.18%.Marginal workers are around 19% & about 56% are non-workers.

Assessment of Infrastructure Demand (Physical & Social),

The road facility is already available which shall be used and maintained. The labour requirement is drawn from the nearby villages. Housing complex is not required as the staff and the labour stay at nearby villages. Other infrastructure like office, rest room etc are already existing and in use.

Amenities/Facilities.

Facilities for road transport and power supply is available. Communication facilities with Mobile telephone service are available at site and landline service is provided.

Other amenities for workers and staff like canteen, dispensary, drinking water facility, toilets, First Aid Room will be provided.

PROPOSED INFRASTRUCTURE

(ii) **Residential Area (Non Processing Area).**

No residential area is proposed within ML area.

(iii) **Green Belt.**

The plantation of native and local species shall leave a congenial environment for immigration of avi-fauna by including the fruit and flower bearing shady trees. It shall improve aesthetic beauty of the area.

(iv) **Social Infrastructure.**

The mining industry will improve the economic status of the people in and around the land area, with the direct and indirect employment opportunities created and the CSR benefits provided. There are 1000 families depend on this mine directly and indirectly. The increase in production will certainly increase in employment and it is expected that almost 800 persons will be depending on this mine in direct and indirect. The following CSR benefits shall be continued to be provided.

Water for irrigation to villages : through pipelines Potable Water supply to villages

Health, safety and medical facilities: First aid and basic medicines provided from Mngama& Bura dispensary.

Education & Training: Supply of school uniform, notebooks, bags etc for school students.

Recreation facilities: Donations to sports, social and cultural organizations, Infrastructural facilities.

(v) **Connectivity (Traffic and Transportation Road/ Rail/Metro/Water ways etc)**

Being a working mine, it is well connected by road to mine, highway and the railway station.

(vi) **Drinking Water Management (Source &Supply of water)**

Drinking water to office and canteen is being supplied by drawing it from well water in the nearby areas through contractor. The Surface runoffs and dump runoffs are diverted to the open pits. There is one worked out pit which is water logged. Water from this pit is used to supply to the villagers for the irrigation. Part of the water from the working pit is sent to the other worked out pit.

(vii) **Sewerage System.**

No sewage is generated from the mine. The drainage water from toilet are treated in the soak pit. The waste water in the canteen will be treated and reused for garden purpose. The waste water generated during washing and maintenance of the machineries will be treated and recycled.

(viii) **Industrial Waste Management.**

No industrial waste is generated from the mine.

(ix) Solid Waste Management.

The existing waste dumps within the Mining Landshall occupy about 10acres of. area. During the present mining plan about 2.3 million tonnes of waste will be generated which shall be accommodated within the ML area. Each stage will be of 10 meter height and width of 10 meter, overall dump slope of 25° will be maintained. The hard material (lateritic material) will be generated during the plan period will be utilized for environmental protective measures like creation of bunds, covering on dump, soling of mine road. The size of the dump at end of block period shall be about 31 Ha.built-up to a max height of 60 m above GL.

(x) **Power Requirement & Supply / source.**

DG sets are used for Mine office. Solar lights are used for street lighting. Diesel Fuel is used by Heavy Earth Moving Machineries, like excavator, loader and transport vehicles etc. DG sets are used for Mine office. Solar lights are used for street lighting is within the office and workshop premises. 1000Kva Power.

CONCLUSION

Estimated project requirements and along with analysis in terms of economic viability of the project

The total capital cost for the project is furnished below:

i. Building (office & statutory buildings& rents).

ii. Plant & machinery including transport vehicles and

Crushing & screening plant.

ECONOMIC VIABILITY

Parameters:

1) Reserves & Resources : 22.5 Million Tonnes

2) Nature of ore : Iron Ore

3) Production : 1.1 MTPA

4) Average ore to waste ratio : 1 : 2.5

5) Mining Royalty : 8% of Ex. Mine Price.

The total reserves and resources available at this mine as on today are 22.205Million Tonnes. With the rate of production of 1.1.MTPA, the expected life of the mine will be 21yrs.The life of the mine may get extend with the increase in resources by future exploration to be carried out.