

# **MINING PLAN**

## **GUGULDOH MANGANESE ORE BLOCK**



Lease Area : Revenue - 5.05 ha

Lease Area In Forest - 99.95 ha

Total Lease Area - 105.00 ha

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**VILLAGE : GUGULDOH, TALUKA : RAMTEK**

**DISTRICT: NAGPUR, MAHARASHTRA STATE**

**Category : A Mechanized**

**Lease Period - 50 Years from the Date of Registration of  
Executed Mining Lease Deed**

**UNDER RULE 18 (1) OF M C R 2016**

**पत्र संख्या द्वारा  
वीड लेटर No.**

**NGP/MM/MALN-1177/NGP-2019 dt 18/09/2019**

**PREFERRED BIDDER**

**M/s. SHANTI G.D. ISPAT & POWER PVT. LTD.**

**Corporate Office: 504, Rajiv Gandhi Complex, Bal Ashram Compound,  
Kutchery Chowk, Raipur-492001**

**Phone: 0771-4243000/01/02, Fax: 0771-4243031, Mobile No. 9425204308**

**sgdiplmining@gmail.com**

**QUALIFIED PERSON**

**M. S. WAGHMARE B.E.(Mining Engg.)  
33, Gadam Layout, Trimurti Nagar  
Nagpur 440022 (M.S.)  
Cell: 80551 57799**

**Abhay 18.9.19.**  
**क्षेत्रीय खान निरीक्षक (मा. रं.)**  
**Regional Controller of Mines (M. R.)**  
**खान निरीक्षण विभाग, नागपुर**  
**Indian Bureau of Mines, Nagpur**

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## ANNEXURES

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**MINING PLAN  
GUGULDOH MANGANESE ORE BLOCK  
LESSEE: M/S SHANTI G.D. ISPAT & POWER PVT. LTD.  
TAHSIL: RAMTEK, DIST: NAGPUR (M.S.)**

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**6.00 INTRODUCTION**

M/s Shanti G.D. Ispat & Power Pvt. Ltd, Raipur, is engaged in power generation since 2004, and the Bio mass Power plant is located in Champa in Chhattisgarh state. It has a generation capacity of 15 megawatts per hour. Apart from this, M/s Shanti G.D. Ispat & Power Pvt. Ltd, Raipur, has other businesses such as logistic, Real estate, and Hospitality. Now the applicant is a new entrant to the mining industry.

The Company has decided to diversify the business and wish to enter in mining business and got the mining lease through auction in Guguldoh area for manganese ore in Ramtek - taluka, Nagpur district for an area 105.00 ha vide. The Letter of Intent has been issued by the Govt. of Maharashtra vide their letter no.MH01-0518/C.R.30/Industry-8 dated 5.6.2018 and is placed as Annexure 1 with a direction to obtain approval/permits required for opening the mine in a time frame of three years. The applicant entered in auction held in the month of May 2018 for which minimum premium price was fixed 5% of value of mineral dispatched, however, the applicant became the preferred bidder at a bid price 55.5% of value of mineral dispatched. Consequent to preferred bidder, the applicant has paid the upfront payment to the State Govt of Maharashtra as first instalment amounting Rs. 6,14,216/- vide GRN. MH001158590201819M dated 03-05-2018 (Annexure 1.1).

As per rule 16(1) of MCR 2016, every applicant has to prepare the Mining Plan for lease grant and submit to the approving authority of IBM. Accordingly, this Mining Plan has been prepared as per formats and guidelines of IBM incorporating production proposals for five year and put for approval. in compliance to or to satisfy the condition specified in Rule 10 (1) (d) of mineral (Auction) Rules 2015 to be considered as a "Successful Bidder" for the Guguldoh Manganese Ore mineral block.

**1.0 GENERAL:**

a) Name of the Preferred bidder:: M/s Shanti G.D. Ispat & Power Pvt.Ltd.

Corporate Office: 504, Rajiv Gandhi Complex

Bal Ashram Compound

Kulchery Chowk

Raipur-492001

Phone: 0771-4243000/01/02

Fax: 0771-4243031

Email: [sgdmining@gmail.com](mailto:sgdmining@gmail.com)

Mobile: 9425204308, 9131422230

Nominated Owner: Shri Prakash Kumar Agrawal,

PAN: BARPA5160M

AADHAR: 992946501244

PASSPORT: G7857021

IBM Registration No. as per Rule 45 of MCDR'17: In Process

b) Status of lessee:

Other (Please specify): Private Limited Company

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**Board of Directors**

| S. No. | Director's Name            | Address                                                            | Identity proof                                               |
|--------|----------------------------|--------------------------------------------------------------------|--------------------------------------------------------------|
| 1      | Shri Anup Agrawal          | B-3, Behind Shyam Plaza,<br>Ravi Nagar, Raipur – CG<br>492001      | PAN:ACJPA2567K<br>AADHAR: 281757095567<br>PASSPORT: G9521078 |
| 2      | Shri Kamleshwar<br>Agrawal | B-18, Near Shyam Plaza,<br>Ravi Nagar, Raipur – CG<br>492001       | PAN:ACPPA2743P<br>AADHAR: 434488714718<br>PASSPORT: G9621237 |
| 3      | Shri Harshit Agrawal       | B-3, Behind Shyam Plaza,<br>Ravi Nagar, Raipur – CG<br>492001      | PAN:BVOPA8221M<br>AADHAR: 327403656648<br>PASSPORT: L8342432 |
| 4      | Shri Prakash<br>Agrawal    | Agrawal Dharam Shale<br>Road, Saraspali,<br>Mahasamund – CG 493558 | PAN:BARPA5160M<br>AADHAR: 992946501244<br>PASSPORT: G7857021 |

c) Mineral which is included in the prospecting license (For Fresh grant): Not Applicable

Mineral for which the block has been auctioned: Manganese Ore

d) Mineral which is included in the letter of Intent: Manganese Ore

e) Mineral which is the lessee intends to mine: Manganese Ore

f) Name of Qualified Person under rule 15(1) of MCR,2016 who prepared Mining Plan:

Shri M. S. WAGHMARE, B. E. (Mining)

Address: 33, Gedam Layout, Trimurti Nagar, Nagpur 440022 (M.S.).

Phone: 9055157799, Fax : None, Email: mewaghmare60@gmail.com



Details are attached in Annexure-10

## 2.9 LOCATION AND ACCESSIBILITY:

Lease Details (fresh grant/ through Auction of Mineral Block)

Name of mine: Guguldoh Manganese ore Mine

Lat/Long of lease area: Lat from 21° 25' 53.06" to 21° 26' 19.36"  
: Log from 79° 24' 04.29" to 79° 25' 31.55"

Date of grant of lease: Not yet executed.

Period of lease: Shall be 50 years from the date of registration of lease deed

Name of Preferred bidder: M/s Shanti G.D. Ipat & Power Pvt. Ltd.

504, Rajiv Gandhi Complex

Bal Ashram Compound

Kutchery Chowk

Raipur-492001

Phone: 0771-4243000/01/02

Fax : 0771-4243031

Email: Sgdipmining@gmail.com

Mobile: 9425204308

Shri Prakash Kumar Agrawal, Nominated Owner

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Details of area allotted with location map (fresh area):

| Forest           |           | Non-forest              |           |
|------------------|-----------|-------------------------|-----------|
| Forest (specify) | Area (ha) |                         | Area (ha) |
|                  | 99.95.00  | (i) waste land,         | 5.05      |
|                  |           | (ii) grazing land,      | 0.00      |
|                  |           | (iii) Agriculture land, | 0.00      |
|                  |           | (iv) others (Private)   | 0.00      |

Total lease area: 105.00 ha



Occupancy/ Ownership of land: It is as below:

| Name of Person/Company                           | Survey No. | Area Under Guguldoh Block (Ha) | Area in ha.                      |
|--------------------------------------------------|------------|--------------------------------|----------------------------------|
| M/s Shanti G.D. Ispat and Power Pvt. Ltd. Raipur | 107        | 2.80                           | 5.05 Hectare                     |
|                                                  | 144        | 2.45                           |                                  |
|                                                  | 145        | 48.50                          |                                  |
|                                                  | 148        | 2.83                           | 99.95 Hectare (Protected Forest) |
|                                                  | 149        | 42.54                          |                                  |
|                                                  | 150        | 1.00                           |                                  |
|                                                  | 151        | 7.08                           |                                  |
|                                                  |            | 105.00 Hect.                   | 105.00 Hect.                     |

District & State: Nagpur, State: Maharashtra

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Taluka : Ramtek, Village: Guguldoh .

Whether the area falls under Coastal Regulation Zone (CRZ)? if yes, details thereof: No

Existence of public road/railway line, if any nearby and approximate distance.

Area has well communication and transport facilities. Village Guguldoh is situated about 18 Km from Ramtek town and connected by all weathered road. The mine in question is located to a distance of about 5.00 km from Guguldoh village and can be approached by tar road going to village from Ramtek. From Nagpur to Ramtek can be approached by NH – 8, which is about 50 Km from Nagpur. The nearest railway station is Ramtek about 20 Km away from the mine. Nagpur airport is the nearest airport situated at 75 Km from the lease area.

Toposheet No. with latitude & longitude of all corner boundary point.

Topo-sheet No. : 55 O/7

#### CO-ORDINATES OF BOUNDARY PILLARS

| Boundary Pillars | LATTITUDE      | LONGITUDE      |
|------------------|----------------|----------------|
| BP-1             | 21°-26'-18.82" | 79°-24'-06.57" |



|                                                                                   |                |
|-----------------------------------------------------------------------------------|----------------|
|  | 79°-24'-33.67" |
|  | 79°-25'-04.74" |
|  | 79°-25'-31.55" |
|  | 79°-25'-27.36" |
|  | 79°-25'-04.98" |
|  | 79°-24'-40.10" |
|  | 79°-24'-15.07" |
|  | 79°-24'-04.29" |
|  | 79°-24'-07.27" |

 the DGPS survey and demarcated the above mentioned co-ordinates of boundary with the Tender Document.

 and access routes. It is preferred that topographical map or a cadastral map or none of these are available, the area

 closed.

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 / SCHEME OF MINING (If any):

 P/SOM:

 previous approved period) of approved for modification

 Osāl (if any) in respect of exploration.

|       |                |                |
|-------|----------------|----------------|
| BP-2  | 21°-26'-11.55" | 79°-24'-33.67" |
| BP-3  | 21°-26'-15.74" | 79°-25'-04.74" |
| BP-4  | 21°-26'-19.36" | 79°-25'-31.55" |
| BP-5  | 21°-26'-08.40" | 79°-25'-27.36" |
| BP-6  | 21°-26'-0.08"  | 79°-25'-04.98" |
| BP-7  | 21°-25'-53.06" | 79°-24'-40.10" |
| BP-8  | 21°-26'-7.38"  | 79°-24'-15.07" |
| BP-9  | 21°-26'-10.94" | 79°-24'-04.29" |
| BP-10 | 21°-26'-16.58" | 79°-24'-07.27" |

Before auction the State Govt has carried out the DGPS survey and demarcated the area as per CGOM's circular 2/2010. The above mentioned co-ordinates of boundary pillars are provided by the State Govt. along with the Tender Document.

c) Attach a general location map showing area and access routes. It is preferred that the area be marked on a Survey of India topographical map or a cadastral map or forest map as the case may be. However, if none of these are available, the area may be shown on an administrative map.

Topo-sheet as Key Plan showing Plate 2 is enclosed.

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### 3.0 DETAILS OF APPROVED MINING PLAN / SCHEME OF MINING (if any):

#### 3.1 Date and reference of earlier approved MP/SOM:

None

#### 3.2 Details of last modifications if any (for the previous approved period) of approved MP/SOM indicating date of approval, reason for modification

None

#### 3.3 Give review of earlier approved proposal (if any) in respect of exploration, excavation, reclamation etc.

None

## PART – A

### 1.D. GEOLOGY & EXPLORATION

(a) Briefly describe the topography, drainage pattern, vegetation, climate, rainfall data of the area applied.

i) Topography: The lease area lies in the hilly region north of Ramtek Township. It has an elevated hill with steep slope having highest contour 438 m and lowest is 335 m. The hill trends E-W and is covered under the forest.

ii) Drainage pattern: Drainage of the area is controlled by seasonal gullies and streams flowing NE-SW or E-W direction and finally merge with Khindal Lake. Since the slopes are formed all along the edge of the hill, various seasonal drains are formed at number of places depending on the local topography of the slope. There are numerous such drains, but none of them is perennial in nature.

iii) Vegetation: It is a forest land and has thick vegetation.

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iv) Climate: The area is characterized by tropical climate. Summer season starts from April and lasts till May. The average temperature in summer varies from 36° to 45° C but on some days during peak of summer in May it rises beyond 46° C. The average minimum temperature in winter varies from 12.2° to 14° C but as low as 8° C is also recorded as cold winter nights in December-January.

v) Rainfall: The monsoon season starts off in the month of June and stays till September with an overall rainfall of 12.02 to 14.4 cm., highest amount of rainfall of 340mm was recorded in the month of July.

b) Brief descriptions of Regional Geology with reference to location of lease area

#### Regional Geology:

Sausar group of rocks having NE-SW trend, extend from Balaghat District in Madhya Pradesh in the east to Nagpur District in Maharashtra in the west. The manganese bearing ore belt which is a constituent of the Gondite formation of Sausar series of rocks stretches over a length of 200km and about 25 to 30 km in width in the central portion.

These deposits of Manganese belong to the lower part of sequence of meta-sedimentary formations of rocks of Sausar series of Pre-cambrian age. The area falls under the eastern part of the manganese ore belt in between Balaghat to Bhandara which is located almost middle of the belt. The litho units of this formation

are quartzite, quartz muscovite schist, phyllite, conglomerate and felspathic grit. Further, eastwards the Sausar group of rocks is covered with Deccan Trap.

The Manganese deposits of this area are syngenetic meta-sedimentary type. The deposition is in the form of alternating layers of chert and Manganese ore occurring as small detached lenses and also stratified in nature. These stratified deposits occur in three different stratigraphic positions in the 'Sausar Series'. The Manganese ore deposits and Gondite formations are restricted to the Schists and Quartzites of the Mansar and Chhorbaoli stages. The other rock types met within this belt are biotite schist besides granitic rock with associated pegmatite and quartz vein.

The regional stratigraphic sequence of the Manganese bearing deposits in the area as given by Fournier (1926) and West (1935) is as follows:

| Formation                | Rock Types                                                                                                                                                              |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Late Cretaceous-Eocene   | Deccan trap, Basalts and other dyke rocks                                                                                                                               |
| Lameta formation         | Sandstone and fresh water Limestone                                                                                                                                     |
| ----- Unconformity ----- |                                                                                                                                                                         |
| <b>Sausar Series</b>     |                                                                                                                                                                         |
| Bichua Stage             | Dolomitic marble, calc gneisses and schist, actinolite schist, tremolite and anthrophyllite.                                                                            |
| Junewari Stage           | Biotite Muscovite schist and Quartz biotite granulite.                                                                                                                  |
| Chhorbaoli Stage         | Quartzites, Quartz Muscovite Schist and Felspathic Muscovite schist.<br>Manganese ore and Gondite Horizon I                                                             |
| Mansar Stage             | Muscovite schist, Muscovite biotite schist, Phyllite, commonly garnetiferous.<br>Manganese ore Horizon-II within Mansar schist, Low grade actinolite schist & phyllite. |
| Lohangi Stage            | Manganese ore and Gondite Horizon III<br>Pink and white calcitic marble, partly also Dolomitic at places                                                                |
| SitaSaongi Stage         | Quartz Muscovite schist and felspathic                                                                                                                                  |

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muscovite schist with inter-calated quartzites

**Older Metamorphics**

Ortho and Para gneisses, amphibolites  
Lenses, Epidiorites, quartzites with

pegmatites and quartz vein.

**e) Local Geology:**

The Guguldoh manganese lease area forms the eastern continuity of the manganeseiferous sediment forming the entire Manegaon-Guguldoh belt of Mn ore. The rock type found in this area are muscovite schist with sillimanite, garnet magnetite, quartzite, manganeseiferous quartzite, auto-clastic conglomerate, quartz muscovite schist, gondite, pegmatite, Mn ore, deformed granite, and impure dolomitic marble. The rocks in this area strike in strike from WNW-ESE to ENE-WSW and E-W with dips to the south often reaching vertical. Structurally Mn ore bearing horizon in Manegaon-Guguldoh belt represents a tight syncline with an easterly plunge. The keel of the synclinal fold represented by hill 403m north-east of Musawadi. The lease area was explored by the GSI through core bore holes and geological mapping too was done. Based on the exploration, lithology observed is as follow:

**The tentative litho-stratigraphy as inferred from borehole intersection and geological mapping:**

|                   |                                      |                              |
|-------------------|--------------------------------------|------------------------------|
|                   | Soil and overburden                  | <b>अनुमोदित<br/>APPROVED</b> |
| <b>Intrusives</b> | Vein quartz                          |                              |
|                   | Pegmatite                            |                              |
|                   | Intrusive granite                    |                              |
| <b>Chorbaoli</b>  | Auto clastic brecciated conglomerate |                              |
|                   | Quartzite/Mn ferrous quartz          |                              |
| <b>Mansar</b>     | Mn ore                               |                              |
|                   | Quartz mica schist                   |                              |
|                   | Mica schist/with impure dolomite     |                              |



### **bands**

The foliation and bedding strike N 70° E to S 70° W and dip steeply towards south. The cleavage (crenulations cleavage) strikes NE-SW with southerly dip of 55°

### **ABANDONED MINES PIT**

There are number of rectangular deep pits in ENE -WSW direction for over a length of 2.5 km. These are mostly the ancient abandoned mines and trial pits and trenches. Low-grade ore is exposed in these pits. Numerous ore dumps are also found in and around the abandoned pits. The Central block has the largest abandoned quarry for over 700 m in length. The western block has 3-abandoned quarries indicating lateral extension of the ore for 200m, and in the eastern block, there are numerous small quarries arranged in a linear fashion increasing lateral extent of the ore for more than a km in length.

### **MANGANESE ORE HORIZONS**

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Manganese ore horizons are represented by manganiferous quartzite, gondite and low grade Mn ore. Mn ore horizon is 4 to 6 m thick and is traceable for a strike length of 900 m in Central block. Four conformable Mn bands were identified, during detailed mapping and drilling. From south to north the bands have a strike length of 250m, 720m, 640m, and 50m respectively. They define an arcuate pattern with strike ranging from NW-SE to E-W to ENE-WSW with steep to sub vertical dip to south. The abandoned quarries discontinuously extend both to east and west for over a strike length of 1.0 km. Lithologically, Mn ore occurs at the interface of garnetiferous mica schist and quartz mica schist as well as within the quartzite. The Mn ore band has a southern convexity due to N-S trending F4 fold.

In eastern block, Mn ore occur discontinuously over 900 m strike length in ENE direction. Two conformable stratified Mn ore band have been mapped. In western block two bands have been identified based on the presence of two abandoned Mn quarry. The strike length is about 100 m with widths varying from 1 to 3 m. Detailed mapping of the area has revealed that the different Mn ore bands in the block belong to the same stratigraphic horizon and repeated due to folding.



d) i) Name of prospecting / exploration agency: By Geological Survey of India, Central Zone, Nagpur 440 001

e) Details of prospecting/exploration already carried out:

i) Number of pits and trenches indicating dimensions, spacing etc along and across the strike/ foliation with reference to geological plan.

None

ii) Number of boreholes indicating type (Core/RC/DTH), diameter, spacing, inclination, Collar level, depth etc with standard borehole logs duly marking on geological plan/sections:

#### EXPLORATION:

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GSI drilled eighteen core bore holes. The details of exploration are furnished below:

The abandoned quarries discontinuously extend from Manegon to Guguldh village for about 2.4 km in WNW-ESE direction, the individual quarry diameter is roughly 40m x 40m and depth is about 20 m. The abandoned quarries were mapped on 1:2000 scales. Drilling commenced in Guguldh block on 15<sup>th</sup> November 1998 and the investigation was closed end of September 2001. A total of 1586.45m was drilled in eighteen boreholes. The entire exploration block is divided into 3 blocks namely western block, eastern block and central block. The geological report and surface geological map prepared based on cross sections attached as Annexure 5 by the GSI is enclosed as Annexure 5 and Plate 3 A.

#### EASTERN BLOCK

Abandoned quarries of Mn ore occur discontinuously over a strike length of 900 m in eastern block. Two conformable Mn ore bands within mica schist have been identified. Eight boreholes (MNG-8-MNG-16) have been drilled in this block. MNG-12 was abandoned; hence borehole MNG-12A was drilled adjacent to it. No significant Mn mineralisation was intersected in any of the boreholes; MNG-9, 10, 12A, 13 and 14 intersected minor Mn ore bands and Gondite, rests of boreholes were barren.

## CENTRAL BLOCK

Work was initially taken up in the central block which has huge abandoned quarries, based on detailed mapping and surface exposures, eight bore holes have been drilled (MNG-1-MNG-8) spaced at 100 m interval. Seven boreholes intersected Gondite, manganese ore with thickness ranging from 20 cm to 13.14 m. Borehole No MNG-5 was barren; 4 conformable Mn bands have been traced based on surface mapping and bore hole intersection. The strike lengths of these bands range from 50 m to maximum 720 m. A total of 748 m has been drilled in 8 boreholes in this block.

## WESTERN BLOCK

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Mapping in Western block indicated presence of two level of abandoned Mn quarry for a total strike length of over 220 m. Two conformable stratified Mn ore bands have been mapped at the interface of quartz-mica schist and quartzite. Northern band extends for over 125 m in strike length while southern band is about 120m in strike length located 40 m to south of northern band. Widths of individual band vary from 1 to 3 m. To confirm the strike and dip extension of ore horizon exposed in old working, drilling machine was deployed. Boreholes were planned and drilled to intersect the ore body at expected depth. Based on the attitude of the ore horizon boreholes were drilled vertical or inclined, so as to intersect the ore horizon around its true width. Generally the angle ranges from 40° to 60°, borehole are spaced at equal interval depending on the strike continuity of ore zone. Two boreholes have been drilled (MNG-17-MNG-18) in this block. Both the boreholes have not intersected any of the Mn ore horizons except for streak and thin bands of Mn ore

## CORE LOGGING

The recovered cores from each borehole are placed in the core box either in book pattern or staggered pattern. The core is studied run wise and they are logged in a register noting down its lithological description, depth wise mineralisation and structural features if any. The length of core recovered, is measured and recovery percentage is calculated. In this way run wise logging is carried out for all the boreholes drilled. Run wise litholog of all the 18 boreholes have been furnished in Annexure 5 and summarized litholog in annexure 8 with chemical analysis.

## MANGANESE ORE HORIZON

Out of 18 boreholes drilled in Guguldoh block, quantifiable manganese ore with Gondite and manganiferous quartzite were intersected in six bore holes viz MNG1, MNG2, MNG3, MNG6, MNG7 & MNG8 in central block upon which GSI estimated the Mn resource. Annexure 5 shows the depth wise intersection of Mn ore, manganiferous quartzite, Gondite in each borehole.

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### Details of Drilled Boreholes

| Sr. No. | Drilled Bore holes | PBH Collar mRL | Northing   | Easting   | Depth (m) | Type of Hole |
|---------|--------------------|----------------|------------|-----------|-----------|--------------|
| 1       | MNG-1              | 347.6          | 2371061.44 | 335621.83 | 125.0     | 45° Inclined |
| 2       | MNG-2              | 344.2          | 2371069.42 | 335405.79 | 79.50     | — do —       |
| 3       | MNG-3              | 363.8          | 2371087.74 | 335510.39 | 80.25     | — do —       |
| 4       | MNG-4              | 363.22         | 2371182.28 | 335311.50 | 80.50     | — do —       |
| 5       | MNG-6              | 361.5          | 2371296.24 | 335112.95 | 100.00    | — do —       |
| 6       | MNG-8              | 348.2          | 2371213.55 | 335113.10 | 100.00    | — do —       |
| 7       | MNG-7              | 341.02         | 2371031.00 | 335310.00 | 75.15     | — do —       |
| 8       | MNG-6              | 342.0          | 2371115.09 | 335210.87 | 108.50    | — do —       |
| 9       | MNG-9              | 353.165        | 2371125.00 | 335710.00 | 90.00     | — do —       |
| 10      | MNG-10             | 380.4          | 2371188.78 | 335790.46 | 76.5      | — do —       |
| 11      | MNG-11             | 350.045        | 2371231.31 | 335879.97 | 70.0      | — do —       |
| 12      | MNG-12A            | 381.53         | 2371328.94 | 336178.76 | 78.65     | — do —       |
| 13      | MNG-13             | 382.295        | 2371382.70 | 336280.33 | 85.00     | — do —       |
| 14      | MNG-14             | 369.8          | 2371385.46 | 336402.86 | 107.10    | 60° inclined |
| 15      | MNG-15             | 361.2          | 2371401.13 | 336502.46 | 80.55     | 45° inclined |
| 16      | MNG-16             | 352.8          | 2371274.71 | 336104.93 | 80.55     | — do —       |
| 17      | MNG-17             | 344.565        | 2371385.48 | 334562.77 | 88.00     | — do —       |

|    |        |        |            |           |       |        |
|----|--------|--------|------------|-----------|-------|--------|
| 18 | MNG-18 | 370.88 | 2371488.62 | 334402.39 | 85.20 | — do — |
|----|--------|--------|------------|-----------|-------|--------|

iii) Details of samples analysis indicating type of sample (Surface/sub-surface from pits/trenches/borehole etc). Complete chemical analysis for entire strata for all radicate may be undertaken for selected samples from a NABL accredited.

### Sampling

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Sampling was carried out for mineralized core and also bedrock. Using a core splitter core was split longitudinally into two half. One half was preserved and other half was crushed to -200 mesh size. Conning and quartering was carried out for getting the minimum amount required for sampling.

Minimum length of sample was 4 cm while maximum length was 60 cm. Depending on the nature of ore and width of barren zone sample spacing was decided. Table below shows the number of samples drawn and analyzed from each borehole. Similarly bedrock samples were split into two. One half was powdered and same sampling procedure was adopted and the other sample was kept as a duplicate.

Table showing number of samples drawn bore hole wise

| Borehole no. | No. of sample | Total no. of samples generated from borehole |
|--------------|---------------|----------------------------------------------|
| MNG-1        | 27            | 243                                          |
| MNG-2        | 24            |                                              |
| MNG-3        | 55            |                                              |
| MNG-4        | 20            |                                              |
| MNG-6        | 58            |                                              |
| MNG-7        | 20            |                                              |

|         |    |  |
|---------|----|--|
| MNG-8   | 19 |  |
| MNG-9   | 8  |  |
| MNG-10  | 3  |  |
| MNG-12A | 9  |  |

All the 243 samples were analyzed and its results are furnished below in table:

| Bh .no  | No of sample | Mn%         | P%          | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> |
|---------|--------------|-------------|-------------|------------------|--------------------------------|
| MNG-1   | 27           | 6.5 - 40.72 | 0.05 - 0.38 | 20 - 59          | 3 - 17                         |
| MNG-2   | 24           | 1.22 - 40   | 0.09 - 0.52 | 9 - 45           | 4 - 12                         |
| MNG-3   | 55           | 5 - 40      | 0.1 - 0.7   | 23 - 80          | 1.5 - 18                       |
| MNG-6   | 58           | 30          | 1.08        | 11-38            | 4.5-12                         |
| MNG-7   | 20           | 26          | 0.3 - 1.5   | 20-42            | 5-11                           |
| MNG-8   | 19           | 32          | 1.12        | 25-37            | 6-9                            |
| MNG-9   | 8            | -           | -           | -                | -                              |
| MNG-10  | 3            | 25.56       | 1           | 21-25            | 10-12                          |
| MNG-12A | 9            | 26.6        | 0.6-1.7     | 21-50            | 7-12                           |

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iv) Expenditure incurred in various prospecting operations:

Information not available

The analysis report is enclosed as Annexure 8.



f) The surface plan of the lease area may be prepared on a scale of 1: 1000 or 1: 2000 with contour interval of maximum of 10 m depending upon the topography and size of the area duly marked by grid lines showing all features indicated under Rule 32(1)(e) of MCDR 2017:

Surface plan of the lease area on scale 1:2000 is enclosed as plate 5.

g) For preparation of geological plan, surface plan prepared on a scale of 1: 1000 or 1: 2000 scale specified under para 1.0 (f) of Part A of the format may be taken as the base plan. The details of exploration already carried out along with supporting data for existence of mineral, locations of proposed exploration, various litho units along with structural features, mineralized/ore zone with grade variation if any may be marked on the geological plan along with other features indicated under Rule 32(1)(b) of MCDR 2017.

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Surface Geological plan prepared on scale 1:2000 is enclosed as plate no. 3

h) Geological sections may be prepared on natural scale of geological plan at suitable interval across the lease area from boundary to boundary.

Geological sections prepared on scale 1:2000 are enclosed as plate no. 4 and geological cross sections prepared by GSI are enclosed as Annexure 5.

i) Broadly indicate the future programme of exploration with due justification(duly marking on Geological plan year wise location in different colours) taking into consideration the future tentative excavation programme planned in next five years as in table below:

The GSI explored the deposit by drilling 18 bore holes and established the resource in G2 category. However, majority of lease area remained un-explored. It is now proposed to explore the probable mineralized area in dip site of the existing Mn ore bands. The details of these proposed bore holes are given below:

#### Details of Boreholes Proposed

| Sr. No. | Boreholes proposed | PBH Collar mRL | Northing   | Easting   | Depth             | Type of Hole  |
|---------|--------------------|----------------|------------|-----------|-------------------|---------------|
| 1       | PBH 1              | 345            | 2371235.43 | 335081.52 | 125m from surface | 45° Inclined, |
| 2       | PBH 2              | 346            | 2371178.29 | 335153.71 | 125m from surface | 80° Inclined, |



|    |        |     |            |           |                   |               |
|----|--------|-----|------------|-----------|-------------------|---------------|
| 3  | PBH 3  | 346 | 2371149.59 | 335194.64 | —do—              | —do—          |
| 4  | PBH 4  | 346 | 2371109.70 | 335239.46 | 125m from surface | 45° Inclined, |
| 5  | PBH 5  | 348 | 2371064.64 | 335267.17 | —do—              | —do—          |
| 6  | PBH 6  | 347 | 2371070.84 | 335346.93 | 125m from surface | 60° Inclined, |
| 7  | PBH 7  | 347 | 2371048.91 | 335451.39 | —do—              | —do—          |
| 8  | PBH 8  | 351 | 2371032.72 | 335529.06 | 125m from surface | 45° Inclined, |
| 9  | PBH 9  | 353 | 2371060.77 | 335669.80 | —do—              | —do—          |
| 10 | PBH 10 | 348 | 2371100.60 | 335813.38 | —do—              | —do—          |
| 11 | PBH 11 | 349 | 2371136.36 | 335876.38 | —do—              | —do—          |
| 12 | PBH 12 | 352 | 2371205.06 | 335978.08 | —do—              | —do—          |
| 13 | PBH 13 | 354 | 2371243.95 | 336056.03 | —do—              | —do—          |
| 14 | PBH 14 | 357 | 2371309.70 | 336215.00 | —do—              | —do—          |
| 15 | PBH 15 | 360 | 2371311.03 | 336290.87 | —do—              | —do—          |
| 16 | PBH 16 | 379 | 2371361.13 | 336344.62 | —do—              | —do—          |
| 17 | PBH 17 | 367 | 2371367.82 | 336440.54 | —do—              | —do—          |
| 18 | PBH 18 | 372 | 2371272.44 | 336643.03 | —do—              | —do—          |
| 19 | PBH 19 | 371 | 2371231.29 | 336526.66 | —do—              | —do—          |
| 20 | PBH 20 | 382 | 2371152.95 | 336420.37 | —do—              | —do—          |
| 21 | PBH 21 | 385 | 2371156.87 | 336285.66 | —do—              | —do—          |
| 22 | PBH 22 | 386 | 2371078.88 | 336021.61 | —do—              | —do—          |
| 23 | PBH 23 | 356 | 2371040.64 | 335917.96 | —do—              | —do—          |
| 24 | PBH 24 | 347 | 2371012.31 | 335753.95 | —do—              | —do—          |
| 25 | PBH 25 | 345 | 2370926.19 | 335511.97 | —do—              | —do—          |
| 26 | PBH 26 | 343 | 2370907.35 | 335425.80 | —do—              | —do—          |

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|    |        |     |            |           |      |      |
|----|--------|-----|------------|-----------|------|------|
| 27 | PBH 27 | 338 | 2370925.97 | 335288.24 | —do— | —do— |
| 28 | PBH 28 | 338 | 2370978.14 | 335164.58 | —do— | —do— |
| 29 | PBH 29 | 341 | 2371167.86 | 334972.77 | —do— | —do— |
| 30 | PBH 30 | 340 | 2371253.93 | 334853.18 | —do— | —do— |
| 31 | PBH 31 | 340 | 2371311.16 | 334778.29 | —do— | —do— |
| 32 | PBH 32 | 346 | 2371428.06 | 334828.38 | —do— | —do— |
| 33 | PBH 33 | 344 | 2371369.70 | 334703.13 | —do— | —do— |
| 34 | PBH 34 | 346 | 2371400.15 | 334823.75 | —do— | —do— |
| 35 | PBH 35 | 350 | 2371453.50 | 334859.01 | —do— | —do— |
| 36 | PBH 36 | 356 | 2371487.99 | 334555.22 | —do— | —do— |
| 37 | PBH 37 | 384 | 2371508.79 | 334488.19 | —do— | —do— |
| 38 | PBH 38 | 387 | 2371521.99 | 334430.04 | —do— | —do— |
| 39 | PBH 39 | 357 | 2371447.46 | 334419.18 | —do— | —do— |
| 40 | PBH 40 | 349 | 2371400.88 | 334486.86 | —do— | —do— |
| 41 | PBH 41 | 360 | 2371378.88 | 334947.20 | —do— | —do— |
| 42 | PBH 42 | 430 | 2371309.87 | 335473.37 | —do— | —do— |
| 43 | PBH 43 | 380 | 2371409.89 | 335783.74 | —do— | —do— |
| 44 | PBH 44 | 390 | 2371321.97 | 335809.51 | —do— | —do— |
| 45 | PBH 45 | 384 | 2371450.48 | 336159.28 | —do— | —do— |
| 46 | PBH 44 | 382 | 2371503.9  | 335541.43 | —do— | —do— |

All the 48 proposed bore holes will be drilled during the five year plan period for total meterage 5750 in compliance to the provisions of Rule 12(3) of MCDR 2017, to explore the entire potentially mineralized area under G-1 level, within a period of five years from the date of opening of the mine after execution of the mining lease; and as per the conditions/procedures laid down in the MEMC Rules 2015.

## Explored & unexplored area in Ha

| Explored by GSI in G2 category                                                                                           | Probable mineralized area to be explored in G 2 category in Plan period                         | Unexplored area, as per state DGM (ha) | Total lease area (ha) | Mineralized Area as per DGM, Maharashtra Notification |
|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------|-----------------------|-------------------------------------------------------|
| Area under the influence of MNG-1 to MNG-8, No demarcation done in the map (Central Part of the Mineral Block Auctioned) | Exact data not available. Thus 46 core bore holes are proposed to be drilled in the Plan period | 30.00                                  | 105.0                 | Approximately 75 ha (marked on Geological Plan)       |

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**Note:-** In the Prospecting Report as obtained during the time of auction, clear demarcation of G-2 area has not been done by GSI; but DGM, Maharashtra has demarcated approximately 75 ha area under mineralized zone. However, resources have been estimated for MNG-1 to MNG-8 only. Thus, the area under influence of MNG-1 to MNG-8 only has been considered for five years production proposals and 46 core boreholes have been proposed in the mineral block to clearly demarcate mineralized area in the mineral block. After the results of exploration in the five year plan period, the document may be modified, if required.

J) Reserves and Resources as per UNFC with respect to the threshold value notified by IBM may be furnished in a tabular form as given below: (Area explored under different level of exploration may be marked on the geological plan and UNFC code for area considered for different categories of reserve/resources estimation may also be marked on geological cross sections). Submit a feasibility/pre-feasibility study report along with financial analysis for economic viability of the deposit as specified under the UNFC field guidelines may be incorporated.

Resource estimated by the GSI & re-estimated by State DGM is reproduced below:

### I) GSI

Resource based on bore hole data were estimated by the GSI for the bore holes that encountered Mn mineralization. The GSI on resource estimation has stated as below:

As seen from analytical report, MNG-8, MNG-2, MNG-3, MNG-1, MNG-6, and MNG-7 has intersected the same Mn ore horizon at different depth and these Mn value ranges between 25 to 30% which can be categorized into Low grade high silica ore (LGHS). They also have low phosphorous content. MNG-10 and MNG-12A 300m west of MNG 1 have also intersected Mn horizon. They are also categorized as Low grade high silica ore and has low phosphorous. Cross section of the entire above borehole was drawn to estimate the reserves. From the borehole plan the strike influence of each borehole was calculated. The boreholes have intersected the ore horizon at about 30 to 35m vertical depth from ground level and below the bottom of the quarry. Up dip wise extension was defined on the basis of correlation with surface / old working. Down dip direction being half of the up dip length, strike extension was considered on the basis of positive intersection in adjacent bore. In this way area of influence was calculated for each borehole and reserves estimated. From the bore hole logs it is observed they had estimated resource only in central part of the deposit up to RL 280m from RL 382.295m which accounts for a depth of 122.295m. The average dip of ore body is 70°. For each borehole true thickness of the ore body was calculated from apparent thickness. Average specific gravity of manganese was taken as 3.1 gm/cm<sup>3</sup>

Estimation of the ore reserve is summarized and furnished in Annexure 3. **अनुमोदित**  
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The resource estimated by GSI = 2,18,700.0 tonnes, grade 29.25% Mn, G2 category;

#### **II) REVISED ESTIMATION BY DGM**

The resource for the Guguldoh mine was estimated by GSI taking into consideration 20% as the cut off for Mn. As the IBM has revised the threshold value for Manganese as 10%, the resource was re-estimated by DGM. Thus, the total resource for Guguldoh Manganese block is 0.440 million tonnes (indicated resource 332) with an average grade of 22.70% Mn. A total of 18 bore holes were drilled in the Guguldoh area, out of 18 boreholes, 6 boreholes were drilled in central part are considered for resource estimation which have mineralisation. Rest of the bore holes intersected minor Mn ore bands and Gondite. While estimating the resource, the DGM enhanced the width of ore body up to threshold value of 10% Mn content. The calculation is furnished in Annexure 7.

The resource re-estimated by DGM = 4,40,185.0 tonnes, grade 22.70% Mn, G2 category



esou Der DGM as on 1.4.2019

| otal,<br>nnes | Grade             | Category |
|---------------|-------------------|----------|
| ,40,1         | 22.70% Mn content | G2       |
| ,40,1         |                   |          |

pe d enches: Nil

Nil

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onsi for production planning.

m, t nomic viability and representing the first  
rd d d geologic and the third digit. The three  
ave s 1,2 & 3 in decreasing order. Similarly,  
han codes 1,2 & 3 while the four stages of  
sen four codes, 1) Detailed exploration, 2)  
g & connaisance. Thus the highest category  
cod ) & lowest category the code (334).  
arlowase/code of UNFC to this deposit are

ed ring and there are remnants of old pits.  
ke available, the lease was surrendered. The  
se rneralization of Mn ore, the GSI drilled 18  
re recovered in central part of the mine and  
are ore bed has been fully delineated &  
heganese ore has also been done by GSI.  
to roved to a maximum depth of 122.285m  
is Manganese ore has already market &

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L

**SUMMARY: Updated Resource as per DGM as on 1.4.2019**

| Resource               | Total, tonnes | Grade             | Category |
|------------------------|---------------|-------------------|----------|
| Proved Category Mn ore | 4,40,185.0    | 22.70% Mn content | G2       |
| Total                  | 4,40,185.0    |                   |          |

**Blocked resources:**

- i) Ore blocked in ultimate pit slope due to benches: Nil
- ii) Ore blocked in 7.5m barrier: Nil

**Total blocked Resource: Nil**

**Mineable Reserve: 4,40,185 t      Code:122**

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This mineable reserve has been considered for production planning.

**Application of UNFC guideline:**

It is a three digit code base system, the economic viability axis representing the first digit, the feasibility axis the second digit and geologic axis the third digit. The three categories of economic viability have codes 1,2 & 3 in decreasing order. Similarly, the categories of feasibility study have also codes 1,2 & 3 while the four stages of geological assessment are represented by four codes, 1) Detailed exploration, 2) General exploration, 3) Prospecting & 4) Reconnaissance. Thus the highest category under UNFC system will have the code (111) & lowest category the code (334).

The details of application of various class/code of UNFC to this deposit are discussed below:-

**(i) Economic Axis E1:**

The lease area was earlier granted for mining and there are remnants of old pits. However, being low grade, no market was available, the lease was surrendered. The lease area falls in forest. To assess the mineralization of Mn ore, the GSI drilled 18 core bore holes. Low grade Mn ore was discovered in central part of the mine and established the resource. The Manganese ore bed has been fully delineated & exposed in old pits. Mapping of the Manganese ore has also been done by GSI. Manganese ore mineralization has been proved to a maximum depth of 122.285m by core bore holes. The end use of Manganese ore has already market &



Manganese ore is saleable with profit though it is a low grade. Because of downward revision of threshold value of Mn content in ore, the DGM re-estimated the resource utilizing the data of bore holes drilled by GSI. This has enhanced the quantum of resource but Mn content reduced to 22.70%. Feasibility report has been prepared and annexed to this mining plan elucidating mining profitable venture. Thus, quantifies of Manganese ore resource of proved category qualifies for E-1 code.

**(ii) Feasibility Axis F2:**

The deposit is on elevated hill with steep slope. It is proposed to mine Mn ore by open cast method of mining, fully mechanized which is feasible. Mining plan is being prepared for lease grant. There is a mineable resource to the tune of 4,40,185 tonnes with an average grade 22.70% Mn content. Lease is being granted through auction mode, a legal platform for obtaining the lease. There has been no legal problem. It is a forest land and its clearance will be sought earliest and it will not be a hurdle in opening the mine. Feasibility report has been prepared and enclosed to this mining plan that reveals the mining profitable. Thus, resource of proved category is eligible for F2 code.

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**(iii) Geological Axis G2:**

The deposit has been explored by GSI by drilling 18 inclined core bore holes to a depth of 125m. There are old pits as deep as 20m in which Mn ore body is exposed. GSI has also done geological mapping and ore bodies have been delineated on geological plan on the basis of data generated through core drilling. Resource has been estimated with standard cross sectional method. Mining plan is being prepared for grant of mining lease. There is a mineable reserve of 4,40,185 tonnes with saleable grade. The ore has been estimated with standard method with core bore hole drilling data, the proved resource is thus, eligible for G2 category.

k) Furnish detailed calculation of reserves/resources section wise (When the mine is other than fully mechanized and deposit is of complex nature with variation of size, shape of mineralized zones, grade due to intrusion within ore zone etc, an attempt may be made to estimate reserves/resources by slice plan method). In case of deposits where underground mining is proposed, reserves/resources may be estimated by level plan method, as applicable, as per the proposed mining parameters.

Resource calculation furnished by GSI and re-calculation of resource by DGM is given in Annexure 6 & 7 respectively.

### I) Mineral Reserves/Resources:

Mineral Resources: (Mineral resources may be estimated purely based on level of exploration, with reference to the threshold value of minerals declared by IBM)

#### Mineral Reserves/Resources:

Mineral Resources: (Mineral resources may be estimated purely based on level of exploration, with reference to the threshold value of minerals declared by IBM)

| Level of Exploration                | Resources/Reserve in tonnes | Grade In%                                                                                                                |
|-------------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------|
| G1 - Detailed Exploration           |                             |                                                                                                                          |
| G2 - General Exploration<br>Mn ore: | 4,40,185.0                  | Mn: 1.22 to 40.72%<br>SiO <sub>2</sub> : 9.0 to 59.0%<br>Fe: 1.50 to 17.0%<br>P : 0.05 to 1.70%<br>Avg. grade: Mn 22.70% |
| G3 - Prospecting                    | 00                          | —                                                                                                                        |
| G4- Reconnaissance                  | 00                          | —                                                                                                                        |

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Resources and reserves within the lease may be arrived after applying results feasibility/prefeasibility study and economic evaluation of deposit based on various factors such as:

|                                                | UNFC Code   | Quantity in tonnes | Grade                                                                                                                    |
|------------------------------------------------|-------------|--------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>A. Total Mineral Resource</b>               | 122         | 4,40,185.0         |                                                                                                                          |
| Proved Mineral:<br>Mineable Mn ore<br>Reserve, | 122         | 4,40,185.0         | Mn: 1.22 to 40.72%<br>SiO <sub>2</sub> : 9.0 to 59.0%<br>Fe: 1.50 to 17.0%<br>P : 0.05 to 1.70%<br>Avg. grade: Mn 22.70% |
| Probable mineral<br>Reserve, blocked<br>ore    | 121 and 122 | 0.0                |                                                                                                                          |
| <b>B.Total Remaining</b>                       | —           | 0.0                |                                                                                                                          |

|                                           |             |                   |  |
|-------------------------------------------|-------------|-------------------|--|
| <b>Resources</b>                          |             |                   |  |
| <b>Feasibility mineral Resource</b>       | 211         | —                 |  |
| <b>Profitability mineral resource</b>     | 221 and 222 | —                 |  |
| <b>Measured mineral resource, Blocked</b> | 331         | —                 |  |
| <b>Indicated mineral resource</b>         | 332         | —                 |  |
| <b>Inferred mineral resource</b>          | 333         | —                 |  |
| <b>Reconnaissance mineral resource</b>    | 334         | —                 |  |
| <b>Total Reserves + Resources</b>         |             | <b>4,40,185.0</b> |  |

Note: It may not be possible to quantify grade wise reserves, as normally there is considerable variation in size and grade distribution within the ore zone, which results variable recovery factor and bulk density. Thus, tonnages arrived are tentative.

## 2.0 MINING

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### A. OPEN CAST MINING:

a) Briefly describe the existing as well as proposed method for excavation with all design parameters indicating on plans /sections.

**Present Method of Working: Not Applicable**

No mining activities are going on in lease area and it is under grant. However, there are fourteen abandoned old mining pits. The length & breadth with depth of these pits are given below:

#### Dimensions of existing pits

| S.No. | Length, m | Width, m | Depth, m | Area, m <sup>2</sup> |
|-------|-----------|----------|----------|----------------------|
| 1.    | 40.46     | 9.99     | 14.58    | 404.20               |
| 2.    | 41.22     | 20       | 9        | 824.40               |
| 3.    | 68.52     | 21.40    | 13.13    | 1466.33              |

|            |        |       |       |          |
|------------|--------|-------|-------|----------|
| 4.         | 24.73  | 13.65 | 4.25  | 337.66   |
| 5.         | 413    | 37.34 | 28.39 | 15421.42 |
| 6.         | 46.13  | 14.34 | 14.33 | 661.50   |
| 7.         | 68.20  | 29    | 24.07 | 2557.80  |
| 8.         | 206.88 | 21.67 | 18.54 | 4483.09  |
| 9.         | 81.63  | 30    | 22.66 | 2448.90  |
| 10         | 150.13 | 37.63 | 20    | 6648.39  |
| 11.        | 9.51   | 12.46 | 2.75  | 118.49   |
| 12.        | 32.94  | 28.65 | 8.67  | 950.32   |
| 13.        | 13.30  | 9.24  | 2.57  | 122.89   |
| 14.        | 13.30  | 9.29  | 3.57  | 123.66   |
| Total Area |        |       |       | 35569.86 |

The area occupied by these old pits amounts to 35569.86 m<sup>2</sup>.

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#### **Proposed Method of Working:**

The mineralization is on steep slope and amenable to opencast method of mining. The mining will be by A category mechanized operation commencing from highest altitude of mineralized area and subsequently descending downward forming systematic benches of six meter high and width not less than the height i.e. six meter and slope of individual bench to 60° from horizontal. The width of the working bench shall not be less than three times the maximum width of dumper plying on haul road.

There is infertile soil of about two meter thick and it will be removed separately by forming two meter high bench and stacked to its designated place. The overburden being hard, it will be drilled and blasted. The bench height in OB will be maintained six meter. For drilling in over burden, spacing will be 3.0m & burden 2.5m. Drilling will be carried by Wagon drill 100mm dia. The 6.0m bench will be sliced in one go. Thus, maximum depth of hole will be 6m excluding sub grade drilling. Sub grade drilling will be kept to 10% of hole depth i.e. 0.60m to maintain bench floor avoiding toe formation. Total depth of blast hole will be 6.60m. The blast holes in overburden will be charged with shury based cap sensitive Solar gel of five cartridges weighing each 2.75kg. Nonel system will be used for controlled blasting. The powder factor in OB will be 3.27m<sup>3</sup> per kg of





explosive or about 6.54L. Overall slope of hanging and foot wall will be maintained at 60°. In a bench height of six meter in ore, and average true width 2.45m wide; hence it will be sliced four times by drilling Jack Hammer 32mm dia to a depth of 1.5m with spacing 1.0 m and burden 0.75 m. The holes will be charged with explosive slurry based gelatin 80% strength with 0.5kg in each hole in conjunction and fired with Nonel. At a time maximum 20 blast holes will be fired.

Approach roads and haul roads of proper gradient will be formed and inter benches will be connected by ramps of gradient 1:16.

Blasted OB and mineralized muck will be loaded by the loader in to dumpers of 10 tonnes capacity. OB will be dumped to its dump site and Mn ROM to its stack yard. At stack yard the ROM will be sorted out as per grade and size. Low grade will be subjected to jigging.

The winning of Mn ore will be carried out as shown in production and development plates 6.1 to 6.5. A garland drain 1 m x 1 m will be provided at top bench. No loose boulder or trees will be kept within three meters from the edge of the top bench. Proper steps for men and material working will be formed. The year wise production proposals are discussed below and its calculation is furnished in Annexure 9.

**First Year:** Excavation will commence from west end simultaneously for both C1 & C2 Mn ore bodies for eight benches of six meter high each and mined forming systematic benches both in H.W. & F.W. Width of bench will not be less than the height of the bench. Both the ore bodies will be mined from 385m RL up to 337. The cross sectional area to be mined constitutes 10.84m<sup>2</sup> & 10.30m<sup>2</sup> for C1 & C2 ore bodies respectively with lateral distance 33.87m & 45.0m. This will achieve the targeted production 25955.0 tonnes. OB benches will be sliced in one go and Mn ore body four times of 1.5m each high by Jack hammer drill holes. Blasting, loading & hauling of blasted OB & muck will be done as discussed above.

**Second Year:** During the year, production will be achieved from C1, C2, C4, A1, A2 & B1 ore bodies. Production from C1, C2, will come from ninth bench for a cross sectional area 11.51 & 15.29m<sup>2</sup> and lateral distance 33.87 & 45m respectively. Similarly, C4 ore body, from 355m RL for a single bench to a lateral distance 139.9m and cross sectional area 32.27m<sup>2</sup> will be mined. A1, A2 & B1 ore bodies too will be mined for a lateral distance 33.43m, 14.48m & 231.22m with cross sectional area 24.31m<sup>2</sup>, 11.50m<sup>2</sup> & 11.91m<sup>2</sup>. This will achieve the targeted production 28909.0 tonnes. OB benches will be sliced in one go and Mn ore body four times of 1.5m each high by Jack hammer drill holes. Blasting,



loading & hauling of blasted OB & muck will be done as discussed above.

**Third Year:** During the year, production will be achieved from C4 ore body alone for a lateral distance 139.9m & cross sectional area 32.27m<sup>2</sup> from bench 2, 3 & 4 from RL 349 to 337m. This will achieve the targeted production 34244.0 tonnes. OB benches will be sliced in one go and Mn ore body four times of 1.5m each high by Jack hammer drill holes. Blasting, loading & hauling of blasted OB & muck will be done as discussed above.

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**Fourth Year:** During the year, production will be achieved from C4, C5, & B2 ore bodies. Production from C4, & B2, will come from fifth & sixth bench for a cross sectional area 26.32 & 13.64m<sup>2</sup> and lateral distance 139.9 & 106.74m respectively. Similarly, C5 ore body, from 346m RL for two benches to a lateral distance 228m and cross sectional area 12.95m<sup>2</sup> will be mined. This will achieve the targeted production 43494.0 tonnes. OB benches will be sliced in one go and Mn ore body four times of 1.5m each high by Jack hammer drill holes. Blasting, loading & hauling of blasted OB & muck will be done as discussed above.

**Fifth Year:** During the year, production will be achieved from C1, C2, C4, C5, A1, A4 & B1, B2 ore bodies. Production from C1, C2, will come from 325 to 301m RL for a cross sectional area 11.51 & 15.29m<sup>2</sup> and lateral distance 33.87 & 45m. Similarly, C4 ore body, from 319m to 292m RL for a lateral distance 139.9m and cross sectional area 26.32m<sup>2</sup> will be mined. A1, & A4 ore bodies too will be mined from RL 325 to 286m A1 and A4 from RL 331 to 301m for a lateral distance 33.43m, 6.78m with cross sectional area 30.21m<sup>2</sup>, & 9.0m<sup>2</sup>. Also B1, & B2 ore bodies too will be mined from RL 325 to 295m B1 and B2 319 to 292m for a lateral distance 231.22 & 106.74m, with cross sectional area 14.80m<sup>2</sup>, & 14.27m<sup>2</sup>. Besides, C5 ore body too will be mined from 334m RL to 271 m RL for a cross sectional area 13.58m<sup>2</sup> for a lateral distance 228.0m. This will achieve the targeted production 3,06,065.0 tonnes. OB benches will be sliced in one go and Mn ore body four times of 1.5m each high by Jack hammer drill holes. Blasting, loading & hauling of blasted OB & muck will be done as discussed above.

Haul roads and steps with proper gradient would be formed. The Manganese ore brought to stack yard will be sorted according to size and grade. The area under pits at the end of ensuing plan period is given below.



|                        |                        |
|------------------------|------------------------|
| Area in m <sup>2</sup> | Hill slope Depth in m. |
| 89651.53               | 114                    |



b) Indicate year-wise tentative Excavation in Cubic meters indicating development ROM, pit wise as in table below.

**I In-situ Tentative Excavation (Annexure 2)**

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| Year     | Total tentative Excavation (Cum) | Soil (Cu m) | OB/SE/IB (Cum) | ROM (Cu m) | ROM Tonnes | Mineral reject (Cum) | Mineral Reject (tonnes) 10% | Ore /Waste Ratio t / m <sup>3</sup> |
|----------|----------------------------------|-------------|----------------|------------|------------|----------------------|-----------------------------|-------------------------------------|
| 1        | 3                                | 4           | 5              | 6          |            | 8                    | 9                           | 10                                  |
| I Year   | 51622.15                         | 5917.0      | 77555.0        | 8376.13    | 25666.0    | 837.61               | 2566.6                      | 1:3.213                             |
| II Year  | 38230.47                         | 1401.0      | 28454.0        | 9325.47    | 28909.0    | 932.54               | 2890.9                      | 1:1.032                             |
| III Year | 52543.44                         | 5142.0      | 63454.0        | 11046.44   | 34244.0    | 1104.64              | 3424.4                      | 1:2.000                             |
| IV Year  | 101205.32                        | 2042.0      | 84288.0        | 14090.33   | 43494.0    | 1409.03              | 4349.4                      | 1:2.004                             |
| V Year   | 3888170.64                       | 85211.0     | 3704500.0      | 98730.86   | 308065.0   | 9873.06              | 30806.5                     | 1:12.382                            |
| Total    | 4203872.00                       | 103613.0    | 3858174.0      | 141698.03  | 4,38,678   | 14180.9              | 43867.8                     | 1:9.259                             |

NOTE: For tonnage of the ore, bulk density is considered 3.1t per m<sup>3</sup> as per GSI report.

यस संख्या द्वारा NGP/MN/MPLN-1177/4GP-2019-21 18/09/2019  
वीर लक्ष्मण यादव

**Summary of Year Wise OB Removal and ROM Mn Production**

| Year  | Mn ore Production, ROM tonnes | Soil m <sup>3</sup> | OB removal, m <sup>3</sup> |
|-------|-------------------------------|---------------------|----------------------------|
| I     | 25,986.0                      | 5917.0              | 77533.0                    |
| II    | 28,909.0                      | 1401.0              | 28454.0                    |
| III   | 34,244.0                      | 5142.0              | 63454.0                    |
| IV    | 43,494.0                      | 2042.0              | 84233.0                    |
| V     | 3,06,065.0                    | 85211.0             | 3704500.0                  |
| Total | 4,38,678.0                    | 103613.0            | 3858174.0                  |

**II Dump re-handling (for the purpose of recovery of mineral):**

Estimated available material (Cum): Nil

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c) Enclose individual year wise development plans and sections showing pit layouts, dumps, stacks of mineral reject, if any, etc in case of 'A' category mines. Composite development plans showing pit layouts, dumps, stacks of mineral reject, if any, etc, and year wise sections in case of 'B' category mines.

Individual year's development plan is enclosed as plate no. 6.1 to 6.5 & sections as Plate 6A.

d) Describe briefly giving salient features of the proposed method of working indicating Category of mine.

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Excavation will be done by category A mechanized mode. Drilling & blasting in OB will be carried out by Wagon drill 100mm dia with bench height 8m and width not less than the height of bench. The OB benches will be blasted six meter high in one go. Drilling and blasting in ore will be done by small dia Jack hammer drill. Ore and OB will be loaded by deploying loader into 18 tonnes tippers. The ore will be brought to sorting yard and waste to its waste dumping yard.

e) Describe briefly the layout of mine workings, pit road layout, the layout of faces and sites for disposal of overburden/waste along with ground preparation prior to disposal of waste, reject etc. A reference to the plans and sections may be given. UPL or ultimate size of the pit is to be shown for identification of the suitable dumping site.

It is shown in plate 6.1 to 6.5 & sections in Plate 6A. Further, It is described briefly as below:

**Top soil:** There is no top soil that supports crop where the excavation of Mn ore is proposed during the ensuing mining plan period. Hence, top soil will not generate during the plan period, therefore, its careful removal and separate stacking is not needed.

**Soil:** In lease, infertile soil not suitable for crops is available for a two meter thickness from surface. This soil will be scrapped meticulously and stacked to its designated place for which an area of 23733.35m<sup>2</sup> has been earmarked. The dump will be temporarily in nature as this soil will be used for plantation. There will be generation of 103613m<sup>3</sup> of soil during the plan period. To avoid erosion and siltation it will be provided with retaining wall.

**Layout of Mine workings:** Manganese ore mineralization is delineated on surface geological plan plate 3. The Mn ore will be mined from west direction of the proposed area advancing towards east following the Mn bands forming systematic benches of six meter high. During the mining of Mn ore, infertile soil will encounter in all year of operation. Hence, it will be removed and stacked as waste. At 385m RL, first bench



will be opened to a height of 6m during the first year of operation. In second year, mining of Mn ore will proceed in east direction from RL 355m. The mining will be descending order along hill slope, mining all Mn ore bodies in central part of the lease. Mn ore & OB being hard will be drilled by Wagon drill 100mm dia hole and blasted with slurry explosive. Blasted muck will be loaded by the loader in to 10 tonnes tippers to be transported at crusher site for making saleable size.

The recovery of Mn ore will be 100% by volume from pit and reject will be 10% while sorting. This reject will be stacked to its designated place.

**Pit road layout:** Approach road from hill bottom will be formed as shown in Development & Production Plates 6.1 to 6.5. This road will be made up to 365 m RL i.e. the area from first year production will start. A ramp with gradient 1:16 will be formed to reach the tippers and excavator at pit bottom of bench floor.

**Layout of Faces:** Mining will start from the C1 ore body which is at the highest level compared to other ore bodies. The faces of the benches will be along strike of the ore body and height of bench to be along dip of ore body. Foot wall will follow the dip of the ore body. The benches will be in descending order along dip of ore body.

**Site for disposal of OB/waste:** OB/Waste generation excluding soil will be in the form of quartzite, mica schist amounting to 3958174m<sup>3</sup> during five year period. For stacking, a separate dump will be created for which 149084m<sup>2</sup> of area has been earmarked. The waste will be dumped from foot hill in steps along hill slope 10high 20m wide. As per the exploration done by GSI and state DGM, the land chosen is non-mineralised. Further, to avoid wash off from dump, it will be provided gabion wall at toe of the dump.

**Rejects:** There will be generation of reject due to winning of Mn Ore which will be 14150.9m<sup>3</sup> during five year period. Reject will constitute less than 10mm in size and also which contain +10 to -20% Mn. This will be stacked separately.

#### **Details on Drilling and Blasting, Mining Machinery.**

(1) **Drilling:-** Drilling operations to be done by Wagon drills in over burden and by Jack hammer in Manganese ore body.

#### **Parameters for drilling in over burden and ore body:**

| Drilling in Ore Body |        | Drilling In Over Burden |       |
|----------------------|--------|-------------------------|-------|
| Depth of hole        | 1.5 m  | Depth of hole           | 6.6 m |
| Burden               | 0.75 m | Burden                  | 2.5 m |
| Spacing of holes     | 1.0 m  | Spacing                 | 3.0m  |
| Dia. of Hole         | 32 mm  | Dia of hole             | 100mm |



**(A) Requirement of Jack hammer drill machine.**

- (i) Manganese ore blasted by each hole:  $1.5\text{m} \times 1.0\text{m} \times 0.75\text{m} = 1.125\text{m}^3$   
(ii) Maximum Manganese ore handling in a shift:  $3,06,065.0\text{t} / 3.1 = 98730.64\text{m}^3 / 300 = 329.10\text{m}^3$   
(iii) Average meterage drilled by 1 drill machine in a shift: 30m  
(iv) No. of drill holes required for Manganese ore production in a shift:  $329.10 / 1.125 = 292.53$   
(v) Drill meterage required in a shift:  $292.53 \times 1.5 = 438.80\text{m}$   
(vi) One Jack hammer can drill 30m in a shift, hence Jack hammer required  $438.80 / 30 = 14.63$  or say 15nos

**(B) Requirement of Wagon Drill machine.**

- (i) Overburden blasted by each hole:  $6.6\text{m} \times 2.5\text{m} \times 3.0\text{m} = 49.5\text{m}^3$   
(ii) Maximum overburden handling in a shift:  $37,89,711.0\text{m}^3 / 300 = 12632.37\text{m}^3$   
(iii) No. of drill holes required for overburden removal in a shift:  $12632.37 / 49.5 = 255.19$   
(iv) Drill meterage required in a shift:  $255.19 \times 6.6 = 1684.25\text{m}$   
(v) One drill machine can drill 50m in a shift, thus, no of drill machine required =  $1684.25 / 50 = 33.68$  or say 34

**(C) Requirement of Tipper Trucks**

- (i) Maximum Manganese ore handling in a shift:  $3,06,065.0\text{t} / 300 = 1020.22\text{t}$   
(ii) Maximum OB handling in a shift:  $37,89,711.0\text{m}^3 / 300 = 12632.37\text{m}^3$  or in tonnes  $\times 1.8\text{BD} = 22738.26\text{t}$   
(iii) Total handling of OB & ore in a shift:  $1020.22 + 22738.26 = 23758.26\text{t}$   
(iv) No. of effective working hours in a shift: 7  
(v) No. of trips by 1 tipper in one hour: 3  
(vi) No. of trips by 1 tipper in a shift:  $7 \times 3 = 21$   
(vii) Total tonnage transported by one tipper in a shift:  $21 \times 16\text{t} = 336\text{T}$   
(viii) No. of tipper trucks required:  $23758.26 / 336 = 70.70$  say 71  
(ix) No of spare tippers: 1  
(x) Total no. of tippers required:  $71 + 1 = 72$

**D) Loading Equipment:**

**Calculations for Loading Equipment**

- i) Maximum handling of Mn ore in a shift:  $329.10\text{m}^3$   
ii) Maximum OB handling in a shift =  $12632.37\text{m}^3$   
iii) Total handling of OB & Mn ore in a shift:  $329.10\text{m}^3 + 12632.37\text{m}^3 =$



12661.47m<sup>3</sup>

- iv) Mn ore handling in a shift in terms of tonnage =  $329.10 \times 3.180 = 1020.21 \text{ t}$
- v) OB handling in a shift =  $12632.37 \text{ m}^3 \times 1.880 = 22738.26 \text{ t}$
- vi) Total Mn ore & OB handling in a shift ( $1020.21 \text{ t} + 22738.26 \text{ t}$ ) = **23758.47 t**
- vii) Average bucket capacity =  $2.1 \text{ m}^3$
- viii) Fill factor = 80%
- ix) Broken ore density =  $2.0 \text{ t/m}^3$
- x) Tonnage handled/Bucket ( $2.1 \times 0.8 \times 2.0$ ) =  $3.36 \text{ t}$
- xi) Average Cycle time/bucket = 45 seconds
- xii) No of buckets /hour ( $60 \times 60 / 45$ ) = 80
- xiii) TPH of excavator ( $80 \times 3.36$ ) =  $268.80 \text{ t}$
- xiv) Effective TPH to be considered (80%) =  $268.80 \times 0.80 = 215.04 \text{ t}$   
(For shiffling, waiting, face preparation etc.)
- xv) Total time required for loading materials in a shift ( $23758.47 \text{ t} / 215.04 \text{ t}$ ) =  
110.48 hours
- xvi) No. of effective working hours in a shift = 7
- xvii) Percentage Equipment utilization = 70%
- xviii) Percentage Equipment availability = 75%
- xix) Hours available per excavator in a shift ( $7 \times 0.75 \times 0.70$ ) = 3.67
- xx) No of Excavators required ( $110.48 / 3.67$ ) = 30.10 or say 31

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## **(2) Blasting:**

Based on parameters of drilling and blasting discussed above and powder factor arrived at, the requirement of explosive in a year will be as below:

### **Small dia for blasting in Manganeese ore:**

- (i) Maximum quantity of Manganeese ore to be blasted in a year: 3,06,085 t

(ii) Powder Factor:  $(1.5\text{mD} \times 1.0\text{m Spacing} \times 0.75\text{m Burden}) = 1.125\text{m}^3$  in 0.5kg explosive

(iii) Therefore, in one kg explosive  $1.125\text{m}^3 \times 2 = 2.25\text{m}^3$  or  $2.25 \times 3.1 = 6.97$

(iv) Hence maximum requirement of explosive in a year  $= 3,08,095 / 6.97 = 43911.78$  kg or 43912 kg

#### Large dia explosive for blasting Overburden:

i) Maximum quantity of Overburden to be blasted in a year:  $37,89,711\text{m}^3$

(ii) Powder Factor:  $(8.0\text{mD} \times 3.0\text{m Spacing} \times 2.5\text{m Burden}) = 45\text{m}^3$  in 13.75kg explosive

(iii) Therefore, in one kg explosive  $45.0\text{m}^3 / 13.75 = 3.27\text{m}^3$

(iv) Hence maximum requirement of explosive in a year  $= 3789711\text{m}^3 / 3.27 = 1158933.02$  or say 11 58933.0 kg.

The drilling and blasting will be done through Govt. registered contractor.

The workers will be provided with protective appliances to avoid dust problem at the time of drilling & blasting & wet drilling will be adopted

#### Deployment of Machinery:

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#### List of Machineries & Equipment

| Sr. No. | Type                                                    | No. |
|---------|---------------------------------------------------------|-----|
| 1.      | Self Propelled portable air compressor                  | 15  |
| 2.      | Compressed air operated Jack hammer drills              | 15  |
| 3.      | Exploder                                                | 1   |
| 4.      | Water pumps: 10HP                                       | 1   |
| 5.      | Wagon drill 100mm                                       | 34  |
| 6.      | Tractor, 45 HP                                          | 1   |
| 7.      | Water tanker, 10,000 Litre capacity                     | 1   |
| 8.      | Tipper trucks, 16 tonnes                                | 72  |
| 9.      | JCB & Backhoe Loader, 2.1m <sup>3</sup> bucket capacity | 31  |
| 10.     | Rock Breaker                                            | 1   |
| 11.     | Dozer 400 HP                                            | 1   |
| 12.     | Road Grader                                             | 1   |

The lessee will deploy the above mentioned machineries on contract basis as per requirement.

f) Conceptual Mine planning up to the end of lease period taking into consideration the present available reserves and resources describing the excavation, recovery of ROM, Disposal of waste, backfilling of voids, reclamation and rehabilitation showing on a plan with few relevant sections.

The lease has been granted through auction and under process of obtaining various permits / approvals. It will be executed after securing all approvals. As per the amended Act, the lease will be executed for the period fifty year. There shall be nine conceptual periods during lease period.

There is a mineable reserves of 4,40,185 tonnes as per DGM's re-estimation. The preferred bidder now intends to mine 4,38,676.0 tonnes during the ensuing mining plan period, leaving balance 1507 tonnes for conceptual period. Thus, due to meager reserve left out for conceptual period, there will be no conceptual mining. However, due to proposed exploration, if proved additional reserve, it will be modified accordingly.

The land use as per the present exploration status will be as below:

| Sr. No. | Land use Pattern | Land use at the stage of conceptual stage,m <sup>2</sup> |
|---------|------------------|----------------------------------------------------------|
| 1       | Area under Pit   | 88551.83                                                 |
| 2       | Waste Dump       | 213478.70                                                |
| 3       | Soil dump        | 23733.35                                                 |
| 4       | Roads            | 4500.00                                                  |
| 5       | Mineral storage  | 1775.00                                                  |
| 6       | Reject stack     | 895.00                                                   |
| 7.      | Structures       | 4924.00                                                  |
| 8       | Plantation       | 20,000.00                                                |
|         | <b>Total</b>     | <b>358857.88</b>                                         |

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**Excavation:** There will be no excavation.

**Recovery of ROM:** None

**Disposal of waste:** None

**Reclamation and rehabilitation:**

Pit will be converted to water reservoir after conceptual period. It is shown in reclamation plan, plate 9. Conversion to water reservoir, the area fall under reclamation and rehabilitation will be to the tune of 53982.15m<sup>2</sup>.

## B UNDERGROUND MINING: None

### 3. MINE DRAINAGE

a) Minimum and maximum depth of water table based on observations from nearby wells and water bodies.

Groundwater condition in the plain area appears to be quite good as seen in the nearby existing wells. The water table in dug wells varies from 10 to 20 meters from winter to summer season from general ground level 329m RL.

b) Indicate maximum and minimum depth of workings.

The working will be on hill slope from 365m RL to 271m RL for a depth of 114m and it may go below 58m from surface level.

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c) Quantity and quality of water likely to be encountered, the pumping arrangement and places where the mine water is finally proposed to be discharged.

The working will intercept the water table because; excavation will be below the ground water table. This water will be pumped out by deploying 10 HP water pumps. The water will be allowed to join natural drainage system after passing through settling tanks. The necessary approvals shall be taken from the competent authorities for the working below the ground water table.

d) Describe regional and local drainage pattern. Also indicate annual rain fall, catchments area, and likely quantity of rain water to flow through the lease area, arrangement for arresting solid wash off etc.

Drainage of the area is controlled by seasonal gullies and streams flowing NE-SW or E-W direction and finally merge with Khindal Lake. Since the slopes are formed all along the edge of the hill, various seasonal drains are formed at number of places depending on the local topography of the slope. There are numerous such drains, but none of them is perennial in nature.

#### 4. STACKING OF MINERAL REJECT/ SUB-GRADE MATERIAL AND DISPOSAL OF WASTE

##### Existing Waste Dumps:

Presently there are eleven old waste dumps of the following capacity & quantity within the lease area. Details of existing waste dumps are given below in tabular form:

| S.No | Waste Dump No | Area, Top of the Dump m <sup>2</sup> | Area, Bottom of the Dump m <sup>2</sup> | Average area of Dump m <sup>2</sup> | Height of Dump m | Quantity in Dump m <sup>3</sup> |
|------|---------------|--------------------------------------|-----------------------------------------|-------------------------------------|------------------|---------------------------------|
| 1    | D1            | 224.80                               | 670.90                                  | 447.75                              | 15.98            | 7155.05                         |
| 2    | D2            | 858.65                               | 1313.72                                 | 986.19                              | 9.655            | 9521.62                         |
| 3    | D3            | 20362.96                             | 31577.00                                | 26069.98                            | 16.979           | 440944.21                       |
| 4    | D4            | 748.21                               | 1776.66                                 | 1262.44                             | 4.272            | 5393.12                         |
| 5    | D5            | 3372.78                              | 5895.39                                 | 4634.09                             | 8.21             | 38045.64                        |
| 6    | D6            | 719.30                               | 1693.32                                 | 1206.31                             | 9.707            | 11709.65                        |
| 7    | D7            | 4287.53                              | 8428.34                                 | 6356.94                             | 5.32             | 33818.93                        |
| 8    | D8            | 2970.50                              | 6152.20                                 | 4561.35                             | 20.801           | 94880.67                        |
| 9    | D9            | 853.36                               | 2944.96                                 | 1899.17                             | 10               | 18991.69                        |
| 10   | D10           | 2084.91                              | 3381.45                                 | 2733.18                             | 14               | 38264.52                        |
| 11   | D11           | 133.62                               | 562.26                                  | 348.04                              | 7.448            | 2592.20                         |
|      |               | 38416.80                             | 64394.22                                | 50405.44                            | Total            | 701317.50                       |

The area occupied by these waste dumps constitutes 6.4394ha. No sub grade or reject stock is in the lease area.

**Re-handling of dump:** The dumps which are falling within the mining area, will be re-handled. The waste generated due to re-handling will be dumped at the waste dump site. As these are very old dumps and due to growth of natural plantation, it has been subsumed in the surface topography, instead of dump re-handling, it has been considered under overburden handling.



a) Indicate briefly the nature and quantity of top soil, overburden / waste and Mineral Reject to be disposed off.

There is no top soil in the area which supports crops; however it has a layer of infertile soil. Hence, no top soil will be generated. The soil intermixed with waste amounting to 103613m<sup>3</sup> will be stacked separately in southern side of the lease and mineral reject as shown in plate no. 6.1 to 6.5 (Development & Production Plan). The reject generated will be stacked separately. During the ensuing plan period, waste/OB removal would be 3958174.0m<sup>3</sup> during First to fifth year and would be dumped NE corner of the lease area in a single dump. The area earmarked for this purpose is 149084m<sup>2</sup>. The waste dumping will be in a retreating manner.

The details about quantity of reject are shown in table below:

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| Year  | Soil (cum)      |          | Mineral Rejects (cum) |         |          |               |
|-------|-----------------|----------|-----------------------|---------|----------|---------------|
|       | Reuse/spreading | Storage  | Backfilling           | Storage | Blending | Beneficiation |
| I     | 0.00            | 5917.0   | 0.00                  | 837.61  | 0.00     | 0.00          |
| II    | 0.00            | 1401.0   | 0.00                  | 932.54  | 0.00     | 0.00          |
| III   | 0.00            | 8142.0   | 0.00                  | 1104.64 | 0.00     | 0.00          |
| IV    | 0.00            | 2942.0   | 0.00                  | 1403.03 | 0.00     | 0.00          |
| V     | 0.00            | 85211.0  | 0.00                  | 9873.08 | 0.00     | 0.00          |
| Total | 0.00            | 103613.0 | 0.00                  | 14160.9 | 0.00     | 0.00          |

b) The proposed dumping ground within the lease area be proved for presence or absence of mineral and be outside the UPL unless simultaneous backfilling is proposed or purely temporary dumping for a short period is proposed in mineralized area with technical constraints & justification.

The proposed dumping ground is within the lease area and non mineralized as per the documents provided by the state DGM for auction. It is also outside the present known UPL. No simultaneous back filling is proposed as the mineral exists in depth. These existing dumps that fall in proposed excavation site will be re-handled. To avoid siltation from dump, a retaining wall at toe of dump will be provided. It will be one meter high above surface and half a meter beneath the surface as foundation. Its width will be kept one meter at top and on ground level it will be 1.5m wide. In addition to that plantation will be done on dead dumps.

c) Attach a note indicating the manner of disposal of waste, configuration and sequence of year wise build up of dumps along with the proposals for protective measures.

The waste will be disposed in retreating manner. In this process, the waste will be first dumped at the one end of the dump and with 10m high retreating towards other side of the dump. In this process it will get time for stabilization and will have minimum erosion.

d) Protective measures to be taken in plan period.

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As a step towards environment protection, the proponent shall do the following protective measures.

- i) **Retaining wall:** To prevent any wash-off and degradation of land in the adjoining areas, it will be constructed along the toe of proposed waste dump/soil and reject stacks during the plan period. It will be one meter high above surface and width one meter.
- ii) **Garland drain:** It will be 1.0m wide and 1.0m deep to arrest the siltation and is proposed to be constructed along the retaining wall.
- iii) **Settling Tanks:** Two settling tanks are proposed in the downstream direction of natural drainage, one each in the SE and SW direction of the proposed working area to arrest siltation, if any, prior to discharge of mine water.

## **6.6 USE OF MINERAL AND MINERAL REJECT**

The following are to be furnished in the interest of mineral conservation.

a) Describe briefly the requirement of end-use industry specifically in terms of physioal and chemical composition.

The consuming industry in general demands the chemical composition of more than 25% Mn content. As per the GSI's chemical analysis, the ore has about 30% Mn content; therefore, the ore mined will be in demand fetching good price for at least the 50% of the saleable ore. The balance 50% saleable ore may be in the range of 22 to 25% Mn content as per DGM's analysis. This grade too may fetch good price on account of depleting manganese ore resources. It will be sold to such traders who offers highest price to a particular grade.

The reject constitutes +10% - 20% Mn content material. The cut off grade has been considered based on present market scenario that may change upon actual start of mining operations.

b) Give brief requirement of intermediate industries involved in up gradation of mineral before its end-use.

No industry is involved in up-gradation of mineral before its end-use.

c) Give detail requirements for other industries, captive consumption, export, associated industrial use etc.

It is not for either captive consumption or export.

d) Indicate precise physical and chemical specification stipulated by buyers

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Not applicable

e) Give details of processes adopted to upgrade the ROM to suit the user requirements.

Sorting of ROM, grade wise, by manual means for dispatches as per different grade requirement of user will be done.

## 6.5 PROCESSING OF ROM AND MINERAL REJECT

a) If processing / beneficiation of the ROM or Mineral Reject is planned to be conducted, briefly describe nature of processing / beneficiation. This may indicate size and grade of feed material and concentrate (finished marketable product), recovery etc.

No processing / beneficiation of the ROM or Mineral Reject are planned. However, the lessee will install the crusher to make the size saleable. Besides, a jigging facility is proposed for washing and segregating gangue mineral from low grade ore. This will improve the recovery and grade of the ore.

b) Give a material balance chart with a flow sheet or schematic diagram of the processing procedure indicating feed, product, recovery, and its grade at each stage of processing.

Not applicable

c) Explain the disposal method for tailings or reject from the processing plant.

Not applicable.

d) Quantity and quality of tailings /reject proposed to be disposed, size and capacity of tailing pond, toxic effect of such tailings, if any, with process adopted to neutralize any such effect before their disposal and dealing of excess water from the tailings dam.

Not applicable

e) Specify quantity and type of chemicals if any to be used in the processing plant.

Not applicable

f) Specify quantity and type of chemicals to be stored on site / plant.

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Not applicable

g) Indicate quantity (cum per day) of water required for mining and processing and sources of supply of water, disposal of water and extent of recycling.  
Water balance chart may be given.

Not applicable

**(h) Monitoring of Dust, Water, Noise & Ground vibrations:**

**Monitoring schedule**

1. Air: It will be monitored as per CCOM's circular no 3/92. The monitoring will be at quarry edge in summer season for two days per week for two weeks. There will be two samples per day of 8 hours totalling 8 samples in each station. Further, at drilling site and near haulage road, it will be monitored in post monsoon season. Parameters to be monitored will be RSPM, PM10, PM 2.5 and NO<sub>x</sub>, SO<sub>2</sub>, CO

2. Water: Mine water samples will be collected in winter, summer and monsoon seasons. Three spot samples per season at the rate of one sample each on 3 different days. Parameters to be monitored will be as per IS:2490 (Part-1) 1981.

3. Noise: It will be monitored in dry season i.e. summer at near quarry edge. One reading will be taken showing instantaneous values in dB(A).

4. Vibration: Blast induced vibration will be monitored near the human settlement or public road for three heavy blasts on three different days measuring peak PPV with frequency.



Along with the above details, specific conditions, if any, imposed at the time of grant of Environmental Clearance, and Consents from CPCB/MPCB in respect of location, number and schedule for monitoring of various environmental parameters, shall be complied with. The cost on monitoring of environmental parameters will be about Rs two lac per annum.

These monitoring stations are shown on Plate 6 i.e. environmental plan.

## 7.0 OTHER:

Describe briefly the following:

### a) Site services:

The following site services will be provided at mine site.

- i) Office
- ii) Stores Shed
- iii) Rest Shelter
- iv) Blasters Sheds
- v) Bore well for drinking water

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These site services are considered to be adequate at the proposed scale of operation. Additional facilities would however, be provided as and when required and statutory provisions in this regard would be complied with.

### b) Employment potential:

#### Existing Manpower:

The mining operations have not yet commenced, however, the lessee has appointed the following personnel for overseeing the operation.

|                             |   |
|-----------------------------|---|
| Highly Skilled (Geologists) | 3 |
|-----------------------------|---|

**Proposed Manpower:** The following manpower will be deployed for achieving the targeted production.

|                                                          |   |
|----------------------------------------------------------|---|
| Mines Manager with I class Certificate & Mining Engineer | 1 |
| Mine Foreman (R)                                         | 1 |
| Mine Mate                                                | 1 |



|                           |       |
|---------------------------|-------|
| Blaster                   | 1     |
| Supervisors/ Office Staff | 3     |
| Mechanical Supervisor     | 1     |
|                           | <hr/> |
|                           | 8     |

There shall be the manpower as below:

|                    |       |
|--------------------|-------|
| Highly Skilled     | 7     |
| Skilled workers    | 5     |
| Un-Skilled workers | 30    |
|                    | <hr/> |
| Total              | 42    |

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### 8.0 PROGRESSIVE MINE CLOSURE PLAN UNDER RULE 23 OF MCDR'2017

**8.1 Environment Base line information:** Attach a note on the status of baseline information with regard to the following.

#### Existing land Use pattern:

The mining activity for exploitation of Manganese ore has not yet commenced. However, due to old workings, there are 14 pits and 11 dumps of waste material. The existing land use pattern is as under.

| No. | Head                       | Present Land use pattern<br>m <sup>2</sup> |
|-----|----------------------------|--------------------------------------------|
| 1   | Area under pit             | 35589.86                                   |
| 2   | Overburden dumps           | 64394.22                                   |
| 3   | Structures ( old magazine) | 24.00                                      |
|     | Total                      | 99987.90                                   |

**Water regime:** The lease area is a steep hill having slope towards south direction. The rain water is mostly drained through adjoining drain ultimately joining to the main nala which goes to Khindai tank. Groundwater condition in the plain area appears to be quite good as seen in the nearby existing wells. The water table in dug wells varies from 10 to 20 meters from winter to summer season.

**Flora & Fauna:** It is a forest land and has thick vegetation. The trees such as Neem, Tamarind, Babul, Teak, Bija, Mango, Behda, etc. are naturally grown in core zone.

As it is a forest land, there is ample fauna in the core zone. The fauna such as fox, wild animals are seen in the core zone. Rabbits too are commonly seen. Common birds like doves, koel, seven sisters, wood pecker, maina are seen. There is a forest land of 99.95ha on which grown up trees are 35,703 in number which requires felling. Thus, density of trees on forest land is 367.21trees/ha or 0.0367 trees/m<sup>2</sup>. In respect of revenue land there are 1251grown up trees on 5.05 ha area which requires felling. Thus, density of trees on revenue land is 249.70trees/ha or 0.0249 trees/m<sup>2</sup>.

**Climatic Conditions:** The area is characterized by tropical climate. Summer season starts from April and lasts till May. The average temperature in summer varies from 35° to 45° C but on some days during peak of summer in May it rises beyond 45° C. The average minimum temperature in winter varies from 12.2° to 14° C but as low as 6° C is also recorded as cold winter nights in December-January.

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**Rainfall:** The monsoon season starts off in the month of June and stays till September with an overall rainfall of 12.02 to 14.4 cm. Highest amount of rainfall of 340mm was recorded in the month of July.

**Human Settlement:** There is no human settlement in the lease area. The nearest human settlement is in the village Manegaon which is about 0.5 km due S of the area. Villages within 5 km have been furnished in the following table. The villagers are middle to lower class and generally earn their livelihood from agriculture and other local industries including mines.

| Sr. No. | Name of the village | Distance in km. | Direction |
|---------|---------------------|-----------------|-----------|
| 1.      | Manegaon            | 0.5             | S         |
| 2.      | Sonegaon            | 1.0             | SE        |
| 3.      | Mandri              | 1.5             | SW        |
| 4.      | Panchala Buzurg     | 3.5             | S         |
| 5.      | Mahadula            | 4.0             | S         |
| 6.      | Panchala Khurd      | 5.0             | S         |
| 7.      | Shanderbodi         | 5.0             | SE        |
| 8.      | Bhimtola            | 2.5             | SE        |
| 9.      | Guguldoh            | 2.0             | E         |
| 10.     | Musowadi            | 2.0             | W         |
| 11.     | Gudhegaon           | 2.5             | W         |



|     |            |     |    |
|-----|------------|-----|----|
| 12. | Mangli     | 4.0 | W  |
| 13. | Nohabi     | 5.0 | W  |
| 14. | Maharajpur | 4.5 | NW |
| 15. | Umri       | 2.0 | NW |
| 16. | Nayagaon   | 2.5 | NW |
| 17. | Chichda    | 3.0 | NW |
| 18. | Maharpeth  | 4.0 | NW |
| 19. | Murda      | 2.6 | N  |
| 20. | Gholi      | 5.0 | N  |
| 21. | Ramjan     | 4.5 | N  |

Public building, Monuments, Worship place, etc.: None.

Quality of Air: Around the Mn lease in the vicinity of 5km radius, no Industrial activity which produces SPM exists. Deposit is surrounded by agricultural fields /Forest Land which are devoid of SPM of appreciable quantity. Thus, quantum of total SPM and RSPM in ambient air in buffer zone remains much below the permissible limit.

Sanctuary:

No sanctuary is located in the vicinity of lease area.

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8.2 Impact Assessment: Attach an Environmental Impact Assessment Statement describing the impact of mining and beneficiation on environment on the following:

- i) Land area indicating the area likely to be degraded due to quarrying / pitting dumping, roads, working, processing plants, township, etc.

Land area likely to be degraded due to quarrying / pitting, dumping, roads, working etc at the end of review plan period, at conceptual plan period is given below in tabular form.

| Sr. No. | Land use Pattern | Present Land use<br>m <sup>2</sup> | Additional land use in<br>Plan period | Total Land degraded at the<br>end of plan period,<br>m <sup>2</sup> |
|---------|------------------|------------------------------------|---------------------------------------|---------------------------------------------------------------------|
| 1       | Area under Pit   | 35569.68                           | 53982.15                              | 89551.83                                                            |
| 2       | Waste Dump       | 64394.22                           | 149084.48                             | 213478.70                                                           |
| 3       | Soil Dump        | 0.00                               | 23733.35                              | 23733.35                                                            |
| 3       | Roads            | 0.00                               | 4500.00                               | 4500.00                                                             |
| 4       | Mineral storage  | 0.00                               | 1775.00                               | 1775.00                                                             |
| 5       | Reject stack     | 0.00                               | 895.00                                | 895.00                                                              |
| 6       | Structures       | 24.00                              | 4900 .00                              | 4924.00                                                             |

|    |            |          |           |           |
|----|------------|----------|-----------|-----------|
| 7. | Plantation | 0.00     | 20,000.00 | 20,000.00 |
|    | Total      | 99987.90 | 258869.98 | 358857.88 |

Total area degraded due to mining activities at the end of plan period amounts to 35.8858ha.

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ii) Air Quality: As stated above, it is A category mine; it may generate SPM but not to a noticeable level. Level of SPM in air is raised by the operation of machinery, drilling and blasting. EIA is being prepared by the EC consultant. These data will be submitted to the IBM for record. During mining plan period, mining machineries of medium capacity will be deployed hence; SPM generation shall be less and shall always be kept within permissible level. Haul roads will be sprinkled with water to suppress SPM generation. Dust suppression or extraction techniques shall be used during drilling operations to control the pollution at source level. Regular monitoring will be done as per the CCOM's circular and as per the conditions of EC/ Consent to operate.

iii) Water Quality: No toxic elements are present or detected in the samplings done in the area that may cause toxicity in the water. Further, no toxic fluid shall be discharged from any source during the course of mining and allied operations. Water will be drawn for drinking purpose, sprinkling on haul roads and watering the plants. The proponent has proposed garland drains and settling tanks to arrest the siltation in the mine water. These channels shall be regularly maintained. Water quality shall also be regularly monitored, as per the MoEF & CC guidelines, at prominent locations in the upstream and downstream directions and parameters of monitoring shall be kept within the permissible limits. The proponent shall take necessary approvals for working below the water table from the competent authority and also monitor the quality of ground water, as per the conditions laid down in the approval so obtained.

iv) Noise Levels: The mining machineries, movement of vehicle and blasting are the main sources of producing noise in any mine. This mine being A category, it may produce the noise level due to operation of small capacity machineries and blasting, the latter a onetime operation for fraction of second. By operation of machineries, the generation of cumulative noise levels may not be alarming and may not be carried to a nearest dwelling house beyond the permissible level raising back ground noise levels. The noise levels will be monitored at source and nearest residential houses as per CCOM's circular and mitigative measures shall be taken in case of any indications of noise pollution.

v) Vibration Levels: Small dia Jack hammer drill holes to a depth of 1.5 m and blast hole 100mm dia to a depth of 6.6 meter will be drilled and blasted. This may not generate higher PPV level beyond the permissible levels fixed by the DGMS. To





avoid ground vibration levels beyond the permissible limits, Nonel is proposed to be used as initiation system for blasting. Also, by adopting proper blast design and using delays down-the-hole as well as in surface, blast vibrations shall be kept minimal. Regular monitoring of ground vibrations shall be done to check the levels of vibration due to operations of heavy earth moving machineries and blasting.

vi) Water Regime: No subsurface or surface water will be used for mining activities or for beneficiation of ore. In ensuing mining plan period; there is no proposal to use water for any activity except drinking for workers, dust suppression and watering plants. It will be a mining on hill slope and also it will intercept the water table requiring its pumping. The ground water level will be lowered. Permission for water abstraction will be taken from the CGWB.

vii) Socio-economics: Carrying out mining activities in the area by the lessee will have positive impact. It will create employment opportunities to local people, enhancing their income and standard of living. The demographic profile of the area will not change as there will be no influx of people from outside. No colony of workers will come up in the area. In respect of occupational health hazards, the impact will be positive as manganese does not create any health hazards to the workers or local people as it is non-toxic.

viii) Historical Monuments: It does not exist within lease area or nearby lease area. Hence, these will not be impacted due to proposed mining operations.

### 8.3 Progressive reclamation Plan:

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To mitigate the impacts and ameliorate the condition, describe year wise steps proposed for phased restoration, reclamation of lands already/to be degraded in respect of following items separately for 5 years period.

**8.3.1. Mined-Out Land:** Describe the proposals to be implemented for reclamation and rehabilitation of mined-out land including the manner in which the actual site of the pit will be restored for future use. The proposals may be supported with yearly plans and sections depicting yearly progress in the activities for land restoration/ reclamation/rehabilitation, afforestation etc, called "Reclamation Plan".

At the moment, mining operations are based on present level of exploration (G-2 level), there is no plan to reclaim the mined-out area by back filling due to depth persistency of Manganese ore body as observed in the boreholes that shall be proved (G-1 level) after further drilling in the area. The proposals will be discussed in detail in subsequent Review of Mining Plan to be submitted to IBM for approval. The mined out land will be converted to water reservoir after conceptual period, considered as reclaimed and rehabilitated.



**8.3.2 Soil Management:** The soil available at the site and its utilization may be described.

The lease area has a thick vegetation and also bestows soil cover about two metre thick from surface. This soil contains less nutrients, however, it will be removed carefully i.e. by dozer and will be stacked separately for which an area 23733.35m<sup>2</sup> has been earmarked. It is calculated that there would be generation of 103613m<sup>3</sup> of soil in five year period. Part of this soil will be used for proposed plantation.

**8.3.3 Tailings Dam Management:** The steps to be taken for protection and stability of tailing dam, stabilization of tailing material and its utilization, periodic desilting measures to prevent water pollution from tailings etc. arrangement for surplus water overflow along with detail design, structural stability studies, the embankment seepage loss into the receiving environment and ground water contaminant if any may be described.

No beneficiation of ore will be carried out and there is no proposal to erect the beneficiation plant. Hence, tailings dam will not come up and no question of its management arises.

**8.3.4 Acid mine drainage, if any and its mitigative measures.**

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The proposed area does not contain the ore/mineral/waste which helps to produce acid thus, there will be no acid mine drainage and hence no mitigative measures are required.

**8.3.5 Surface subsidence & mitigation measures through backfilling of mine voids or by any other means and its monitoring mechanism.** The information on protective measures for reclamation and rehabilitation works year wise may be provided as per the following table.

It is furnished in table below:

**SUMMARY OF YEARWISE PROPOSAL FOR ITEM NO. 8.3, YEAR WISE**

| Items           | Details                                       | I | II | III | IV | V |
|-----------------|-----------------------------------------------|---|----|-----|----|---|
| Dump management | Area afforestation (Ha)                       | 0 | 0  | 0   | 0  | 0 |
|                 | No of saplings to be planted                  | 0 | 0  | 0   | 0  | 0 |
|                 | Cumulative no of plants                       | 0 | 0  | 0   | 0  | 0 |
|                 | Cost including watch and care during the year | 0 | 0  | 0   | 0  | 0 |

|                                                |                                                                                   |         |         |         |         |                          |
|------------------------------------------------|-----------------------------------------------------------------------------------|---------|---------|---------|---------|--------------------------|
| Management of worked out benches               | Construction of Retaining wall, m                                                 | 1656.43 | 1656.58 | 1656.58 | 1656.58 | 1656.58                  |
|                                                | Area available for rehabilitation (ha)                                            | 0       | 0       | 0       | 0       | 0                        |
|                                                | Afforestation to be done (ha)                                                     | 0       | 0       | 0       | 0       | 0                        |
|                                                | No of saplings to be planted in the year                                          | 0       | 0       | 0       | 0       | 0                        |
|                                                | Cumulative no of plants                                                           | 0       | 0       | 0       | 0       | 0                        |
|                                                | Any other method of rehabilitation (Specify)                                      | 0       | 0       | 0       | 0       | 0                        |
|                                                | Garland drains, m                                                                 | 55.7    | 0       | 154.3   | 199.5   | 0                        |
|                                                | Cost including watch and care during the year                                     | 0       | 0       | 0       | 0       | 0                        |
| Reclamation and rehabilitation by back filling | Void available for Backfilling (LxWxD) pit wise/slope wise                        | 0       | 0       | 0       | 0       | 0                        |
|                                                | Void to be filled by waste/tailings                                               | 0       | 0       | 0       | 0       | 0                        |
|                                                | Afforestation on the backfilled area                                              | 0       | 0       | 0       | 0       | 0                        |
|                                                | Rehabilitation by making water reservoir                                          | 0       | 0       | 0       | 0       | After vth year reservoir |
|                                                | Any other means (specify)                                                         | 0       | 0       | 0       | 0       | 0                        |
| rehabilitation of waste land within lease      | Area available (ha)                                                               | 0.4     | 0.4     | 0.4     | 0.4     | 0.4                      |
|                                                | Area rehabilitated                                                                | 0       | 0       | 0       | 0       | 0                        |
|                                                | Method of rehabilitation (Plant/tree)                                             | 400 no  | 400 no  | 400 no  | 400 no  | 400 no                   |
| Settling tank                                  | Construction, nos                                                                 | 2       | 0       | 0       | 0       | 0                        |
| Check dam                                      | Construction, nos                                                                 | 2       | 0       | 0       | 0       | 0                        |
| Others (Specify)                               | Cost including watch and care during the year including environmental monitoring, | 5.0 lac | 5.0 lac | 5.0 lac | 5.0 lac | 5.0 lac                  |

Benchies are dynamic in nature; hence, rehabilitation will not be possible in the plan period. However, after proposed exploration, surface geological plan will be updated and based on it reclamation will be decided in subsequent Review of Mining Plan

**8.4 Disaster Management and Risk Assessment:** This may deal with action plan for high risk accidents like landslides, subsidence, flood, inundation in underground mines, fire, seismic activities, tailing dam failure etc. and emergency plan proposed for quick evacuation, ameliorative measures to be taken etc. The capability of lessee to meet such eventualities and the assistance to be required from the local authority may also be described.

The natural disasters likely to be as given below:

**1.0 Geological disasters**

1.1 Avalanches and mudslides

1.2 Earthquakes

1.3 Sinkholes

1.4 Volcanic eruptions

**2.0 Hydrological disasters**

2.1 Floods

2.2 Linnic eruptions

2.3 Tsunami

**3.0 Meteorological disasters**

3.1 Blizzards

3.2 Cyclonic storms

3.3 Droughts

3.4 Thunder storms

3.5 Hailstorms

3.6 Heat waves

3.7 Tornadoes

**4.0 Wildfires**

**5.0 Health disasters**

5.1 Epidemics

**6.0 Space disasters**

6.1 Impact events and airburst

6.2 Solar flare

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All the above stated disasters are not applicable to this mine as it is a shallow mine. The disasters likely to occur at mine may be as stated below:

1 Landslide: This may occur due to seismic activities or due to manmade, steep slopes not following the rules. Slope of walls are proposed as per rule and it is not likely to occur.

2 Fire: It is surrounded by the forest and there is a chance of fire in lease area. In case of eventualities, firefighting equipment will be provided at mine site.

3. Tailings dam: There is no ore processing plant within or outside lease area. No tail water will be generated hence, no tailing dam will come up or there is no proposal to erect in future. Thus, due to its collapse, no disaster is anticipated.

4.0 Inundation: It is an open cast operation not surrounded by the dams, lakes or rivers. Hence, flooding of open cast workings are ruled out

5.0 Subsidence: It does not have underground operation. Thus, there shall be no surface subsidence.



In case of eventualities such as fire etc. mines manager will be empowered to take immediate decision. He shall contact concerned state government offices for help if needed. The applicant has developed capabilities to seek assistance from local authorities.

**8.5 Care and maintenance during temporary discontinuance:** An emergency plan for the situation of temporary discontinuance due to court order or due to statutory requirements or any other unforeseen circumstances may indicate measures of care, maintenance and monitoring of status of discontinued mining operations expected to re-open in near future.

During the plan period, there is no proposal to discontinue the operation temporarily, however, if emergency arises, plan will be prepared according to need and implemented. Since the mining will be an opencast, no rigid emergency plan is required. The excavated area will be guarded round the clock so as no one falls in excavated pit inadvertently. Besides, untoward entry will be strictly prohibited in lease area. The workers, who are engaged on emergency work such as safe making of benches, dewatering of pits will be allowed. The notices as envisaged in the statute will be given to the Govt. departments.

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**8.6 Time Scheduling for Abandonment:** Mineable reserves will be mined up to five year period. As per the proposed exploration, it is expected that there would be addition of resource. That resource will be mined during subsequent years. Before abandonment, FMCP will be prepared and get approved from the IBM and as per approved proposals; the action will be taken up.

#### **8.6 Financial Assurance:**

The financial assurance can be submitted in any encashable form preferably a Bank Guarantee from a Scheduled Bank as stated in Rule 23(F)(2) of Mineral Conservation and Development Rules, 1968 for five years period expiring at the end of validity of the document. The amount calculated for the purpose of Financial Assurance is based on the CCOM's Circular no. 4 dated 2006 as below.

#### **Table indicating the break-up of areas in the Mining Lease for calculation of Financial Assurance**

The area required for different mining activities at the end of modified Mining Plan period is tabulated below:





| SNo | Head                                      | Area put on use at start of Plan (in Ha) | Additional Requirement during Plan Period (in Ha) | Total (in Ha) | Area considered as fully reclaimed & rehabilitated (in Ha) | Net area Considered for Calculation (in Ha) |
|-----|-------------------------------------------|------------------------------------------|---------------------------------------------------|---------------|------------------------------------------------------------|---------------------------------------------|
| 1.  | Area under Mining                         | 3.5570                                   | 5.3982                                            | 8.9552        | 0.00                                                       | 8.9552                                      |
| 2.  | Storage for soil                          | 0.00                                     | 2.3733                                            | 2.3733        | 0.00                                                       | 2.3733                                      |
| 3.  | Waste dump site                           | 6.4384                                   | 14.9084                                           | 21.3478       | 0.00                                                       | 21.3478                                     |
| 4.  | Mineral Storage                           | 0.00                                     | 0.1775                                            | 0.1775        | 0.00                                                       | 0.1775                                      |
| 5   | Infrastructure Office etc.(blaster shade) | 0.0024                                   | 0.4900                                            | 0.4924        | 0.00                                                       | 0.4924                                      |
| 6   | Roads                                     | 0.00                                     | 0.4500                                            | 0.4500        | 0.00                                                       | 0.4500                                      |
| 7   | Railways                                  | 0.00                                     | 0.00                                              | 0.00          | 0.00                                                       | 0.00                                        |
| 8   | Tailings Camp/pond                        | 0.00                                     | 0.00                                              | 0.00          | 0.00                                                       | 0.00                                        |
| 9   | Effluent Treatment Plant                  | 0.00                                     | 0.00                                              | 0.00          | 0.00                                                       | 0.00                                        |
| 10  | Mineral Separation Plant                  | 0.00                                     | 0.00                                              | 0.00          | 0.00                                                       | 0.00                                        |
| 11  | Township area                             | 0.00                                     | 0.00                                              | 0.00          | 0.00                                                       | 0.00                                        |
| 12  | Others to specify                         | 0.00                                     | 0.00                                              | 0.00          | 0.00                                                       | 0.00                                        |
|     | Plantation:                               | 0.00                                     | 2.0000                                            | 2.0000        | 0.00                                                       | 2.0000                                      |
|     | Reject:                                   | 0.00                                     | 0.0885                                            | 0.0885        | 0.00                                                       | 0.0885                                      |
|     | Grand Total                               | 8.9888                                   | 25.8869                                           | 35.8857       | 0.00                                                       | 35.8857                                     |

अनुमोदित  
APPROVED

The lease has been granted through auction. As per rule 27(1) of MCDR 2017, Financial Assurance is not applicable to this mine. Hence, FA is not calculated.

*[Signature]* 18-2-19  
Regional Controller of Mines (N. R.)  
राज्यीय खन नियंत्रक (न. र.)  
राज्यीय खन नियंत्रक  
Regional Controller of Mines, Nagpur

*[Signature]*



## **FEASIBILITY REPORT GUGULDOH MANGANESE ORE MINE**

### **0.0 GENERAL:**

For a mining venture, to arrive its economic viability, feasibility study is a must. As per Minerals (Evidence of Mineral Contents) rules 2015, every lessee has to prepare feasibility report to know its economic viability and for estimation & reporting of Mineral reserves based on a Geological report. In view of this, feasibility report of Guguldoh Manganese ore mine area 105.0ha; taluka: Ramtek, Dist: Nagpur, preferred bidder M/s Shanti G.D. Ispat & Power Pvt. Ltd, Raipur, has been prepared based on available technical data as per contents of feasibility report given in Minerals (Evidence of Mineral Contents) Rule 2015.

### **0.1 INTRODUCTION:**

M/s Shanti G.D. Ispat & Power Pvt. Ltd, Raipur, has been granted a mining lease through auction for over an area 105.0 ha, for manganese ore in Taluka Ramtek, Dist Nagpur M.S. in village Guguldoh by the State Govt. The LOI has been received and it is annexed to this mining plan report. The Company has its office at 504, Rajiv Gandhi Complex, Bal Ashram Compound, Kutchery Chowk, Raipur-492001. The lease has not been executed yet but it will be executed after obtaining all approval/ permits.

#### **1.0) Mineral Resource estimate for conversion to Mineral Reserves:**

**Resource estimation:** Resource estimated by the GSI & State DGM is reproduced below:

##### **i) GSI**

Resource based on bore hole data were estimated by the GSI for the bore holes that encountered Mn mineralization. The GSI on resource estimation has stated as below:

As seen from analytical report, MNG-8, MNG-2, MNG-3, MNG-1, MNG-6, and MNG-7 has intersected the same Mn ore horizon at different depth and these Mn value ranges between 25 to 30% which can be categorized into Low grade high silica ore (LGHS). They also have low phosphorous content. MNG-10 and MNG-12A 900m west of MNG 1 have also intersected Mn horizon. They are also categorized as Low grade high silica ore and has low phosphorous. Cross section of the entire above borehole was drawn to estimate the reserves. From the borehole plan the strike

Influence of each borehole was calculated. The boreholes have intersected the ore horizon at about 30 to 35m vertical depth from ground level and below the bottom of the quarry. Up dip wise extension was defined on the basis of correlation with surface / old working. Down dip direction being half of the up dip length, strike extension was considered on the basis of positive intersection in adjacent bore. In this way area of influence was calculated for each borehole and reserves estimated. The average dip of ore body is  $70^\circ$ . For each borehole true thickness of the ore body was calculated from apparent thickness. Average specific gravity of manganese ore was taken as  $3.1 \text{ gm/cm}^3$

Estimation of the ore reserve is summarized and furnished in Annexure 3.

The resource estimated by GSI = 2,18,700.0 tonnes, grade 20.28% Mn, G2 category

## **II) REVISED ESTIMATION BY DGM**

The resource for the Guguldoh mine was estimated by GSI taking into consideration 20% as the cut off for Mn. As the IEI has revised the threshold value for Manganese as 10%, the resource was re-estimated by DGM. Thus, the total resource for Guguldoh Manganese block is 0.440 million tonne (indicated resource 332) with an average grade of 22.70% Mn. A total of 18 bore holes were drilled in the Guguldoh area, out of 18 boreholes, 8 boreholes drilled in central part are considered for resource estimation which have mineralization. Rest of the bore holes intersected minor Mn ore bands and Gondite. While estimating the resource, the DGM enhanced the width of ore body up to threshold value of 10% Mn content.

The resource re-estimated by DGM = 4,40,185.0 tonnes, grade 22.70% Mn, G2 category

**SUMMARY:** Updated Resource as per DGM as on 1.4.2019

| Resource               | Total, tonnes | Grade             | Category |
|------------------------|---------------|-------------------|----------|
| Proved Category Mn ore | 4,40,185.0    | 22.70% Mn content | G2       |
| Total                  | 4,40,185.0    |                   |          |

### **Sampling:**

Sampling was carried out for mineralized core and also bedrock. Using a core splitter, core was split longitudinally into two half. One half was preserved and other half was crushed to -200 mesh size. Coning and quartering was carried out for getting the minimum amount required for sampling.

Minimum length of sample was 4 cm while maximum length was 80 cm. Depending on the nature of ore and width of barren zone sample spacing was decided. Table below shows the number of samples drawn and analyzed from each borehole. Similarly bedrock samples were split into two. One half was powdered and same sampling procedure was adopted and the other sample was kept as a duplicate.

**Table showing number of samples drawn bore hole wise**

| Borehole no. | No. of sample | Total no. of samples generated from borehole |
|--------------|---------------|----------------------------------------------|
| MNG-1        | 27            | 243                                          |
| MNG-2        | 24            |                                              |
| MNG-3        | 55            |                                              |
| MNG-4        | 20            |                                              |
| MNG-6        | 56            |                                              |
| MNG-7        | 20            |                                              |
| MNG-8        | 19            |                                              |
| MNG-9        | 8             |                                              |
| MNG-10       | 3             |                                              |
| MNG-12A      | 9             |                                              |

All the 243 samples were analyzed and its results are furnished below in table:

| Bh .no  | No of sample | Mn%         | P%          | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> |
|---------|--------------|-------------|-------------|------------------|--------------------------------|
| MNG-1   | 27           | 6.5 - 40.72 | 0.05 - 0.38 | 20 - 59          | 3 - 17                         |
| MNG-2   | 24           | 1.22 - 40   | 0.09 - 0.52 | 9 - 45           | 4 - 12                         |
| MNG-3   | 55           | 5 - 40      | 0.1 - 0.7   | 23 - 80          | 1.5 - 18                       |
| MNG-6   | 56           | 30          | 1.08        | 11-38            | 4.5-12                         |
| MNG-7   | 20           | 26          | 0.3 - 1.5   | 20-42            | 5-11                           |
| MNG-8   | 19           | 32          | 1.12        | 25-37            | 6-9                            |
| MNG-9   | 8            | -           | -           | -                | -                              |
| MNG-10  | 3            | 25.55       | 1           | 21-25            | 10-12                          |
| MNG-12A | 9            | 26.6        | 0.6-1.7     | 21-50            | 7-12                           |

**MINERAL RESERVE:** Mineral reserve is that reserve which is mineable with known method of mining out of mineral resource. Thus, resource blocked in various pillars and ultimate pit slope is subtracted from resource to arrive at mineral reserve.

**Blocked resources:**

iii) Ore blocked in ultimate pit slope due to benches: Nil

iv) Ore blocked in 7.5m barrier: Nil

**Total blocked Resource:** Nil

**Mineable Reserve:** 4,48,186 t      **Code:**122

This mineable reserve has been considered for production planning.



- v) From the bore hole logs it is observed they had estimated resource only in central part of the deposit up to RL 250m from RL 382.295m which accounts for a depth of 122.295m .

Feasibility study report has been considered to convert mineral Resource to Mineral Reserves. Besides, from geological sections, the ore that will be blocked in ultimate pit slope while mining has been calculated, considering the existing legislation for safe mining.

#### **2) Cut off Parameters:**

The average Mn content in ore is 22.70% i.e. above the threshold value limit of 10% Mn content. Other contents of deleterious elements in Mn ore are within acceptable level. Ore even containing above 16% Mn content, a low grade, is also saleable. However, analysis of Mn ore elucidates values of average Mn content about 22.70%. The sorting of ore will be done as per grade, thus, cut off parameters considered here is threshold value limit.

#### **3) Mining Factors or assumptions:**

The shape, size & content of Mn in ore body is amenable to opencast mode of operation where in-situ recovery of ore is 100% and less gestation period. Ore to OB ratio is economically mineable. There will be no dilutions of ore in opencast workings. It will be mined by forming systematic benches as per the size of benches and degree of mechanisation considered in mining plan.

#### **4) Metallurgical Factors or assumptions.**

No metallurgical process as required for base metal is required for making Mn ore saleable. Hence, no metallurgical test work was undertaken or metallurgical recovery factors applied. No bulk sample or pilot scale test was done.

While excavating Mn ore from pit, the whole ROM will be excavated and loaded into tipper and brought to surface at sorting yard where sorting is done as per Mn content in ore. Low content Mn ore is subjected to jigging to remove impurities.

The deleterious elements like Phosphorous is within acceptable level in ore itself by the consuming industry. No metallurgical process is required for its removal from ore before sale.



**5.9 Cost and Revenue Factors:** It is furnished separately in tabular form.

**Year wise cash flows in Rs**

I Year = 22,448,940.66

II Year = 26,894,826.63

III Year = 35,345,593.93

IV Year = 51,927,356.52

V Year = 422,202,174.14

I) Internal Rate of Return (IRR): = 30.52 %

Considering the same rate of production and profitability as stated above, the NPV for the mineable reserve is as below:

J) Net Present Value: Rs = 186,864,256.79 at 12% Discount Rate

**Sensitivity Analysis:** As per the GSI's report, it is basically a low grade deposit. The GSI in their report stated average Mn content of 29.28 %. This finding is based on the data generated by the core bore hole drilling. In such event, the proponent is optimistic to get Mn ore about 30% during the course of mining. This grade of ore may not be hundred percent but at least fifty percent is likely to get. The ore of plus 25% Mn content is likely to get higher price and project becomes viable. The grade that is declared by the DGM on auction platform is 22.70% enhancing the quantum of resource. Whole resource is not likely to get this grade. These are not based on bore hole data but by simple averaging the grade. While mining, grading of ore will be done. To make the price fetching grade at least 30% Mn, if needed, the high grade ore will be purchased from other mines for blending with low grade so as it is a price fetching grade.

#### **6) Market Assessment:**

Manganese ore is always in demand as it is being used in basic industry i.e. steel manufacturing. Consumption of Manganese ore is in tune with the consumption/demand of steel. However, demand/supply position do not affect the selling of Mn ore indigenously due to high production capacity of steel industry. Profitability ratio is more in Mn ore mining due to low production cost. To find the market, the lessee may reduce the sale price of Mn ore sacrificing the profitability. The consuming industry even due to depleting resources, the ore will always be in demand.

## Evaluation of Manganese Project

| Particulars |                                        | 0 | 1                 | 2             | 3               | 4               |
|-------------|----------------------------------------|---|-------------------|---------------|-----------------|-----------------|
| <b>A</b>    | <b>Production</b>                      |   | 25,966.00         | 28,909.00     | 34,344.00       | 43,494.00       |
| a           | Balance Production                     |   | 23,389.40         | 26,018.10     | 30,819.60       | 39,144.60       |
| b           | Grade < 27%                            |   | 11,084.70         | 11,009.05     | 11,009.05       | 18,072.30       |
| c           | Grade > 27% < 35%                      |   | 11,004.70         | 13,009.05     | 10,409.80       | 10,072.30       |
| <b>C</b>    | <b>Overhead per ton = 22%</b>          |   | 2,101.00          | 2,027.10      | 2,092.30        | 2,120.90        |
| <b>D</b>    | <b>Overhead per ton = 25% &lt; 35%</b> |   | 6,334.00          | 6,967.80      | 5,501.40        | 6,574.11        |
| <b>E</b>    | <b>Total Overhead</b>                  |   | 8,435.00          | 8,994.90      | 7,593.70        | 8,695.01        |
| <b>F</b>    | <b>Cost of Production Per Ton</b>      |   |                   |               |                 |                 |
| a           | Direct Costs                           |   |                   |               |                 |                 |
| b           | Expenditure                            |   | 0.37              | 0.73          | 10.23           | 10.73           |
| c           | Mining                                 |   | 194.82            | 211.35        | 229.35          | 246.94          |
| d           | Beneficiation/Upgradation              |   | 4.40              | 4.62          | 4.85            | 5.09            |
| e           | Over head                              |   | 3.15              | 3.07          | 3.06            | 3.04            |
| <b>F</b>    | <b>Subtotal (Per Ton)</b>              |   | 211.64            | 228.80        | 247.47          | 266.71          |
| <b>G</b>    | <b>Subtotal</b>                        |   | 8,499,444.34      | 6,614,471.71  | 8,474,204.75    | 11,640,612.61   |
| <b>H</b>    | <b>Operating Profit</b>                |   |                   |               |                 |                 |
| a           | Revenue                                |   | 9,276,600.00      | 11,144,600.00 | 13,231,300.00   | 15,170,200.00   |
| b           | Other Expense                          |   |                   |               |                 |                 |
| c           | Revenue                                |   | 4,963,030.33      | 6,075,153.30  | 8,063,825.00    | 9,531,003.21    |
| d           | Expenditure                            |   | 496,307.63        | 607,515.94    | 806,382.51      | 953,100.29      |
| e           | Revenue to MPT                         |   | 90,261.53         | 121,563.07    | 161,375.50      | 235,169.64      |
| f           | Revenue to Govt                        |   | 25,169,406.73     | 67,599,065.66 | 80,069,734.48   | 130,925,054.21  |
| g           | Others                                 |   | 54,924.44         | 66,144.72     | 64,243.05       | 116,440.14      |
| <b>I</b>    | <b>Subtotal</b>                        |   | 60,800,000.66     | 74,400,790.16 | 98,789,597.80   | 144,389,228.43  |
| <b>J</b>    | <b>Total Expense</b>                   |   | 69,298,432.00     | 81,072,213.67 | 1,09,260,468.84 | 1,45,025,327.44 |
| <b>K</b>    | <b>Total Profit</b>                    |   | 27,681,568.66     | 22,328,476.49 | 40,529,139.06   | 1,19,363,901.99 |
| <b>L</b>    | Depreciation                           |   | 6,237,500.00      | 5,025,025.00  | 4,054,343.75    | 3,075,030.36    |
| <b>M</b>    | EBIT                                   |   | 21,330,139.36     | 38,848,757.14 | 41,487,184.13   | 64,730,868.36   |
| <b>N</b>    | Interest                               |   | 1,155,274.35      | 839,535.08    | 703,448.34      | 445,225.05      |
| <b>O</b>    | PBT                                    |   | 20,074,784.78     | 37,906,222.07 | 40,783,735.79   | 64,375,553.21   |
| <b>P</b>    | Taxes                                  |   | 15,018,088.70     | 6,970,055.02  | 10,193,013.90   | 10,066,839.30   |
| <b>Q</b>    | PAT                                    |   | 5,056,696.08      | 20,936,166.95 | 30,590,721.89   | 54,308,713.91   |
| <b>R</b>    | Depreciation                           |   | 6,237,500.00      | 5,025,025.00  | 4,054,343.75    | 3,075,030.36    |
| <b>S</b>    | Interest                               |   | 1,155,274.35      | 839,535.08    | 703,448.34      | 445,225.05      |
| <b>T</b>    | Cashflow after tax should              |   | 22,163,911.73     | 20,431,606.87 | 25,832,929.80   | 44,228,458.50   |
| <b>U</b>    | <b>Capital Employed</b>                |   |                   |               |                 |                 |
| a           | Adjustments of Amounts                 |   |                   |               |                 |                 |
| b           | Rechargeable/Adjustable                |   |                   |               |                 |                 |
| c           | Less : PTD for Bt for EIT              |   | 1,228,436.00      |               |                 |                 |
| d           | Less : Unpaid Dividend                 |   | 50,142,100.00     |               |                 |                 |
| e           | Less : PTD for Bt for Performance      |   |                   |               |                 |                 |
| f           | Security                               |   | 6,142,210.00      |               |                 |                 |
| <b>V</b>    | <b>Net Capital Employed</b>            |   | 109,800,000.00    |               |                 |                 |
| <b>W</b>    | <b>Repayment of Debt</b>               |   |                   |               |                 |                 |
| a           | Capital for Equity Shareholder         |   | 1,00,00,00,000.00 |               |                 |                 |
| b           | Repayment of Debt                      |   |                   |               |                 |                 |
| c           | Capital for Equity Shareholder         |   | 1,00,00,00,000.00 |               |                 |                 |
| d           | Repayment of Debt                      |   |                   |               |                 |                 |

There are several small Mn ore mine owners and a few large scale producers in the country. These large scale producers are the competitors for small mine owners but demand pattern does not affect the selling of ore. In case of competition, sale price may be reduced, but Mn content in ore being marginal there may not be a problem in marketing the ore from this deposit due to depleting resources of high grade. Mn ore produced will be sorted out as per customer specification by sizing. Analysis will be done before supply of ore to buyers.

#### **7) Other Modifying Factors:**

Mn ore will be mined by the opencast mode of operation with a shallow depth of about 114m from surface. Natural risk in mining is reduced compared to underground mining. No major infrastructure is required or it may not be a hurdle in project viability. Environmental Clearance may be obtained without hurdles as degradation of environmental parameters will be practically nil except land degradation which can be resorted after cessation of mining activities. No beneficiation of ore, consuming toxic chemicals is required at site. Legal hurdles may not come in way as mining activities will start after obtaining all legal permits. Due to demand, sale has no problem. For instance, if there is no market, Mn ore can be stacked for longer duration as it is non deteriorating material. No social problems are likely to face as the preferred bidder has cordial relation with the land owners and land belongs to Govt. No hurdles either from public or Govt. are likely to put in operating the mine as lessee will not violate the rule as the lease is granted in auction.

The GSI has proved the reserves by core bore holes with a high confidence level on occurrence of Mn ore. Analysis of core established the average quality of Mn ore in ML area. Reserves are estimated with standard method of cross section. The procedure used for estimation of reserves may not jeopardise the availability of mineable reserve affecting the viability of mining.

Execution of mining lease will be done after obtaining all permits. LOI has been issued by the Govt. There will be no hurdles for granting further permits from Govt. and it will not be a factor for viability of project. No environmental liabilities are expected to come in way of operating the mine due to nature of mining operation.

#### **8 Classifications:**

Mineral reserves are estimated with the maximum depth of 122.285m and reserves are mineable with known method of opencast mining. The reserves are classified as G2 category applying UNFC criteria. The reserves estimation is based on the core drill data as per UNFC classification. Mineral resource and mineable mineral reserve have been clearly demarcated. The known grade of Mn ore is acceptable to

consuming industry. All necessary approvals/contracts are being obtained within a reasonable time frame. This is not going to jeopardize the economic viability of the project. Environmental Clearance will also be sought at the earliest for the production proposed in mining plan. There shall be long term contracts with the buyers which will not be affecting its economic viability. As far as possible, short term contracts will be avoided. The UNFC code for the deposit is 122.

Place: Nagpur

Date: 8.8.2019



(M.S. Waghmare)  
Qualified Person

XXXXXXXX

# CERTIFICATES





# SHANTI G.D. ISPAT & POWER PVT. LTD.

CIN : U22200CT1904PTC000192

" A UNIT OF POWER GENERATION "

CERTIFICATE: 1

## Part B

### 9.0 Certificates /Undertaking/Consents (As detailed Below)

#### CONSENT LETTER/UNDERTAKING/CERTIFICATE FROM THE LESSEE:

The Mining Plan in respect of Guguldeh Manganese ore Mine over and area of 105.00 Hectare in Guguldeh - Village, Taluka: Ramtek, District: Nagpur, State- Maharashtra under rule 16(1) of MCR 2016 has been prepared by Qualified person shri M.S. Waghmare.

This is to request the Regional Controller of Mines, Indian Bureau of Mines, Nagpur Region, to make any further correspondence regarding any correction of the Mining Plan with the said qualified person at his address below:

#### MANOHAR SHRIRAM WAGHMARE

33, Gedam Layout, Trimurti Nagar

Nagpur 440022 ( M.S.),

Cell:8055157799

Regd. No. RQP/BNG/285/2011-A

Valid up to 04.12.2021

We hereby undertake that all modifications / updating as made in the said Mining Plan by the said qualified person be deemed to have been made with our Knowledge and consent and shall be acceptable on us and binding in all respects.

Place: Raipur

Dated: 14.06.2019



Prakash Kumar Agrawal

Nominated Owner:



CERTIFICATE: 2

## CERTIFICATE

It is certificate that the Progressive Mine Closure Plan of Guguldoh Manganese ore Mine Over an area of 105.00 Hectares in Guguldoh - Village, Taluka: Ramtek; District: Nagpur, State- Maharashtra Complies with all Statutory rules, Regulations, orders made by the Central or state Government, Statutory Organization, Court etc. which have been taken into consideration and wherever any specific permission is required the lessee will approach the concerned authorities. The information furnished in the Progressive Mine Closure Plan is true and correct to the best of our knowledge and records.

The provisions of Mines Act, Rules and Regulation made there under have been observed in the Mining plan over the area of 105.00 hectare in Nagpur District in Maharashtra State belonging to M/S Shanti G.D. Ispat and Power Pvt. Ltd. Raipur and where specific permissions are required, the lessee will approach the D.G.M.S. Further, standards prescribed by D.G.M.S. in respect of miner's health will be strictly implemented.

Place: Raipur

Date: 14.06.2019



Prakash Kumar Agrawal  
Nominated Owner:

**CERTIFICATE: 3**

**M. S. WAGHMARE**  
**E. E. (Mining Engg.)**

**Office:**  
**33, Gedam Layout**  
**Trimurti Nagar**  
**Nagpur 440 022**  
**Cell: 9055157789**

**CERTIFICATE FROM QP**

The provisions of the Mineral Conservation and Development Rules, 2017 made under Section 18 of the Mines & Minerals (Development & Regulation) Act 1957, have been observed in the preparation of the Mining Plan for Guguldoh Manganese ore Deposit, over an area of 105.8ha of lessee M/s Shanti G.D. Inpat and Power Pvt. Ltd, in village Guguldoh, Tahsil: Ramtek, Dist: Nagpur, State: Maharashtra and whenever specific permissions are required, the lessee will approach the concerned authorities of Indian Bureau of Mines.

The information furnished in the Mining Plan is true and correct to the best my knowledge.

**Date: 21/08/2019**  
**Place: Nagpur**

  
**(M.S. WAGHMARE)**  
**Qualified Person**

# ANNEXURES

## GOVERNMENT OF MAHARASHTRA

No. MN-0512/C.R. 30/Industry &  
 Industries, Energy and Labour  
 Department,  
 Maharashtra, Mumbai - 400 032.  
 Date: 03.05.2018

## Shree GD Inpat and Power Private Limited

304, High Ground Complex,

Bul. Ashoka Chowd,

Kashyap Chowk,

Aurang, Chhatrapati - 402 001

**Sub:** Letter of intent with reference to a notice dated April 12, 2018 for grant of a mining lease for Chagolich Block for Manganese Ore in Chagolich, Mangrove Village, Ratnakh Taluka, Nagpur District of Maharashtra on 105.60 Hectare Area.

## Background:

12. The Directorate of Geology and Mining (DGM), Government of Maharashtra, formed by the Mines and Minerals (Development and Regulation) Act, 1957 (the "Act") and the Mines (Amendment) Rules, 2015 is operating from time to time the "Auction Rules", issued by the govt. in 1974, under dated January 19, 2018 to operate the auction process for grant of mining lease for Chagolich Block, located in Nagpur District of Maharashtra. The auction process was conducted in accordance with the tender document for the said mineral block and Shree GD Inpat and Power Private Limited was declared as the "Preferred Bidder" under Rule 9(1)(ii) of the Auction Rules.

13. As required under Rule 10(1) of the Auction Rules and the tender document for the said mineral block, Shree GD Inpat and Power Private Limited has made payment of the first instalment, being 10% of the amount of the tender payment which is INR 64.218 Crores (Sixty Four Crores Twenty One Lakhs Eighty Four Thousand Eight Hundred Eighty Eight Rupees) by NEFT on 03.05.2018, which was received on 08.05.2018.

## Grant of Letter of Intent

Accordingly, pursuant to Rule 10(2) of the Auction Rules, the Government of Maharashtra is issuing this letter of intent for grant of Mining Lease for Chagolich Block for Manganese Ore in Chagolich, Mangrove Village, Ratnakh Taluka, Nagpur District of Maharashtra on 105.60 Hectare Area to Shree GD Inpat and Power Private Limited for a period of 50 years.



## Conditions

This letter of intent and the subsequent grant of aforementioned mining lease shall be subject to the provisions of the Act and the rules made thereunder, as amended from time to time and Ispat and Power Private Limited shall be deemed to be a 'company' as defined in the Companies Act, 1956 and shall be deemed to be a company for the purposes of the Act and the rules made thereunder.

12. The Letter of Intent shall be valid only if Ispat and Power Private Limited shall ensure that the said lease is validly granted and the same shall be subject to the provisions of the Act and the rules made thereunder, as amended from time to time and Ispat and Power Private Limited shall be deemed to be a company for the purposes of the Act and the rules made thereunder.

13. Subsequent to signing of the Mining Lease, Ispat and Power Private Limited shall ensure that the said lease is validly granted and the same shall be subject to the provisions of the Act and the rules made thereunder, as amended from time to time and Ispat and Power Private Limited shall be deemed to be a company for the purposes of the Act and the rules made thereunder.

14. Ispat and Power Private Limited shall ensure that the said lease is validly granted and the same shall be subject to the provisions of the Act and the rules made thereunder, as amended from time to time and Ispat and Power Private Limited shall be deemed to be a company for the purposes of the Act and the rules made thereunder.

15. Ispat and Power Private Limited shall ensure that the said lease is validly granted and the same shall be subject to the provisions of the Act and the rules made thereunder, as amended from time to time and Ispat and Power Private Limited shall be deemed to be a company for the purposes of the Act and the rules made thereunder.

16. Ispat and Power Private Limited shall ensure that the said lease is validly granted and the same shall be subject to the provisions of the Act and the rules made thereunder, as amended from time to time and Ispat and Power Private Limited shall be deemed to be a company for the purposes of the Act and the rules made thereunder.

### (c) Grant of mining lease

Subsequent to signing of the Mining Lease, Ispat and Power Private Limited shall ensure that the said lease is validly granted and the same shall be subject to the provisions of the Act and the rules made thereunder, as amended from time to time and Ispat and Power Private Limited shall be deemed to be a company for the purposes of the Act and the rules made thereunder.

#### Validity

This letter of intent is valid for a period of 2 (two) years from the date of its issuance, within which time all the above conditions must be fulfilled and the Mining Lease deed must be executed between Shree GD Inet and Power Private Limited and the Government of Maharashtra. In case there is a delay in execution of Mining Lease Deed due to reasons beyond the control of the Preferred Bidder, then it may submit an application to Government of Maharashtra, requesting for further extension.

If the Government of Maharashtra is satisfied that there is a delay in execution of Mining Lease Deed due to reasons beyond the control of the Preferred Bidder, longer period is required to enable the Preferred Bidder to satisfy all or any of the above conditions, it may extend the validity of this letter of intent for such further period as the Government of Maharashtra may specify. Provided that: (a) this letter of intent shall be extended for a maximum period of 3 years; and (b) the total period for which this letter of intent would remain valid must not exceed 5 (five) years from the date of issuance.

Kindly attach the duplicate copy of this Letter of Intent duly signed by authorized signatory of the Company and furnish a written Board Resolution to show of having accepted the above terms and conditions. The accepted copy of Letter of Intent along with Board resolution should be submitted latest by 31.06.2018.

  
(Deputy In-charge)  
Deputy Secretary to  
Government of Maharashtra

#### Copy to:

1. The Director, Directorate of Geology and Mining, Nagpur.
2. The Collector, District Collector, Nagpur.
3. The Deputy Director, Directorate of Geology and Mining, Regional Office, Nagpur.
4. The District Mining Officer, District Collector, Nagpur.
5. Select File (44-9).



**Model No.**                      **W-2000-100**

Remarks  
Digitally signed by  
VIRTUAL TREASURY  
MUNICIPALITY  
Date: 2015.05.25  
11:37:00  
Reason: I am  
Document  
Location: local

| Sr.No.                          | Remarks                                                               | Subcontract No. | Indemnity Date   | Grade  | Subcontract Amount |
|---------------------------------|-----------------------------------------------------------------------|-----------------|------------------|--------|--------------------|
| 1                               | Digitally signed<br>VIRTUAL TREASURY<br>MUNICI 01<br>Date: 06-05-2018 | 0019070002048-1 | 06/05/2018 05:05 | 000000 | 014218.00          |
| <b>Total Subcontract Amount</b> |                                                                       |                 |                  |        | <b>014218.00</b>   |

**SHANTI G.D. ISPAT & POWER PVT. LTD.**

CIN : U3300CT1804PTC000192

**"A UNIT OF POWER GENERATION"**

CERTIFIED TRUE COPY OF RESOLUTION PASSED IN THE MEETING OF THE BOARD OF DIRECTORS OF M/S SHANTI G D ISPAT & POWER PRIVATE LIMITED HELD AT REGISTERED OFFICE OF THE COMPANY ON WEDNESDAY, THE 12<sup>TH</sup> DAY OF JUNE, 2019:

**AGENDA AUTHORIZING MR. PRAKASH KUMAR AGRAWAL**

The Chairman informed the Board that the Letter of Intent (LOI) for Mining Lease of Gugulodh Manganese Ore Block having area of 105 Hectares in Village Manegaon, Tehsil Ranjok, District Nagpur, State Maharashtra has been issued by the Government of Maharashtra vide their letter No. vide the Government of Maharashtra, Industries, Energy and Labour Department Letter No. MMN - 0518/C.R.30/Industry-9, dated 05.06.2018.

As per Section 76 of the Mines Act, 1952 it is required to authorize any of the Directors of the company as nominated owner of the mine and also to comply with all the required sanction/approval from the Government and other legal and regulatory authorities for any type of legal work.

The Board then decided to authorize and nominate Mr. Prakash Kumar Agrawal, Director of the Company for the above purpose and passed the following resolution unanimously.

"RESOLVED THAT Mr. Prakash Kumar Agrawal, Director of the Company, be and hereby authorized and nominated owner under Section 76 of of the Mines Act, 1952 and to do all works related to above mentioned agenda and comply with all the required sanction/approval from the Government and other legal and regulatory authorities for any type of legal work on behalf of the Company."

"RESOLVED FURTHER THAT Mr. Prakash Kumar Agrawal is further authorized to submit any document and to do all such acts, things and deeds as may be necessary for the above purpose."

For, M/s Shanti G. D. Ispat and Power Private Limited

**Shanti G.D. Ispat & Power Pvt. Ltd.**

(Director)

Director

Name: Anup Agrawal

DIN: 00095540

Address: Ravi Nagar,  
Raipur, CG, 492 001

**Abhishek Kumar Jain**  
(Practising Company Secretary)  
B. Com, F.C.S.  
Membership No.- FCS-8701  
C.P. No. - 8894

आयकर विभाग  
INCOME TAX DEPARTMENT



भारत सरकार  
GOVT. OF INDIA

PRAKASH KUMAR AGRAWAL  
NARESH CHANDRA AGRAWAL

22/06/1978

Permanent Account Number

BARPA5160M

Signature









**THE COMPANIES ACT, 2013**

**(A COMPANY LIMITED BY SHARES)**

**(COMPANY INCORPORATED UNDER COMPANIES ACT, 1956)**

**MEMORANDUM & ARTICLES**

**OF ASSOCIATION**

**OF**

**SHANTI G.D. ISPAT AND POWER PRIVATE LIMITED**

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**Abstract**

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**Abstract**

**Abstract**

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Shree G.D. Ispat & Power Pvt. Ltd.

**Director**



# GOVERNMENT OF INDIA

MINISTRY OF CORPORATE AFFAIRS

Registrar of companies, Chhattisgarh

Registrar of Companies cum Official Liquidator, 1st Floor, Ashok Pingley Bhawan Municipal Corporation, Nehru Chowk,  
Bilaspur, Chhattisgarh, India, 485001

Corporate Identity Number: U23201CT1994PTC009192

## SECTION 13(1) OF THE COMPANIES ACT, 2013

### Certificate of Registration of the Special Resolution Confirming Alteration of Object Clause(s)

The shareholders of M/s SHANTI G.D.ISPAT AND POWER PRIVATE LIMITED having passed Special Resolution in the Annual/Extra Ordinary General Meeting held on 01-12-2018 altered the provisions of its Memorandum of Association with respect to its objects and complied with the Section 13(1) of the Companies Act, 2013.

I hereby certify that the said Special Resolution together with the copy of the Memorandum of Association as altered has this day been registered.

Given under my hand at Bilaspur this Eleventh day of December Two thousand eighteen.



Ratnod Kantakshamar Gangibhai

Registrar of Companies

RoC - Chhattisgarh

Mailing Address as per record available in Registrar of Companies office

SHANTI G.D.ISPAT AND POWER PRIVATE LIMITED

504, 4TH FLOOR, RAJEEV GANDHI COMPLEX, BALASHRAM  
COMPOUND, KUTCHERY CHOWK, RAIPUR, Chhattisgarh, India, 482001





**GOVERNMENT OF INDIA**  
MINISTRY OF CORPORATE AFFAIRS

Registrar of companies, Chhattisgarh

Registrar of Companies cum Official Liquidator, 1st Floor, Ashok Pinglay Bhawan Municipal Corporation, Nehru Chowk,  
Bilaspur, Chhattisgarh, India, 495001

Corporate Identity Number: U23301GT1994PTC008192

**SECTION 13(1) OF THE COMPANIES ACT, 2013**

**Certificate of Registration of the Special Resolution Confirming Alteration of  
Object Clause(s)**

The shareholders of M/s SHANTI G.D.ISPAT AND POWER PRIVATE LIMITED having passed Special Resolution in the Annual Extra Ordinary General Meeting held on 10-08-2017 altered the provisions of its Memorandum of Association with respect to its objects and complied with the Section 13(1) of the Companies Act, 2013.

I hereby certify that the said Special Resolution together with the copy of the Memorandum of Association as altered has this day been registered.

Given under my hand at Bilaspur this Twenty first day of September Two thousand seventeen.



Registrar of Companies, Chhattisgarh

Registrar of Companies

RoC - Chhattisgarh

Mailing Address as per record available in Registrar of Companies office:

SHANTI G.D.ISPAT AND POWER PRIVATE LIMITED

504, 4TH FLOOR, RAJEEV GANDEE COMPLEX, SALASHEEM  
COMPOUND, KUTCHERY CHOWK, RAIPUR, Chhattisgarh, India, 492001

Shanti G.D. Ispat & Power Private Limited

*[Signature]*  
Director







सत्यमेव जयते

# FRESH CERTIFICATE OF INCORPORATION CONSEQUENT ON CHANGE OF NAME

Company Rego. No. **8192**

In the Office of the Registrar of Companies, Madhya Pradesh,  
In the matter of **DHOLAKIA PETROCHEMICALS PRIVATE LIMITED**

I here by approve and signify in writing under Section 21 of The Companies Act, 1956 (Act. I of 1956) read with the Government of India, Department of Company Affairs, Notification No. G. S. R. 507 B, dated the 24th June, 1985 the change of name of the company from **Dholakia Petrochemicals Private Limited**

to **S.D. SHANTI ISPAT PRIVATE LIMITED**

and

I hereby certify that **Dholakia Petrochemicals Private Limited**

which was originally incorporated on **18.3.1994** under The Companies Act, 1956, and under the name **Dholakia Petrochemicals Private Limited**

having duly passed the necessary resolution in terms of Section 21/22 (1) (a)/22 (1) (b) of The Companies Act, 1956 the name of the said company is this day changed to **S.D. SHANTI ISPAT PRIVATE LIMITED**.

and this certificate is issued pursuant to Section 23 (1) of the said Act.

Given under my hand at GWALIOR this **FIFTEENTH**  
**OCTOBER**

day of **OCTOBER** **THREE**.



**SHANTI S. D. ISPAT & POWER PVT. LTD.**

*(Signature)*  
Managing Director

(*(Signature)* Singh)  
Registrar of Companies  
Madhya Pradesh, Gwalior

*(Signature)*  
Shanti S. D. Ispat & Power Pvt. Ltd.

*(Signature)*  
Director

8192  
COMPANY No. \_\_\_\_\_

**Certificate of Registration of the special  
Resolution Confirming Alteration of Object**

**CLAUSE**

(Section 18 (1) (a) of the Companies Act, 1936)

The shareholders of M/s. G.D. SHANTI ISPAT PRIVATE LIMITED,

having passed Special Resolution in the Annual General Meeting / Extra Ordinary General Meeting held on 22.7.2008 altered the provisions of its Memorandum of Association with respect to the object and complied with Section 18 (1) of the Companies Act, 1936.

I hereby certify that the above said Special Resolution together with the printed copy of the Memorandum of Association as altered has this day been registered.

Given under my hand at Gwalior, this THIRTEENTH  
day of JULY TWO THOUSAND FOUR.



(DR. RAJ SINGH)  
Registrar of Companies  
Madhya Pradesh, Gwalior  
कम्पनी रजिस्ट्रार  
मध्य प्रदेश सरकार

Shanti G.D. Ispat & Power Pvt. Ltd.

Director

SHANTI G. D. ISPAT & POWER PVT. LTD.

Managing Director / Director



संस्कृत नमो

# FRESH CERTIFICATE OF INCORPORATION CONSEQUENT ON CHANGE OF NAME

Company Reg. No. **8192**

In the Office of the Registrar of Companies, Madhya Pradesh,  
**G.D. SHANTI ISPAT PRIVATE LIMITED**  
In the matter of

I have by approve and signify in writing under Section 21 of The Companies Act, 1956 (Act. I of 1956) read with the Government of India, Department of Company Affairs, Notification No G. S. R. 507 B, dated the 24th June, 1981 the change of name of the company from

**SHANTI G.D. ISPAT AND POWER PRIVATE LIMITED**

and **G.D. Shanti Ispat Private Limited**  
I hereby certify that

which was originally incorporated on **30.3.94** under The Companies Act, 1956 and under the name **G.D. Shanti Ispat Private Limited**

having duly passed the necessary resolution in terms of Section 21(2)(i) to (2)(j) of The Companies Act, 1956 the name of the said company is this day changed to **SHANTI G.D. ISPAT AND POWER PRIVATE LIMITED**

and this certificate is issued pursuant to Section 23(1) of the said Act.

Given under my hand at GWALIOR this **THIRTIETH**  
**JULY**  
day of **TWO THOUSAND FOUR**

**SHANTI G. D. ISPAT & POWER PVT. LTD.**



*[Signature]*  
Managing Director

(DR. R. D. SINGH)  
Registrar of Companies  
Madhya Pradesh, Gwalior

*[Handwritten signature]*

COMPANY No. 8192

**Certificate of Registration of the special  
Resolution Confirming Alteration of Object  
CLAUSE**

(Section 18 (1) (a) of the Companies Act, 1956)

The shareholders of M/s. DIOLAKIA PETROCHEMICALS PRIVATE  
LIMITED.

having passed Special Resolution in the Annual General Meeting / Extra  
Ordinary General Meeting held on 1.10.2003 altered the provisions of  
its Memorandum of Association with respect to the object and complied  
with Section 18 (1) of the Companies Act, 1956.

I hereby certify that the above said Special Resolution together  
with the printed copy of the Memorandum of Association as altered has  
this day been registered.

Given under my hand at Gwalior, this FIFTEENTH  
day of OCTOBER TWO THOUSAND THREE.



SHANTI G. D. ISPAT & POWER PVT. LTD.

Managing Director

Registrar of Companies  
M.P. & Chhattisgarh, Gwalior.

हस्ताक्षर रजिस्ट्रार

शान्ति ग. ड. इस्पट & पावर प्रा. लि.

Shanti G. D. Ispat & Power Pvt. Ltd.

(RECEIVED)



संस्कृत भाषा में जारी

Form I. B.

# निर्माण का प्रमाण-पत्र Certificate Of Incorporation

दि. 10-08-1954  
No. 10-08-1954 of 1954

मैं यहाँ द्वारा प्रमाणित करता हूँ कि  
संविधान पत्र - केन्द्रित प्रायवद  
लिमिटेड,  
कम्पनी अधिनियम, 1956 (1956 का 1) के अन्तर्गत निर्माण की गई है, जो कम्पनी  
परिचालित है।

I hereby certify that  
LIMITED.

is this day incorporated under the Companies Act, 1956 (No. 1 of 1956)  
and that the Company is limited by shares.

मेरे हस्ताक्षर के साथ जारी है  
की दिनांक है।

Given under my hand at GWALIOR this  
day of 10-08-1954 One thousand Nine hundred and



REGISTRAR C.A.C.  
कम्पनी का रजिस्ट्रार  
Registrar of Companies  
Madhya Pradesh Government

Shri H. O. D. Inpat & Power Pvt. Ltd.

Director



**THE COMPANIES ACT, 2013**  
**(COMPANY LIMITED BY SHARES)**  
**(COMPANY INCORPORATED UNDER COMPANIES ACT, 1956)**

**MEMORANDUM OF ASSOCIATION**

**OF**

**SHANTI G.D. ISPAT AND POWER PRIVATE LIMITED**

**I. The name of the company is SHANTI G.D. ISPAT AND POWER PRIVATE LIMITED**

**II. The Registered office of the company will be situated in the state of Chhattisgarh.**

**III. (a) The objects to be pursued by the company on its incorporation are:—**

- 1. (a) To carry on the business of buyers, sellers, manufactures of ferrous of all kinds including sponge iron, pig iron, cast iron and/or ferrous/non-ferrous metals and steel of all kinds such as stainless steel, sheet metal, alloys and special steels, steel forging and steel pipe from recycling of Iron and Steel scrap and sponge iron or any other such material with the help of furnaces or foundry of all kinds or by any such other method and to deal in ferrous and non-ferrous metals and iron and steels of all kinds and to do business of conversion agents, iron makers, steel makers, steel converters, melters, tin engineers, plate makers and iron founders, steel rolling or re-rolling in all their respective branches and to deal in iron ore, iron scrap and such other allied metals, scraps and substances of all kinds.**

**(b) To acquire whether on lease or otherwise and possess mines of iron ore and coal and to undertake mining of iron ore coal for the manufacture of sponge iron.**

- 2. To carry on the business of sellers, manufactures, processors, rollers, re-rollers, importers, exporters of and dealers in all kinds of ferrous or non-ferrous metals and its materials, articles or things meant for any industrial or non-industrial use and to carry on the business in cold or hot rolling, re-rolling, slitting, edgemoiling, sheeting, stamping, annealing, forging, extruding, drawing, flattening, pressing, straightening, and heat treatment of all kinds of aluminium, steel and other such metals of all kinds or any other kind of strips, sheets, foils, tapes, wire rods, plates and in any other sections, shapes or forms.**

- 3. To carry on the business of manufacturers, importers and exporters of and dealers in ferrous and non-ferrous castings of all kinds.**

Shanti G.D. Ispat & Power Pvt. Ltd.



4. To carry on in India or elsewhere the business of manufacturing, producing, processing, melting, converting, manipulating, treating and to act as agent, broker, buyer, seller, trader, importer, exporter, distributor, stockiest, metallurgist, engineer, consultant, foundry man, job worker, supplier, contractor or otherwise to deal in ferro alloys of all grades and forms including powder form such as ferro silicon, ferro chrome, silico manganese, silico calcium, silico chrome, ferro molybdenum, ferro Vanadium, ferro tungsten, ferro-silico magnesium, ferro manganese, ferro columbium, ferro niobium, ferro titanium or other ferro alloys present or future and other allied items.
5. To produce, manufacture, process, refine, import, export, purchase, sell and generally to deal in, and to act as agents, stockiest, distributors and suppliers of Iron Steel / steel products such as shutters, shutter profiles, flats angles, rounds, squares, hexagons, octagons, rails, joists, channels, Hot & Cold-steel strips, sheets, plates, industrial fasteners, Deformed bars plain & cold twisted bars, bright bars, shelling, light structural, window sections agriculture implements, Blacks Galvanized pipes corrugated sheet, lift rails and things, compounds and preparations, connected with the aforesaid products and in connection herewith to take on lease or acquire, erect, construct, establish, work operate and maintain factories, quarries, mines, workshops and other works.
6. To carry on in India and/or abroad the business to produce, generate, process transform, formulate, buy, sell or in any way deal in, acquire, store, pack, transport, distribute, dispose off, utilize Electrical Energy, Thermal Energy, Bio Energy, Solar Energy, Hydro Power, Wind Power, Atomic Power, Bio Gas, Coal Gas, Natural Gas, Hydrogen Gas, Steam Water Gas, Methane Gas, Petroleum Gas, R/LH Gas, and fuel Gases of all kind and to convert and/or to otherwise deal with or dispose off the generated bye by products, wastes, effluents and emissions into saleable materials like Coke, Ash, Bricks, Char, Briquettes, Charcoal, Cinders, Tar, Carbolic Acids, husk, Gypsum and other Chemicals or distilled products.
7. To acquire concessions, facilities or licenses from electricity boards, government, semi governments or local authorities for generation, distribution, production, transmission or use of electric power and to take over along with all movable and immovable properties, the existing facilities on mutually agreed terms from aforesaid authorities.

Shakti G.D. Ispat & Power Pvt. Ltd.

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Director

8. To carry on the business as buyer, seller, importer, exporter, broker, agent, representative, stockiest, distributor or otherwise to deal in all kinds of agricultural and forest products and food grains/ products.
9. To buy, sell, import, export and deal in chemical, chemical compounds, chemical products, acids, alkalis, petrochemicals, solvents, plastic of all types, dyes, dye stuff, intermediate, paints, varnishes, deodorants, bio-chemicals and etching, bleaching and photographic materials, industrial solvents and passing agents, extenders, rubber chemicals including vulcanisers antioxidants, accelerators reinforcing agents carbon black silica compounds softeners, blowing agents, special chemical substances, cements oils, paints, plasticizers and extenders, pigments and varnishes, waxes natural and synthetic, organic and mineral intermediates and synthetic, neutral or blended polymer and rubber products, polymer intermediates, raw materials, derivatives, mixtures, compounds, constituents, auxiliary products, by-products, co-products and related products.
10. To carry on the business of providing Manpower placement and recruiting, Selecting, Interviewing, Training and Employing all types of executives, Middle Management Staff, Junior Level Staff, Workers, Labourers Skilled/Unskilled required by various Industries and organizations including providing security services, Labour contractors, Industrial, Commercial, Housing and other security services and workers for office management and to conduct employment bureau and to provide consultancy and other services in connection with requirements of persons and manpower supply in India and abroad and providing training to employees for developing their skills or learn specific knowledge to improve performance in their current roles and to provide opportunities for increased responsibility, career advancement, cross-training, skill assessment programs, mentoring and such other learning support on such terms and conditions as may be decided by the company from time to time.
11. To explore for, exploit, obtain, render suitable, produce, smelt, refine, handle, transport or otherwise distribute all types of hydrocarbons, natural gas, coal and crude oil, oils and their products, by products, sparse, uranium, precious metals, ores, fuels, minerals, gas and participation, seismic data services onshore, transition zones and offshore, and general offshore energy related services and whatever else may be considered incidental or conducive thereto and carry on the business of contractors for operating, working, promoting, managing, supervising, drilling and repairing oil, gas and geothermal wells, mines and mineral claims and acquire, hold and develop any concession rights, options, permits and other authorizations for or in relation to the working of lands for mining, of all type and description.

Shashi G.D. Gupta & Power Pvt. Ltd.

**(b) Matters which are necessary for furtherance of the objects specified in clause III**

**(a) are:—**

1. To build, construct, erect, improve, maintain, alter, enlarge, purchase, hire or otherwise acquire or provide, any buildings, offices, factories, workshops, plants, or machinery or other things necessary or useful for the purpose or carrying out the above object of the company, to purchase or otherwise acquire land and here determinants, or any tenure for the object aforesaid, and to sell or otherwise dispose of any property of the company.
2. To purchase acquire and undertake all or any of the business property and liabilities of any person/company carrying on or proposing to carry on any business which this Company is authorised to carry on or processed of property suitable for the purposes of the Company or which can be carried on in conjunction there with or which is capable of being conducted so as directly or indirectly to benefit the Company.
3. To acquire from any person, firm or body corporate or unincorporated, whether in India or elsewhere, technical information, know-how, processes, engineering, manufacturing and operating data, plans, layout, warehouses, cold storage and blueprints useful for designs, erection and operation of plant required for any of the business of the Company and to acquire any grant or license and other rights and benefits in the foregoing matters and things.
4. To pay for any property, rights or privileges, acquired by the Company or for the services rendered or to be rendered in connection with the promotion of or the business of the Company or for acquisition of any property for the Company or otherwise, either wholly or partly in cash or in shares, bonds, debentures or other securities of the Company and to issue any shares either or fully paid up or which such amount credited as paid up thereon as may be agreed upon to charged any such bonds debentures of other securities upon all or any part of the property or the Company while so doing the Company shall comply with all requirements of Law for the time being in force.
5. To amalgamate or to enter into partnership or into any arrangement for sharing profits, union of interest, co-operation, joint venture, license, or reciprocal concession or for limiting competition with any person or persons or company or companies carrying on or engaged in or about to carry on or engage in or being authorised to carry on or engage in any business or transaction which the Company is authorised to carry on or engage in or which can be carried on in conjunction therewith or which is capable of being conducted so as directly or indirectly to benefit the Company.

Shanti Q.D. Inpat & Power Pvt. Ltd.

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Director

6. To give guarantee counter, guarantees, indemnities and/or counter indemnities for any person for any loans or performances of any contract of other obligation but shall not do any banking business but shall not do any, balance business.
7. To establish and maintain any agencies or branches in any part of the world for the sale of any materials, articles or things for the time being at the disposal of the Company or for sale or purchase of goods and materials required by the Company or its constituents or other purposes whatsoever and to appoint managers, brokers, contractors and other persons for the purposes of the Company and to discontinue and discharge them.
8. To acquire by purchase, concession, grant, license or otherwise such lands, buildings, minerals, waterworks, plant, machinery, stock-in-trade, stores, rights, privileges, easements and other property as may from time to time be deemed necessary for carrying on the business of the Company and to build or erect upon any land of the Company howsoever acquired, such manufactories workshop warehouse, offices, residences and other buildings and to erect such machinery and construct such roadways, tramways, railway branches or siding, bridges, reservoirs, water courses hydraulic works.
9. To improve, manage, cultivate, develop, exchange, let on mortgage, sell, dispose of turn to account, grants, rights and privileges in respect of or otherwise deal in all or any part of the properties and rights of the Company on such terms as the Company shall determine and to supply power, light and heat and to lay out land for building purposes, and to sell the same, and to build on improve, let on building advance money to persons, building or otherwise to develop the same.
10. To sell or subject to any right, concession or license obtained or contracts entered into any generally to sell to the whole or any part of the property and business of the Company for cash or for shares whether fully paid up or not, debentures or securities, of another Company or partly in cash or partly in such shares, debentures, or securities as or distributed in specie amongst the members or otherwise.
11. To establish branches, Depot, Show-Rooms, Service Centers, Research Bureaus with a view to facilitate the work of the Company and to expand its business.

*[Handwritten signature]*



12. To subscribe for acquire, hold, sell and otherwise deal in shares, stock, debenture, debenture stock, bond, mortgages, obligations, commodities, derivatives, forex and securities of any kind issued or guaranteed by any company (body corporate or undertaking) of whatever nature and whosoever constitute or carrying on business in shares, stock, debentures, debenture stock, bonds, mortgage, obligations, commodities, derivatives, forex and other securities issued or guaranteed by any Government, sovereign, ruler, commissioners, trust, municipal, local or other authority or body of whatever nature whether in India or elsewhere.
13. In connection with the main business and subject to the provisions of the Companies Act, 2013 to lend money to such persons and on such terms and conditions as may seem expedient with or without security and in particular to customers and others having dealings with the company and to give any guarantee or indemnity as may seem expedient. But the company will not do banking business as defined under the Banking Regulation Act, 1949.
14. To enter into any arrangement with any Government Authority Central provincial, Local or other public or Quasi Public Bodies that may seem conducive to the Companies object or any rights, privileges and concessions which the company may think fit, desirable to obtain and to carry out exercise and comply with any such arrangements, rights privileges and concession.
15. Subject to the provisions of the Companies Act, 2013 and its rules made there under and directives of RBI to borrow or raise, accept deposits or secure the payment of money in such lawful manner as the Company shall think fit and in particular by the issue of debenture stock, perpetual or otherwise, mortgage, or any other securities charged or based upon the undertaking of the Company or any parts of its property both present and future including the uncalled capital and the rights of the Company or without any such security, and upon such terms as to property or otherwise and generally to borrow money in such lawful manner as the Company shall think fit provided that the Company shall not carry on the business as defined by Banking regulation Act, 1949.

Shanti O.D.apat & Power Pvt. Ltd.

  
Director

16. To draw cheques, make, accept, endorse, discount, execute and issue promissory notes, bills of exchange, bills of lading, charter parties, warrants, debentures and other negotiable and transferable instruments but shall not carry on the banking business as defined under the Banking Regulations Act, 1948.
17. To give guarantee counter, guarantee, indemnities and/or counter indemnities for any person for any loans or performances of any contract of other obligation but shall not do any banking business but shall not do any, balance business.
18. To pay all the costs charges and expenses incidental to the promotion formation, registration, and establishment of the Company.
19. To get the company registered or established or authorized to do business as company with limited liability in any foreign country or place.
20. To use trademarks, trade names, or boards for the products and goods of the Company and adopt such names of making know the business and or products of the Company, as may seem expedient and in particular by advertising in newspapers, magazines, periodicals by circulars by purchase and exhibition of work of art and interest by opening Stalls and Exhibition by publication of books and periodicals by distribution of sample and by granting prizes, reward and donations but the Company shall not make any donation for political purposes.
21. To sell the undertaking of the Company, or part thereof for such consideration as the Company may think fit and in particular for shares, debentures, bonds or securities, commodities to any other Company having objects altogether or in part similar to those of the Company, to promote any other company or companies for the purpose of its or their acquiring all or any of the property, rights or liabilities of these company or for any other purpose which may seem directly calculated to benefit the Company.
22. To distribute any of the property of the company in specie or kind among members on the event of its winding up.
23. To enter into arrangements with the Employees, Engineers, Technicians, Workman, Office Staff, Salesmen and other persons having special knowledge or matters relating to the business of the Company for full or part time employment as may be necessary or expedient for conducting the business of the Company.

Shanti G.D. Export & Power Pvt. Ltd.

  
Director

24. To undertake and execute any trust, the undertaking of which seems to the company desirable, either gratuitously or otherwise.
25. To give any Officer, servants or employees of the Company any share or interest in the profit of the Company's business or any branch thereof, whether carried on by means of through the agency or any subsidiary Company or not and for that purpose to enter in to any arrangement which the Company may think fit.
26. To remunerate any persons, or body corporate rendering service, to the Company either by cash payment or by allotment to him or them any shares or securities of the Company credited as paid up in full or in part otherwise or by shares in the profits of the Company.
27. To subscribe or guarantee money for any charitable, benevolent, public, general or useful object and to make donations, subject to the provisions of the Companies Act, 2013.
28. To form, constitute and promote or join in promoting and forming companies, societies, syndicates, Association and undertaking of all kinds for the moral and intellectual, physical and mental and Social advancement or workers generally and to establish and support or aid in the establishment of associations, institutions, trusts and conveniences calculated to benefit the employees or ex employees of the company or the dependents or connection or such persons and the to grant pension and allowances and to make payment towards insurance and to subscribe or guarantee money for Charitable or benevolent objects to pay for any exhibitions or for any public or general or useful objects.
29. To grant pension, allowance, compensations, annuities, gratuities and bonus and to provide amenities to employees or ex-employees of the Company or its predecessors in business or the dependents of such persons and to support of to subscribe to any charitable educational institutions.
30. To establish and maintain schools and workshop for the training of the employees, students and apprentices and to send them elsewhere for training on behalf of and at the expense of the Companies or otherwise.

Shanti G.D. Lepat & Partner Pvt. Ltd.

31. To promote, carry on and conduct research at any educational or other institutions for attainment of above objects.

32. To establish and support or aid in the establishment of library or libraries for the benefit of the company, to its workers and people in general.

33. To indemnify officers, directors, promoters and servants of the company against proceedings, cost damages, claims and demand in respect of anything done or ordered to be done for and in the interest of the company or for any loss or damage misfortune whatever which shall happen in execution of the duties or their office or in relations thereof.

34. To create any reserve funds, sinking funds, insurance funds or any other special funds, whether for depreciations for repairing, improving extending or maintaining any of the property of the Company, for repaying liabilities or for any other purpose, conducive to the interest of the Company for any purpose whatsoever.

IV. The liability of the Members is limited and this liability is limited to the amount unpaid, if any, on the shares held by them.

V. The Authorised Share Capital of the Company is ₹ 20,000,000/- (Rupees Two Crore only) divided into 2,000,000 (Twenty Lakhs) Equity Shares of ₹ 10/- (Rupees Ten

only each)  
Sharda Steel & Power Pvt. Ltd.

  
Director

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+

We the several persons, whose names, addresses and description are subscribed hereunder are desirous of being formed into a Company in pursuance of this Memorandum of Association and we respectively agree to take number of shares in the capital of the Company set opposite our respective names.

| S. No.                        | Names, addresses, Descriptions and Occupation of subscribers                                 | No. of Equity Shares taken by each Subscriber | Signature of Subscribers | Signature, Name, Address, Description & Occupation of Witnesses                                                                                |
|-------------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                            | Pratul Chandra C. Dholakia<br>Kumhar Para, Fafadih<br>Raipur (C.G.) 492009.<br>Industrialist | 100<br>(One Hundred Shares)                   | Sd/-                     | Witness to the signature of Subscriber No. 1 to 3<br><br>Sd/-<br>G.S. Agrawal<br>Chartered Accountant<br>Jawahar Nagar Raipur<br>(C.G.) 492001 |
| 2.                            | Vipul P. Dholakia<br>Kumhar Para, Fafadih<br>Raipur (C.G.) 492009.<br>Engineer               | 100<br>(One Hundred Shares)                   | Sd/-                     |                                                                                                                                                |
| 3.                            | Manish P. Dholakia<br>Kumhar Para, Fafadih<br>Raipur (C.G.) 492009.<br>Engineer              | 100<br>(One Hundred Shares)                   | Sd/-                     |                                                                                                                                                |
| TOTAL NUMBER OF EQUITY SHARES |                                                                                              | 300                                           | (Three Hundred Shares)   |                                                                                                                                                |

Place: Raipur  
Date: 16/02/1984

Shanti G.D. 1spat & Power Pvt. Ltd.

Director



**THE COMPANIES ACT, 2013**

**(A COMPANY LIMITED BY SHARES)**

**Articles of Association**

**SHANTI G.D. ISPAT AND POWER PRIVATE LIMITED**

***Interpretation.***

**(1) In these regulations—**

- (a) "the Act" means the Companies Act, 2013.**
- (b) "the seal" means the common seal of the company.**

**(2) Unless the context otherwise requires, words or expressions contained in these regulations shall bear the same meaning as in the Act or any statutory modification thereof in force at the date at which these regulations become binding on the company.**

***Private Company***

**(3) The Company is a Private Company within the meaning of Section 2(68) of the Companies Act, 2013 and accordingly:-**

- a. The right to transfer shares of the company is restricted.**
- b. No invitation shall be issued to the public to subscribe for any shares in or debentures of the Company; and**
- c. The number of members of the Company shall be limited to Two Hundred not including:-**
  - I. Person who are in the employment of the Company; and**
  - II. Persons who having been formerly in the employment of the Company were members of the Company while in that employment and have continued to be the members of the company after the employment ceased;**

**Provided that where two or more persons held one or more shares in the Company jointly, they shall for the purpose of this clause be treated as a single member.**

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### Share Capital and Variation of Rights

- (4) The Authorised Share Capital of the Company ` 20,000,000/- (Rupees Two Crore only) divided into 2,000,000 (Twenty Lakhs) Equity Shares of ` 10/- (Rupees Ten only) each with power to increase or decrease its capital and to divide the shares into several classes and attach thereto respectively and preferentially, qualified or special rights, privileges or conditions as may from time to time be determined by or in accordance with the Regulations of Companies and the Companies Act, 2013.
- (5) Subject to the provisions of the Act and these Articles, the shares in the capital of the company shall be under the control of the Directors who may issue, allot or otherwise dispose of the same or any of them to such persons, in such proportion and on such terms and conditions and either at a premium or at par and at such time as they may from time to time think fit.
- (6) (i) Every person whose name is entered as a member in the register of members shall be entitled to receive within two months after incorporation, in case of subscribers to the memorandum or after allotment or within one month after the application for the registration of transfer or transmission or within such other period as the conditions of issue shall be provided,—
- (a) One certificate for all his shares without payment of any charges; or
  - (b) Several certificates, each for one or more of his shares, upon payment of twenty rupees for each certificate after the first.
- (ii) Every certificate shall be under the seal and shall specify the shares to which it relates and the amount paid-up thereon.
- (iii) In respect of any share or shares held jointly by several persons, the company shall not be bound to issue more than one certificate, and delivery of a certificate for a share to one of several joint holders shall be sufficient delivery to all such holders.
- (7) (i) If any share certificate be worn out, defaced, mutilated or torn or if there be no further space on the back for endorsement of transfer, then upon production and surrender thereof to the company, a new certificate may be issued in lieu thereof, and if any certificate is lost or destroyed then upon proof thereof to the satisfaction of the company and on execution of such indemnity as the company deem adequate, a new certificate in lieu thereof shall be given. Every certificate under this Article shall be issued on payment of twenty rupees for each certificate.

*[Signature]*

*[Signature]*

- (k) The provisions of Articles (2) and (3) shall *mutatis mutandis* apply to debentures of the company.
- (8) Except as required by law, no person shall be recognised by the company as holding interest in any share, or any interest in any fractional part of a share, or (except only as by these regulations or by law otherwise provided) any other rights in respect of any share except an any share upon any trust, and the company shall not be bound by, or be compelled in any way to recognize (even when having notice thereof) any equitable, contingent, future or partial absolute right to the entirety thereof in the registered holder.
- (9) (i) The company may exercise the powers of paying commissions conferred by sub-section (6) of section 40, provided that the rate per cent. or the amount of the commission paid or agreed to be paid shall be disclosed in the manner required by that section and rules made thereunder.
- (ii) The rate or amount of the commission shall not exceed the rate or amount prescribed in rules made under sub-section (6) of section 40.
- (iii) The commission may be satisfied by the payment of cash or the allotment of fully or partly paid shares or partly in the one way and partly in the other.
- (10) (i) If at any time the share capital is divided into different classes of shares, the rights attached to any class (unless otherwise provided by the terms of issue of the shares of that class) may, subject to the provisions of section 48, and whether or not the company is being wound up, be varied with the consent in writing of the holders of three-fourths of the issued shares of that class, or with the sanction of a special resolution passed at a separate meeting of the holders of the shares of that class.
- (ii) To every such separate meeting, the provisions of these regulations relating to general meetings shall *mutatis mutandis* apply, but so that the necessary quorum shall be at least two persons holding at least one-third of the issued shares of the class in question.
- (11) The rights conferred upon the holders of the shares of any class issued with preferred or other rights shall not, unless otherwise expressly provided by the terms of issue of the shares of that class, be deemed to be varied by the creation or issue of further shares ranking *pari passu* therewith.

Agreed

4/15/11

(12) Subject to the provisions of section 55, any preference shares may, with the sanction of an ordinary resolution, be issued on the terms that they are to be redeemed on such terms and in such manner as the company before the issue of the shares may, by special resolution, determine.

### Lien

(13)(i) The company shall have a first and paramount lien—

(a) on every share (not being a fully paid share), for all monies (whether presently payable or not) called, or payable at a fixed time, in respect of that share; and

(b) on all shares (not being fully paid shares) standing registered in the name of a single person, for all monies presently payable by him or his estate to the company;

Provided that the Board of directors may at any time declare any share to be wholly or in part exempt from the provisions of this clause.

(ii) The company's lien, if any, on a share shall extend to all dividends payable and bonuses declared from time to time in respect of such shares.

(14) The company may sell, in such manner as the Board thinks fit, any shares on which the company has a lien:

Provided that no sale shall be made—

(a) unless a sum in respect of which the lien exists is presently payable; or

(b) until the expiration of fourteen days after a notice in writing stating and demanding payment of such part of the amount in respect of which the lien exists as is presently payable, has been given to the registered holder for the time being of the share or the person entitled thereto by reason of his death or insolvency.

(15)(i) To give effect to any such sale, the Board may authorise some person to transfer the shares sold to the purchaser thereof.

(ii) The purchaser shall be registered as the holder of the shares comprised in any such transfer.

*Approved*

*14/11/11*

(16) The purchaser shall not be bound to see to the application of the purchase money, nor shall his title to the shares be affected by any irregularity or invalidity in the proceedings in reference to the sale.

(16)(i) The proceeds of the sale shall be received by the company and applied in payment of such part of the amount in respect of which the lien exists as is presently payable.

(ii) The residue, if any, shall, subject to a like lien for sums not presently payable as existed upon the shares before the sale, be paid to the person entitled to the shares at the date of the sale.

#### **Calls on Shares**

(17)(a) The Board may, from time to time, make calls upon the members in respect of any monies unpaid on their shares (whether on account of the nominal value of the shares or by way of premium) and not by the conditions of allotment thereof made payable at fixed times:

Provided that no call shall exceed one-fourth of the nominal value of the share or be payable at less than one month from the date fixed for the payment of the last preceding call.

(b) Each member shall, subject to receiving at least fourteen days' notice specifying the time or times and place of payment, pay to the company, at the time or times and place so specified, the amount called on his shares.

(c) A call may be revoked or postponed at the discretion of the Board.

(18) A call shall be deemed to have been made at the time when the resolution of the Board authorising the call was passed and may be required to be paid by instalments.

(19) The joint holders of a share shall be jointly and severally liable to pay all calls in respect thereof.

(20)(a) If a sum called in respect of a share is not paid before or on the day appointed for payment thereof, the person from whom the sum is due shall pay interest thereon from the day appointed for payment thereof to the time of actual payment at ten per cent. per annum or at such lower rate, if any, as the Board may determine.

*Approved*

*4/15/14*

- (18) The Board shall be at liberty to waive payment of any such interest wholly or in part.
- (21)(a) Any sum which by the terms of issue of a share becomes payable on allotment or at any fixed date, whether on account of the nominal value of the share or by way of premium, shall, for the purposes of these regulations, be deemed to be a call duly made and payable on the date on which by the terms of issue such sum becomes payable.
- (b) In case of non-payment of such sum, all the relevant provisions of these regulations as to payment of interest and expenses, forfeiture or otherwise shall apply as if such sum had become payable by virtue of a call duly made and notified.

(22) The Board—

- (a) may, if it thinks fit, receive from any member willing to advance the same, all or any part of the monies uncalled and unpaid upon any shares held by him; and
- (b) upon all or any of the monies so advanced, may (until the same would, but for such advance, become presently payable) pay interest at such rate not exceeding, unless the company in general meeting shall otherwise direct, twelve per cent. per annum, as may be agreed upon between the Board and the member paying the sum in advance.

**Transfer of Shares**

- (23)(a) The instrument of transfer of any share in the company shall be executed by or on behalf of both the transferor and transferee.
- (b) The transferor shall be deemed to remain a holder of the share until the name of the transferee is entered in the register of members in respect thereof.
- (24) The Board may, subject to the right of appeal conferred by section 58 decline to register—
- (a) the transfer of a share, not being a fully paid share, to a person of whom they do not approve; or
- (b) any transfer of shares on which the company has a lien.

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*Lucy*



(25) The Board may decline to recognise any instrument of transfer unless—

(a) the instrument of transfer is in the form as prescribed in rules made under subsection (1) of section 56;

(b) the instrument of transfer is accompanied by the certificate of the shares to which it relates, and such other evidence as the Board may reasonably require to show the right of the transferor to make the transfer; and

(c) the instrument of transfer is in respect of only one class of shares.

(26) On giving not less than seven days' previous notice in accordance with section 91 and rules made thereunder, the registration of transfers may be suspended at such times and for such periods as the Board may from time to time determine:

Provided that such registration shall not be suspended for more than thirty days at any one time or for more than forty-five days in the aggregate in any year.

#### *Transmission of Shares*

(27) (i) On the death of a member, the survivor or survivors where the member was a joint holder, and his nominee or nominees or legal representatives where he was a sole holder, shall be the only persons recognised by the company as having any title to his interest in the shares.

(ii) Nothing in clause (i) shall release the estate of a deceased joint holder from any liability in respect of any share which had been jointly held by him with other persons.

(28) (i) Any person becoming entitled to a share in consequence of the death or insolvency of a member may, upon such evidence being produced as may from time to time properly be required by the Board and subject as hereinafter provided, elect, either—

(a) to be registered himself as holder of the share; or

(b) to make such transfer of the share as the deceased or insolvent member could have made.

(ii) The Board shall, in either case, have the same right to decline or suspend registration as it would have had, if the deceased or insolvent member had transferred the share before his death or insolvency.

*Adm*

*6.1.54*

(29)(f) If the person so becoming entitled shall elect to be registered as holder of the share himself, he shall deliver or send to the company a notice in writing signed by him stating that he so elects.

(g) If the person aforesaid shall elect to transfer the share, he shall testify his election by executing a transfer of the share.

(h) All the limitations, restrictions and provisions of these regulations relating to the right to transfer and the registration of transfers of shares shall be applicable to any such notice or transfer as aforesaid as if the death or insolvency of the member had not occurred and the notice or transfer were a transfer signed by that member.

(30) A person becoming entitled to a share by reason of the death or insolvency of the holder shall be entitled to the same dividends and other advantages to which he would be entitled if he were the registered holder of the share, except that he shall not, before being registered as a member in respect of the share, be entitled in respect of it to exercise any right conferred by membership in relation to meetings of the company:

Provided that the Board may, at any time, give notice requiring any such person to elect either to be registered himself or to transfer the share, and if the notice is not complied with within ninety days, the Board may thereafter withhold payment of all dividends, bonuses or other monies payable in respect of the share, until the requirements of the notice have been complied with.

#### **Forfeiture of Shares**

(31) If a member fails to pay any call, or installment of a call, on the day appointed for payment thereof, the Board may, at any time thereafter during such time as any part of the call or installment remains unpaid, serve a notice on him requiring payment of so much of the call or installment as is unpaid, together with any interest which may have accrued.

(32) The notice aforesaid shall—

(a) name a further day (not being earlier than the expiry of fourteen days from the date of service of the notice) on or before which the payment required by the notice is to be made; and



(b) state that, in the event of non-payment on or before the day so named, the shares in respect of which the call was made shall be liable to be forfeited.

(33)(i) If the requirements of any such notice as aforesaid are not complied with, any share in respect of which the notice has been given may, at any time thereafter, before the payment required by the notice has been made, be forfeited by a resolution of the Board to that effect.

(34)(i) A forfeited share may be sold or otherwise disposed of on such terms and in such manner as the Board thinks fit.

(ii) At any time before a sale or disposal as aforesaid, the Board may cancel the forfeiture on such terms as it thinks fit.

(35)(i) A person whose shares have been forfeited shall cease to be a member in respect of the forfeited shares, but shall, notwithstanding the forfeiture, remain liable to pay to the company all monies which, at the date of forfeiture, were presently payable by him to the company in respect of the shares.

(ii) The liability of such person shall cease if and when the company shall have received payment in full of all such monies in respect of the shares.

(36)(i) A duly verified declaration in writing that the declarant is a director, the manager or the secretary, of the company, and that a share in the company has been duly forfeited on a date stated in the declaration, shall be conclusive evidence of the facts therein stated as against all persons claiming to be entitled to the share;

(ii) The company may receive the consideration, if any, given for the share on any sale or disposal thereof and may execute a transfer of the share in favour of the person to whom the share is sold or disposed of;

(iii) The transferee shall thereupon be registered as the holder of the share; and

(iv) The transferee shall not be bound to see to the application of the purchase money, if any, nor shall his title to the share be affected by any irregularity or invalidity in the proceedings in reference to the forfeiture, sale or disposal of the share.

*Agreed*

*WKS*

- (37) The provisions of these regulations as to forfeiture shall apply in the case of nonpayment of any sum which, by the terms of issue of a share, becomes payable at a fixed time, whether on account of the nominal value of the share or by way of premium, as if the same had been payable by virtue of a call duly made and notified.

#### *Alteration of Capital*

- (38) The company may, from time to time, by Ordinary resolution increase the share capital by such sum, to be divided into shares of such amount, as may be specified in the resolution.

- (39) Subject to the provisions of section 61, the company may, by Special resolution,—

- (a) consolidate and divide all or any of its share capital into shares of larger amount than its existing shares;
- (b) convert all or any of its fully paid-up shares into stock, and reconvert that stock into fully paid-up shares of any denomination;
- (c) sub-divide its existing shares or any of them into shares of smaller amount than is fixed by the memorandum;
- (d) cancel any shares which, at the date of the passing of the resolution, have not been taken or agreed to be taken by any person.

- (40) Where shares are converted into stock,—

- (a) the holders of stock may transfer the same or any part thereof in the same manner as, and subject to the same regulations under which, the shares from which the stock arose might before the conversion have been transferred, or as near thereto as circumstances admit.

Provided that the Board may, from time to time, fix the minimum amount of stock transferable, so, however, that such minimum shall not exceed the nominal amount of the shares from which the stock arose.

- (b) the holders of stock shall, according to the amount of stock held by them, have the same rights, privileges and advantages as regards dividends, voting at meetings of the company, and other matters, as if they held the shares from which the stock arose; but no such privilege or advantage (except participation in the dividends and profits of the company and in the assets on winding up) shall be conferred by an amount of stock which would not, if existing in shares, have conferred that privilege or advantage.
- (c) such of the regulations of the company as are applicable to paid-up shares shall apply to stock and the words "share" and "shareholder" in those regulations shall include "stock" and "stock-holder" respectively.
- (41) The company may, by special resolution, reduce in any manner and with, and subject to, any incident authorised and consent required by law,—
- (a) its Share Capital;
  - (b) any Capital Redemption Reserve Account; or
  - (c) any Share Premium Account.

#### Capitalisation of Profits

- (42)(i) The company in general meeting may, upon the recommendation of the Board, resolve—
- (a) that it is desirable to capitalise any part of the amount for the time being standing to the credit of any of the company's reserve accounts, or to the credit of the profit and loss account, or otherwise available for distribution; and
  - (b) that such sum be accordingly set free for distribution in the manner specified in clause (i) amongst the members who would have been entitled thereto, if distributed by way of dividend and in the same proportions.
- (ii) The sum aforesaid shall not be paid in cash but shall be applied, subject to the provision contained in clause (ii), either in or towards—
- a) paying up any amounts for the time being unpaid on any shares held by such members respectively;

*Amend*

*4/13/10*

- b) paying up in full, unissued shares of the company to be allotted and distributed, credited as fully paid-up, to and amongst such members in the proportions aforesaid;
- c) partly in the way specified in sub-clause (a) and partly in that specified in sub-clause (b);
- d) A securities premium account and a capital redemption reserve account may, for the purposes of this regulation, be applied in the paying up of unissued shares to be issued to members of the company as fully paid bonus shares;
- e) The Board shall give effect to the resolution passed by the company in pursuance of this regulation.

(43)(i) Whenever such a resolution as aforesaid shall have been passed, the Board shall—

- (a) make all appropriations and applications of the undivided profits resolved to be capitalised thereby, and all allotments and issues of fully paid shares if any; and
- (b) generally do all acts and things required to give effect thereto.

(ii) The Board shall have power—

- a) to make such provisions, by the issue of fractional certificates or by payment in cash or otherwise as it thinks fit, for the case of shares becoming distributable in fractions; and
- b) to authorise any person to enter, on behalf of all the members entitled thereto, into an agreement with the company providing for the allotment to them respectively, credited as fully paid-up, of any further shares to which they may be entitled upon such capitalisation, or as the case may require, for the payment by the company on their behalf, by the application thereto of their respective proportions of profits resolved to be capitalised, of the amount or any part of the amounts remaining unpaid on their existing shares;

(iii) Any agreement made under such authority shall be effective and binding on such members.

*James Smith*

*1/1*



### **Buy-Back of Shares**

- (44) Notwithstanding anything contained in these articles but subject to the provisions of sections 68 to 70 and any other applicable provision of the Act or any other law for the time being in force, the company may purchase its own shares or other specified securities.

### **General Meetings**

- (45) All general meetings other than annual general meeting shall be called extraordinary general meeting.

- (45)(i) The Board may, whenever it thinks fit, call an extraordinary general meeting.

(ii) If at any time directors capable of acting who are sufficient in number to form a quorum are not within India, any director or any two members of the company may call an extraordinary general meeting in the same manner, as nearly as possible, as that in which such a meeting may be called by the Board.

### **Proceedings at General Meetings**

- (47)(i) No business shall be transacted at any general meeting unless a quorum of members is present at the time when the meeting proceeds to business.

(ii) Save as otherwise provided herein, the quorum for the general meetings shall be as provided in section 103.

- (48) The chairperson, if any, of the Board shall preside as Chairperson at every general meeting of the company.

- (49) If there is no such Chairperson, or if he is not present within fifteen minutes after the time appointed for holding the meeting, or is unwilling to act as chairperson of the meeting, the directors present shall elect one of their members to be Chairperson of the meeting.

- (50) If at any meeting no director is willing to act as Chairperson or if no director is present within fifteen minutes after the time appointed for holding the meeting, the members present shall choose one of their members to be Chairperson of the meeting.

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### Adjournment of Meeting

(51) (f) The Chairperson may, with the consent of any meeting at which a quorum is present, and shall, if so directed by the meeting, adjourn the meeting from time to time and from place to place.

(g) No business shall be transacted at any adjourned meeting other than the business left unfinished at the meeting from which the adjournment took place.

(h) When a meeting is adjourned for thirty days or more, notice of the adjourned meeting shall be given as in the case of an original meeting.

(i) Save as aforesaid, and as provided in section 103 of the Act, it shall not be necessary to give any notice of an adjournment or of the business to be transacted at an adjourned meeting.

### Voting Rights

(52) Subject to any rights or restrictions for the time being attached to any class or classes of shares,—

a. on a show of hands, every member present in person shall have one vote; and

b. on a poll, the voting rights of members shall be in proportion to his share in the paid-up equity share capital of the company.

(53) A member may exercise his vote at a meeting by electronic means in accordance with section 106 and shall vote only once.

(54) (i) In the case of joint holders, the vote of the senior who tenders a vote, whether in person or by proxy, shall be accepted to the exclusion of the votes of the other joint holders.

(ii) For this purpose, seniority shall be determined by the order in which the names stand in the register of members.

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(55) A member of unsound mind, or in respect of whom an order has been made by any court having jurisdiction in lunacy, may vote, whether on a show of hands or on a poll, by his committee or other legal guardian, and any such committee or guardian may, on a poll, vote by proxy.

(56) Any business other than that upon which a poll has been demanded may be proceeded with, pending the taking of the poll.

(57) No member shall be entitled to vote at any general meeting unless all calls or other sums presently payable by him in respect of shares in the company have been paid.

(58) (i) No objection shall be raised to the qualification of any voter except at the meeting or adjourned meeting at which the vote objected to is given or tendered, and every vote not disallowed at such meeting shall be valid for all purposes.

(ii) Any such objection made in due time shall be referred to the Chairperson of the meeting, whose decision shall be final and conclusive.

#### *Proxy*

(59) The instrument appointing a proxy and the power-of-attorney or other authority, if any, under which it is signed or a notarised copy of that power or authority, shall be deposited at the registered office of the company not less than 48 hours before the time for holding the meeting or adjourned meeting at which the person named in the instrument proposes to vote, or, in the case of a poll, not less than 24 hours before the time appointed for the taking of the poll; and in default the instrument of proxy shall not be treated as valid.

(60) An instrument appointing a proxy shall be in the form as prescribed in the rules made under section 105.

(61) A vote given in accordance with the terms of an instrument of proxy shall be valid, notwithstanding the previous death or insanity of the principal or the revocation of the proxy or of the authority under which the proxy was executed, or the transfer of the shares in respect of which the proxy is given: Provided that no intimation in writing of such death, insanity, revocation or transfer shall have been received by the company at its office before the commencement of the meeting or adjourned meeting at which the proxy is used.

*WAS*

*Board of Directors*

(82) (i) The number of the directors and the names of the first directors shall be determined in writing by the subscribers of the memorandum or a majority of them.

(ii) Followings are the first directors of the company:

1. SHRI PRAFULCHAND C. DHOLKIA
2. SHRI VIPUL P. DHOLKIA
3. SHRI MANISH P. DHOLAKIA

(83) (i) The remuneration of the directors shall, in so far as it consists of a monthly payment, be deemed to accrue from day-to-day.

(ii) In addition to the remuneration payable to them in pursuance of the Act, the directors may be paid all travelling, hotel and other expenses properly incurred by them—

- a. in attending and returning from meetings of the Board of Directors or any committee thereof or general meetings of the company; or
- b. in connection with the business of the company.

(84) The Board may pay all expenses incurred in getting up and registering the company.

(85) The company may exercise the powers conferred on it by section 88 with regard to the keeping of a foreign register; and the Board may (subject to the provisions of that section) make and vary such regulations as it may think fit respecting the keeping of any such register.

(86) All cheques, promissory notes, drafts, hundies, bills of exchange and other negotiable instruments, and all receipts for monies paid to the company, shall be signed, drawn, accepted, endorsed, or otherwise executed, as the case may be, by such person and in such manner as the Board shall from time to time by resolution determine.

(87) Every director present at any meeting of the Board or of a committee thereof shall sign his name in a book to be kept for that purpose.



4/5/77

(68)(i) Subject to the provisions of section 149, the Board shall have power at any time, and from time to time, to appoint a person as an additional director, provided the number of the directors and additional directors together shall not at any time exceed the maximum strength fixed for the Board by the articles.

(ii) Such person shall hold office only up to the date of the next annual general meeting of the company but shall be eligible for appointment by the company as a director at that meeting subject to the provisions of the Act.

#### *Proceedings of the Board*

(69)(i) The Board of Directors may meet for the conduct of business, adjourn and otherwise regulate its meetings, as it thinks fit.

(ii) A director may, and the manager or secretary on the requisition of a director shall, at any time, summon a meeting of the Board.

(70)(i) Save as otherwise expressly provided in the Act, questions arising at any meeting of the Board shall be decided by a majority of votes.

(ii) In case of an equality of votes, the Chairperson of the Board, if any, shall have a second or casting vote.

(71) The continuing directors may act notwithstanding any vacancy in the Board; but, if and so long as their number is reduced below the quorum fixed by the Act for a meeting of the Board, the continuing directors or director may act for the purpose of increasing the number of directors to that fixed for the quorum, or of summoning a general meeting of the company, but for no other purpose.

(72)(i) The Board may elect a Chairperson of its meetings and determine the period for which he is to hold office.

(ii) If no such Chairperson is elected, or if at any meeting the Chairperson is not present within five minutes after the time appointed for holding the meeting, the directors present may choose one of their number to be Chairperson of the meeting.

*A. B. S.*

*W. S. H.*

(73)(f) The Board may, subject to the provisions of the Act, delegate any of its powers to committees consisting of such member or members of its body as it thinks fit.

(g) Any committee so formed shall, in the exercise of the powers so delegated, conform to any regulations that may be imposed on it by the Board.

(74)(i) A committee may elect a Chairperson of its meetings.

(j) If no such Chairperson is elected, or if at any meeting the Chairperson is not present within five minutes after the time appointed for holding the meeting, the members present may choose one of their members to be Chairperson of the meeting.

(75)(i) A committee may meet and adjourn as it thinks fit.

(j) Questions arising at any meeting of a committee shall be determined by a majority of votes of the members present, and in case of an equality of votes, the Chairperson shall have a second or casting vote.

(76) All acts done in any meeting of the Board or of a committee thereof or by any person acting as a director, shall, notwithstanding that it may be afterwards discovered that there was some defect in the appointment of any one or more of such directors or of any person acting as aforesaid, or that they or any of them were disqualified, be as valid as if every such director or such person had been duly appointed and was qualified to be a director.

(77) Save as otherwise expressly provided in the Act, a resolution in writing, signed by all the members of the Board or of a committee thereof, for the time being entitled to receive notice of a meeting of the Board or committee, shall be valid and effective as if it had been passed at a meeting of the Board or committee, duly convened and held.

*Chief Executive Officer, Manager, Company Secretary or Chief Financial Officer*

(78) Subject to the provisions of the Act,—

(i) A chief executive officer, manager, company secretary or chief financial officer may be appointed by the Board for such term, at such remuneration and upon such conditions as it may think fit; and any chief executive officer, manager, company secretary or chief financial officer so appointed may be removed by means of a resolution of the Board;



(i) A director may be appointed as chief executive officer, manager, company secretary or chief financial officer.

(79) A provision of the Act or these regulations requiring or authorizing a thing to be done by or to a director and chief executive officer, manager, company secretary or chief financial officer shall not be satisfied by its being done by or to the same person acting both as director and as, or in place of, chief executive officer, manager, company secretary or chief financial officer.

#### ***The Seal***

(80) (i) The Board shall provide for the safe custody of the seal.

(ii) The seal of the company shall not be affixed to any instrument except by the authority of a resolution of the Board or of a committee of the Board authorized by it in that behalf, and except in the presence of at least two directors and of the secretary or such other person as the Board may appoint for the purpose; and those two directors and the secretary or other person aforesaid shall sign every instrument to which the seal of the company is so affixed in their presence.

#### ***Dividends and Reserve***

(81) The company in general meeting may declare dividends, but no dividend shall exceed the amount recommended by the Board.

(82) Subject to the provisions of section 123, the Board may from time to time pay to the members such interim dividends as appear to it to be justified by the profits of the company.

(83) (i) The Board may, before recommending any dividend, set aside out of the profits of the company such sums as it thinks fit as a reserve or reserves which shall, at the discretion of the Board, be applicable for any purpose to which the profits of the company may be properly applied, including provision for meeting contingencies or for equalizing dividends; and pending such application, may, at the like discretion, either be employed in the business of the company or be invested in such investments (other than shares of the company) as the Board may, from time to time, think fit.

*Handwritten signature*

*Handwritten signature*

- (d) The Board may also carry forward any profits which it may consider necessary not to divide, without setting them aside as a reserve.
- (84)(f) Subject to the rights of persons, if any, entitled to shares with special rights as to dividends, all dividends shall be declared and paid according to the amounts paid or credited as paid on the shares in respect whereof the dividend is paid, but if and so long as nothing is paid upon any of the shares in the company, dividends may be declared and paid according to the amounts of the shares.
- (g) No amount paid or credited as paid on a share in advance of calls shall be treated for the purposes of this regulation as paid on the share.
- (h) All dividends shall be apportioned and paid proportionately to the amounts paid or credited as paid on the shares during any portion or portions of the period in respect of which the dividend is paid; but if any share is issued on terms providing that it shall rank for dividend as from a particular date such share shall rank for dividend accordingly.
- (85) The Board may deduct from any dividend payable to any member all sums of money, if any, presently payable by him to the company on account of calls or otherwise in relation to the shares of the company.
- (86)(i) Any dividend, interest or other monies payable in cash in respect of shares may be paid by cheque or warrant sent through the post directed to the registered address of the holder or, in the case of joint holders, to the registered address of that one of the joint holders who is first named on the register of members, or to such person and to such address as the holder or joint holders may in writing direct.
- (j) Every such cheque or warrant shall be made payable to the order of the person to whom it is sent.
- (87) Any one of two or more joint holders of a share may give effective receipts for any dividends, bonuses or other monies payable in respect of such share.
- (88) Notice of any dividend that may have been declared shall be given to the persons entitled to share therein in the manner mentioned in the Act.
- (89) No dividend shall bear interest against the company.

### Accounts

(90) (i) The Board shall from time to time determine whether and to what extent and at what times and places and under what conditions or regulations, the accounts and books of the company, or any of them, shall be open to the inspection of members not being directors.

(ii) No member (not being a director) shall have any right of inspecting any account or book or document of the company except as conferred by law or authorised by the Board or by the company in general meeting.

### Borrowing Powers

(91) Subject to provision of the Companies Act, 2013 & rules there under the payment of any sum or sums of money for the purpose of the Company in such manner and upon such terms and conditions in all respects as it think fit and in particular by property present or future, or of the uncalled capital of the Company or by issue of bonds, debentures or debenture-stock of the Company charged upon all or any property of the Company or part thereof both present or future, including the uncalled capital for the time being, the creation of any mortgage or charge on the undertaking of the whole or any part of the undertaking.

### Winding up

(92) Subject to the provisions of Chapter XIX of the Act and rules made thereunder—

(i) If the company shall be wound up, the liquidator may, with the sanction of a special resolution of the company and any other sanction required by the Act, divide amongst the members, in specie or kind, the whole or any part of the assets of the company, whether they shall consist of property of the same kind or not.

(ii) For the purpose aforesaid, the liquidator may set such value as he deems fair upon any property to be divided as aforesaid and may determine how such division shall be carried out as between the members or different classes of members.

(iii) The liquidator may, with the like sanction, vest the whole or any part of such assets in trustees upon such trusts for the benefit of the contributories if he considers necessary, but so that no member shall be compelled to accept any shares or other securities whereon there is any liability.

ABand

### **Indemnity**

- (93) Every officer of the company shall be indemnified out of the assets of the company against any liability incurred by him in defending any proceedings, whether civil or criminal, in which judgment is given in his favour or in which he is acquitted or in which relief is granted to him by the court or the Tribunal.

### **Secrecy**

- (94) Every Director, Auditor, Trustee, Member of a Committee, Officer, Servant, Agent, Accountant or other persons employed in the business of the company shall if so required by the directors before entering upon his duties sign a declaration pledging himself to observe strict secrecy, respecting all transactions of the company with its customers and the State of Accounts with individuals and in matters relating thereto and shall on such declaration pledge himself not to reveal any of the matters which may come to his knowledge in the discharge of his duties except when required so by the Director or by any meeting or by a Court of law and except so far as may be necessary in order to comply with any of the provisions in these presents contained.

.....  
Signed

For

We the several persons, whose names, addresses and description are subscribed, hereunder are desirous of being formed into a Company in pursuance of these Articles of Association:

| S. No                            | Names, addresses, Descriptions and Occupation of subscribers                                 | No. of Equity Shares taken by each Subscriber | Signature of Subscribers | Signature, Name, Address, Description & Occupation of Witnesses                                                                                   |
|----------------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                               | Pratul Chandra C. Dholakia<br>Kumhar Para, Pafadli<br>Raipur (C.G.) 492009,<br>Industrialist | 100<br>(One<br>Hundred<br>Shares)             | Sd/-                     | Witness to the signature<br>of Subscriber No. 1 to 3<br><br>Sd/-<br>G.S. Agrawal<br>Chartered Accountant<br>Jawahar Nagar Raipur<br>(C.G.) 492001 |
| 2.                               | Vipul P. Dholakia<br>Kumhar Para, Pafadli<br>Raipur (C.G.) 492009,<br>Engineer               | 100<br>(One<br>Hundred<br>Shares)             | Sd/-                     |                                                                                                                                                   |
| 3.                               | Manish P. Dholakia<br>Kumhar Para, Pafadli<br>Raipur (C.G.) 492009,<br>Engineer              | 100<br>(One<br>Hundred<br>Shares)             | Sd/-                     |                                                                                                                                                   |
| TOTAL NUMBER OF EQUITY<br>SHARES |                                                                                              | 300                                           | (Three Hundred Shares)   |                                                                                                                                                   |

Place: Raipur  
Date: 16/02/1994

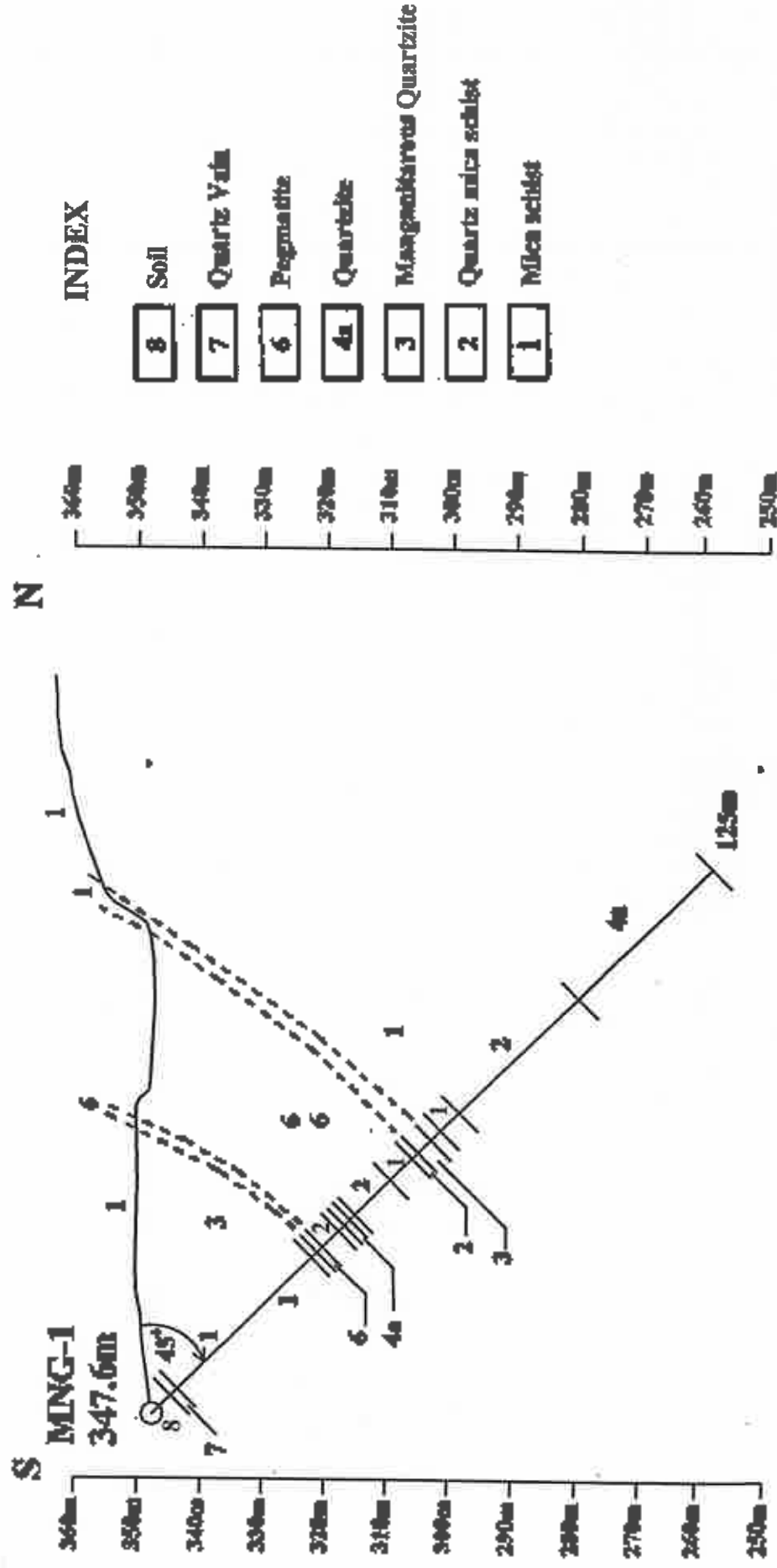




# EXPLORATION FOR Mn ORE IN GUGULDOH BLOCK, RAMTEK TAHSIL, NAGPUR DISTRICT, MAHARASHTRA GEOLOGICAL CROSS - SECTION ALONG BOREHOLE No. MNG-1

1 10 20 30 40 METRES

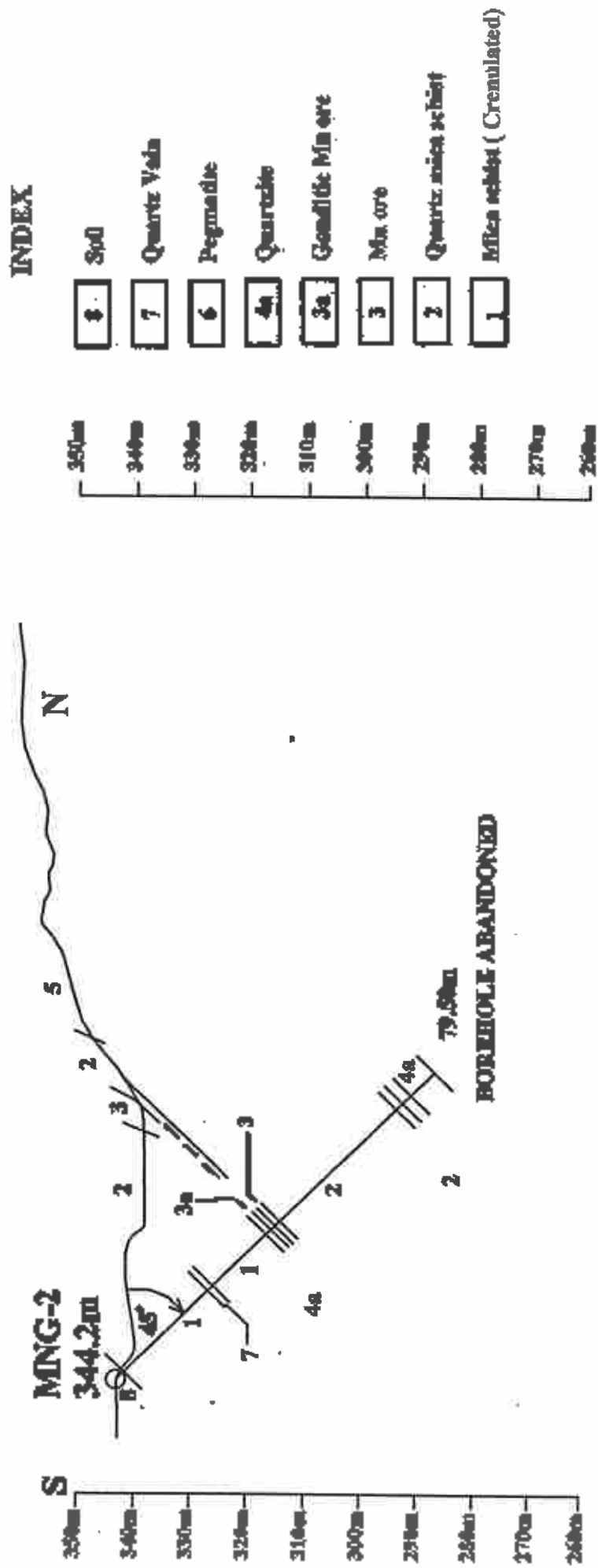
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Mapped by - S.N. Mashram, Geologist (Sr.)  
F.S.1999-2000

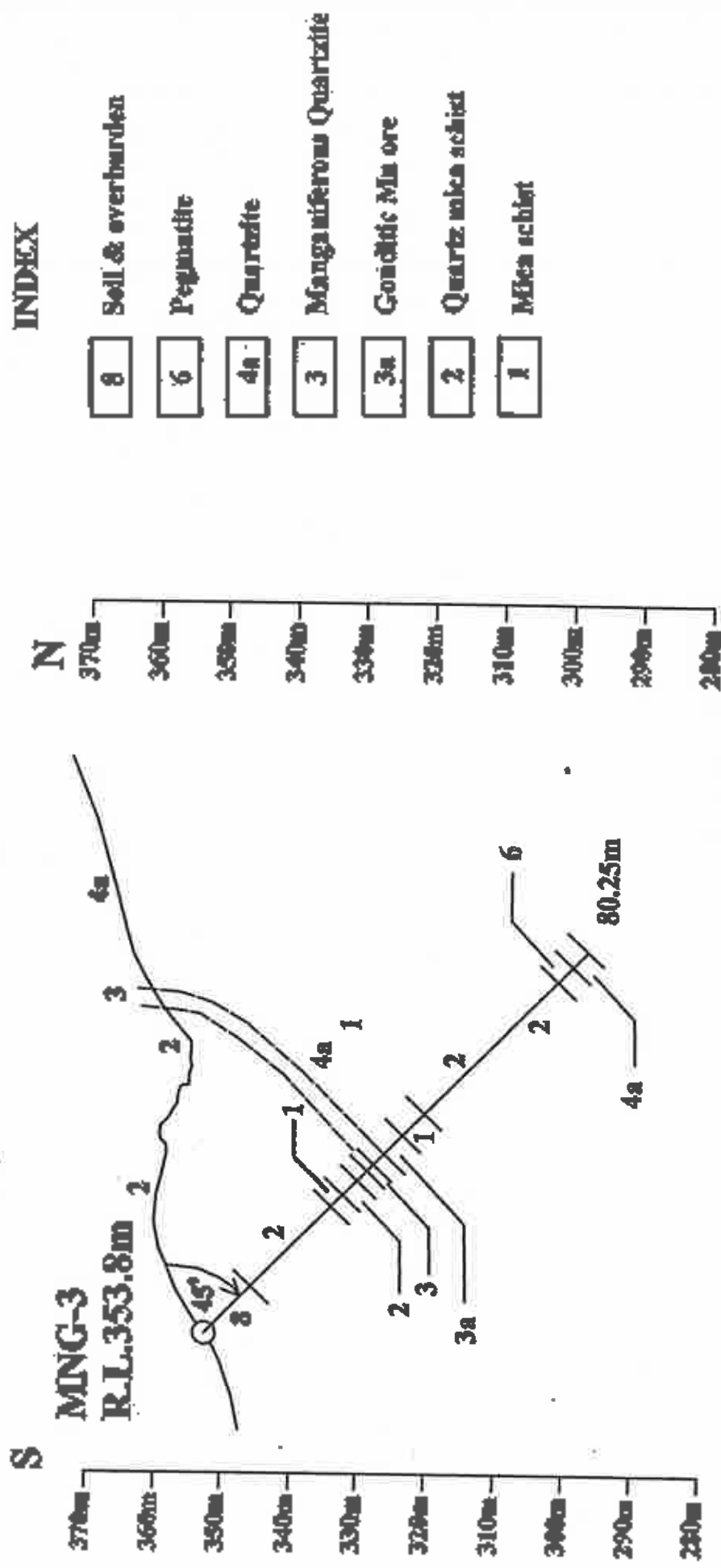
**EXPLORATION FOR Mn ORE IN GUGULDOH BLOCK, RAMTEK TAHSIL,  
NAGPUR DISTRICT, MAHARASHTRA  
GEOLOGICAL CROSS - SECTION ALONG BOREHOLE No. MNG-2**

0 10 20 30 40 50 METRE  
SCALE - 1:1000



Mapped by - S.N. Meshram, Geologist (Sr.)  
P.S. 1999-2000

# EXPLORATION FOR Mn ORE IN GUGULDOH BLOCK, RAMTEK TAHSIL, NAGPUR DISTRICT, MAHARASHTRA GEOLOGICAL CROSS - SECTION ALONG BOREHOLE No. MNG-3

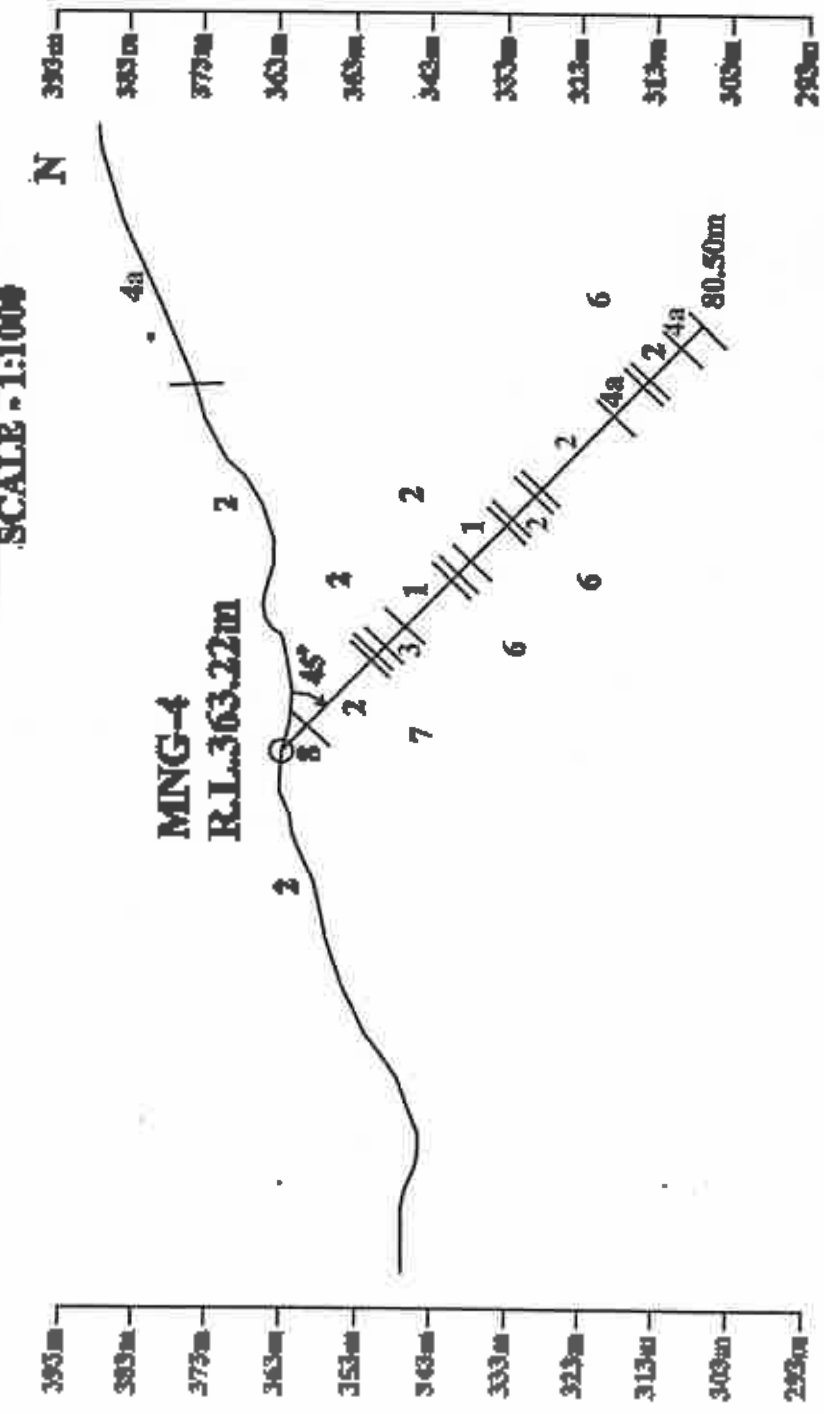


Mapped by - S.N. Meshram, Geologist (Sr.)  
F.S. 1999-2000

# INVESTIGATION FOR Mn ORE IN GUGULDOH BLOCK, RAMTEK TAHSIL, NAGPUR DISTRICT, MAHARASHTRA GEOLOGICAL CROSS - SECTION ALONG BOREHOLE No. MNG-4

0 10 20 30 40 METRES

SCALE - 1:1000

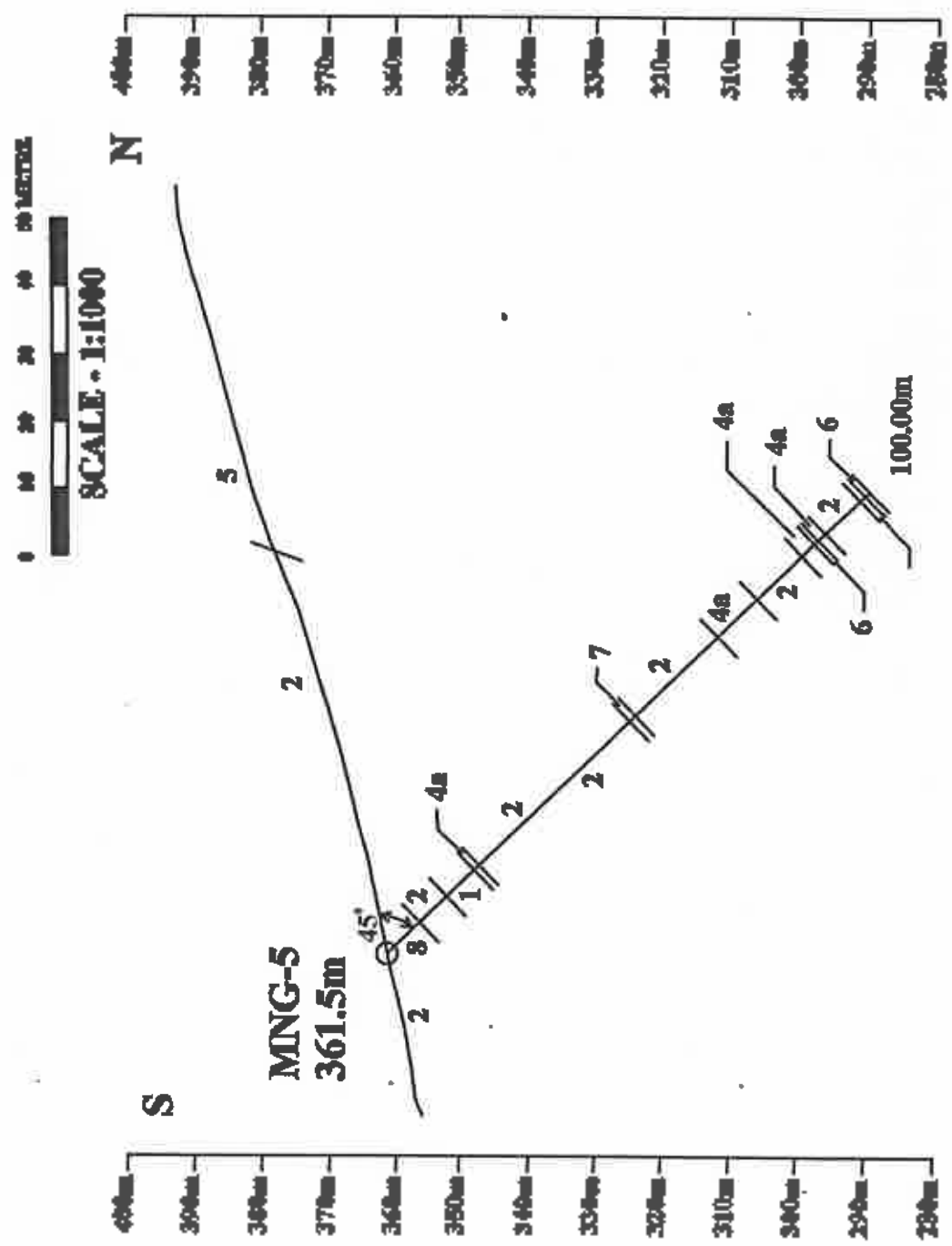


## INDEX

- 8 Overburden
- 7 Quartz vein
- 6 Pegmatite
- 4a Quartzite
- 3 Mn ore
- 2 Quartz mica schist
- 1 Mica schist

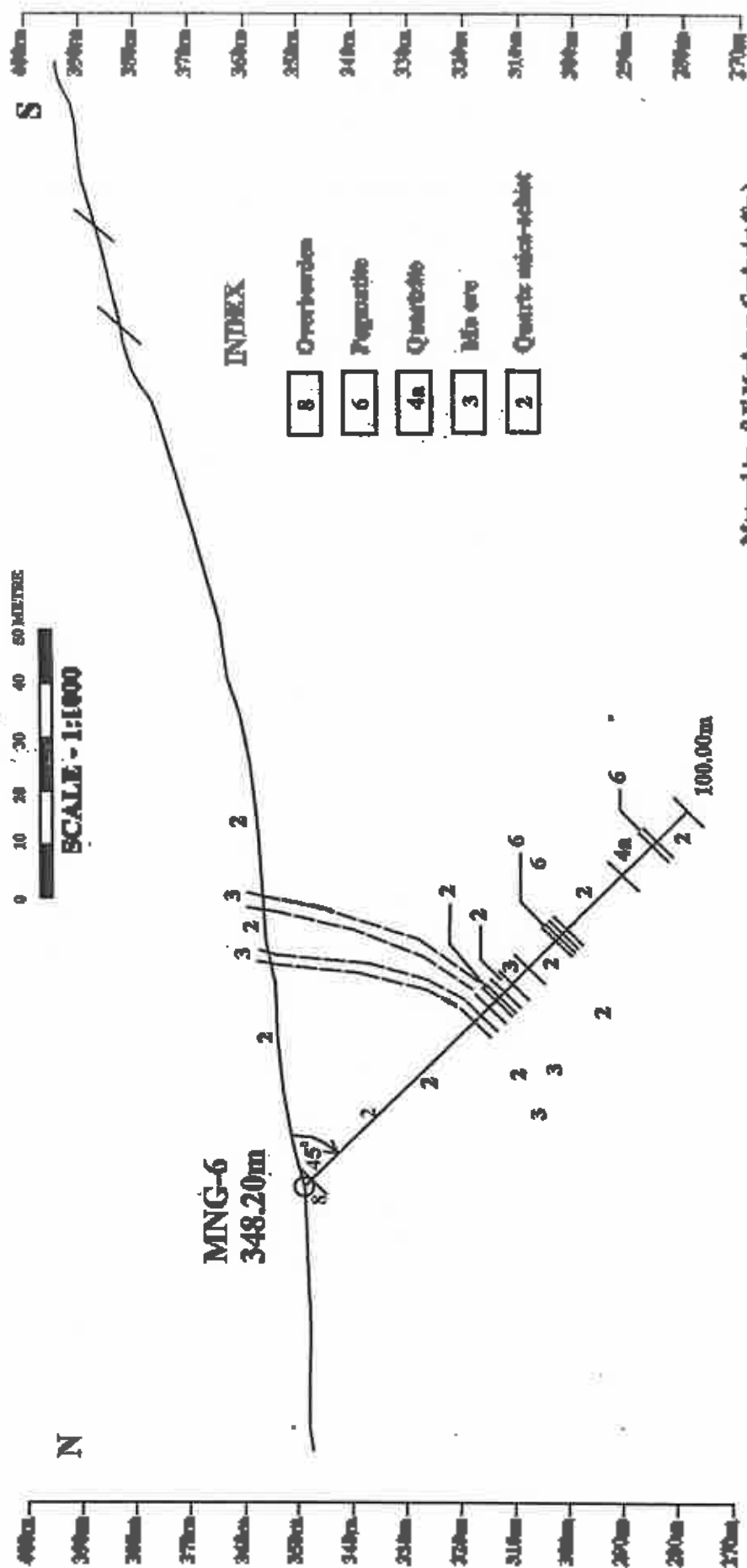
Mapped by - S.N. Meheram, Geologist (Sr.)  
P.S. 1993-2000

# EXPLORATION FOR Mn ORE IN GUGULDOH BLOCK, RAMTEK TAHSIL, NAGPUR DISTRICT, MAHARASHTRA GEOLOGICAL CROSS - SECTION ALONG BOREHOLE No. MNG-5



Mapped by - B.N. Mohanram, Geologist (Sr.)  
P.R.1999-2000

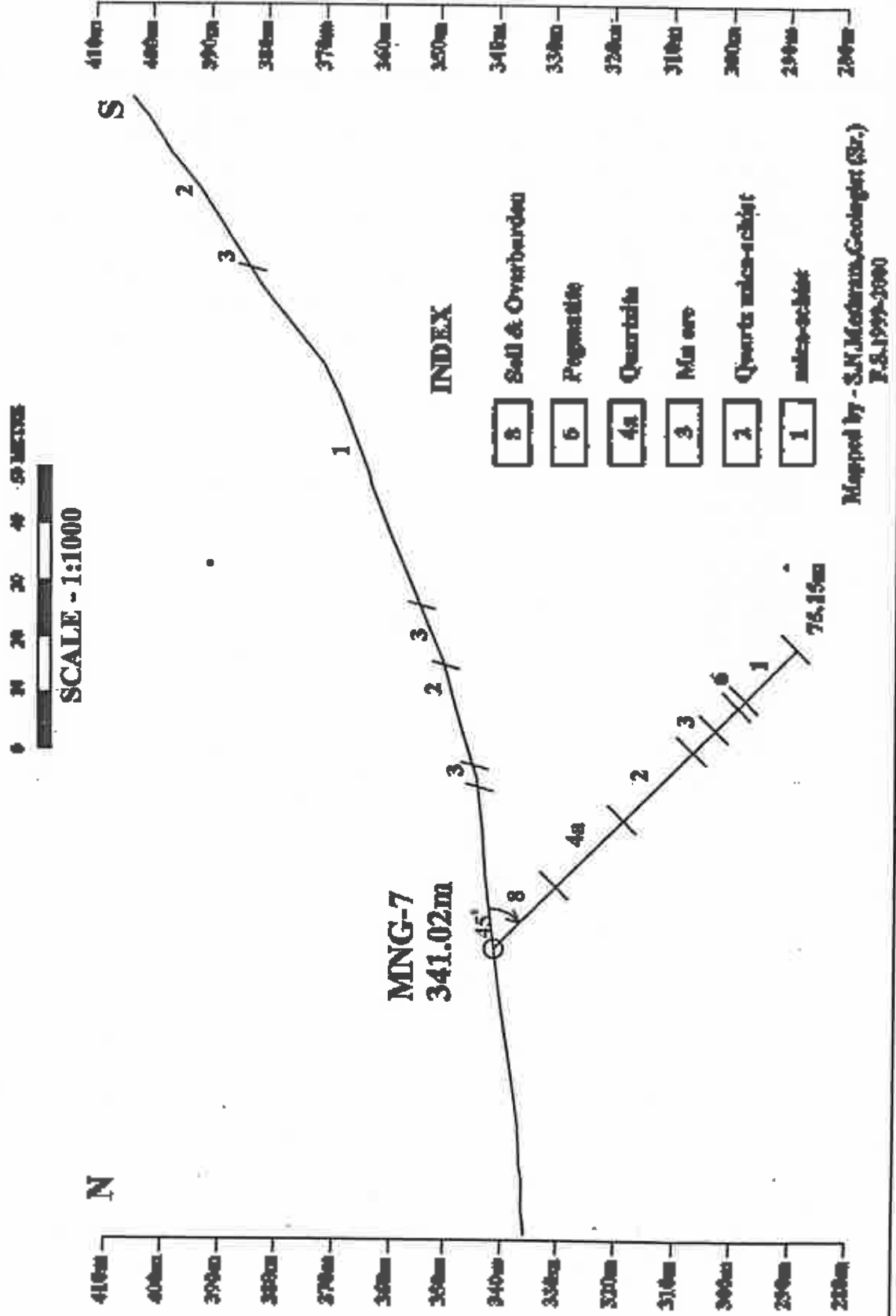
**EXPLORATION FOR Mn ORE IN GUGULDOH BLOCK, RAMTEK TAHSIL,  
NAGPUR DISTRICT, MAHARASHTRA  
GEOLOGICAL CROSS - SECTION ALONG BOREHOLE No. MNG-6**



Mapped by - S.H. Mahabum, Geologist (Sr.)  
F.A.1999-2000

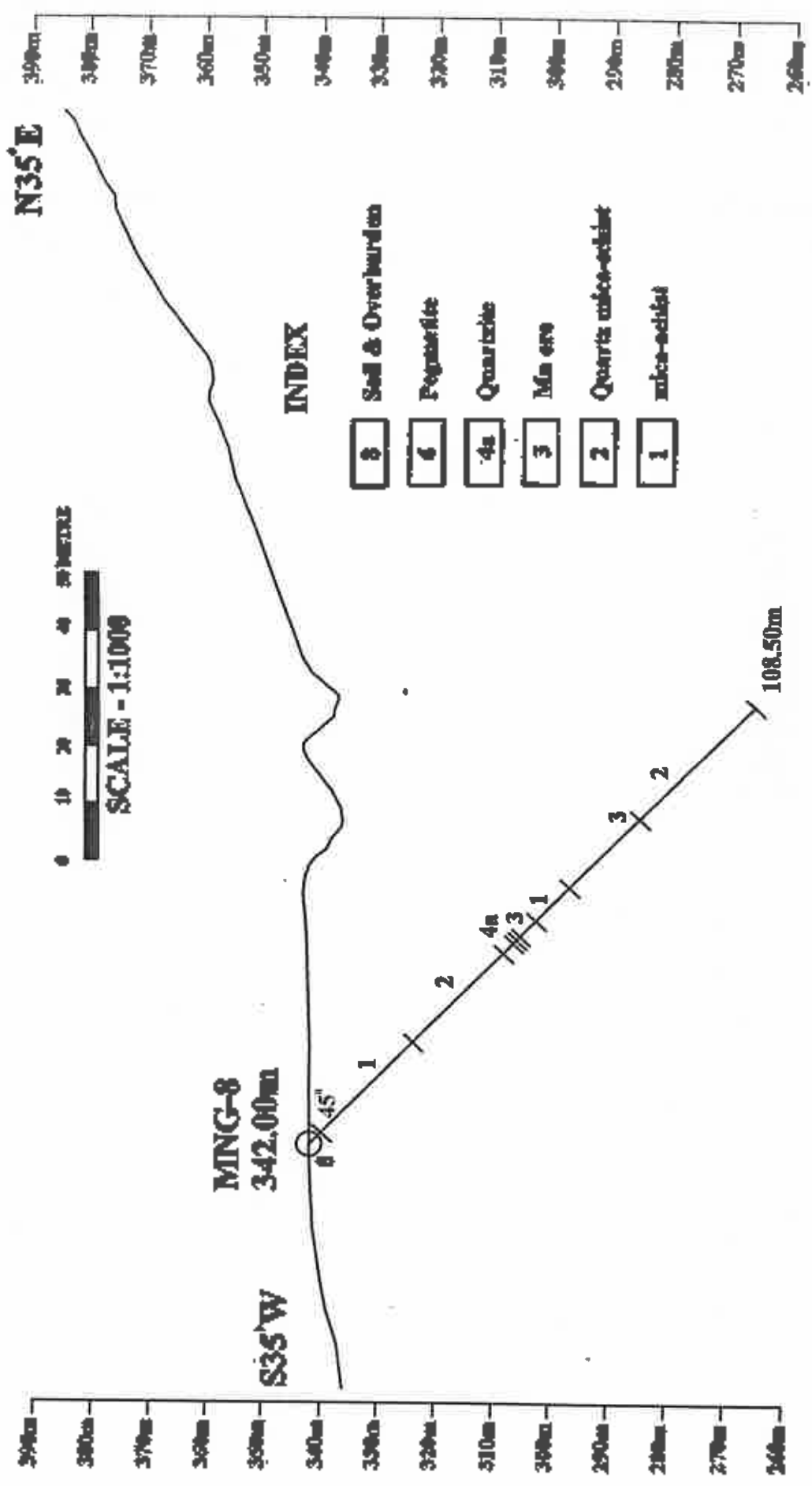


# EXPLORATION FOR Mn ORE IN GUGULDOH BLOCK, RAMTEK TAHSIL, NAGPUR DISTRICT, MAHARASHTRA GEOLOGICAL CROSS - SECTION ALONG BOREHOLE No. MNG-7

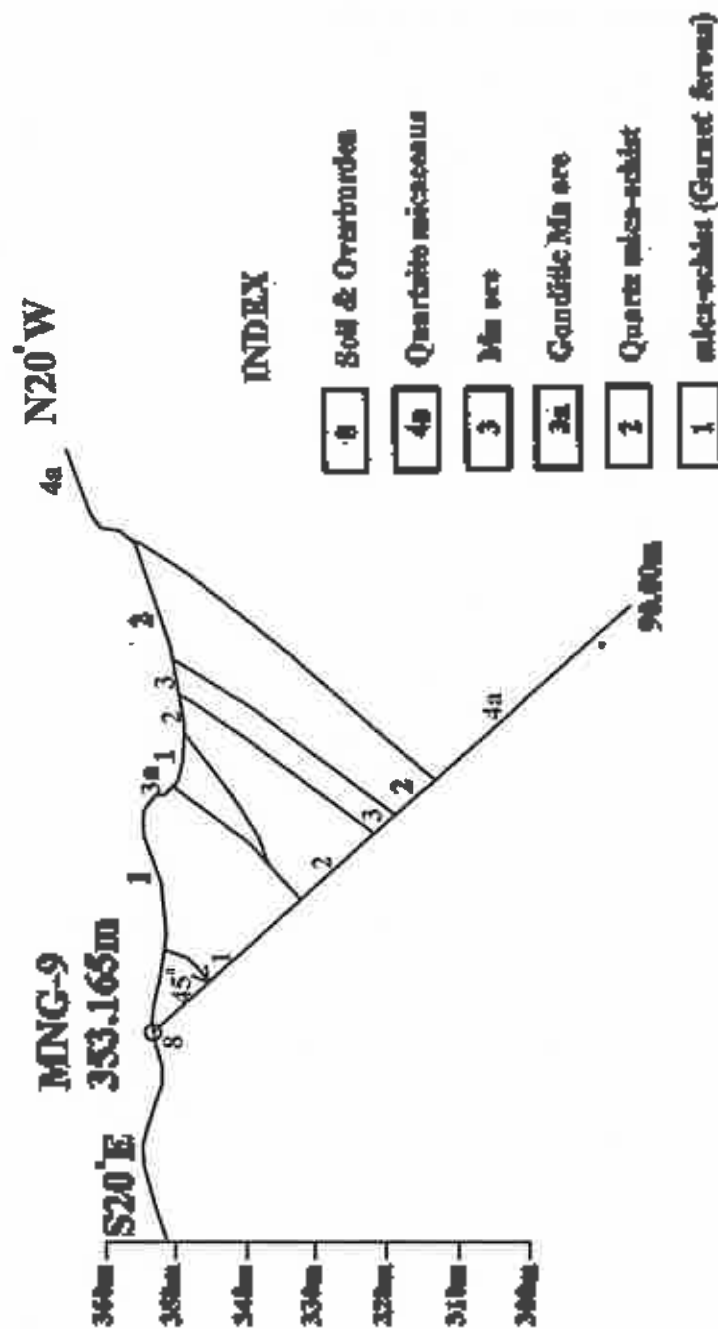


Mapped by - S.N. Moharana, Geologist (Sr.)  
P.S. 1999-2000

# EXPLORATION FOR Mn ORE IN GUGULDOH BLOCK, RAMTEK TAHSIL, NAGPUR DISTRICT, MAHARASHTRA GEOLOGICAL CROSS - SECTION ALONG BOREHOLE No. MNG-8



**EXPLORATION FOR  $Mn$  ORE IN GUGULDOH BLOCK, RAMTEK TAHSIL,  
NAGPUR DISTRICT, MAHARASHTRA  
GEOLOGICAL CROSS - SECTION ALONG BOREHOLE No. MNG-9**

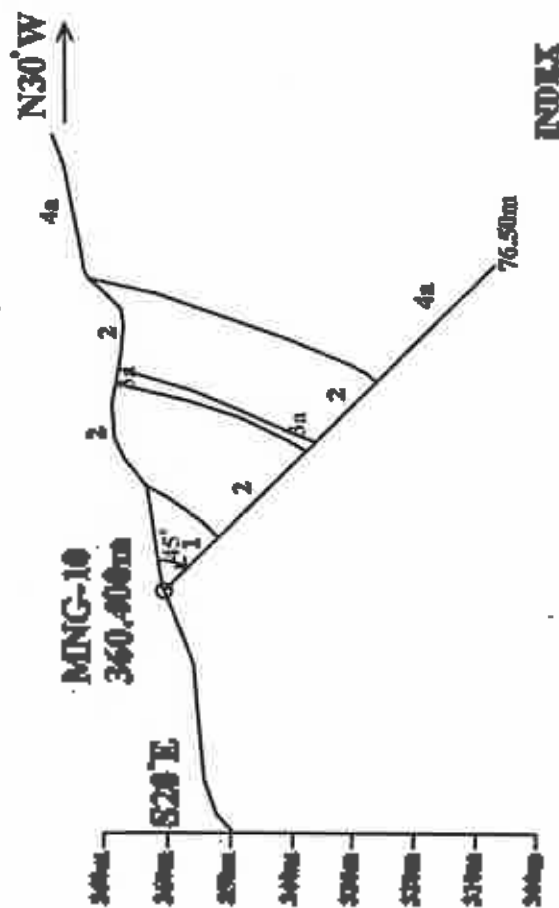


Mapped by - M. Chandrahar, Geologist (Jr.)  
F.S. 1999-2000

**EXPLORATION FOR Mn ORE IN GUGULDOH BLOCK, RAMTEK TAHSIL,  
NAGPUR DISTRICT, MAHARASHTRA  
GEOLOGICAL CROSS - SECTION ALONG BOREHOLE No. MNG-10**



SCALE - 1:1000



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| 8  | Soil & Overburden           |
| 4a | Quartzite micaceous         |
| 3a | Gneissic Mn ore             |
| 2  | Quartz mica-schist          |
| 1  | mica-schist (Garnetiferous) |

Mapped by - M. Chaudhary, Geologist (G.)  
B.A. 1599-2000

**EXPLORATION FOR Mn ORE IN GUGULDOH BLOCK, RAMTEK TAHSIL,  
NAGPUR DISTRICT, MAHARASHTRA  
GEOLOGICAL CROSS - SECTION ALONG BOREHOLE No. MNG-11**

0 10 20 30 40 50 METRE



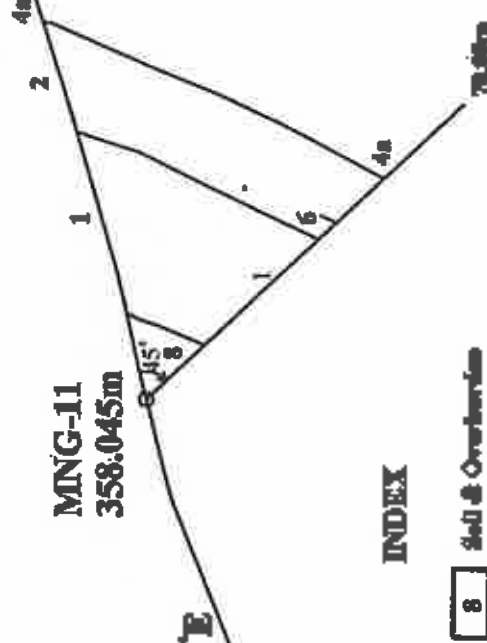
SCALE - 1:1000

N20°W

38m  
36m  
34m  
32m  
30m  
28m  
26m  
24m  
22m  
20m

S20°E

MNG-11  
358.045m

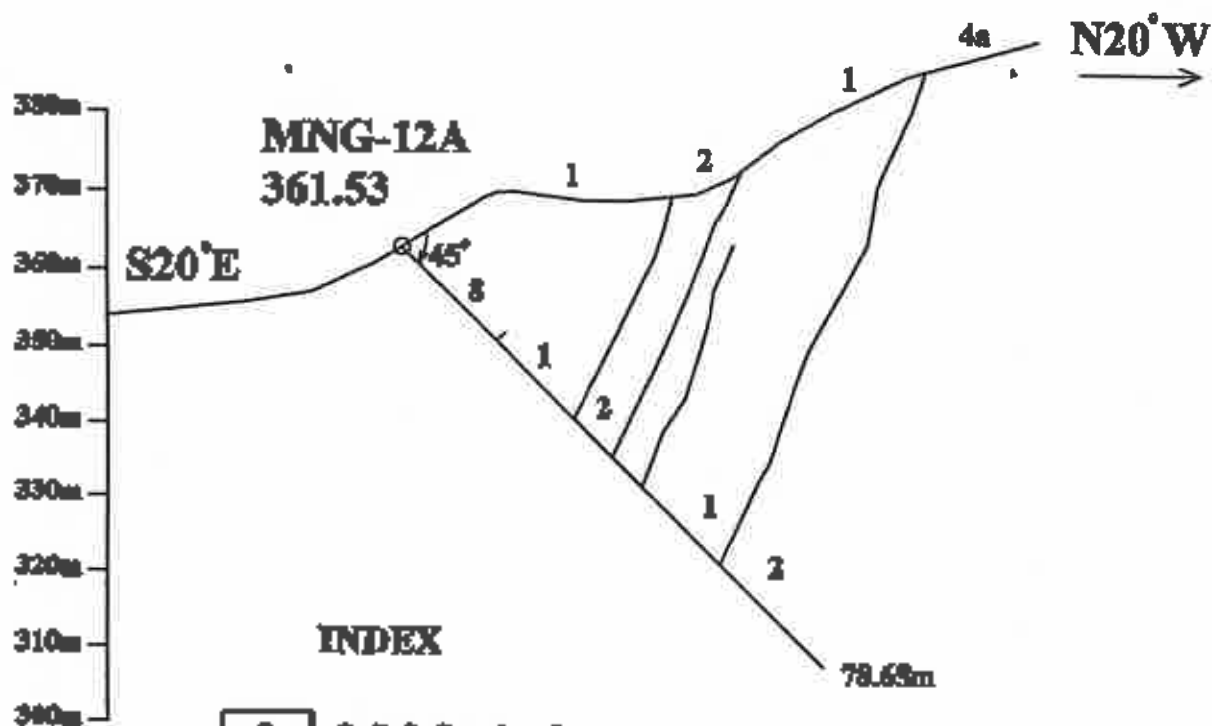


**INDEX**

- 8** Silt & Overburden
- 4a** Quartzite calcareous
- 6** Fragments with fossiliferous
- 2** Quartz mica-schist
- 1** mica-schist

**EXPLORATION FOR Mn ORE IN GUGULDOH BLOCK, RAMTEK TAHSIL,  
NAGPUR DISTRICT, MAHARASHTRA  
GEOLOGICAL CROSS - SECTION ALONG BOREHOLE No. MNG-12A**

0 10 20 30 40 50 METRE  
SCALE - 1:2000



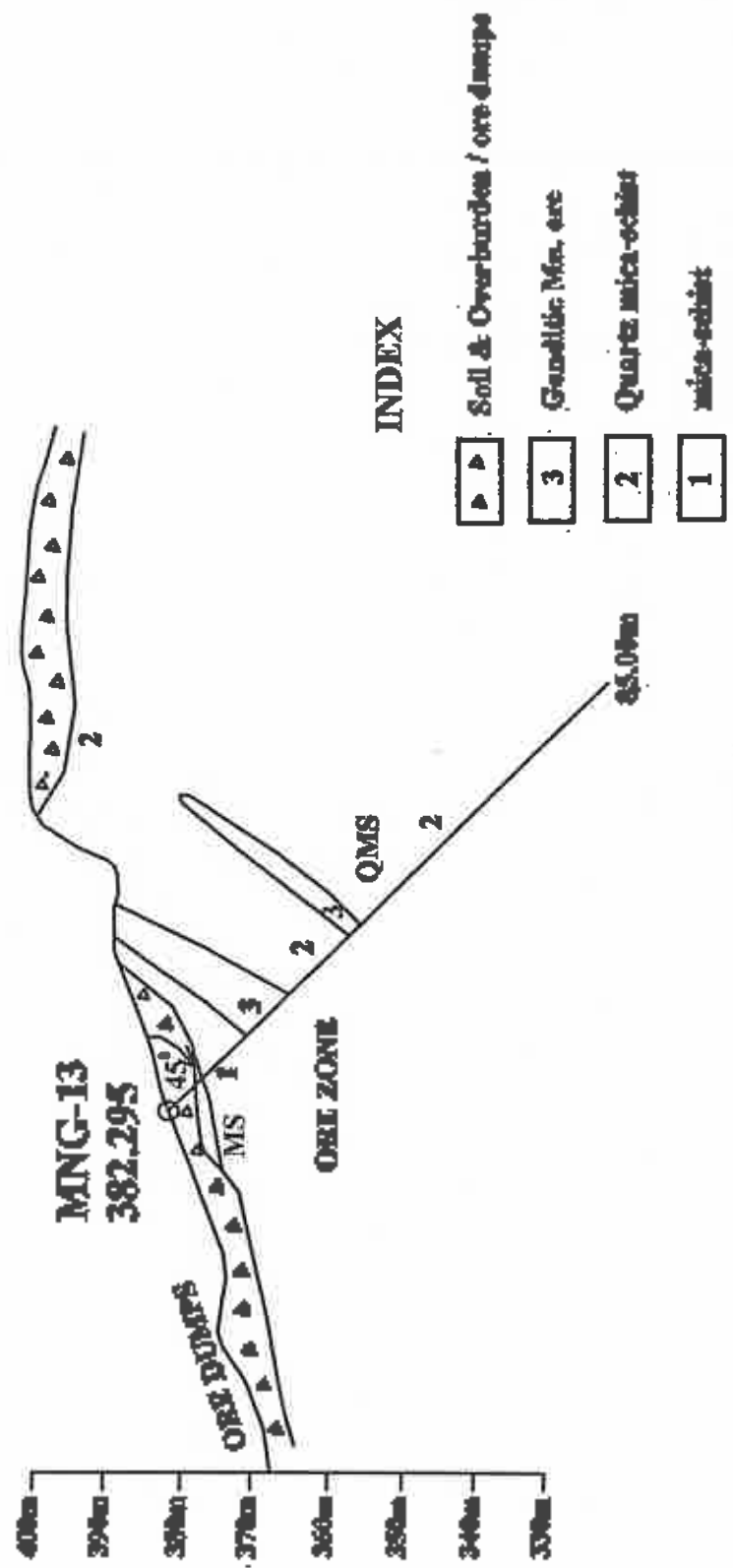
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|----|-----------------------------|
| 8  | Soil & Overburden           |
| 4a | Quartzite micaceous         |
| 3  | Mn ore                      |
| 2  | Quartz mica-schist          |
| 1  | mica-schist (Garnetiferous) |

Mapped by - M. Chandradar, Geologist (Jr.)  
P.S. 1999-2000

EXPLORATION FOR Mn ORE IN GUGULDOH BLOCK, RAMTEK TAHSIL,  
NAGPUR DISTRICT, MAHARASHTRA  
GEOLOGICAL CROSS - SECTION ALONG BOREHOLE No. MNG-13

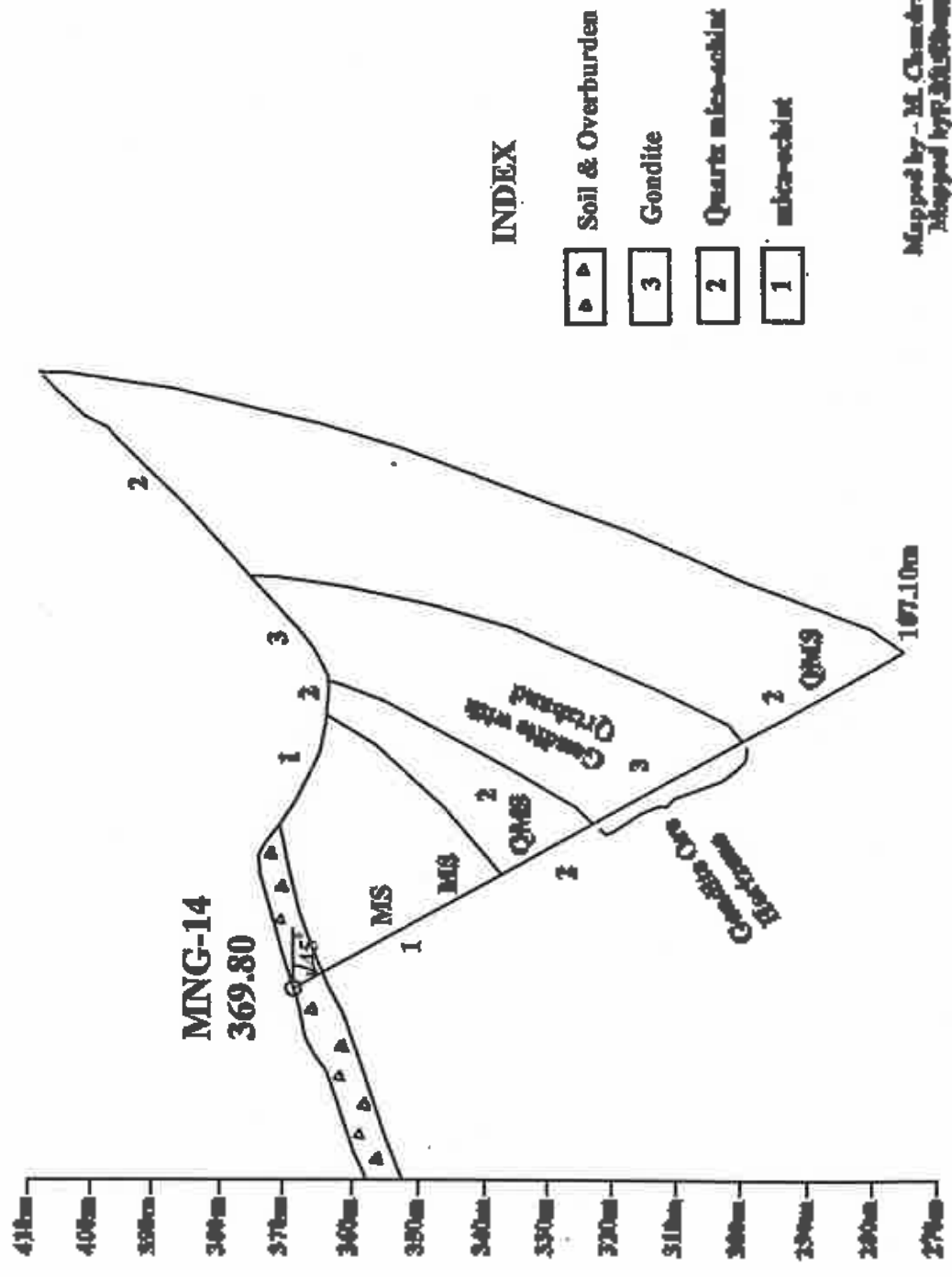
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**EXPLORATION FOR Mn ORE IN GUGULIONH BLOCK, RAMTEK TAHSIL,  
NAGPUR DISTRICT, MAHARASHTRA  
GEOLOGICAL CROSS - SECTION ALONG BOREHOLE No. MNG-14**

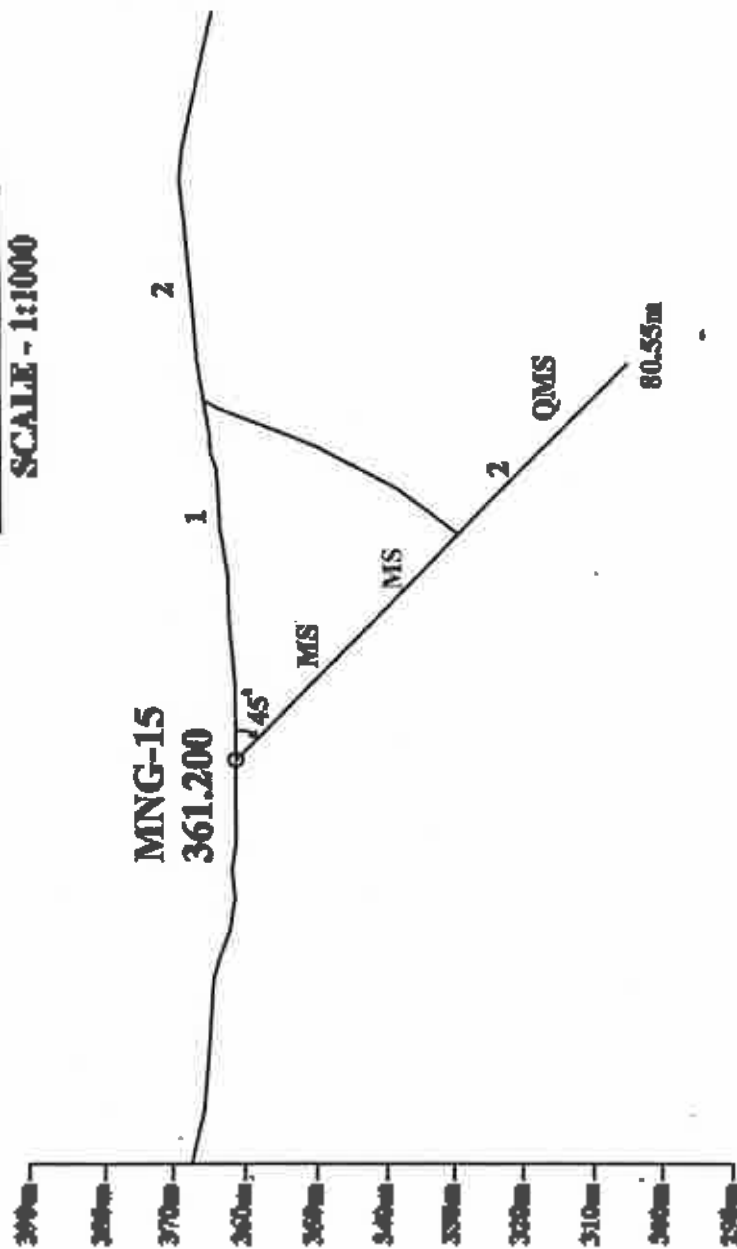
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Mapped by - M. Chandraiah, Geologist (Sr.)  
Mapped by T. M. S. Chandraiah, Geologist (Jr.)  
R.G. 1993-2000

EXPLORATION FOR Mn ORE IN GUGULDOH BLOCK, RAMTEK TAHSIL,  
NAGPUR DISTRICT, MAHARASHTRA  
GEOLOGICAL CROSS - SECTION ALONG BOREHOLE No. MNG-15

0 10 20 30 40 METRES  
SCALE - 1:1000

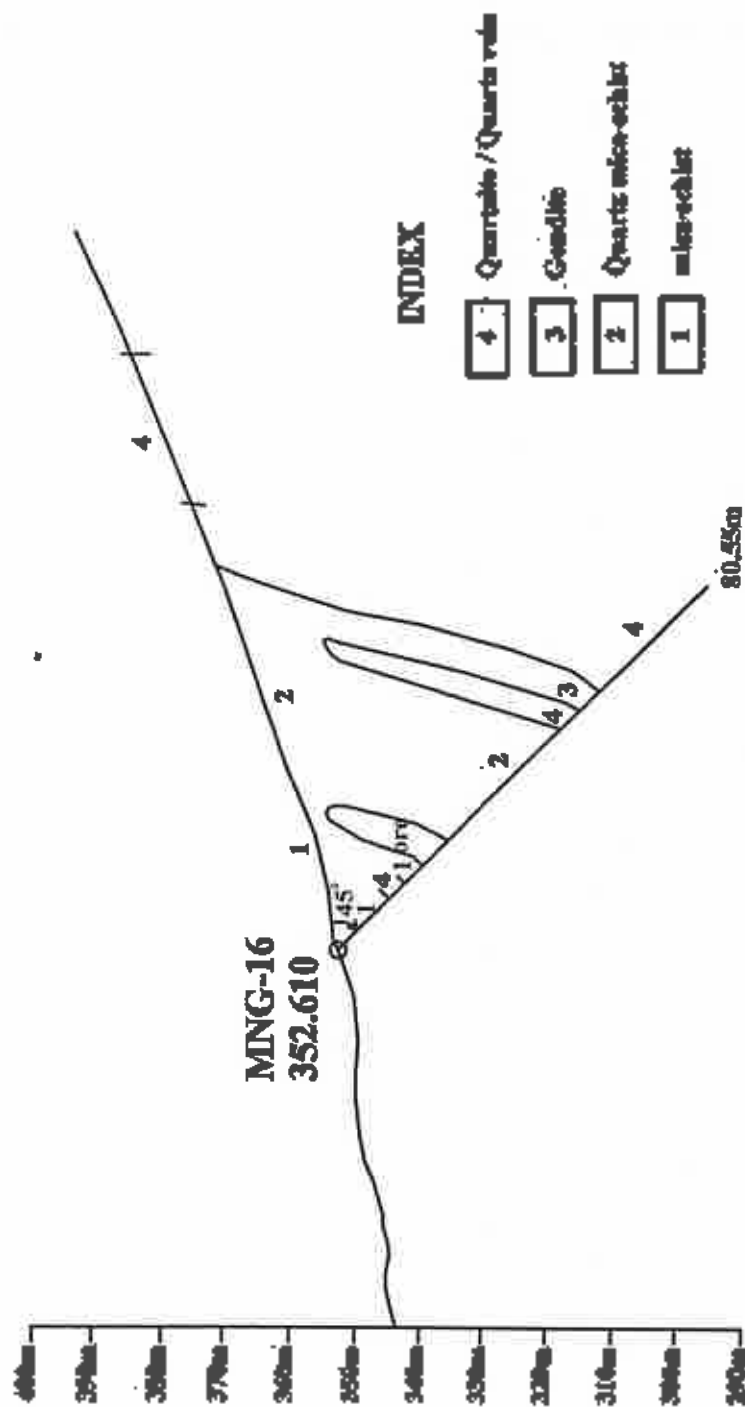


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|   |                    |
|---|--------------------|
| S | Soil               |
| 2 | Quartz mica-schist |
| 1 | mica-schist        |

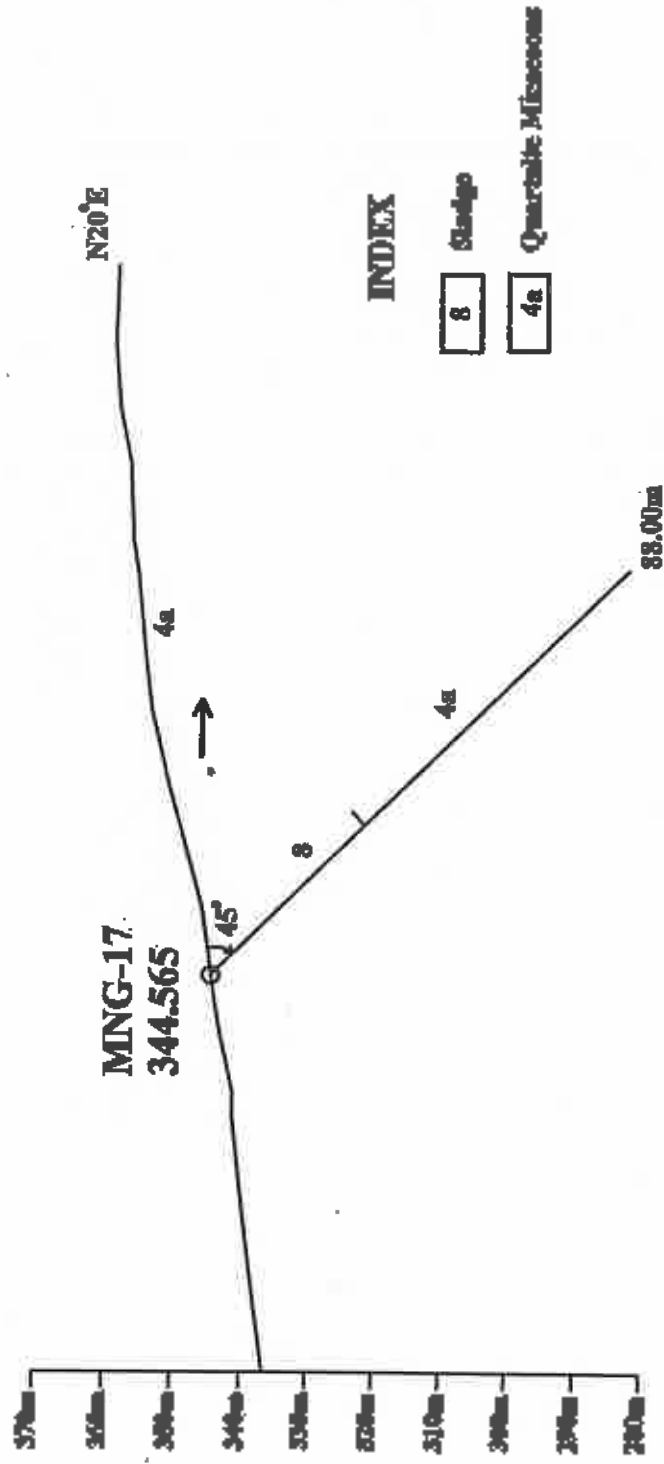
EXPLORATION FOR  $Mn$  ORE IN GUGULDOH BLOCK, RAMTEK TAHSIL,  
NAGPUR DISTRICT, MAHARASHTRA  
GEOLOGICAL CROSS - SECTION ALONG BOREHOLE No. MNG-16

0 10 20 30 40 50 METRE  
SCALE - 1:1000



**EXPLORATION FOR  $Mn$  ORE IN GUGULDOH BLOCK, RAMTEK TAHSIL,  
NAGPUR DISTRICT, MAHARASHTRA  
GEOLOGICAL CROSS - SECTION ALONG BOREHOLE No. MNG-17**

0 10 20 30 40 METRE  
SCALE - 1:1000

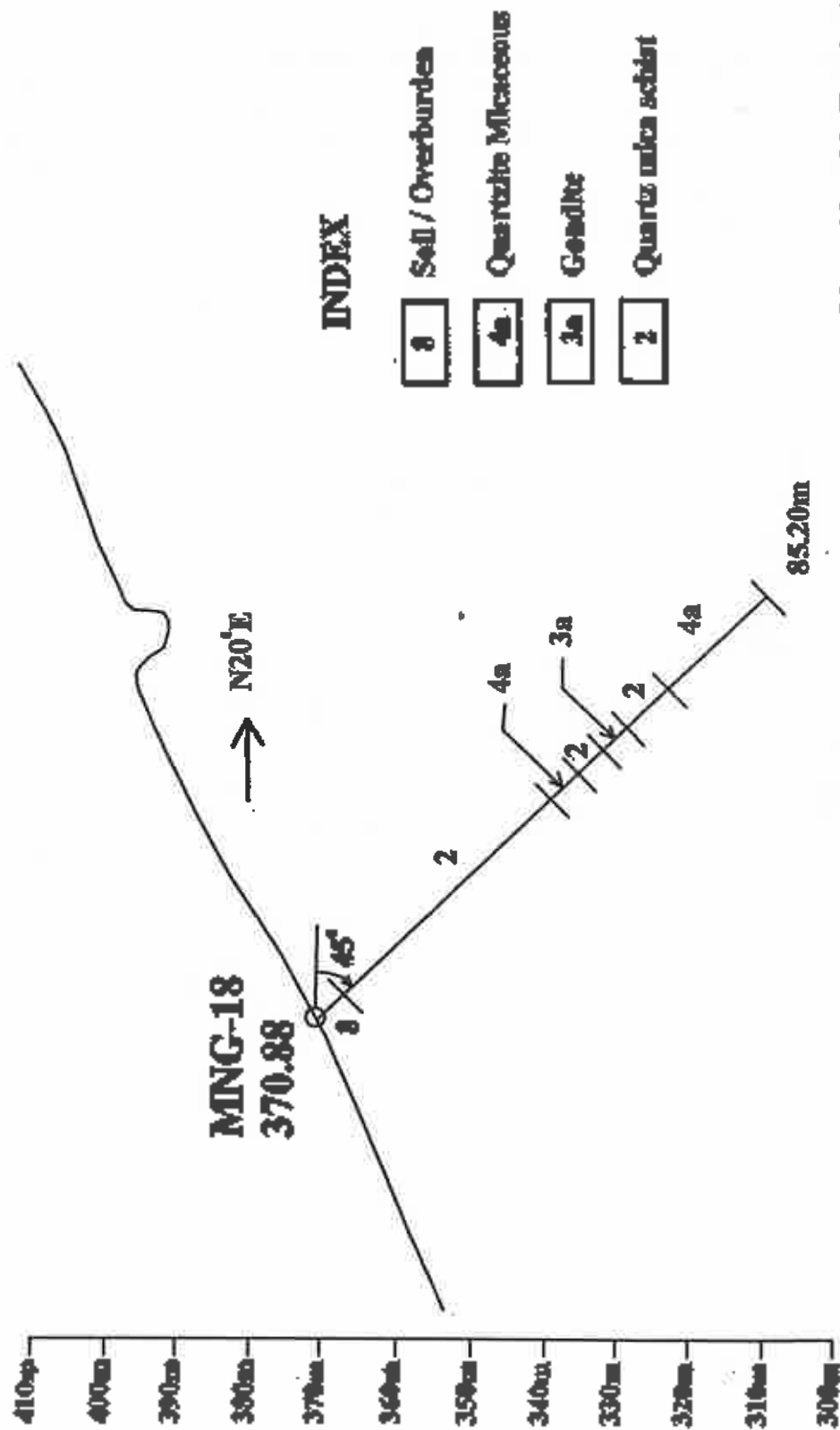


**EXPLORATION FOR Mn ORE IN GUGULDOH BLOCK, RAMTEK TAHSIL,  
NAGPUR DISTRICT, MAHARASHTRA  
GEOLOGICAL CROSS - SECTION ALONG BOREHOLE No. MNG-18**

0 10 20 30 40 50 METRES



SCALE - 1:1000



## Annexure 5

**SUMMARISED LITHOLOG OF MNG-1**

BORE HOLE NO: MNG-1  
 R.L AT COLLAR: 347.5m  
 ANGLE: 45  
 BEARING: DUE NORTH  
 DATE OF COMMENCEMENT: 15-11-1999  
 DATE OF COMPLETION: 24-12-1999  
 TOTAL DEPTH DRILLED: 125.00m

| FROM (m) | TO (m) | LITHOLOGICAL DESCRIPTION |
|----------|--------|--------------------------|
| 00.00    | 2.50   | Soil + overburden        |
| 2.50     | 3.00   | White quartz vein        |
| 3.00     | 36.00  | Crenulated mica schist   |
| 36.00    | 36.4   | Manganiferous- quartzite |
| 36.40    | 36.90  | Pegmatite                |
| 36.90    | 40.57  | Quartz mica schist       |
| 40.97    | 42.30  | Pegmatite                |
| 42.30    | 42.95  | Quartzite                |
| 42.95    | 43.16  | Pegmatite                |
| 43.16    | 53.00  | Quartz mica schist       |
| 53.00    | 57.85  | Crenulated mica schist   |
| 57.85    | 58.75  | Quartz mica schist       |
| 58.75    | 61.89  | Manganiferous quartzite  |
| 61.89    | 64.00  | Quartz mica schist       |
| 64.00    | 67.65  | Crenulated mica schist   |
| 67.65    | 94.86  | Quartz mica schist       |
| 94.86    | 125.00 | Quartzite micaceous      |

**SUMMARISED LITHOLOG OF MNG-2**

BORE HOLE NO: MNG-2  
 R.L AT COLLAR: 344.2M  
 ANGLE: 45  
 BEARING: DUE NORTH  
 DATE OF COMMENCEMENT: 15-1-2000  
 DATE OF COMPLETION: 12-2-2000  
 TOTAL DEPTH DRILLED: 79.50M  
 LOCATION: W<sub>20-1</sub> N<sub>3-6</sub>

| FROM (m) | TO (m) | LITHOLOGICAL DESCRIPTION             |
|----------|--------|--------------------------------------|
| 00.00    | 3.00   | Soil + overburden                    |
| 3.00     | 24.00  | Garnetiferous mica schist            |
| 24.00    | 24.70  | Quartz vein white                    |
| 24.70    | 38.35  | Crenulated garnetiferous mica schist |
| 38.35    | 38.97  | Mn ore - Gonddite                    |
| 38.97    | 39.59  | Quartzite                            |
| 39.59    | 40.05  | Gonddite quartzitic Mn Ore           |
| 40.05    | 41.00  | Mn Ore                               |

|                              |       |                    |
|------------------------------|-------|--------------------|
| 410.00                       | 70.42 | Quartz mica schist |
| 70.42                        | 71.53 | White pegmatite    |
| 71.53                        | 73.53 | Quartz mica schist |
| 73.53                        | 79.50 | Quartzite          |
| -----BOREHOLE ABANDONED----- |       |                    |

### SUMMARISED LITHOLOG OF MNG-3

|                       |                                   |
|-----------------------|-----------------------------------|
| BORE HOLE NO:         | MNG-3                             |
| R.L. AT COLLAR:       | 353.8m                            |
| ANGLE:                | 45                                |
| BEARING:              | DUE NORTH                         |
| DATE OF COMMENCEMENT: | 24-2-2000                         |
| DATE OF COMPLETION:   | 21-3-2000                         |
| TOTAL DEPTH DRILLED:  | 80.25m                            |
| LOCATION              | W <sub>10</sub> N <sub>13-4</sub> |

| FROM<br>(m) | TO (m) | LITHOLOGICAL DESCRIPTION |
|-------------|--------|--------------------------|
| 00.00       | 10.20  | Soil + overburden        |
| 10.20       | 27.05  | Quartz mica schist       |
| 27.05       | 29.30  | Mica schist              |
| 29.30       | 32.30  | Quartz mica schist       |
| 32.30       | 33.85  | Quartzite                |
| 33.85       | 35.26  | Min ferrous quartzite    |
| 35.26       | 37.95  | Mica schist              |
| 37.95       | 40.21  | Gondite                  |
| 40.21       | 40.40  | Min ore                  |
| 40.40       | 41.41  | Gondite                  |
| 41.41       | 46.04  | Mica schist              |
| 46.04       | 73.98  | Quartz mica schist       |
| 73.98       | 77.25  | White pegmatite          |
| 77.25       | 80.25  | Quartzite                |

### SUMMARISED LITHOLOG OF MNG-4

|                       |                                   |
|-----------------------|-----------------------------------|
| BORE HOLE NO:         | MNG 4                             |
| R.L. AT COLLAR:       | 363.22m                           |
| ANGLE:                | 45                                |
| BEARING:              | DUE NORTH                         |
| DATE OF COMMENCEMENT: | 6-4-2000                          |
| DATE OF COMPLETION:   | 3-5-2000                          |
| TOTAL DEPTH DRILLED:  | 30.50m                            |
| LOCATION              | W <sub>10</sub> N <sub>14-5</sub> |

| FROM<br>M (m) | TO (m) | LITHOLOGICAL DESCRIPTION |
|---------------|--------|--------------------------|
| 00.00         | 5.00   | Soil + overburden        |
| 5.00          | 17.80  | Quartz mica schist       |
| 17.80         | 18.00  | White quartz vein        |
| 18.00         | 20.35  | Quartz mica schist       |
| 20.35         | 22.90  | Min ore                  |
| 22.90         | 32.25  | Mica schist              |



|       |       |                    |
|-------|-------|--------------------|
| 32.25 | 39.41 | Quartz mica schist |
| 33.41 | 36.20 | White pegmatite    |
| 36.20 | 43.25 | Mica schist        |
| 43.25 | 43.50 | White quartz vein  |
| 43.50 | 47.93 | Quartz mica schist |
| 47.93 | 48.77 | White pegmatite    |
| 48.77 | 63.20 | Quartz mica schist |
| 63.20 | 69.50 | Quartzite          |
| 69.50 | 69.95 | Pegmatite          |
| 69.95 | 76.27 | Quartz mica schist |
| 76.27 | 80.50 | Quartzite          |

### **SUMMARISED LITHOLOG OF MNG-5**

|                       |                                   |
|-----------------------|-----------------------------------|
| BORE HOLE NO:         | MNG-5                             |
| R.L. AT COLLAR:       | 361.5m                            |
| ANGLE:                | 45                                |
| BEARING:              | DUE NORTH                         |
| DATE OF COMMENCEMENT: | 15-5-2000                         |
| DATE OF COMPLETION:   | 22-6-2000                         |
| TOTAL DEPTH DRILLED:  | 100.00m                           |
| LOCATION:             | W <sub>20</sub> N <sub>20</sub> E |

| FROM (m) | TO (m) | LITHOLOGICAL DESCRIPTION |
|----------|--------|--------------------------|
| 00.00    | 7.00   | Soil + overburden        |
| 7.00     | 12.00  | Quartz mica schist       |
| 12.00    | 18.62  | Mica schist              |
| 18.62    | 18.82  | Mn-ferrous quartzite     |
| 18.82    | 51.43  | Quartz mica schist       |
| 51.43    | 51.60  | Quartz vein              |
| 51.60    | 68.60  | Quartz mica schist       |
| 68.60    | 77.40  | Quartzite                |
| 77.40    | 86.10  | Quartz mica schist       |
| 86.10    | 89.14  | Quartzite                |
| 89.14    | 89.35  | Pegmatite                |
| 89.35    | 90.80  | Quartzite                |
| 90.80    | 98.77  | Quartz mica schist       |
| 98.77    | 99.75  | Quartzite                |
| 99.75    | 100.00 | Pegmatite                |

### **SUMMARISED LITHOLOG OF MNG-6**

|                       |                                 |
|-----------------------|---------------------------------|
| R.L. AT COLLAR:       | 349.20m                         |
| ANGLE:                | 45                              |
| BEARING:              | DUE NORTH                       |
| DATE OF COMMENCEMENT: | 1-7-2000                        |
| DATE OF COMPLETION:   | 8-8-2000                        |
| TOTAL DEPTH DRILLED:  | 100.00m                         |
| LOCATION:             | W <sub>20</sub> N <sub>20</sub> |

| FROM (m) | TO (m) | LITHOLOGICAL DESCRIPTION |
|----------|--------|--------------------------|
| 00.00    | 2.25   | Overburden               |
| 2.25     | 44.50  | Quartz mica schist       |
| 44.50    | 46.10  | Mn ore                   |
| 46.10    | 46.98  | Quartz mica schist       |

|       |        |                     |
|-------|--------|---------------------|
| 46.98 | 48.96  | Mn ore              |
| 48.96 | 49.64  | Quartz mica schist  |
| 49.64 | 50.63  | Mn ore              |
| 50.63 | 52.75  | Quartz mica schist  |
| 52.75 | 57.64  | Mn ore              |
| 57.64 | 66.35  | Quartz mica schist  |
| 66.35 | 66.41  | Pegmatite           |
| 66.41 | 66.60  | Quartz mica schist  |
| 66.60 | 66.72  | Pegmatite           |
| 66.72 | 82.80  | Quartz mica schist  |
| 82.80 | 90.90  | Quartzite micaceous |
| 90.90 | 91.75  | Pegmatite           |
| 91.75 | 100.00 | Quartz mica schist  |

### **SUMMARISED LITHOLOG OF MNG-7**

|                              |                                   |
|------------------------------|-----------------------------------|
| <b>BORE HOLE NO:</b>         | <b>MNG-7</b>                      |
| <b>R.L AT COLLAR:</b>        | <b>341.02m</b>                    |
| <b>ANGLE:</b>                | <b>45</b>                         |
| <b>BEARING:</b>              | <b>DUE NORTH</b>                  |
| <b>DATE OF COMMENCEMENT:</b> | <b>22-8-2000</b>                  |
| <b>DATE OF COMPLETION:</b>   | <b>8-9-2000</b>                   |
| <b>TOTAL DEPTH DRILLED:</b>  | <b>75.15m</b>                     |
| <b>LOCATION</b>              | <b>W<sub>2</sub>N<sub>4</sub></b> |

| <b>FROM (m)</b> | <b>TO (m)</b> | <b>LITHOLOGICAL DESCRIPTION</b> |
|-----------------|---------------|---------------------------------|
| 00.00           | 15.35         | Overburden                      |
| 15.35           | 31.59         | Micaceous quartzite             |
| 31.59           | 48.75         | Quartz mica schist              |
| 48.75           | 54.75         | Gondite                         |
| 54.75           | 60.63         | Mica schist                     |
| 60.63           | 62.00         | Pegmatite                       |
| 62.00           | 75.15         | Mica schist                     |

### **SUMMARISED LITHOLOG OF MNG-8**

|                              |                                   |
|------------------------------|-----------------------------------|
| <b>BORE HOLE NO:</b>         | <b>MNG-8</b>                      |
| <b>R.L AT COLLAR:</b>        | <b>342.00m</b>                    |
| <b>ANGLE:</b>                | <b>45°</b>                        |
| <b>BEARING:</b>              | <b>N35°E</b>                      |
| <b>DATE OF COMMENCEMENT:</b> |                                   |
| <b>DATE OF COMPLETION:</b>   |                                   |
| <b>TOTAL DEPTH DRILLED:</b>  | <b>108.50m</b>                    |
| <b>LOCATION</b>              | <b>W<sub>2</sub>N<sub>4</sub></b> |

| <b>FROM (m)</b> | <b>TO (m)</b> | <b>LITHOLOGICAL DESCRIPTION</b> |
|-----------------|---------------|---------------------------------|
| 00.00           | 3.00          | Soil and overburden             |
| 3.00            | 25.00         | Mica schist                     |
| 25.00           | 47.62         | Quartz mica schist Mn ore       |
| 47.62           | 50.15         | Quartzite micaceous             |
| 50.15           | 50.25         | Pegmatite                       |
| 50.25           | 51.55         | Quartzite micaceous             |
| 51.55           | 55.25         | Gondite                         |
| 55.25           | 74.70         | Mica schist                     |
| 74.70           | 78.37         | Quartz mica schist              |

|        |        |                     |
|--------|--------|---------------------|
| 78.37  | 80.25  | Gondite             |
| 80.25  | 82.25  | Quartz mica schist  |
| 82.25  | 102.20 | Micaceous quartzite |
| 102.20 | 108.50 | Quartz mica schist  |

### **SUMMARISED LITHOLOG OF MNG-9**

|                              |                                      |
|------------------------------|--------------------------------------|
| <b>BORE HOLE NO:</b>         | <b>MNG-9</b>                         |
| <b>R.L AT COLLAR:</b>        | <b>353.165m</b>                      |
| <b>ANGLE:</b>                | <b>45°</b>                           |
| <b>BEARING:</b>              | <b>N20°W</b>                         |
| <b>DATE OF COMMENCEMENT:</b> | <b>18.10.00</b>                      |
| <b>DATE OF COMPLETION:</b>   | <b>7.11.00</b>                       |
| <b>TOTAL DEPTH DRILLED:</b>  | <b>90.00m</b>                        |
| <b>LOCATION:</b>             | <b>E<sub>10</sub> N<sub>10</sub></b> |

| <b>FROM (m)</b> | <b>TO (m)</b> | <b>LITHOLOGICAL DESCRIPTION</b>                     |
|-----------------|---------------|-----------------------------------------------------|
| 00.00           | 21.80         | Micaceous soil brown colour                         |
| 21.80           | 26.00         | Garnetiferous mica schist crystallized              |
| 26.00           | 27.20         | Gondite Manganese ore with spessartite.             |
| 27.20           | 36.55         | Quartz mica schist.                                 |
| 36.55           | 41.70         | Mica schist.                                        |
| 41.70           | 45.30         | Mn ore                                              |
| 45.30           | 52.40         | Mica schist with some minor bands of manganese ore. |
| 52.40           | 78.20         | Gneiss                                              |
| 78.20           | 80.80         | Highly foliated Quartz mica schist.                 |
| 80.80           | 90.00         | Quartz mica schist.                                 |

### **SUMMARISED LITHOLOG OF MNG-10**

|                              |                                          |
|------------------------------|------------------------------------------|
| <b>BORE HOLE NO:</b>         | <b>MNG-10</b>                            |
| <b>R.L AT COLLAR:</b>        | <b>360.400m</b>                          |
| <b>ANGLE:</b>                | <b>45°</b>                               |
| <b>BEARING:</b>              | <b>N20°W</b>                             |
| <b>DATE OF COMMENCEMENT:</b> | <b>17.11.2000</b>                        |
| <b>DATE OF COMPLETION:</b>   | <b>7.12.2000</b>                         |
| <b>TOTAL DEPTH DRILLED:</b>  | <b>76.50</b>                             |
| <b>LOCATION:</b>             | <b>E<sub>10.5</sub> N<sub>16.4</sub></b> |

| <b>FROM (m)</b> | <b>To (m)</b> | <b>LITHOLOGICAL DESCRIPTION</b>                                      |
|-----------------|---------------|----------------------------------------------------------------------|
| 00.00           | 13.00         | Ferruginous garnetiferous mica schist                                |
| 13.00           | 33.50         | Foliated quartz mica schist.                                         |
| 33.50           | 35.45         | Gondite Manganese ore.                                               |
| 35.45           | 49.65         | Crystallized foliated mica schist.                                   |
| 49.65           | 61.60         | Garnetiferous quartz mica schist with penecontemporaneous structure. |
| 61.60           | 76.50         | Quartz mica schist.                                                  |

**SUMMARISED LITHOLOG OF MNG-11**

BORE HOLE NO: MNT-11  
 R.L. AT COLLAR: 358.045m  
 ANGLE: 45°  
 BEARING: N20W  
 DATE OF COMMENCEMENT: 16-12-2000  
 DATE OF COMPLETION: 6-1-2001  
 TOTAL DEPTH DRILLED: 70.00m  
 LOCATION: W<sub>27.2</sub>N<sub>21</sub>

| FROM (m) | TO (m) | LITHOLOGICAL DESCRIPTION |
|----------|--------|--------------------------|
| 00.00    | 21.90  | Overburden               |
| 21.90    | 33.70  | Micaceous quartzite      |
| 33.70    | 70.00  | Quartz mica schist       |

**SUMMARISED LITHOLOG OF MNG 12A**

BORE HOLE NO: MNG-12A  
 R.L. AT COLLAR: 361.53m  
 ANGLE: 45°  
 BEARING: N20° W  
 DATE OF COMMENCEMENT: 17.2.2001  
 DATE OF COMPLETION: 9.3.2001  
 TOTAL DEPTH DRILLED: 78.65m  
 LOCATION: W<sub>27.6</sub>N<sub>20-1</sub>

| FROM (m) | TO (m) | LITHOLOGICAL DESCRIPTION                                 |
|----------|--------|----------------------------------------------------------|
| 00.00    | 21.80  | Sludge and mica schist                                   |
| 21.80    | 32.80  | Crystalline mica schist                                  |
| 32.80    | 38.10  | Quartz mica schist, contact with Gondite towards bottom. |
| 38.10    | 44.15  | Gondite with Mn ore streaks and bands                    |
| 44.15    | 58.10  | Crystalline mica schist                                  |
| 58.10    | 78.65  | Quartz mica schist                                       |

**SUMMARISED LITHOLOG OF MNG-13**

BORE HOLE NO: MNG-13  
 R.L. AT COLLAR: 382.295m  
 ANGLE: 45°  
 BEARING: N20° W  
 DATE OF COMMENCEMENT: 23.3.2001  
 DATE OF COMPLETION: 11.4.2001  
 TOTAL DEPTH DRILLED: 85.00m  
 LOCATION: W<sub>27.2</sub>N<sub>20-2</sub>

| FROM (m) | TO (m) | LITHOLOGICAL DESCRIPTION                |
|----------|--------|-----------------------------------------|
| 00.00    | 4.25   | Soil and overburden                     |
| 4.25     | 16.00  | Ferruginous brown micaceous sludge      |
| 16.00    | 23.00  | Quartzite with Mn ore streaks and bands |
| 23.00    | 27.00  | Sludge                                  |
| 27.00    | 44.95  | Quartzite at places calcareous.         |
| 44.95    | 85.00  | Quartz mica schist                      |

**SUMMARISED LITHOLOG OF MNG-14**

BORE HOLE NO: MNG-14  
 R.L AT COLLAR: 369.800m  
 ANGLE: 60°  
 BEARING: N20° W  
 DATE OF COMMENCEMENT: 21.4.01  
 DATE OF COMPLETION: 21.5.01  
 TOTAL DEPTH DRILLED: 107.10m  
 LOCATION: W<sub>80</sub>N<sub>20</sub>

| FROM (m) | TO (m) | LITHOLOGICAL DESCRIPTION                |
|----------|--------|-----------------------------------------|
| 00.00    | 6.50   | Overburden mainly dumps                 |
| 6.50     | 36.45  | Mica schist                             |
| 36.45    | 41.75  | Sludge (mica schist)                    |
| 41.75    | 53.80  | Quartz mica schist                      |
| 53.80    | 55.80  | Quartzite with Mn ore streaks and bands |
| 55.80    | 58.25  | Gondite                                 |
| 58.25    | 80.35  | Gondite with quartz bands               |
| 80.35    | 107.10 | Cretulated quartz mica schist           |

**SUMMARISED LITHOLOG OF MNG-15**

R.L AT COLLAR: 363.200m  
 ANGLE: 45°  
 BEARING: N20° W  
 DATE OF COMMENCEMENT: 1.06.01  
 DATE OF COMPLETION: 15.06.01  
 TOTAL DEPTH DRILLED: 80.55m  
 LOCATION: W<sub>80</sub>N<sub>20</sub>

| FROM (m) | TO (m) | LITHOLOGICAL DESCRIPTION              |
|----------|--------|---------------------------------------|
| 00.00    | 21.05  | Sludge (cretulated mica schist)       |
| 21.05    | 31.60  | Ferruginous garnetiferous mica schist |
| 31.60    | 49.50  | Cretulated mica schist                |
| 49.50    | 54.85  | Micaceous quartzite                   |
| 54.85    | 80.55  | Quartz mica schist                    |

**SUMMARISED LITHOLOG OF BOREHOLE MNG16**

R.L AT COLLAR: 352.610m  
 ANGLE: 45°  
 BEARING: N20° E  
 DATE OF COMMENCEMENT: 20.06.01  
 DATE OF COMPLETION: 29.06.01  
 TOTAL DEPTH DRILLED: 80.55m  
 LOCATION: W<sub>80</sub>N<sub>20</sub>

| FROM (m) | TO (m) | LITHOLOGICAL DESCRIPTION                   |
|----------|--------|--------------------------------------------|
| 00.00    | 12.00  | Sludge mica schist                         |
| 12.00    | 15.00  | Micaceous quartzite                        |
| 15.00    | 18.00  | Garnetiferous mica schist                  |
| 18.00    | 24.00  | Quartz vein                                |
| 24.00    | 49.90  | Garnetiferous Quartz mica schist           |
| 49.90    | 52.70  | Micaceous quartzite                        |
| 52.70    | 57.46  | Manganiferous quartzite with Gondite band  |
| 57.46    | 80.55  | Quartzite mica schist with quartzite band. |

**SUMMARISED LITHOLOG OF MNG-17**

BORE HOLE NO: MNG-17  
 R.L AT COLLAR: 344.565m  
 ANGLE: 45°  
 BEARING: N70° E  
 DATE OF COMMENCEMENT: 06.07.01  
 DATE OF COMPLETION: 23.07.01  
 TOTAL DEPTH DRILLED: 88.00m  
 LOCATION: W<sub>105</sub>N<sub>21.4</sub>

| FROM (m) | TO (m) | LITHOLOGICAL DESCRIPTION                               |
|----------|--------|--------------------------------------------------------|
| 00.00    | 33.40  | Micaceous brown sludge with quartz vein towards bottom |
| 33.40    | 43.00  | Ferruginous Quartz mica schist                         |
| 43.00    | 88.00  | Ferruginous Quartzite micaceous                        |

**SUMMARISED LITHOLOG OF MNG-18**

BORE HOLE NO: MNG-18  
 R.L AT COLLAR: 370.880m  
 ANGLE: 45°  
 BEARING: N20° E  
 DATE OF COMMENCEMENT: 07.04.01  
 DATE OF COMPLETION: 05.10.01  
 TOTAL DEPTH DRILLED: 85.20m  
 LOCATION: W<sub>125</sub>N<sub>10</sub>

| FROM (m) | TO (m) | LITHOLOGICAL DESCRIPTION                  |
|----------|--------|-------------------------------------------|
| 00.00    | 4.50   | Sludge                                    |
| 4.50     | 12.60  | Quartz mica schist garnetiferous (sludge) |
| 12.60    | 44.10  | Quartz mica schist                        |
| 44.10    | 49.20  | Quartzite (micaceous)                     |
| 49.20    | 54.65  | Quartz mica schist                        |
| 54.64    | 58.40  | Gneiss                                    |
| 58.40    | 66.85  | Quartz mica schist                        |
| 66.85    | 85.20  | Quartzite with mica                       |

## CALCULATION OF RESOURCE BY QSI

### Borehole No MNG 6

Located on the western part of the central block in  $W_{50}N_{20}$  angle of the borehole in  $45^\circ$  bearing due North. Mn ore has been intersected between 320 and 310 RL and the true thickness of the intersected ore is 4.58m (apparent thickness is 6.42m) RL of the collar is 345.2m. From the longitudinal vertical section the strike influence of the borehole is 60m, and dip length is 60m

Average grade of the ore (13+16 = 29 samples)

| Apparent width<br>(intersected length in the<br>borehole) (m) | True<br>Width<br>(m) | Mn%   | P <sub>2</sub> O <sub>5</sub> % | SiO <sub>2</sub> % | Fe <sub>2</sub> O <sub>3</sub><br>% |
|---------------------------------------------------------------|----------------------|-------|---------------------------------|--------------------|-------------------------------------|
| 2.93                                                          | 2.09                 | 30.3  | 1.08                            | 20.75              | 8.68                                |
| 3.49                                                          | 2.49                 | 29.78 | 1.09                            | 21.40              | 8.86                                |

Strike length extension of these two bands is 120 m (50m on the western and 70m on the eastern side)

Dip length is 55 m (up dip direction 35 m and towards down dip direction 20 m)

Reserve calculation

Strike Length x Dip Length x True width x Specific gravity

$120m \times 55m \times 4.58 \times 3.1 = 93707 \text{ tonnes} = R_1$

### Borehole No MNG 8

Located on the western part of the central block in  $W_{40}N_{10}$  angle of the borehole in  $45^\circ$  bearing due north. Manganese ore has been intersected at 305 RL, and the true thickness of the intersected ore is 0.73m (apparent thickness is 1.03m) RL of the collar is 342.m. From the longitudinal vertical section the strike length of influence of the borehole is 120m and dip length is 55m.



**Average grade of the ore (4 samples)**

| Apparent width<br>(intersected length in the<br>borehole) (m) | True<br>Width<br>(m) | Mn% | P <sub>2</sub> O <sub>5</sub> % | SiO <sub>2</sub> % | Fe <sub>2</sub> O <sub>3</sub> % |
|---------------------------------------------------------------|----------------------|-----|---------------------------------|--------------------|----------------------------------|
| 1.03                                                          | 0.73                 | 32  | 1.12                            | 23.21              | 8.28                             |

Strike length extension of the band is 140 m (70m on the western and 70m on the eastern side)

Dip length is 57 m (up dip direction 37 m and towards down dip direction 20 m)

**Reserve calculation**

Strike Length x Dip Length x True width x Specific gravity

140m x 57m x 0.75 x 3.1 = 18554 tons =R<sub>2</sub>

**Borehole No MNG 7**

Located on the western part of the central block in W<sub>50</sub>N<sub>0</sub> angle of the borehole in 45° Bearing due North. Mn ore has been intersected at 309m. RL and the true thickness of the intersected ore is 1.92m (apparent thickness is 2.70) RL of the collar is 341.02m. From the longitudinal vertical section the strike length of influence of the borehole is 140m, dip length is 45m.

**Average grade of the ore (8 samples)**

| Apparent width<br>(intersected length<br>in the borehole)<br>(m) | True<br>Width (m) | Mn%   | P <sub>2</sub> O <sub>5</sub> % | SiO <sub>2</sub> % | Fe <sub>2</sub> O <sub>3</sub> % |
|------------------------------------------------------------------|-------------------|-------|---------------------------------|--------------------|----------------------------------|
| 2.70m                                                            | 1.92              | 28.02 | .80                             | 30.23              | 6.4                              |

Strike length extension of the band is 120 m (70m on the western and 50m on the eastern side)

Dip length is 75 m (up dip direction 50 m and towards down dip direction 25 m)

**Reserve calculation**

Strike Length x Dip Length x True width x Specific gravity

120m x 75m x 1.92x 3.1 = 53568 tons =R<sub>3</sub>

### **Borehole No MNG 2**

Located on the western part of the central block in  $W_{20.5}N_{30.5}$  angle of the borehole in  $45^\circ$  bearing due North. Mn ore has been intersected at 315 RL, and the true thickness of the intersected ore is 1.14m (apparent thickness is 1.60m) RL of the collar is 344.2m. From the longitudinal vertical section the strike length of influence of the borehole is 60m and dip length is 45m

**Average grade of the ore (17 samples)**

| <b>Apparent width<br/>(intersected<br/>length in the<br/>borehole)(m)</b> | <b>True<br/>Width<br/>(m)</b> | <b>Mn%</b>   | <b>P<sub>2</sub>O<sub>5</sub>%</b> | <b>SiO<sub>2</sub>%</b> | <b>Fe<sub>2</sub>O<sub>3</sub><br/>%</b> |
|---------------------------------------------------------------------------|-------------------------------|--------------|------------------------------------|-------------------------|------------------------------------------|
| <b>1.60</b>                                                               | <b>1.14</b>                   | <b>29.06</b> | <b>0.19</b>                        | <b>25.73</b>            | <b>8.97</b>                              |

Strike length extension of the band is 100 m (50m on the western and 50m on the eastern side)

Dip length is 45 m (up dip direction 30 m and towards down dip direction 15 m)

**Reserve calculation**

Strike Length x Dip Length x True width x Specific gravity

100m x 45m x 1.14 x 3.1 = 15903 tons =R<sub>4</sub>

### **Borehole No MNG 3**

Located on the central part of the central block in  $W_{10}N_{13.4}$  angle of the borehole in  $45^\circ$  Bearing due North. Mn ore has been intersected at 324 RL, and the true thickness of the intersected ore is 0.93m (apparent thickness is 1.30m) RL of the collar is 353.6m. From the longitudinal vertical section the strike length of influence of the borehole is 100m and dip length is 40m

**Average grade of the ore (15 samples)**

| <b>Apparent width<br/>(intersected length<br/>in the borehole)</b> | <b>True<br/>Width<br/>(m)</b> | <b>Mn%</b>  | <b>P<sub>2</sub>O<sub>5</sub>%</b> | <b>SiO<sub>2</sub>%</b> | <b>Fe<sub>2</sub>O<sub>3</sub><br/>%</b> |
|--------------------------------------------------------------------|-------------------------------|-------------|------------------------------------|-------------------------|------------------------------------------|
| <b>1.3</b>                                                         | <b>0.93</b>                   | <b>28.7</b> | <b>0.37</b>                        | <b>31.6</b>             | <b>8.89</b>                              |

Strike length extension of the band is 100 m (50m on the western and 50m on the eastern side)

Dip length is 60 m (up dip direction 40 m and towards down dip direction 20 m)

**TABLE SHOWING THE MANGANESE ORE RESOURCE CALCULATED  
FOR THE ZONES INTERSECTED IN BOREHOLE**

| Bore<br>hole<br>No                                                                                                                             | True<br>Widt<br>h(m) | Mn%   | P <sub>2</sub> O<br><sub>5</sub> % | SiO<br><sub>2</sub> % | Fe <sub>2</sub><br>O <sub>3</sub> % | Dip<br>len<br>gth | Stri<br>ke<br>len<br>gth | R= SL x DL x TW x<br>SG                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------|------------------------------------|-----------------------|-------------------------------------|-------------------|--------------------------|------------------------------------------------------------------------|
| MN<br>G-6                                                                                                                                      | 2.09                 | 30.3  | 1.08                               | 20.<br>75             | 8.68                                | 120<br>m          | 55<br>m                  | 140m x 40m x 4.58 x<br>3.1 = 93707 tons                                |
|                                                                                                                                                | 2.49                 | 29.78 | 1.09                               | 21.<br>40             | 8.86                                |                   |                          |                                                                        |
| MN<br>G-8                                                                                                                                      | 0.73                 | 32    | 1.12                               | 23.<br>21             | 8.28                                | 140<br>m          | 57<br>m                  | 140m x 57m x 0.75 x<br>3.1 = 18554 tons                                |
| MN<br>G 7                                                                                                                                      | 1.92                 | 26.02 | .80                                | 30.<br>23             | 8.4                                 | 120<br>m          | 75<br>m                  | 120m x 75m x 1.92x<br>3.1 = 53568 tons                                 |
| MN<br>G 2                                                                                                                                      | 1.14                 | 29.06 | 0.19                               | 25.<br>73             | 8.97                                | 100<br>m          | 45<br>m                  | 100m x 45m x 1.14 x<br>3.1 = 15803 tons                                |
| MN<br>G 3                                                                                                                                      | 0.93                 | 29.7  | 0.37                               | 31.<br>6              | 8.89                                | 100<br>m          | 60<br>m                  | 100m x 60m x 0.93 x<br>3.1 = 17288 tons                                |
| MN<br>G 1                                                                                                                                      | 0.94                 | 32.05 | 0.14                               | 22.<br>72             | 8.10                                | 100<br>m          | 75<br>m                  | 90m x 75m x 0.94 x<br>3.1 = 19870 tons                                 |
| $\frac{\Sigma R_1 Mn\% + R_2 Mn\% + R_3 Mn\% + R_4 Mn\% + R_5 Mn\% + R_6 Mn\%}{R_1 + R_2 + R_3 + R_4 + R_5 + R_6} = \text{Weighted av. Grade}$ |                      |       |                                    |                       |                                     |                   |                          | 216700 tons (0.216 million tons) and the average grade is 29.28% of Mn |

**REPORT ON EXPLORATION AND ASSESSMENT FOR  
MANGANESE, IN GUGULDOH BLOCK IN RAMTEK TAHSIL, NAGPUR  
DISTRICT, MAHARASHTRA**

(Item No 962/MIE/CR/MAH/1999/011)  
FSP 1999-2001

By  
**S. N. MESHRAM, GEOLOGIST (Sr)**  
and  
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## 1. INTRODUCTION

In pursuance of the annual field season programme of Geological Survey of India for the year 1999-2000 and 2000-2001, Item No MIE/CR/MAH/1999/011 exploration for manganese ore in Guguldoh block of Ramtek Tahsil, Nagpur district was carried out with the objective of assessing the manganese ore reserve in the block. Mansar Kandri belt forms an important source of low to medium grade manganese ore suitable for steel industries.

Rocks of the Sausar Group occur in broad arcuate shape with convexity towards south. Manganese ore is confined to the contact between Mansar and Chorbaoli formation. Exploration for manganese in this belt commenced since early seventy on the recommendation by Ministry of Mines to prove ferro-manganese ore in deeper horizon in existing mines and in their extension area.

Hence, investigation of manganese ore in this belt by large scale mapping (L.S.M) and then identifying promising blocks for detailed work was carried out. A 10 km x 3 km E. W trending Mn belt between Manegaon in the west and Hivra in the east through Guguldoh in Nagpur district, Maharashtra occurs flanking the southern Sausar supracrustals. Numerous abandoned Mn quarries dot the entire belt in two E-W trending parallel zones with particular concentrations at Guguldoh, Bhimalkola, Bhandarbodi and Hivra.

The Guguldoh block (55 0/7) was studied and mapped in detail on 1:2000 scale to cover 1 sq.km. area. Rock types exposed in the project area include garnetiferous mica schist, quartz mica schist, stratified Mn ore and gonditic ores, quartzite, often manganiiferous, autoclastic conglomerate / breccia and feldspathic quartzite. Pegmatite and quartz veins locally occur as intrusive.

There are four conformable bands of stratified Mn ore in the mapped area of Guguldoh block. From south to north, the bands have strike-lengths of 250 m, 720 m, 640m and 50 m respectively. They define an arcuate outcrop pattern with strike ranging from NW -SE to E- W to ENE-WSW with steep to subvertical dips to the south. Abandoned quarries (up to 40m wide x 400m long) are present which speak of extensive mining activity in the past. The thickness of the bands varies from 1m to about 4m. The abandoned quarries discontinuously extend both to the east and west of the present block for over 1.9 km in total strike length. Lithologically, the Mn ore is inter stratified at the interface of garnetiferous mica schist and quartz mica schist and also within the quartzite. Both  $S_1$  and  $S_2$  planes have developed in the rocks. The southward convexity of the bands is possibly due to N-S trending  $F_4$ .

### 1.1 LOCATION AND ACCESSIBILITY

The area under study falls in the Survey of India Toposheet no. 55Q/7 and bounded by Lat  $21^{\circ}25'$  to  $21^{\circ}25'$  N and long  $79^{\circ}23'$  to  $79^{\circ}23'E$  forming part of Ramtek tehsil, Nagpur district, Maharashtra. The area is well approachable from Nagpur by Nagpur- Jabalpur road NH7. Mansar Township is situated about 45 km from Nagpur. The Nagpur- Ramtek broad gauge line of SE has a terminus at Ramtek station, which is about 4 km from Mansar and 2 km. from Ramtek Township. Good all weather road takes off from SH 243 towards north for about 15 km and connects Manegaon village to Ramtek. Guguldoh block is adjacent to Manegaon village in the north.

### 1.2 PHYSIOGRAPHY AND DRAINAGE

The area of investigation lies in the hilly region north of Ramtek Township. It has an undulating terrain. The highest peak in the area is 458m and lowest is 320m. The hill trends E-W and only the geomorphic units are marked.

**Residual hills:** - where the present drilling is in progress.

**Pediment:** - low lying area where BH MNG-1 and MNG-2 were drilled.

**Pediplain:** - Soil derived from residual hill and pediment, particularly north of Manegaon village.

**Older flood plain:** - Area around Kandri and Panchala Buzurg where cultivation is being done.

The area is drained by nala and stream, which flow in NE-SW or E-W direction and finally merge with Khindsi Lake.

### 1.3 PREVIOUS WORK

Sausar rocks were first studied by Jenkins (1833) and Voysey (1833) Mallet-1879 and Fermor (1906). Fermor in 1909 did systematic mapping and coined the term Sausar Series for the succession exposed in Sausar tahsil of Chhindwara district, Madhya Pradesh. He introduced the term Gondite for quartz-spessartite manganese silicate rock of Sausar Series. A detailed stratigraphy of entire Sausar belt was proposed by Straczek et al (1956) and was later modified by Narayanaswamy et al (1963) and Basu (1958). Basu and Sarkar (1966) proposed a stratigraphy based on their detailed work of Ramtek-Junawani block.

Fermor (1909) Dunn (1936) Basu (1964) Deshpande (1960) Roy (1961) 66, 68) D. J. Dasgupta et al (1984) Pal and Bhowmik (1995) and others have discussed the mineralogical and para genetic aspect of Mn ore and Gondite. Khan et al (1999) have studied the area under specialized thematic mapping project.

### 1.4. PRESENT WORK

A one year extension has been granted by the MTR committee for completing the mapping and drilling in the extension area for the field season 1999-2000. Overall work schedule is as given below.

| Nature of work | Total work envisaged FS 1998-2000 | Achievement |
|----------------|-----------------------------------|-------------|
| DM (1:2000)    | 1 sq km                           | 1.04 sq km  |
| SMPL           |                                   |             |
| a) BR          | 70 nos                            | 70nos       |
| b) CS          | As required                       | 243 nos     |
| Drilling       | 1600 m                            | 1590.45 m   |

#### Reserve calculation

Strike Length x Dip Length x True width x Specific gravity

$$100\text{m} \times 60\text{m} \times 0.93 \times 3.1 = 17298 \text{ tons} = R_3$$

#### Borehole No MNG 1

Located on the eastern part of the central block in  $W_{13}N_3$  angle of the borehole in  $45^\circ$  Bearing due North. Mn ore has been intersected at 315 RL, and the true thickness of the intersected ore is 0.9m (apparent thickness is 1.30m) RL of the collar is 947.5m. From the longitudinal vertical section the strike length of influence of the borehole is 100m. and dip length is 60m.

Average grade of the ore (12 samples)

| Apparent width (Intersected length in the borehole) | True Width | Mn%   | P <sub>2</sub> O <sub>5</sub> % | SiO <sub>2</sub> % | Fe <sub>2</sub> O <sub>3</sub> % |
|-----------------------------------------------------|------------|-------|---------------------------------|--------------------|----------------------------------|
| 1.32                                                | 0.94       | 32.06 | 0.14                            | 22.72              | 9.10                             |
|                                                     |            |       |                                 |                    |                                  |

Strike length extension of the band is 90 m (50m on the western and 40m on the eastern side)

Dip length is 75 m (up dip direction 50 m and towards down dip direction 25m)

#### Reserve calculation

Strike Length x Dip Length x True width x Specific gravity

$$90\text{m} \times 75\text{m} \times 0.94 \times 3.1 = 19670 \text{ tons} = R_6$$

The average weighted grade (Mn%) is calculated as follows

$$\frac{R_1 \text{ Mn\%} + R_2 \text{ Mn\%} + R_3 \text{ Mn\%} + R_4 \text{ Mn\%} + R_5 \text{ Mn\%} + R_6 \text{ Mn\%}}{R_1 + R_2 + R_3 + R_4 + R_5 + R_6} = \text{Weighted average Grade}$$

The total reserve estimated in this block is  $R_1 + R_2 + R_3 + R_4 + R_5 + R_6 = 218700$  tons (0.218 million tons) and the average grade is 29.28% of Mn



### 1.5 ACKNOWLEDGEMENT

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## 2. GEOLOGY

### 2.1 REGIONAL GEOLOGY

Synsedimentary stratiform manganese ore deposits of this area are mainly associated with the psammo-pelitic rocks of the Sausar group. The Sausar group comprises mainly quartz mica schist, quartzite, calc-granulite and gneiss with calcite and dolomite marble. The basement for this group of rocks is the Tirodi gneiss. The entire Sausar belt is intensively deformed and metamorphosed. The basement gneiss here also participated in all the deformational episodes of Sausar orogeny along with the rocks of Sausar Group. The gneisses, migmatite, syn and post tectonic granite plutons, pegmatite, vein quartz also occur intruded within Sausar Supra crustal rock. The rocks of the Lameta Formation of late cretaceous age and overlying Deccan Trap basalt lie over the Sausar group far from the area of investigation to the south of Mansar.

The general geological succession in the area is briefly stated in Table-I after Narayanswamy et al(1963). The rocks of the Sausar Group show polyphase deformation and metamorphism. The folds are generally overturned towards the north with axial plane steeply dipping towards south along the southern part of the belt.

The regional structure of the Sausar Group is divisible into four belts after Narayanswamy et al 1963.

- a) Southern belt of isoclinal folding
- b) Northern belt of recumbent fold thrust blocks and nappes
- c) Central belt of Gneissic formation with narrow folded schist.
- d) Region of cross folding and refolding.

Regional distribution of cross fold along the belt seems to indicate that the maximum intensity of late stage deformation was confined to a Central axis, extending NE from Ramtek to Pusada and Tirodi.

The important fold in the southern belt of isoclinal folding found around the present study area Junawani – Morcha-Guguldoh folds. These are also affected by Musevadi-Junawani fault with strike E-W and dip due south.

Table-1

|                          |                      |                                                                                                                                                                                  |
|--------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bichon stage             |                      | Dolomite marble and associated calc silicate rock.                                                                                                                               |
| Junawani stage           |                      | Biotite Muscovite schist, Quartz biotite, granulite with characteristic Quartz sillimanite tabloids                                                                              |
| Charboli stage           |                      | Quartzite, Quartz schist, Quartz muscovite schist, feldspathic, Quartz sillimanite tabloids at time with stretched patches of quartz also micaceous conglomerate                 |
| Horizon I                |                      | Manganese ore and Gondite                                                                                                                                                        |
| Maner stage              |                      | Muscovite schist, muscovite biotite schist, Sericite schist often sillimanite bearing                                                                                            |
| Horizon II               |                      | Manganese ore within muscovite schist                                                                                                                                            |
| Horizon III              |                      | Manganese ore band with Gondite                                                                                                                                                  |
|                          | a) Lohang sub stage  | Pink and white calcite dolomite and piedmontite marble with lenticular bands and lenses of Mn ore                                                                                |
|                          | b) Utakata substage  | Calc silicate rock, calc granulite gneiss often garnetiferous epidote bearing epidote-quartzite, epidote                                                                         |
| Lohang stage             | c) Kadukera substage | Quartz biotite granulite with magnetite and epidote intercalated with quartz biotite schist, often found to be gradational with Lohang stage rocks and often with Tirodi gneiss. |
| Sita Baongi stage        |                      | Quartz biotite gneiss gritty quartzite (superior, less developed in the area)                                                                                                    |
| -----Discontinuity?----- |                      |                                                                                                                                                                                  |
|                          |                      | Tirodi biotite gneiss with inclusions of basic rock                                                                                                                              |

In the present area of investigation in the Guguldeh block, the rocks are folded isoclinally but the beds have flattening to moderate dip towards south, along the central part where the isoclinal fold have overturned to recumbent fold, due to this reason the manganese bands have shown repetition as seen in boreholes of the investigated area.

Towards northeastern part the folds are flat and recumbent and are overturned to south with axial plane having low dip to north. Regional structure also shows that isoclinal folds of southern part and recumbent fold and thrust sheet of northern part are disposed in an *en echelon* pattern with fold system shifting toward north as we go towards east. Similarly major strike fault and thrust also show similar pattern with thrust or fault gets shifting to north as we proceeds to east or west. These structures are further complicated by refolding or cross folding of earlier fold in the area by varying degree of intensity. There have also been emplacements of granite pluton along the axis of latter fold.

## 2.2 GEOLOGY OF THE AREA

The Guguldoh manganese prospect forms the eastern continuity of the manganiferous sediment forming the entire Manegaon- Guguldoh belt of Mn ore. The rock type found in this area are muscovite schist with sillimanite, garnet magnetite, quartzite, manganiferous quartzite, auto-clastic conglomerate, quartz muscovite schist, gondite, pegmatite, Mn ore, deformed granite, and impure dolomitic marble. The rocks in this area swerve in strike from WNW-ESE to ENE-WSW and E-W with dips to the south often reaching vertical. Structurally Mn ore bearing horizon in Manegaon –Guguldoh belt represents a tight syncline with a easterly plunge. The keel of the synclinal fold represented by hill 403m north- east of Musawadi.

The tentative litho-stratigraphy as inferred from borehole intersection and geological mapping is as follow-

|            |                                        |
|------------|----------------------------------------|
|            | Soil and overburden                    |
| Intrusives | Vein quartz                            |
|            | Pegmatite                              |
|            | Intrusive granite                      |
| Chorbeoli  | Auto elastic brecciated conglomerate   |
|            | Quartzite/Mn ferrous quartz            |
| Manasar    | Mn ore                                 |
|            | Quartz mica schist                     |
|            | Mica schist/with impure dolomite bands |

Both  $S_1$  and  $S_2$  planes have developed in the rocks. The foliation ( $S_1$ ) and bedding ( $S_0$ ) strikes N 70° E to S 70° W and dip steeply towards south. The cleavage (crenulation cleavage,  $S_2$ ) strikes NE-SW with southerly dip of 55°

## 2.3 ABANDONED MINES/ PIT

There are number of rectangular deep pits in ENE -WSW direction for over a length of 2.5 km. These are mostly the ancient abandoned mines and trial pits and trenches. Low-grade ore isexposed in these pits. Numerous ore dumps are also found in and around the abandoned mines. The Central block has the largest

abandoned quarry for over 700 m in length. The western block has 3 abandoned quarries indicating lateral extension of the ore for 200m, and in the eastern block there are numerous small quarries arranged in a linear fashion indicating lateral extent of the ore for more than a km in length.

## 2.4 MANGANESE ORE HORIZONS

Manganese ore horizons are represented by manganeseiferous quartzite, goudits and low grade Mn ore. Mn ore horizon is 4 to 6 m thick and is traceable for a strike length of 900 m in Central block. Four conformable Mn bands were identified, during detailed mapping and drilling. From south to north the bands have a strike length of 250m, 720m, 640m, and 50m respectively. They define an arcuate pattern with strike ranging from NW-SE to E-W to ENE-WSW with steep to subvertical dip to south. The abandoned quarries discontinuously extend both to east and west for over a strike length of 1.9 km. Lithologically, Mn ore occurs at the interface of garnetiferous mica schist and quartz mica schist as well as within the quartzite. The Mn ore band has a southern convexity due to N-S trending F4 fold.

In eastern block Mn ore occur discontinuously over 900 m strike length in ENE direction. Two conformable stratified Mn ore band have been mapped. In western block two bands have been identified based on the presence of two abandoned Mn quarry. The strike length is about 100 m with widths varying from 1 to 3 m. Detailed mapping of the area has revealed that the different Mn ore bands in the block belong to the same stratigraphic horizon and repeated due to folding.

### 3. EXPLORATION

#### 3.1 DETAILS OF EXPLORATION

The abandoned quarries discontinuously extend from Manegson to Gugulдох villages for about 2.4 km in WNW-ESE direction, the individual quarry diameter is roughly 40m x 40 m and depth is about 20 m. The abandoned quarries were mapped on 1:2000 scale. Drilling commenced in Gugulдох block on 15<sup>th</sup> November 1999 and the investigation was closed end of September 2001. A total of 1586.45m was drilled in eighteen boreholes. The entire exploration block is divided into 3 blocks namely western block, eastern block and central block.

##### EASTERN BLOCK

Abandoned quarries of Mn ore occur discontinuously over a strike length of 900 m in eastern block. Two conformable Mn ore bands within mica schist have been identified. Nine boreholes (MNG-9-MNG-16) have been drilled in this block. MNG-12 was abandoned; hence borehole MNG-12A was drilled adjacent to it. No significant Mn mineralisation was intersected in any of the boreholes, MNG-9, 10, 12A, 13 and 14 intersected minor Mn ore bands and Gondite, rests of boreholes were barren.

##### CENTRAL BLOCK

Work was initially taken up in the central block which has huge abandoned quarries, based on detailed mapping and surface exposures, eight bore holes have been drilled (MNG-1-MNG-8) spaced at 100 m interval. Seven boreholes intersected Gondite, manganese ore with thickness ranging from 20 cm to 13.14 m. Borehole No MNG-5 was barren; 4 conformable Mn bands have been traced based on surface mapping and bore hole intersection. The strike lengths of these bands range from 50 m to maximum 720 m. A total of 748 m has been drilled in 8 boreholes in these blocks.

##### WESTERN BLOCK

Mapping in Western block indicated presence of two level of abandoned Mn quarry for a total strike length of over 220 m. Two conformable stratified Mn ore bands have been mapped at the interface of quartz-mica schist and quartzite. Northern band extends for over 125 m in strike length while southern band is about 120m in strike length located 40 m to south of northern band. Widths of individual

band varies from 1 to 3 m. To confirm the strike and dip extension of ore horizon exposed in old working drilling machine was deployed. Boreholes were planned and drilled to intersect the ore body at expected depth. Based on the attitude of the ore horizon boreholes were drilled vertical or inclined, so as to intersect the ore horizon around its true width. Generally the angle ranges from 40° to 60°, borehole are spaced at equal interval depending on the strike continuity of ore zone. Two boreholes have been drilled (MNG-17-MNG-18) in this block. Both the boreholes have not intersected any of the Mn ore horizons except for streak and thin bands of Mn ore.

### 3.2 CORE LOGGING

The recovered cores from each borehole are placed in the core box either in book pattern or staggered pattern. The core is studied run wise and they are logged in a register noting down its lithological description, depth wise mineralisation and structural features if any. The length of core recovered, is measured and recovery percentage is calculated. In this way run wise logging is carried out for all the boreholes drilled. Run wise litholog of all the 18 boreholes have been furnished in Annexure I and summarized litholog in annexure II.

### 3.3 MANGANESE ORE HORIZON

Out of 19 boreholes drilled in Guguldoh block, manganese ore with Gondite and manganoiferous quartzite were intersected. Table-II shows the depth wise intersection of Mn ore, manganoiferous quartzite, Gondite in each borehole.

### 3.4 SAMPLING

Sampling was carried out for mineralized core and also bedrock. Using a core splitter core was split longitudinally into two half. One half was preserved and other half was crushed to -200 mesh size. Comming and quartering was carried out for getting the minimum amount required for sampling.

Minimum length of sample was 4 cm while maximum length was 60 cm. Depending on the nature of ore and width of barren zone sample spacing was decided. Table-III shows the number of samples drawn and analyzed from each borehole. Similarly bedrock samples were split into two. One half was powdered and same sampling procedure was adopted and the other sample was kept as a duplicate.

**Table-II**

| Borehole no. | No. of sample | Total no. of sample generated from borehole |
|--------------|---------------|---------------------------------------------|
| MNG-1        | 27            | 243                                         |
| MNG-2        | 24            |                                             |
| MNG-3        | 55            |                                             |
| MNG-4        | 20            |                                             |
| MNG-6        | 58            |                                             |
| MNG-7        | 20            |                                             |
| MNG-8        | 19            |                                             |
| MNG-9        | 8             |                                             |
| MNG-10       | 3             |                                             |
| MNG-12A      | 9             |                                             |

A total of 243 samples have been sent to Chemical Laboratory for analysis, of which only few have been received. A critical review of the analytical report indicate as follows

**Table III**

| Bh. no  | No of sample | Mn%         | P%          | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> |
|---------|--------------|-------------|-------------|------------------|--------------------------------|
| MNG-1   | 27           | 6.5 - 40.72 | 0.05 - 0.38 | 20 - 59          | 3 - 17                         |
| MNG-2   | 24           | 1.22 - 40   | 0.09 - 0.53 | 9 - 45           | 4 - 12                         |
| MNG-3   | 55           | 5 - 40      | 0.1 - 0.7   | 23 - 80          | 1.5 - 16                       |
| MNG-6   | 58           | 30          | 1.08        | 11-38            | 4.5-12                         |
| MNG-7   | 20           | 26          | 0.3 - 1.5   | 20-42            | 5-11                           |
| MNG-8   | 19           | 32          | 1.12        | 25-37            | 6-9                            |
| MNG-9   | 8            | -           | -           | -                | -                              |
| MNG-10  | 3            | 25.55       | 1           | 21-25            | 10-12                          |
| MNG-12A | 9            | 26.6        | 0.6-1.7     | 21-50            | 7-12                           |





### 3.5 ESTIMATION OF ORE RESERVES

As seen from analytical report, MNG-8, MNG-2, MNG-3, MNG-1, MNG-6, and MNG-7 has intersected the same Mn ore horizon at different depth and these Mn value ranges between 25 to 30% which can be categorized into Low grade high silica ore (LGHS). They also have low phosphorous content. MNG-10 and MNG-12A 300m west of MNT 1 have also intersected Mn horizon. They are also categorized as Low grade high silica ore and has low phosphorous. Cross section of the entire above borehole was drawn to estimate the reserves. From the borehole plan the strike influence of each borehole was calculated. The boreholes have intersected the ore horizon at about 30 to 35m vertical depth from ground level and below the bottom of the quarry. Up dip wise extension was defined on the basis of correlation with surface / old working. Down dip direction being half of the up dip length, strike extension was considered on the basis of positive intersection in adjacent bore. In this way area of influence was calculated for each borehole and reserves estimated. The average dip of ore body is  $70^\circ$ . For each borehole true thickness of the ore body was calculated from apparent thickness. Average specific gravity of manganese was taken as  $3.1 \text{ gm/cm}^3$

Estimation of the ore reserve is summarized as follows

#### Borehole No MNG 6

Located on the western part of the central block in  $W_{50}N_{20}$  angle of the borehole in  $45^\circ$  bearing due North. Mn ore has been intersected between 320 and 310 RL and the true thickness of the intersected ore is 4.58m (apparent thickness is 6.42m) RL of the collar is 348.2m. From the Longitudinal vertical section the strike influence of the borehole is 80m, and dip length is 60m

Average grade of the ore (13+16 = 29 samples)

| Apparent width (intersected length in the borehole) (m) | True Width (m) | Mn%   | P <sub>2</sub> O <sub>5</sub> % | SiO <sub>2</sub> % | Fe <sub>2</sub> O <sub>3</sub> % |
|---------------------------------------------------------|----------------|-------|---------------------------------|--------------------|----------------------------------|
| 2.93                                                    | 2.09           | 30.3  | 1.08                            | 20.73              | 8.68                             |
| 3.49                                                    | 2.49           | 29.78 | 1.09                            | 21.40              | 8.86                             |

Strike length extension of these two bands is 120 m ( 50m on the western and 70m on the eastern side)

Dip length is 55 m (up dip direction 35 m and towards down dip direction 20 m)

Reserve calculation

Strike Length x Dip Length x True width x Specific gravity

$$80\text{m} \times 40\text{m} \times 4.58 \times 3.1 = 93707 \text{ tons} = R_1$$

#### Borehole No MING 8

Located on the western part of the central block in  $W_{45}N_{10}$  angle of the borehole in  $45^\circ$  bearing due north. Manganese ore has been intersected at 305 RL, and the true thickness of the intersected ore is 0.73m (apparent thickness is 1.03m) RL of the collar is 342.m. From the longitudinal vertical section the strike length of influence of the borehole is 120m and dip length is 55m.

Average grade of the ore (4 samples)

| Apparent width (intersected length in the borehole) (m) | True Width (m) | Mn% | P <sub>2</sub> O <sub>5</sub> % | SiO <sub>2</sub> % | Fe <sub>2</sub> O <sub>3</sub> % |
|---------------------------------------------------------|----------------|-----|---------------------------------|--------------------|----------------------------------|
| 1.03                                                    | 0.73           | 32  | 1.12                            | 23.21              | 8.28                             |

Strike length extension of the band is 140 m (70m on the western and 70m on the eastern side)

Dip length is 57 m (up dip direction 37 m and towards down dip direction 20 m)

Reserve calculation

Strike Length x Dip Length x True width x Specific gravity

$$140\text{m} \times 57\text{m} \times 0.75 \times 3.1 = 18534 \text{ tons} = R_2$$

#### Borehole No MING 7

Located on the western part of the central block in  $W_{30}N_0$  angle of the borehole in  $45^\circ$  Bearing due North. Mn ore has been intersected at 309m. RL and the true thickness of the intersected ore is 1.92m (apparent thickness is 2.70) RL of the collar is 341.02m. From the longitudinal vertical section the strike length of influence of the borehole is 140m. dip length is 45m.

Average grade of the ore (8 samples)

| Apparent width (intersected length in the borehole) (m) | True Width (m) | Mn%   | P <sub>2</sub> O <sub>5</sub> % | SiO <sub>2</sub> % | Fe <sub>2</sub> O <sub>3</sub> % |
|---------------------------------------------------------|----------------|-------|---------------------------------|--------------------|----------------------------------|
| 2.70m                                                   | 1.92           | 26.02 | .80                             | 30.23              | 8.4                              |

Strike length extension of the band is 120 m (70m on the western and 50m on the eastern side)

Dip length is 75 m (up dip direction 50 m and towards down dip direction 25 m)

Reserve calculation

Strike Length x Dip Length x True width x Specific gravity

$120\text{m} \times 75\text{m} \times 1.92 \times 3.1 = 53568 \text{ tons } -R_3$

#### Borehole No MING 2

Located on the western part of the central block in  $W_{21}N_{30}E$  angle of the borehole in  $45^\circ$  bearing due North. Mn ore has been intersected at 315 RL, and the true thickness of the intersected ore is 1.14m (apparent thickness is 1.60m) RL of the collar is 344.2m. From the longitudinal vertical section the strike length of influence of the borehole is 60m and dip length is 45m

Average grade of the ore (17 samples)

| Apparent width<br>(intersected length<br>in the borehole)(m) | True<br>Width (m) | Mn%   | $P_2O_5\%$ | $SiO_2\%$ | $Fe_2O_3\%$ |
|--------------------------------------------------------------|-------------------|-------|------------|-----------|-------------|
| 1.60                                                         | 1.14              | 29.06 | 0.19       | 25.73     | 8.97        |

Strike length extension of the band is 100 m (50m on the western and 50m on the eastern side)

Dip length is 45 m (up dip direction 30 m and towards down dip direction 15 m)

Reserve calculation

Strike Length x Dip Length x True width x Specific gravity

$100\text{m} \times 45\text{m} \times 1.14 \times 3.1 = 15903 \text{ tons } -R_4$

#### Borehole No MING 3

Located on the central part of the central block in  $W_{10}N_{15}E$  angle of the borehole in  $45^\circ$  Bearing due North. Mn ore has been intersected at 324 RL, and the true thickness of the intersected ore is 0.90m (apparent thickness is 1.30m) RL of

the collar is 353.8m. From the longitudinal vertical section the strike length of influence of the borehole is 100m and dip length is 40m

Average grade of the ore (15 samples)

| Apparent width<br>(intersected length in<br>the borehole) | True<br>Width<br>(m) | Mn%  | P <sub>2</sub> O <sub>5</sub> % | SiO <sub>2</sub> % | Fe <sub>2</sub> O <sub>3</sub> % |
|-----------------------------------------------------------|----------------------|------|---------------------------------|--------------------|----------------------------------|
| 1.3                                                       | 0.93                 | 29.7 | 0.37                            | 31.6               | 6.89                             |

Strike length extension of the band is 100 m (50m on the western and 50m on the eastern side)

Dip length is 60 m (up dip direction 40 m and towards down dip direction 20 m)

Reserve calculation

Strike Length x Dip Length x True width x Specific gravity

100m x 60m x 0.93 x 3.1 = 17298 tons =R<sub>3</sub>

Borehole No MNG 1

Located on the eastern part of the central block in W<sub>13</sub>N<sub>3</sub> angle of the borehole in 45° Bearing due North. Mn ore has been intersected at 315 RL, and the true thickness of the intersected ore is 0.9m (apparent thickness is 1.30m) RL of the collar is 347.5m. From the longitudinal vertical section the strike length of influence of the borehole is 100m. and dip length is 60m.

Average grade of the ore (12 samples)

| Apparent width (intersected<br>length in the borehole) | True<br>Width | Mn%   | P <sub>2</sub> O <sub>5</sub> % | SiO <sub>2</sub> % | Fe <sub>2</sub> O <sub>3</sub> % |
|--------------------------------------------------------|---------------|-------|---------------------------------|--------------------|----------------------------------|
| 1.32                                                   | 0.94          | 32.05 | 0.14                            | 22.72              | 9.10                             |

Strike length extension of the band is 100 m (50m on the western and 50m on the eastern side)

Dip length is 75 m (up dip direction 50 m and towards down dip direction 25m)

Reserve calculation

Strike Length x Dip Length x True width x Specific gravity

90m x 75m x 0.94 x 3.1 = 19670 tons =R<sub>4</sub>

The average weighted grade (Mn%) is calculated as follows

$$\frac{\sum R_1 Mn\% + R_2 Mn\% + R_3 Mn\% + R_4 Mn\% + R_5 Mn\% + R_6 Mn\%}{R_1 + R_2 + R_3 + R_4 + R_5 + R_6} = \text{Weighted average Grade}$$

The total reserve estimated in this block is  $R_1 + R_2 + R_3 + R_4 + R_5 + R_6 = 218700$  tons (0.218 million tons) and the average grade is 29.28% of Mn.

**TABLE SHOWING THE MANGANESE ORE RESERVE CALCULATED FOR THE ZONES INTERSECTED IN BOREHOLE**

| Borehole No                                                                                                                           | True Width (m) | Mn%   | P <sub>2</sub> O <sub>5</sub> % | SiO <sub>2</sub> % | Fe <sub>2</sub> O <sub>3</sub> % | Dip length m | Strike length m | R = SL x DL x TW x SG                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------|----------------|-------|---------------------------------|--------------------|----------------------------------|--------------|-----------------|------------------------------------------------------------------------|
| BNG-6                                                                                                                                 | 2.09           | 34.3  | 1.08                            | 20.73              | 8.68                             | 120m         | 55m             | 140m x 40m x 4.58 x 3.1 = 93767 tons                                   |
|                                                                                                                                       | 2.49           | 29.78 | 1.09                            | 21.40              | 8.86                             |              |                 |                                                                        |
| BNG-8                                                                                                                                 | 0.73           | 32    | 1.12                            | 23.21              | 8.28                             | 140m         | 57m             | 140m x 57m x 0.73 x 3.1 = 18354 tons                                   |
| BNG-7                                                                                                                                 | 1.92           | 16.02 | .80                             | 30.23              | 8.4                              | 120m         | 75m             | 120m x 75m x 1.92 x 3.1 = 53568 tons                                   |
| BNG-2                                                                                                                                 | 1.14           | 29.06 | 0.19                            | 25.73              | 8.97                             | 100m         | 45m             | 100m x 45m x 1.14 x 3.1 = 15903 tons                                   |
| BNG-3                                                                                                                                 | 0.93           | 29.7  | 0.37                            | 31.6               | 6.89                             | 100m         | 60m             | 100m x 60m x 0.93 x 3.1 = 17298 tons                                   |
| BNG-1                                                                                                                                 | 0.94           | 32.05 | 0.14                            | 22.72              | 9.10                             | 100m         | 75m             | 90m x 75m x 0.94 x 3.1 = 19670 tons                                    |
| $\sum R_1 Mn\% + R_2 Mn\% + R_3 Mn\% + R_4 Mn\% + R_5 Mn\% + R_6 Mn\%$<br>= Weighted av. Grade<br>$R_1 + R_2 + R_3 + R_4 + R_5 + R_6$ |                |       |                                 |                    |                                  |              |                 | 218700 tons (0.218 million tons) and the average grade is 29.28% of Mn |

#### Revised Estimation by DGM

The above resource for the block was estimated by OSI taking into consideration 20% as the cut off for Mn. As the IBM has revised the threshold value for Manganese as 10%, the resource was re-estimated by DGM. Thus the total resource for Guguldoh Manganese block is 0.440 million tons (indicated resource 332) with an average grade of 22.70% Mn. A total of 18 bore holes were drilled in the Guguldoh area, out of 18 boreholes, 6 boreholes were drilled in

central block(Plate no D ) are consider for resource estimation. Rest of the bore holes intersected minor Mn ore bands and Gondite.

**TABLE SHOWING THE MANGANESE ORE RESOURCE CALCULATED FOR THE FOR THE CENTRAL PART OF THE BLOCK.**

**Geological Cross Section Wise Indicated Manganese Resource (332) at threshold value of 10% Mn.**

| BH. No.                                                                                                | True width(m) | Mn%   | P2O5 | SiO2  | Fe2O3 | Dip Length | Strike Length | R= SL X DL X TW X SG                                                  |
|--------------------------------------------------------------------------------------------------------|---------------|-------|------|-------|-------|------------|---------------|-----------------------------------------------------------------------|
| MNG-8                                                                                                  | 2.48          | 21.82 | 1.28 | 22.88 | 8.82  | 55mm       | 120m          | R1=120X55X7.38X3.1=151199                                             |
|                                                                                                        | 4.60          | 24.84 | 1.35 | 39.9  | 8.06  |            |               |                                                                       |
| MNG-8                                                                                                  | 2.18          | 22.59 | 1.18 | 37.3  | 7.86  | 57m        | 140m          | R2=140X57X2.18X3.1=53920                                              |
| MNG-7                                                                                                  | 2.9           | 24.88 | 0.88 | 30.35 | 8.44  | 75m        | 120m          | R3=120X75X3.85X3.1=107415                                             |
|                                                                                                        | 0.95          | 14.44 | 1.41 | 50.29 | 6.78  |            |               |                                                                       |
| MNG-2                                                                                                  | 2.08          | 27.72 | 0.21 | 27.2  | 10.1  | 45m        | 100m          | R4=100X45X2.05X3.1=28737                                              |
| MNG-3                                                                                                  | 0.69          | 18.22 | 0.48 | 51.4  | 10.17 | 80m        | 100m          | R5=100X80X2.59X3.1=47069                                              |
|                                                                                                        | 1.84          | 25.14 | 0.37 | 33.87 | 11.7  |            |               |                                                                       |
| MNG-1                                                                                                  | 2.23          | 24.39 | 0.18 | 31.7  | 9.83  | 75m        | 100m          | R6=100X75X2.23X3.1=51847                                              |
| $\Sigma R1Mn\% + R2Mn\% + R3Mn\% + R4Mn\% + R5Mn\% + R6Mn\%$ = Weighted average<br>$R1+R2+R3+R4+R5+R6$ |               |       |      |       |       |            |               | 440183 tons(0.440 million tons) and the average grade is 22.70% of Mn |

#### 4. CONCLUSION AND RECOMMENDATION

The investigation continued for 2 years during FS 1999-2000 and 2000-01. Detailed mapping of about 1 sq km in 1:2000 and drilling carried out have revealed no significant Mn ore horizon in Mansar formation/ Chorbaoli Formation. The Mn ore horizons are confined to the Mansar formation at or near contact of Chorbaoli Formation and Mn ore belongs to low-grade ore having Mn % between 20 to 30 %.

Mapping has proved that the Mn ore horizon in Gugeldoh block extends over a strike length of 2 km, but drilling has proved that the down dip extension is very limited. Surface Mn ore grades to Gondite at depth as seen in many of borehole intersections. Whatever enriched Mn ore was present in the area;

earlier exploiting agencies have exploited it. Here the zone of oxidation is limited to up to the depth of 5 to 10m below ground surface.

#### DGM observation:

The total resource for Guguldoh Manganese block is 0.440 million (indicated 332) tone with an average grade of 22.70% Mn. A total of 18 bore holes were drilled in the Guguldoh area, and out of 18 boreholes, 6 boreholes drilled in central part of the area were considered for resource estimation. Rest of the bore holes intersected minor Mn ore bands and Goosite

### 5. LOCALITY INDEX

| Villages    | Latitude | Longitude |
|-------------|----------|-----------|
| Bhandarbori | 21°36':  | 79°54'    |
| Guguldoh    | 21° 25': | 79° 26'   |
| Junawani    | 21° 29': | 79° 18'   |
| Mandri      | 21° 25'  | 79° 24'   |
| Manegaon    | 21° 26': | 79° 28'   |
| Manear      | 21° 24'  | 79° 16'   |
| Merda       | 21° 27'  | 79° 25'   |
| Musewadi    | 21° 26'  | 79° 22'   |
| Ranstek     | 21° 24'  | 79° 20'   |



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**TABLE SHOWING THE MANGANESE ORE RESOURCE CALCULATED  
BY THE DGM FOR THE CENTRAL PART OF THE MINE**

**Geological Cross Section Wise Indicated Manganese Resource (332) at threshold  
value of 10% Mn.**

| BH.<br>No.                                                                                                                       | True<br>width(<br>m) | Mn<br>%   | P2O<br>5 | SiO2      | Fe2O<br>3 | Dip<br>Lengt<br>h | Strike<br>Lengt<br>h | R= SL X DL X TW X SG                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------|----------|-----------|-----------|-------------------|----------------------|--------------------------------------------------------------------------------------------------------|
| MNG<br>-6                                                                                                                        | 2.43                 | 21.9<br>2 | 1.28     | 22.9<br>8 | 8.62      | 55m               | 120m                 | R1=120X55X7.39X3.1=151<br>199                                                                          |
|                                                                                                                                  | 4.96                 | 24.8<br>4 | 1.35     | 33.9      | 8.08      |                   |                      |                                                                                                        |
| MNG<br>-8                                                                                                                        | 2.18                 | 22.5<br>9 | 1.18     | 37.8      | 7.85      | 57m               | 140m                 | R2=140X57X2.18X3.1=539<br>29                                                                           |
| MNG<br>-7                                                                                                                        | 2.9                  | 24.9<br>8 | 0.88     | 30.3<br>5 | 8.44      | 75m               | 120m                 | R3=<br>120X75X3.85X3.1=107415                                                                          |
|                                                                                                                                  | 0.95                 | 14.4<br>4 | 1.41     | 60.2<br>9 | 5.76      |                   |                      |                                                                                                        |
| MNG<br>-2                                                                                                                        | 2.06                 | 27.7<br>2 | 0.21     | 27.2      | 10.1      | 45m               | 100m                 | R4=100X45X2.06X3.1=287<br>37                                                                           |
| MNG<br>-3                                                                                                                        | 0.69                 | 18.2<br>2 | 0.49     | 51.4      | 10.17     | 60m               | 100m                 | R5=100X60X2.53X3.1=470<br>58                                                                           |
|                                                                                                                                  | 1.84                 | 25.1<br>4 | 0.37     | 33.9<br>7 | 11.7      |                   |                      |                                                                                                        |
| MNG<br>-1                                                                                                                        | 2.23                 | 24.3<br>9 | 0.18     | 31.7      | 9.63      | 75m               | 100m                 | R6=100X75X2.23X3.1=518<br>47                                                                           |
| $\frac{\sum R1Mn\%+R2Mn\%+R3Mn\%+R4Mn\%+R5Mn\%+R6Mn\%}{R1+R2+R3+R4+R5+R6} =$ <p align="center"><b>Weighted average grade</b></p> |                      |           |          |           |           |                   |                      | <p><b>440185 tons(0.440 million<br/>tons)</b><br/>and the average grade is<br/><b>22.70% of Mn</b></p> |

**CHEMICAL ANALYSES OF CORE SAMPLES**  
**BOREHOLE NO. MNG-1**  
**TOTAL NO. OF SAMPLES-27**

| Sample no. | Drilling run (ft) |       | Length of full | Length of core recovered | % Of core recovery | Section sampled |       | Sample length (CM) | Analytical data % |                               |                  |                                |                                |         |  |  |
|------------|-------------------|-------|----------------|--------------------------|--------------------|-----------------|-------|--------------------|-------------------|-------------------------------|------------------|--------------------------------|--------------------------------|---------|--|--|
|            | From              | To    |                |                          |                    | From            | To    |                    | Mn                | P <sub>2</sub> O <sub>5</sub> | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> | Al <sub>2</sub> O <sub>3</sub> | Mn% x L |  |  |
| CS-1       | 57.90             | 60.95 | 3.05           | 2.97                     | 97                 | 58.73           | 58.82 | 9                  | 17.10             | 0.31                          | 42.09            | 11.95                          | 4.90                           | 153.9   |  |  |
| CS-2       |                   |       |                |                          |                    | 58.82           | 58.91 | 9                  | 16.29             | 0.40                          | 40.37            | 7.34                           | 9.75                           | 147.61  |  |  |
| CS-3       |                   |       |                |                          |                    | 58.91           | 59.08 | 9                  | 19.54             | 0.38                          | 23.02            | 11.10                          | 6.75                           | 175.86  |  |  |
| CS-4       |                   |       |                |                          |                    | 59.08           | 59.89 | 8                  | 24.03             | 0.26                          | 20.04            | 11.75                          | 60.40                          | 216.27  |  |  |
| CS-5       |                   |       |                |                          |                    | 59.09           | 59.17 | 8                  | 23.62             | 0.13                          | 22.91            | 11.64                          | 4.70                           | 188.96  |  |  |
| CS-6       |                   |       |                |                          |                    | 59.17           | 59.23 | 6                  | 3.14              | 0.12                          | 54.80            | 12.33                          | 4.70                           | 44.84   |  |  |
| CS-7       |                   |       |                |                          |                    | 59.48           | 59.53 | 7                  | 13.84             | 0.10                          | 51.40            | 8.83                           | 4.83                           | 96.88   |  |  |
| CS-8       |                   |       |                |                          |                    | 59.55           | 59.63 | 8                  | 1.22              | 0.21                          | 67.27            | 2.96                           | 9.78                           | 9.76    |  |  |
| CS-9       |                   |       |                |                          |                    | 59.63           | 59.73 | 10                 | 24.44             | 0.19                          | 32.00            | 9.85                           | 3.16                           | 248.40  |  |  |
| CS-10      |                   |       |                |                          |                    | 59.75           | 59.81 | 8                  | 26.88             | 0.14                          | 24.94            | 9.45                           | 3.46                           | 215.04  |  |  |
| CS-11      |                   |       |                |                          |                    | 59.91           | 59.93 | 12                 | 36.24             | 0.18                          | 24.19            | 9.20                           | 1.18                           | 434.18  |  |  |
| CS-12      |                   |       |                |                          |                    | 59.93           | 60.03 | 10                 | 30.95             | 0.12                          | 26.14            | 9.90                           | 3.28                           | 309.58  |  |  |
| CS-13      |                   |       |                |                          |                    | 60.03           | 60.18 | 15                 | 34.61             | 0.10                          | 21.027           | 10.30                          | 2.53                           | 519.15  |  |  |
| CS-14      |                   |       |                |                          |                    | 60.18           | 60.30 | 12                 | 32.17             | 0.16                          | 22.47            | 10.40                          | 3.55                           | 385.04  |  |  |
| CS-15      |                   |       |                |                          |                    | 60.30           | 60.46 | 16                 | 28.10             | 0.17                          | 21.30            | 9.00                           | 3.20                           | 449.60  |  |  |
| CS-16      |                   |       |                |                          |                    | 60.46           | 60.53 | 7                  | 19.14             | 0.14                          | 20.08            | 8.60                           | 4.40                           | 133.98  |  |  |
| CS-17      |                   |       |                |                          |                    | 60.53           | 60.62 | 9                  | 40.72             | 0.08                          | 20.89            | 4.46                           | 2.40                           | 366.48  |  |  |
| CS-18      |                   |       |                |                          |                    | 60.62           | 60.74 | 12                 | 40.32             | 0.11                          | 19.51            | 10.75                          | 2.82                           | 483.84  |  |  |
| CS-19      |                   |       |                |                          |                    | 60.74           | 60.86 | 12                 | 32.98             | 0.17                          | 18.18            | 9.73                           | 2.20                           | 395.76  |  |  |
| CS-20      |                   |       |                |                          |                    | 60.86           | 60.95 | 9                  | 20.77             | 0.21                          | 21.89            | 7.55                           | 5.00                           | 186.93  |  |  |
| CS-21      | 60.95             | 64.00 | 3.05           | 3.05                     | 100                | 60.99           | 61.07 | 12                 | 13.03             | 0.11                          | 44.25            | 11.55                          | 5.52                           | 155.36  |  |  |
| CS-22      |                   |       |                |                          |                    | 61.07           | 61.27 | 10                 | 16.29             | 0.16                          | 31.66            | 11.70                          | 7.80                           | 162.90  |  |  |
| CS-23      |                   |       |                |                          |                    | 61.17           | 61.29 | 12                 | 10.99             | 0.14                          | 46.49            | 10.02                          | 9.50                           | 191.88  |  |  |
| CS-24      |                   |       |                |                          |                    | 61.29           | 61.42 | 13                 | 14.25             | 0.16                          | 38.77            | 11.08                          | 9.50                           | 185.25  |  |  |
| CS-25      |                   |       |                |                          |                    | 61.62           | 61.69 | 8                  | 7.74              | 0.14                          | 46.11            | 10.40                          | 10.34                          |         |  |  |
| CS-26      |                   |       |                |                          |                    | 61.69           | 61.82 | 13                 | 6.52              | 0.05                          | 44.96            | 14.28                          | 15.30                          |         |  |  |
| CS-27      |                   |       |                |                          |                    | 61.82           | 61.89 | 7                  | 8.96              | 0.09                          | 51.76            | 16.85                          | 12.30                          |         |  |  |

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CHEMICAL ANALYSIS OF CORE SAMPLES  
BOREHOLE NO. MNG-2

TOTAL NO. OF

SAMPLES-24

| Sample no. | Drilling run (ft) |       | Length of core | Length of core recovered | % Of core recovery | Section sampled |       | Length of sample (CM) | Analytical data % |                               |                  |                                |                                |  |         | Mo % ± L |
|------------|-------------------|-------|----------------|--------------------------|--------------------|-----------------|-------|-----------------------|-------------------|-------------------------------|------------------|--------------------------------|--------------------------------|--|---------|----------|
|            | From              | To    |                |                          |                    | From            | To    |                       | Mn                | P <sub>2</sub> O <sub>5</sub> | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> | Al <sub>2</sub> O <sub>3</sub> |  |         |          |
| C8-1       | 35.75             | 38.60 | 2.85           | 2.60                     | 91                 | 38.35           | 38.50 | 15                    | 14.42             | 0.15                          | 47.80            | 12.39                          | 50.10                          |  |         |          |
| C8-2       |                   |       |                |                          |                    | 38.50           | 38.60 | 10                    | 17.38             | 0.19                          | 45.47            | 6.90                           | 4.70                           |  |         |          |
| C8-3       | 38.60             | 40.30 | 1.70           | 1.55                     | 91                 | 38.60           | 38.69 | 9                     | 30.48             | 0.28                          | 14.10            | 20.98                          | 5.50                           |  |         |          |
| C8-4       |                   |       |                |                          |                    | 38.69           | 38.75 | 6                     | 12.77             | 0.35                          | 30.03            | 11.95                          | 12.40                          |  |         |          |
| C8-5       |                   |       |                |                          |                    | 38.75           | 38.84 | 9                     | 28.06             | 0.12                          | 9.63             | 8.70                           | 5.20                           |  | 252.72  |          |
| C8-6       |                   |       |                |                          |                    | 38.84           | 38.97 | 13                    | 31.74             | 0.16                          | 19.86            | 11.59                          | 3.60                           |  | 412.62  |          |
| C8-7       |                   |       |                |                          |                    | 38.97           | 39.06 | 7                     | 21.98             | 0.18                          | 45.52            | 6.55                           | 4.30                           |  |         |          |
| C8-8       |                   |       |                |                          |                    | 39.06           | 39.53 | 9                     | 28.69             | 0.36                          | 21.97            | 7.60                           | 6.40                           |  | 256.41  |          |
| C8-9       |                   |       |                |                          |                    | 39.75           | 39.87 | 12                    | 24.42             | 0.19                          | 33.72            | 8.90                           | 5.20                           |  | 293.04  |          |
| C8-10      |                   |       |                |                          |                    | 39.87           | 39.99 | 12                    | 26.85             | 0.26                          | 27.19            | 9.40                           | 7.50                           |  | 312.60  |          |
| C8-11      |                   |       |                |                          |                    | 39.99           | 40.04 | 5                     | 1.22              | 0.52                          | 47.74            | 4.55                           | 18.75                          |  |         |          |
| C8-12      |                   |       |                |                          |                    | 40.04           | 40.10 | 6                     | 21.16             | 0.36                          | 30.46            | 10.75                          | 9.50                           |  |         |          |
| C8-13      |                   |       |                |                          |                    | 40.10           | 40.16 | 6                     | 38.66             | 0.10                          | 27.76            | 3.75                           | 2.15                           |  | 126.96  |          |
| C8-14      |                   |       |                |                          |                    | 40.16           | 40.25 | 9                     | 37.84             | 0.10                          | 22.87            | 11.35                          | 3.00                           |  | 333.836 |          |
| C8-15      |                   |       |                |                          |                    | 40.25           | 40.30 | 5                     | 37.85             | 0.18                          | 21.19            | 11.80                          | 3.60                           |  | 189.25  |          |
| C8-16      | 40.30             | 41.00 | 0.70           | 74                       | 100                | 40.30           | 40.34 | 4                     | 34.59             | 0.16                          | 29.97            | 8.70                           | 5.00                           |  | 138.36  |          |
| C8-17      |                   |       |                |                          |                    | 40.34           | 40.38 | 4                     | 33.78             | 0.16                          | 21.68            | 12.60                          | 3.15                           |  | 135.12  |          |
| C8-18      |                   |       |                |                          |                    | 40.34           | 40.43 | 5                     | 28.81             | 0.25                          | 24.75            | 12.20                          | 5.40                           |  | 114.05  |          |
| C8-19      |                   |       |                |                          |                    | 40.43           | 40.50 | 7                     | 40.39             | 0.15                          | 26.12            | 11.70                          | 3.20                           |  | 282.03  |          |
| C8-20      |                   |       |                |                          |                    | 40.50           | 40.64 | 11                    | 33.78             | 0.09                          | 30.95            | 9.75                           | 4.70                           |  | 371.58  |          |
| C8-21      |                   |       |                |                          |                    | 40.61           | 40.75 | 17                    | 39.88             | 0.11                          | 23.97            | 11.80                          | 2.00                           |  | 558.52  |          |
| C8-22      |                   |       |                |                          |                    | 40.75           | 40.82 | 7                     | 33.78             | 0.09                          | 13.83            | 10.35                          | 2.30                           |  | 236.46  |          |
| C8-23      |                   |       |                |                          |                    | 40.82           | 40.91 | 9                     | 24.83             | 0.18                          | 13.40            | 9.40                           | 8.40                           |  | 223.47  |          |
| C8-24      |                   |       |                |                          |                    | 40.91           | 41.00 | 9                     | 25.23             | 0.23                          | 24.02            | 9.30                           | 6.00                           |  | 227.07  |          |

22462  
CHEMICAL ANALYSIS OF CORE SAMPLES  
BORERHOLE NO. MNG-3

TOTAL NO. OF

SAMPLES-55

| Sample No. | Drilling run (ft) |       | Length of run | Length of core recovered | % Of core recovery | Section sampled |       | Length of sample (CM) | Analytical data % |                               |                  |                                |                                |         |  |  |
|------------|-------------------|-------|---------------|--------------------------|--------------------|-----------------|-------|-----------------------|-------------------|-------------------------------|------------------|--------------------------------|--------------------------------|---------|--|--|
|            | From              | To    |               |                          |                    | From            | To    |                       | Mo                | P <sub>2</sub> O <sub>5</sub> | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> | Al <sub>2</sub> O <sub>3</sub> | Mn% x L |  |  |
| CS-1       | 31.30             | 33.85 | 1.55          | 0.55                     | 35                 | 33.47           | 33.65 | 17                    | 3.30              | Tr                            | 81.54            | 4.73                           | 4.45                           |         |  |  |
| CS-2       |                   |       |               |                          |                    | 33.66           | 33.85 | 17                    | 4.53              | Tr                            | 81.74            | 6.07                           | 0.90                           |         |  |  |
| CS-3       | 33.85             | 34.20 | 0.35          | 0.10                     | 24                 | 33.85           | 34.20 | 35                    | 13.18             | Tr                            | 54.80            | 13.72                          | 9.40                           |         |  |  |
| CS-4       | 34.20             | 34.40 | 0.20          | 0.16                     | 80                 | 34.20           | 34.27 | 7                     | 0.26              | 0.11                          | 88.72            | 1.50                           | 3.90                           |         |  |  |
| CS-5       |                   |       |               |                          |                    | 34.27           | 34.40 | 13                    | 5.35              | 0.17                          | 46.93            | 7.77                           | 3.50                           |         |  |  |
| CS-6       | 34.40             | 35.50 | 0.10          | 0.10                     | 100                | 34.40           | 34.50 | 10                    | 3.30              | 0.13                          | 84.79            | 6.86                           | 0.96                           |         |  |  |
| CS-7       | 34.50             | 35.35 | 0.85          | 0.80                     | 94                 | 34.50           | 34.59 | 9                     | 11.94             | 0.84                          | 44.47            | 13.78                          | 8.62                           |         |  |  |
| CS-8       |                   |       |               |                          |                    | 34.59           | 34.68 | 9                     | 13.59             | 0.71                          | 35.61            | 22.80                          | 10.00                          |         |  |  |
| CS-9       |                   |       |               |                          |                    | 34.68           | 34.70 | 10                    | 14.00             | 0.60                          | 42.67            | 15.75                          | 7.75                           |         |  |  |
| CS-10      |                   |       |               |                          |                    | 34.70           | 34.84 | 6                     | 39.55             | Tr                            | 27.07            | 4.84                           | Tr                             |         |  |  |
| CS-11      |                   |       |               |                          |                    | 34.84           | 34.90 | 6                     | 15.94             | 0.32                          | 34.96            | 8.81                           | 7.25                           |         |  |  |
| CS-12      |                   |       |               |                          |                    | 34.90           | 34.97 | 7                     | 4.12              | 0.60                          | 53.41            | 10.96                          | 9.50                           |         |  |  |
| CS-13      |                   |       |               |                          |                    | 34.97           | 35.03 | 6                     | 0.70              | 0.14                          | 61.30            | 6.13                           | 9.50                           |         |  |  |
| CS-14      |                   |       |               |                          |                    | 35.03           | 35.11 | 8                     | 0.43              | Tr                            | 93.70            | 2.81                           | Tr                             |         |  |  |
| CS-15      |                   |       |               |                          |                    | 35.11           | 35.26 | 15                    | 9.47              | 0.27                          | 50.32            | 14.78                          | 8.50                           |         |  |  |
| CS-16      | 37.35             | 38.60 | 0.85          | 0.76                     | 89                 | 37.93           | 38.00 | 7                     | 15.65             | 0.40                          | 51.62            | 9.17                           | 5.50                           |         |  |  |
| CS-17      |                   |       |               |                          |                    | 38.00           | 38.07 | 7                     | 14.83             | 0.64                          | 48.95            | 13.21                          | 5.70                           |         |  |  |
| CS-18      |                   |       |               |                          |                    | 38.07           | 38.12 | 5                     | 7.40              | 0.67                          | 50.49            | 5.69                           | 8.50                           |         |  |  |
| CS-19      |                   |       |               |                          |                    | 38.12           | 38.22 | 10                    | 8.24              | 0.52                          | 56.43            | 8.14                           | 6.94                           |         |  |  |
| CS-20      |                   |       |               |                          |                    | 38.22           | 38.37 | 15                    | 18.30             | 0.55                          | 60.64            | 7.02                           | 5.65                           |         |  |  |
| CS-21      |                   |       |               |                          |                    | 38.37           | 38.46 | 9                     | 2.06              | 0.24                          | 60.84            | 4.25                           | 8.04                           |         |  |  |
| CS-22      |                   |       |               |                          |                    | 38.46           | 38.51 | 5                     | 0.41              | 0.18                          | 70.62            | 5.19                           | 7.87                           |         |  |  |
| CS-23      |                   |       |               |                          |                    | 38.51           | 38.60 | 9                     | 1.23              | 0.22                          | 60.22            | 5.29                           | 8.36                           |         |  |  |
| CS-24      | 38.60             | 39.20 | 0.60          | 0.53                     | 88                 | 38.60           | 38.68 | 8                     | 8.65              | 0.35                          | 60.88            | 9.30                           | 5.56                           |         |  |  |
| CS-25      |                   |       |               |                          |                    | 38.68           | 38.77 | 9                     | 0.41              | 0.32                          | 70.89            | 3.45                           | 8.39                           |         |  |  |
| CS-26      |                   |       |               |                          |                    | 38.77           | 38.83 | 6                     | 8.85              | 0.20                          | 71.23            | 7.15                           | 2.85                           |         |  |  |
| CS-27      |                   |       |               |                          |                    | 38.83           | 38.94 | 11                    | 0.82              | 0.45                          | 66.27            | 3.47                           | 10.30                          |         |  |  |
| CS-28      |                   |       |               |                          |                    | 38.94           | 39.05 | 11                    | 7.82              | 0.18                          | 68.48            | 14.87                          | 2.78                           |         |  |  |
| CS-29      |                   |       |               |                          |                    | 39.05           | 39.15 | 10                    | 0.41              | 0.60                          | 68.50            | 3.14                           | 9.40                           |         |  |  |



22462  
CHEMICAL ANALYSIS OF CORE SAMPLES  
BORERHOLE NO. MWU-4

TOTAL NO. OF

SAMPLES-20

| Sample no. | Drilling run (ft) |       | Length of run | Length of core recovered | % Of core recovery | Section sampled |       | Length of sample (CM) | Analysed data % |                               |                  |                                |                                |          |
|------------|-------------------|-------|---------------|--------------------------|--------------------|-----------------|-------|-----------------------|-----------------|-------------------------------|------------------|--------------------------------|--------------------------------|----------|
|            | From              | To    |               |                          |                    | From            | To    |                       | Mn              | P <sub>2</sub> O <sub>5</sub> | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> | Al <sub>2</sub> O <sub>3</sub> | Mn % x L |
| C8-1       | 19.90             | 20.90 | 1.00          | 0.45                     | 45                 | 20.35           | 20.46 | 11                    | 2.92            | 0.11                          | 20.14            | 2.37                           | 0.32                           |          |
| C8-2       |                   |       |               |                          |                    | 20.46           | 20.68 | 22                    | 1.90            | 0.23                          | 24.97            | 1.50                           | 0.15                           |          |
| C8-3       |                   |       |               |                          |                    | 20.68           | 20.90 | 22                    | 16.89           | 0.32                          | 51.12            | 5.62                           | 7.46                           |          |
| C8-4       | 20.90             | 21.20 | 0.30          | 0.30                     | 100                | 20.90           | 20.97 | 7                     | 21.01           | 0.43                          | 47.69            | 6.02                           | 6.10                           |          |
| C8-5       |                   |       |               |                          |                    | 20.97           | 21.56 | 9                     | 17.30           | 0.18                          | 48.34            | 6.20                           | 8.23                           |          |
| C8-6       |                   |       |               |                          |                    | 21.06           | 21.11 | 5                     | 23.48           | 0.60                          | 33.80            | 8.88                           | 7.56                           |          |
| C8-7       |                   |       |               |                          |                    | 21.11           | 21.20 | 9                     | 23.89           | 0.32                          | 58.08            | 7.94                           | 8.80                           |          |
| C8-8       | 21.20             | 22.90 | 1.70          | 1.37                     | 80                 | 21.30           | 21.34 | 14                    | 13.18           | 0.20                          | 34.64            | 6.25                           | 8.70                           |          |
| C8-9       |                   |       |               |                          |                    | 21.34           | 21.48 | 14                    | 6.18            | 0.46                          | 44.03            | 7.10                           | 15.68                          |          |
| C8-10      |                   |       |               |                          |                    | 21.48           | 21.62 | 14                    | 6.59            | 0.71                          | 63.82            | 4.10                           | 9.07                           |          |
| C8-11      |                   |       |               |                          |                    | 21.62           | 21.73 | 11                    | 2.25            | 0.32                          | 82.87            | 1.89                           | 5.20                           |          |
| C8-12      |                   |       |               |                          |                    | 21.73           | 21.89 | 16                    | 2.25            | 0.40                          | 82.69            | 2.04                           | 5.17                           |          |
| C8-13      |                   |       |               |                          |                    | 21.89           | 22.12 | 23                    | 2.00            | 0.20                          | 79.76            | 2.23                           | 4.97                           |          |
| C8-14      |                   |       |               |                          |                    | 22.12           | 22.26 | 14                    | 5.89            | 0.32                          | 70.28            | 3.87                           | 6.06                           |          |
| C8-15      |                   |       |               |                          |                    | 22.26           | 22.37 | 11                    | 6.37            | 0.20                          | 71.96            | 3.09                           | 5.02                           |          |
| C8-16      |                   |       |               |                          |                    | 22.37           | 22.53 | 16                    | Tr              | 0.25                          | 69.96            | 0.30                           | 0.62                           |          |
| C8-17      |                   |       |               |                          |                    | 22.53           | 22.64 | 11                    | 4.28            | 0.30                          | 78.15            | 2.44                           | 5.84                           |          |
| C8-18      |                   |       |               |                          |                    | 22.64           | 22.73 | 9                     | 6.45            | 0.60                          | 71.34            | 4.15                           | 6.07                           |          |
| C8-19      |                   |       |               |                          |                    | 22.73           | 22.10 | 7                     | 7.10            | 0.70                          | 66.32            | 3.51                           | 5.97                           |          |
| C8-20      |                   |       |               |                          |                    | 22.80           | 22.90 | 10                    | 9.12            | 0.72                          | 65.71            | 3.70                           | 3.79                           |          |

**CHEMICAL ANALYSES OF CORE SAMPLES**  
**BOBICKOLE NO. MING-4**

TOTAL NO. OF

SAMPLES-37

| Sample no. | Drilling run (ft) |       | Length of run | Length of core recovered | % of core recovery | Section sampled |       | Length of sample (CM) | Analytical data % |                               |                  |                                |                                |  | Meth % L |
|------------|-------------------|-------|---------------|--------------------------|--------------------|-----------------|-------|-----------------------|-------------------|-------------------------------|------------------|--------------------------------|--------------------------------|--|----------|
|            | From              | To    |               |                          |                    | From            | To    |                       | Mn                | P <sub>2</sub> O <sub>5</sub> | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> | Al <sub>2</sub> O <sub>3</sub> |  |          |
| CS-1       | 41.50             | 44.50 | 3.00          | 3.00                     | 100                | 44.00           | 44.15 | 15                    | 4.80              | 0.82                          | 64.32            | 5.80                           | 12.51                          |  |          |
| CS-2       |                   |       |               |                          |                    | 44.15           | 44.44 | 29                    | 8.01              | 0.91                          | 79.02            | 2.82                           | 6.11                           |  |          |
| CS-3       |                   |       |               |                          |                    | 44.44           | 44.50 | 6                     | 8.04              | 0.49                          | 80.31            | 4.85                           | 11.88                          |  |          |
| CS-4       | 44.50             | 45.00 | 1.10          | 0.90                     | 81.1               | 44.50           | 44.57 | 7                     | 18.14             | 2.07                          | 33.91            | 8.72                           | 11.72                          |  |          |
| CS-5       |                   |       |               |                          |                    | 44.57           | 44.75 | 18                    | 28.21             | 0.82                          | 19.04            | 8.00                           | 1.91                           |  | 471.38   |
| CS-6       |                   |       |               |                          |                    | 44.75           | 44.90 | 15                    | 24.91             | 1.10                          | 24.27            | 11.72                          | 3.15                           |  | 578.85   |
| CS-7       |                   |       |               |                          |                    | 44.90           | 45.10 | 20                    | 21.02             | 1.02                          | 29.01            | 4.90                           | 5.34                           |  | 420.4    |
| CS-8       |                   |       |               |                          |                    | 45.10           | 45.21 | 11                    | 24.91             | 1.78                          | 19.57            | 7.81                           | 8.34                           |  | 274.01   |
| CS-9       |                   |       |               |                          |                    | 45.21           | 45.33 | 12                    | 37.93             | 0.84                          | 17.93            | 5.80                           | 1.88                           |  | 466.10   |
| CS-10      |                   |       |               |                          |                    | 45.33           | 45.43 | 11                    | 32.50             | 1.21                          | 18.02            | 5.80                           | 3.48                           |  | 390.72   |
| CS-11      |                   |       |               |                          |                    | 45.43           | 45.60 | 15                    | 32.72             | 0.85                          | 23.22            | 5.37                           | 2.15                           |  | 480.8    |
| CS-12      | 45.60             | 46.00 | 0.40          | 0.40                     | 100                | 45.60           | 45.80 | 20                    | 30.30             | 0.94                          | 17.57            | 10.78                          | 3.23                           |  | 605.8    |
| CS-13      |                   |       |               |                          |                    | 45.80           | 46.00 | 20                    | 28.72             | 1.22                          | 18.23            | 8.70                           | 5.02                           |  | 614.4    |
| CS-14      | 46.00             | 46.10 | 0.10          | 0.10                     | 100                | 46.00           | 46.10 | 10                    | 28.37             | 1.25                          | 25.19            | 10.91                          | 3.88                           |  | 283.7    |
| CS-15      | 46.10             | 47.50 | 1.40          | 1.40                     | 100                | 46.73           | 47.02 | 29                    | 37.77             | 1.09                          | 16.99            | 10.36                          | 2.02                           |  | 1095.3   |
| CS-16      |                   |       |               |                          |                    | 47.02           | 47.30 | 28                    | 35.01             | 0.9                           | 18.18            | 10.71                          | 2.815                          |  | 3        |
| CS-17      |                   |       |               |                          |                    | 47.30           | 47.50 | 19                    | 33.54             | 0.93                          | 24.07            | 10.13                          | 2.48                           |  | 857.20   |
| CS-18      | 47.50             | 48.50 | 1.10          | 0.70                     | 63                 | 47.50           | 47.57 | 7                     | 18.45             | 2.61                          | 41.11            | 6.75                           | 0.16                           |  |          |
| CS-19      |                   |       |               |                          |                    | 47.57           | 48.00 | 43                    | 4.66              | 1.31                          | 60.60            | 4.80                           | 9.80                           |  |          |
| CS-20      |                   |       |               |                          |                    | 48              | 48.00 | 40                    | 8.44              | 1.84                          | 47.94            | 6.89                           | 11.71                          |  |          |
| CS-21      | 48.40             | 50.00 | 1.60          | 1.40                     | 100                | 48.60           | 48.77 | 17                    | 8.87              | 0.90                          | 62.24            | 3.71                           | 7.45                           |  |          |
| CS-22      |                   |       |               |                          |                    | 48.77           | 49.34 | 17                    | 7.01              | 0.79                          | 60.48            | 4.80                           | 4.34                           |  |          |
| CS-23      |                   |       |               |                          |                    | 49.34           | 49.19 | 23                    | 1.46              | 1.87                          | 60.86            | 6.34                           | 13.08                          |  |          |
| CS-24      |                   |       |               |                          |                    | 49.19           | 49.36 | 17                    | 1.31              | 1.08                          | 69.84            | 3.22                           | 12.48                          |  |          |
| CS-25      |                   |       |               |                          |                    | 49.36           | 49.59 | 23                    | 1.83              | 1.02                          | 67.11            | 3.31                           | 11.45                          |  |          |
| CS-26      |                   |       |               |                          |                    | 49.59           | 49.00 | 9                     | 2.89              | 1.24                          | 84.71            | 3.21                           | 12.32                          |  |          |
| CS-27      | 49.68             | 51.00 |               |                          |                    | 49.68           | 50.00 | 41                    | 8.05              | 0.84                          | 67.82            | 3.40                           | 12.20                          |  |          |



|        |       |       |      |      |     |     |       |       |    |       |      |       |       |       |        |
|--------|-------|-------|------|------|-----|-----|-------|-------|----|-------|------|-------|-------|-------|--------|
| CS-28  | 50.58 | 53.00 | 2.50 |      |     |     | 50.80 | 50.58 | 41 | 25.25 | 1.17 | 28.71 | 7.51  | 3.17  |        |
| CS-29  |       |       |      |      |     | 100 | 50.50 | 50.69 | 13 | 11.58 | 1.42 | 51.87 | 5.9   | 7.43  |        |
| CS-30  |       |       |      |      |     |     | 53.65 | 52.91 | 25 | 6.88  | 0.82 | 69.02 | 4.82  | 9.04  |        |
| CS-31  |       |       |      |      |     |     | 51.51 | 53.00 | 9  | 10.72 | 1.57 | 42.54 | 8.22  | 4.08  | 177.49 |
| CS-32  | 53.80 | 53.15 | 0.15 | 10   | 66  |     | 51.88 | 53.09 | 9  | 20.34 | 0.88 | 29.82 | 0.82  | 4.87  | 284.00 |
| CS-33  |       |       |      |      |     |     | 53.09 | 53.15 | 6  | 28.11 | 1.97 | 28.14 | 16.46 | 0.85  | 190.86 |
| CS-33A | 53.15 | 54.38 | 1.13 | 8.64 | 73  |     | 53.15 | 50.30 | 5  | 1.31  | 3.82 | 60.94 | 4.89  | 11.98 |        |
| CS-34  |       |       |      |      |     |     | 53.30 | 53.34 | 34 | 13.55 | 1.11 | 51.33 | 6.75  | 0.84  |        |
| CS-35  |       |       |      |      |     |     | 53.34 | 53.30 | 16 | 10.59 | 0.78 | 58.91 | 8.11  | 0.71  |        |
| CS-36  |       |       |      |      |     |     | 53.58 | 53.53 | 19 | 8.88  | 2.79 | 68.87 | 4.45  | 11.85 |        |
| CS-37  |       |       |      |      |     |     | 50.68 | 53.81 | 18 | 8.82  | 2.79 | 68.96 | 8.36  | 7.61  |        |
| CS-38  |       |       |      |      |     |     | 50.81 | 58.96 | 16 | 13.21 | 0.44 | 58.97 | 0.81  | 7.14  |        |
| CS-39  |       |       |      |      |     |     | 50.96 | 57.04 | 8  | 38.84 | 0.88 | 28.19 | 11.54 | 5.82  | 345.12 |
| CS-40  |       |       |      |      |     |     | 54.04 | 54.09 | 5  | 22.93 | 0.88 | 44.41 | 7.44  | 3.08  | 111.85 |
| CS-41  |       |       |      |      |     |     | 54.09 | 54.30 | 21 | 24.45 | 1.85 | 34.38 | 7.22  | 3.82  | 513.45 |
| CS-42  | 54.30 | 54.50 | 2.20 | 2.20 | 108 |     | 54.38 | 54.58 | 28 | 28.88 | 1.82 | 37.73 | 7.71  | 4.86  | 384.00 |
| CS-43  |       |       |      |      |     |     | 54.58 | 54.78 | 30 | 30.84 | 0.98 | 28.17 | 7.78  | 4.95  | 812.8  |
| CS-44  |       |       |      |      |     |     | 54.78 | 54.95 | 18 | 32.44 | 0.88 | 21.83 | 7.27  | 8.77  | 583.82 |
| CS-45  |       |       |      |      |     |     | 54.95 | 55.34 | 22 | 24.84 | 4.12 | 17.95 | 10.48 | 4.85  | 688.52 |
| CS-46  |       |       |      |      |     |     | 55.34 | 55.31 | 27 | 21.78 | 4.28 | 14.17 | 8.15  | 4.44  | 838.08 |
| CS-47  |       |       |      |      |     |     | 55.31 | 68.75 | 25 | 20.15 | 0.88 | 11.94 | 7.91  | 9.78  | 783.75 |
| CS-48  |       |       |      |      |     |     | 55.76 | 55.98 | 22 | 28.43 | 0.81 | 20.02 | 7.81  | 2.28  | 888.38 |
| CS-49  |       |       |      |      |     |     | 55.98 | 56.34 | 16 | 37.88 | 0.76 | 15.86 | 8.28  | 1.82  | 1387.2 |
| CS-50  |       |       |      |      |     |     | 56.34 | 56.38 | 16 | 33.25 | 1.17 | 15.91 | 9.51  | 5.81  | 532    |
| CS-51  |       |       |      |      |     |     | 56.38 | 56.68 | 18 | 28.51 | 1.48 | 13.11 | 10.44 | 7.88  | 591.18 |
| CS-52  |       |       |      |      |     |     | 56.68 | 56.98 | 38 | 35.04 | 0.78 | 11.12 | 8.27  | 2.68  | 1851.2 |
| CS-53  |       |       |      |      |     |     | 56.98 | 57.20 | 23 | 28.81 | 1.28 | 18.51 | 12.93 | 5.88  | 888.22 |
| CS-54  |       |       |      |      |     |     | 57.20 | 57.45 | 25 | 28.34 | 1.97 | 15.09 | 12.16 | 4.88  | 888    |
| CS-55  |       |       |      |      |     |     | 57.45 | 57.68 | 21 | 18.88 | 1.88 | 43.85 | 8.11  | 2.47  |        |
| CS-56  |       |       |      |      |     |     | 57.68 | 57.88 | 20 | 2.77  | 1.24 | 52.22 | 8.38  | 12.81 |        |
| CS-57  |       |       |      |      |     |     | 57.88 | 58.30 | 23 | 1.86  | 1.08 | 83.88 | 4.88  | 13.28 |        |

22462  
CHEMICAL ANALYSIS OF CORE SAMPLES  
BOREHOLE NO. MNG-7

TOTAL NO. OF

SAMPLES-20

| Sample no. | Drilling run (M) |       | Length of core recovered | % Of core recovery | Section sampled |       | Length of sample (CM) | Analytical data % |                               |                  |                                |                                |         |  |
|------------|------------------|-------|--------------------------|--------------------|-----------------|-------|-----------------------|-------------------|-------------------------------|------------------|--------------------------------|--------------------------------|---------|--|
|            | From             | To    |                          |                    | From            | To    |                       | Mn                | P <sub>2</sub> O <sub>5</sub> | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> | Al <sub>2</sub> O <sub>3</sub> | Mo% x L |  |
| C8-1       | 47.55            | 50.55 | 3.00                     | 91                 | 48.75           | 49.48 | 65                    | 20.14             | 0.79                          | 47.03            | 8.84                           | 6.86                           | 1309.10 |  |
| C8-2       |                  |       | 2.94                     |                    | 49.90           | 49.90 | 46                    | 32.35             | 0.77                          | 19.51            | 11.27                          | 3.15                           | 1488.10 |  |
| C8-3       |                  |       |                          |                    | 49.86           | 50.55 | 69                    | 27.56             | 1.41                          | 22.77            | 8.92                           | 5.67                           | 1981.64 |  |
| C8-4       | 50.55            | 51.00 | 0.45                     | 100                | 50.95           | 50.70 | 15                    | 22.28             | 0.02                          | 30.21            | 6.80                           | 6.65                           | 334.20  |  |
| C8-5       |                  |       |                          |                    | 50.70           | 50.85 | 15                    | 28.23             | 0.12                          | 24.61            | 9.45                           | 3.17                           | 473.45  |  |
| C8-6       |                  |       |                          |                    | 50.85           | 51.00 | 15                    | 23.60             | 0.98                          | 41.83            | 10.35                          | 2.05                           | 354.00  |  |
| C8-7       | 51.00            | 52.15 | 1.15                     | 100                | 51.00           | 51.25 | 25                    | 31.56             | 0.82                          | 21.84            | 6.76                           | 3.28                           | 796.50  |  |
| C8-8       |                  |       |                          |                    | 51.25           | 51.45 | 20                    | 20.96             | 1.64                          | 39.02            | 5.27                           | 4.17                           | 419.20  |  |
| C8-9       |                  |       |                          |                    | 51.45           | 51.65 | 20                    | 17.66             | 1.38                          | 31.23            | 3.51                           | 8.53                           |         |  |
| C8-10      |                  |       |                          |                    | 51.65           | 52.07 | 42                    | 6.11              | 1.40                          | 60.72            | 6.11                           | 10.93                          |         |  |
| C8-11      | 52.15            | 52.75 | 0.60                     | 100                | 52.27           | 52.42 | 15                    | 9.24              | 0.58                          | 62.67            | 6.65                           | 5.13                           |         |  |
| C8-12      |                  |       |                          |                    | 52.42           | 52.60 | 18                    | 8.91              | 0.47                          | 65.98            | 4.41                           | 4.55                           |         |  |
| C8-13      |                  |       |                          |                    | 52.60           | 52.75 | 15                    | 8.82              | 1.15                          | 60.63            | 4.58                           | 13.69                          |         |  |
| C8-14      | 52.75            | 53.50 | 0.75                     | 100                | 53.45           | 53.50 | 5                     | 3.46              | 0.29                          | 67.71            | 13.55                          | 1.23                           |         |  |
| C8-15      | 53.50            | 54.40 | 0.90                     | 100                | 53.50           | 53.68 | 18                    | 10.23             | 1.97                          | 61.82            | 8.82                           | 2.47                           |         |  |
| C8-16      |                  |       |                          |                    | 53.68           | 53.95 | 27                    | 25.42             | 0.95                          | 28.86            | 7.55                           | 6.19                           |         |  |
| C8-17      |                  |       |                          |                    | 53.95           | 54.10 | 15                    | 4.78              | 1.59                          | 57.39            | 6.78                           | 13.18                          |         |  |
| C8-18      |                  |       |                          |                    | 54.10           | 54.40 | 30                    | 11.00             | 1.28                          | 47.91            | 7.51                           | 7.67                           |         |  |
| C8-19      | 54.40            | 56.50 | 2.10                     | 98                 | 54.40           | 54.60 | 20                    | 10.23             | 1.32                          | 38.24            | 5.71                           | 6.47                           |         |  |
| C8-20      |                  |       |                          |                    | 54.60           | 54.75 | 15                    | 9.24              | 0.71                          | 59.36            | 6.54                           | 6.32                           |         |  |

22462  
CHEMICAL ANALYSIS OF CORE SAMPLES  
BORERHOLE NO. BRC-4

TOTAL NO. OF

SAMPLES-19

| Sample<br>no. | Drilling run (M) |       | Length<br>of run | Length of<br>core<br>recovered | % Of core<br>recovery | Section sampled |       | Length of<br>sample<br>(CM) | Analytical data % |                               |                  |                                |                                |          |  |
|---------------|------------------|-------|------------------|--------------------------------|-----------------------|-----------------|-------|-----------------------------|-------------------|-------------------------------|------------------|--------------------------------|--------------------------------|----------|--|
|               | From             | To    |                  |                                |                       | From            | To    |                             | Na                | P <sub>2</sub> O <sub>5</sub> | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> | Al <sub>2</sub> O <sub>3</sub> | Mn % ± L |  |
| CS-1          | 50.35            | 52.40 | 2.05             | 1.40                           | 72                    | 51.55           | 51.66 | 11                          | 5.05              | 1.55                          | 60.45            | 7.31                           | 12.27                          |          |  |
| CS-2          |                  |       |                  |                                |                       | 51.66           | 51.81 | 15                          | 6.05              | 1.51                          | 64.52            | 6.02                           | 6.85                           |          |  |
| CS-3          |                  |       |                  |                                |                       | 51.81           | 52.21 | 40                          | 15.48             | 1.15                          | 37.32            | 9.57                           | 10.51                          |          |  |
| CS-4          |                  |       |                  |                                |                       | 52.21           | 52.40 | 19                          | 10.52             | 1.29                          | 50.25            | 8.02                           | 12.25                          |          |  |
| CS-5          | 52.40            | 53.80 | 1.40             | 1.34                           | 96                    | 52.40           | 52.63 | 23                          | 16.82             | 1.55                          | 38.52            | 9.25                           | 9.91                           |          |  |
| CS-6          |                  |       |                  |                                |                       | 52.63           | 52.78 | 16                          | 5.21              | 1.13                          | 51.09            | 5.84                           | 12.41                          |          |  |
| CS-7          |                  |       |                  |                                |                       | 52.78           | 52.87 | 9                           | 5.54              | 1.48                          | 53.05            | 5.44                           | 14.03                          |          |  |
| CS-8          |                  |       |                  |                                |                       | 52.87           | 53.14 | 27                          | 32.75             | 1.05                          | 19.11            | 10.55                          | 3.25                           | 684.32   |  |
| CS-9          |                  |       |                  |                                |                       | 53.14           | 53.43 | 34                          | 28.59             | 1.11                          | 23.73            | 7.52                           | 4.31                           | 575.45   |  |
| CS-10         |                  |       |                  |                                |                       | 53.43           | 53.80 | 37                          | 57.01             | 1.02                          | 18.22            | 8.53                           | 2.22                           | 1184.32  |  |
| CS-11         | 53.80            | 54.70 | 0.90             | 0.90                           | 100                   | 53.80           | 53.90 | 10                          | 26.75             | 1.05                          | 31.51            | 8.17                           | 5.75                           | 257.5    |  |
| CS-12         |                  |       |                  |                                |                       | 53.90           | 54.07 | 17                          | 13.85             | 0.94                          | 54.51            | 7.23                           | 7.12                           |          |  |
| CS-13         |                  |       |                  |                                |                       | 54.07           | 54.33 | 26                          | 7.33              | 1.45                          | 60.34            | 5.94                           | 10.78                          |          |  |
| CS-14         |                  |       |                  |                                |                       | 54.33           | 54.54 | 21                          | 1.31              | 1.13                          | 65.51            | 3.77                           | 12.47                          |          |  |
| CS-15         |                  |       |                  |                                |                       | 54.54           | 54.70 | 16                          |                   |                               |                  |                                |                                |          |  |
| CS-16         | 54.70            | 55.50 | 0.80             | 0.80                           | 100                   | 54.70           | 54.90 | 20                          |                   |                               |                  |                                |                                |          |  |
| CS-17         |                  |       |                  |                                |                       | 54.90           | 55.04 | 14                          |                   |                               |                  |                                |                                |          |  |
| CS-18         |                  |       |                  |                                |                       | 55.04           | 55.18 | 14                          |                   |                               |                  |                                |                                |          |  |
| CS-19         |                  |       |                  |                                |                       | 55.18           | 55.25 | 7                           |                   |                               |                  |                                |                                |          |  |

**CHEMICAL ANALYSIS OF CORE SAMPLES**  
**BOREHOLE NO. MNG-9**

TOTAL NO. OF

## SAMPLES-8

| Sample no. | Drilling run (ft) |       | Length of run | Length of core recovered | % Of core recovery | Section sampled |       | Length of sample (CM) | Analytical data % |                               |                  |                                |                                |         |
|------------|-------------------|-------|---------------|--------------------------|--------------------|-----------------|-------|-----------------------|-------------------|-------------------------------|------------------|--------------------------------|--------------------------------|---------|
|            | From              | To    |               |                          |                    | From            | To    |                       | Mn                | P <sub>2</sub> O <sub>5</sub> | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> | Al <sub>2</sub> O <sub>3</sub> | Mn% x L |
| G-1        | 26.00             | 26.35 | 0.35          | 0.25                     | 70                 | 26.00           | 26.35 | 0.35                  | 22.82             | 1.27                          | 32.43            | 7.94                           | 8.82                           |         |
| G-2        | 26.35             | 26.80 | 0.45          | 0.35                     | 80                 | 26.35           | 26.80 | 0.45                  | 14.28             | 2.87                          | 48.29            | 7.31                           | 13.31                          |         |
| G-3        | 26.80             | 27.20 | 0.40          | 0.38                     | 80                 | 26.80           | 27.20 | 0.40                  | 18.18             | 2.84                          | 28.21            | 8.95                           | 14.24                          |         |
| G-4        | 41.70             | 42.30 | 0.60          | 0.50                     | 100                | 41.70           | 42.30 | 0.60                  | 8.85              | 1.51                          | 53.84            | 7.77                           | 8.17                           |         |
| G-5        | 42.30             | 43.05 | 0.75          | 0.72                     | 97                 | 42.30           | 43.05 | 0.75                  | 9.67              | 1.25                          | 56.71            | 6.82                           | 8.82                           |         |
| G-6        | 43.05             | 43.80 | 0.75          | 0.72                     | 97                 | 43.05           | 43.80 | 0.75                  | 11.87             | 1.98                          | 49.18            | 5.86                           | 8.53                           |         |
| G-7        | 43.80             | 44.55 | 0.75          | 0.73                     | 97                 | 43.80           | 44.55 | 0.75                  | 25.08             | 1.07                          | 26.88            | 9.86                           | 8.04                           |         |
| G-8        | 44.55             | 45.30 | 0.75          | 0.73                     | 97                 | 44.55           | 45.30 | 0.75                  | 15.74             | 0.98                          | 41.78            | 10.11                          | 10.84                          |         |

**CHEMICAL ANALYSIS OF CORE SAMPLES**  
**BOREHOLE NO. MNG-10**

TOTAL NO. OF

## SAMPLES-3

| Sample no. | Drilling run (M) |       | Length of run | Length of core recovered | % Of core recovery | Section sampled |       | Length of sample (CM) | Analytical data % |                               |                  |                                |                                |         |  |
|------------|------------------|-------|---------------|--------------------------|--------------------|-----------------|-------|-----------------------|-------------------|-------------------------------|------------------|--------------------------------|--------------------------------|---------|--|
|            | From             | To    |               |                          |                    | From            | To    |                       | Mn                | P <sub>2</sub> O <sub>5</sub> | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> | Al <sub>2</sub> O <sub>3</sub> | Mn% x L |  |
| M-1        | 34.03            | 34.15 | 0.12          | 0.10                     | 78                 | 34.03           | 34.15 | 0.12                  | 23.93             | 1.83                          | 23.83            | 10.45                          | 4.47                           | 387.44  |  |
| M-2        | 34.51            | 34.63 | 0.12          | 0.10                     | 78                 | 34.51           | 34.63 | 0.12                  | 33.12             | 1.25                          | 23.54            | 11.72                          | 2.62                           | 438.72  |  |
| G-1        | 33.50            | 35.10 | 1.56          |                          |                    | 33.50           | 35.10 | 1.56                  | 38.58             | 0.97                          | 21.08            | 11.08                          | 2.55                           | 3254.48 |  |

**CHEMICAL ANALYSIS OF CORE SAMPLES**  
**BOREHOLE NO. NING-12A**

TOTAL NO. OF

**SAMPLES**

| Sample No. | Drilling core (M) |       | Length of rod | Length of core recovered | % Of core recovery | Section analyzed |       | Length of sample (CM) | Analytical data % |                               |                  |                                |                                |         |  |  |
|------------|-------------------|-------|---------------|--------------------------|--------------------|------------------|-------|-----------------------|-------------------|-------------------------------|------------------|--------------------------------|--------------------------------|---------|--|--|
|            | From              | To    |               |                          |                    | From             | To    |                       | Mo                | P <sub>2</sub> O <sub>5</sub> | SiO <sub>2</sub> | Fe <sub>2</sub> O <sub>3</sub> | Al <sub>2</sub> O <sub>3</sub> | Mo% x L |  |  |
| G-1        | 38.62             | 39.10 | 0.48          | 0.25                     |                    | 38.62            | 39.10 | 0.48                  | 21.04             | 1.05                          | 27.04            | 11.02                          | 8.02                           | 1000.72 |  |  |
| G-2        | 39.10             | 39.50 | 0.40          | 0.37                     |                    | 39.10            | 39.50 | 0.40                  | 21.31             | 2.14                          | 38.02            | 10.31                          | 9.97                           | 852.4   |  |  |
| G-3        | 39.50             | 39.90 | 0.40          | 0.38                     |                    | 39.50            | 39.90 | 0.40                  | 28.03             | 1.47                          | 29.87            | 8.71                           | 9.06                           | 1121.2  |  |  |
| G-4        | 39.90             | 40.00 | 0.09          |                          |                    | 39.90            | 40.00 | 0.09                  | 28.21             | 1.74                          | 23.71            | 11.08                          | 6.41                           | 2538.0  |  |  |
| M-1        | 40.00             | 40.94 | 0.14          |                          |                    | 40.00            | 40.94 | 0.14                  | 28.07             | 1.38                          | 29.36            | 11.02                          | 2.33                           | 416.30  |  |  |
| G-5        | 40.94             | 41.50 | 0.56          |                          |                    | 40.94            | 41.50 | 0.56                  | 30.31             | 1.34                          | 21.21            | 11.48                          | 7.42                           | 1007.30 |  |  |
| G-6        | 41.50             | 42.15 | 0.65          | 0.35                     |                    | 41.50            | 42.15 | 0.65                  | 8.19              | 1.43                          | 50.18            | 11.87                          | 9.03                           |         |  |  |
| G-7        | 42.15             | 42.75 | 0.60          | 0.25                     |                    | 42.15            | 42.75 | 0.60                  | 7.71              | 0.08                          | 50.34            | 7.02                           | 12.41                          |         |  |  |
| G-8        | 42.75             | 43.45 | 0.70          | 0.20                     |                    | 42.75            | 43.45 | 0.70                  | 15.24             | 0.64                          | 50.36            | 7.19                           | 6.44                           |         |  |  |

**STATEMENT SHOWING CALCULATION OF PRODUCTION AND  
DEVELOPMENT FOR MINERAL MANGANESE ORE, AREA 105 HA FOR FIVE  
YEAR PERIOD**

Production and Development will be achieved from area marked on Plate no 8.1 to 8.5 in along cross sections C1 C1' to C5 C5', as shown in plate 6A for individual year. In first year first bench will be opened for a height 6m at 385m. Then second third and so on bench of six metre high will be worked in descending order following hill slope.. Width of bench will be minimum six metre. Cross sectional area for calculation of Mn ore production has been considered. The cross sectional area multiplied by lateral distance in a particular year and further multiplied by bulk density 3.1 t/m<sup>3</sup> give Mn ore production in that particular year.

**A) PRODUCTION MANGANESE ORE, ROM**

Calculation for year wise production is as below:

**FIRST YEAR**

**Cross section: C2 C2'**

During the year production will be achieved from C1 & C2 ore bodies for consecutive eight benches from RL 385 m to 397m of six metre high for respective length of individual ore bodies.

'C1' ore body, First bench Floor RL 379m: Cross sectional area 10.84m<sup>2</sup> x lateral distance 33.87 m x 3.1BD = 1138.17 tonne

'C2' ore body, First bench Floor RL 379m: Cross sectional area 10.30m<sup>2</sup> x lateral distance 45.0m x 3.1BD = 1436.85 tonne

'C1' ore body, second bench Floor RL 373m: Cross sectional area 11.50m<sup>2</sup> x lateral distance 33.87 m x 3.1BD = 1207.47 tonne

'C2' ore body, second bench Floor RL 373m: Cross sectional area 15.30m<sup>2</sup> x lateral distance 45.0m x 3.1BD = 2134.35 tonne

'C1' ore body, Third bench Floor RL 367m: Cross sectional area 11.51m<sup>2</sup> x lateral distance 33.87 m x 3.1BD = 1208.52 tonne

'C2' ore body, Third bench Floor RL 367m: Cross sectional area 15.29m<sup>2</sup> x lateral distance 45.0m x 3.1BD = 2132.98 tonne

'C1' ore body, Fourth bench Floor RL 361m: Cross sectional area 11.51m<sup>2</sup> x lateral distance 33.87 m x 3.1BD = 1208.52 tonne

'C2' ore body, Fourth bench Floor RL 361m: Cross sectional area  $15.29\text{m}^2$  x lateral distance  $45.0\text{m} \times 3.1\text{BD} = 2132.96$  tonne

'C1' ore body, Fifth bench Floor RL 355m: Cross sectional area  $11.51\text{m}^2$  x lateral distance  $33.87\text{m} \times 3.1\text{BD} = 1208.52$  tonne

'C2' ore body, Fifth bench Floor RL 355m: Cross sectional area  $15.29\text{m}^2$  x lateral distance  $45.0\text{m} \times 3.1\text{BD} = 2132.96$  tonne

'C1' ore body, Sixth bench Floor RL 349m: Cross sectional area  $11.51\text{m}^2$  x lateral distance  $33.87\text{m} \times 3.1\text{BD} = 1208.52$  tonne

'C2' ore body, Sixth bench Floor RL 349m: Cross sectional area  $15.29\text{m}^2$  x lateral distance  $45.0\text{m} \times 3.1\text{BD} = 2132.96$  tonne

'C1' ore body, Seventh bench Floor RL 343m: Cross sectional area  $11.51\text{m}^2$  x lateral distance  $33.87\text{m} \times 3.1\text{BD} = 1208.52$  tonne

'C2' ore body, Seventh bench Floor RL 343m: Cross sectional area  $15.29\text{m}^2$  x lateral distance  $45.0\text{m} \times 3.1\text{BD} = 2132.96$  tonne

'C1' ore body, Eighth bench Floor RL 337m: Cross sectional area  $11.51\text{m}^2$  x lateral distance  $33.87\text{m} \times 3.1\text{BD} = 1208.52$  tonne

'C2' ore body, Eighth bench Floor RL 337m: Cross sectional area  $15.29\text{m}^2$  x lateral distance  $45.0\text{m} \times 3.1\text{BD} = 2132.96$  tonne

Total Production during First year:  $1196.17+1436.65+1207.47+2134.36+ 2132.96+ 1208.52+ 1208.52 + 2132.96 + 1208.52+2132.96 + 1208.52 + 2132.96 + 1208.52 + 2132.96+1208.52+ 2132.96$  tonnes =25985.72 or say 25986.0 tonnes

## SECOND YEAR

During the year production will be achieved from C1, C2, B1, A1 & A2 ore bodies from RL 355 m and 331m of six metre high for respective length of individual ore bodies.

Cross section: C2 C2'

'C1' ore body, Ninth bench Floor RL 331m: Cross sectional area  $11.51\text{m}^2$  x lateral distance  $33.87\text{m} \times 3.1\text{BD} = 1208.52$  tonne

'C2' ore body, Ninth bench Floor RL 331m: Cross sectional area  $15.29\text{m}^2$  x lateral distance  $45.0\text{m} \times 3.1\text{BD} = 2132.96$  tonne

Cross section: C4 C4'

'C4' ore body, First bench Floor RL 331m: Cross sectional area  $32.27\text{m}^2$  x lateral distance  $139.9\text{m} \times 3.1\text{BD} = 13995.16$  tonne

**Cross section: C1 C1'**

'B1' ore body, First bench Floor RL 331m: Cross sectional area  $11.91\text{m}^2 \times$  lateral distance  $231.22\text{m} \times 3.1\text{BD} = 8536.87$  tonne

'A1' ore body, First bench Floor RL 331m: Cross sectional area  $24.31\text{m}^2 \times$  lateral distance  $33.43\text{m} \times 3.1\text{BD} = 2519.32$  tonne

'A2' ore body, First bench Floor RL 331m: Cross sectional area  $11.50\text{m}^2 \times$  lateral distance  $14.48\text{m} \times 3.1\text{BD} = 516.21$  tonne

Total Production during Second year:  $1208.52 + 2132.96 + 13995.18 + 8536.87 + 2519.32 + 516.21$  tonnes =  $28909.06$  or say  $28909.0$  tonnes

**THIRD YEAR**

During the year production will be achieved from C4 ore body alone for from RL 349 m to 337m of six metre high each for 139.9 length of the ore body.

**Cross section: C4 C4'**

'C4' ore body, Second bench Floor RL 349m: Cross sectional area  $26.32\text{m}^2 \times$  lateral distance  $139.9 \text{ m} \times 3.1\text{BD} = 11414.72$  tonne

'C4' ore body, Third bench Floor RL 343m: Cross sectional area  $26.32\text{m}^2 \times$  lateral distance  $139.9 \text{ m} \times 3.1\text{BD} = 11414.72$  tonne

'C4' ore body, Fourth bench Floor RL 337m: Cross sectional area  $26.32\text{m}^2 \times$  lateral distance  $139.9 \text{ m} \times 3.1\text{BD} = 11414.72$  tonne

Total Production during Third year:  $11414.72 + 11414.72 + 11414.72$  tonnes =  $34244.16$  or say  $34244.0$  tonnes

**FOURTH YEAR**

During the year production will be achieved from ore bodies C4, B2, from RL 331 to 325 & C5 from RL 346 m and 340m of six metre high for respective length of individual ore bodies.

**Cross section: C4 C4'**

'C4' ore body, Fifth bench Floor RL 331m: Cross sectional area  $26.32\text{m}^2 \times$  lateral distance  $139.9 \text{ m} \times 3.1\text{BD} = 11414.72$  tonne

'C4' ore body, Sixth bench Floor RL 325m: Cross sectional area  $26.32\text{m}^2 \times$  lateral distance  $139.9 \text{ m} \times 3.1\text{BD} = 11414.72$  tonne



'B2' ore body, First bench Floor RL 331m: Cross sectional area  $13.64\text{m}^2$  x lateral distance  $106.74\text{m} \times 3.1\text{BD} = 4513.39$  tonne

'B2' ore body, First bench Floor RL 325m: Cross sectional area  $14.27\text{m}^2$  x lateral distance  $106.74\text{m} \times 3.1\text{BD} = 4721.86$  tonne

Cross section: C5 C5'

'C5' ore body, First bench Floor RL 346m: Cross sectional area  $3.22\text{m}^2$  x lateral distance  $228.0\text{ m} \times 3.1\text{BD} = 2275.90$  tonne

'C5' ore body, Second bench Floor RL 340m: Cross sectional area  $12.95\text{m}^2$  x lateral distance  $228.0\text{ m} \times 3.1\text{BD} = 9153.06$  tonne

Total Production during Fourth year:  $11414.72+11414.72+4513.39+4721.86+2275.90+9153.06 = 43493.65$  or  $43494.0$  tonnes

#### FIFTH YEAR

Cross section: C5 C5'

During the year production will be achieved from C1, C2, C4,C5, B1, B2, A1 & A4 ore bodies from RL 334 m and 292m of six metre high for respective length of individual ore bodies.

'C5' ore body, Third bench Floor RL 334m: Cross sectional area  $13.58\text{m}^2$  x lateral distance  $228.0\text{ m} \times 3.1\text{BD} = 9598.34$  tonne

'C5' ore body, Fourth bench Floor RL 328m: Cross sectional area  $13.58\text{m}^2$  x lateral distance  $228.0\text{ m} \times 3.1\text{BD} = 9598.34$  tonne

'C5' ore body, Fifth bench Floor RL 322m: Cross sectional area  $13.58\text{m}^2$  x lateral distance  $228.0\text{ m} \times 3.1\text{BD} = 9598.34$  tonne

'C5' ore body, Sixth bench Floor RL 316m: Cross sectional area  $13.58\text{m}^2$  x lateral distance  $228.0\text{ m} \times 3.1\text{BD} = 9598.34$  tonne

'C5' ore body, Seventh bench Floor RL 310m: Cross sectional area  $13.58\text{m}^2$  x lateral distance  $228.0\text{ m} \times 3.1\text{BD} = 9598.34$  tonne

C5' ore body, Eight bench Floor RL 304m: Cross sectional area  $13.58\text{m}^2$  x lateral distance  $228.0\text{ m} \times 3.1\text{BD} = 9598.34$  tonne

C5' ore body, Ninth bench Floor RL 298m: Cross sectional area  $13.58\text{m}^2$  x lateral distance  $228.0\text{ m} \times 3.1\text{BD} = 9598.34$  tonne

C5' ore body, Tenth bench Floor RL 292m: Cross sectional area  $13.58\text{m}^2$  x lateral distance  $228.0\text{ m} \times 3.1\text{BD} = 9598.34$  tonne

C5' ore body, Eleventh bench Floor RL 286m: Cross sectional area  $13.58\text{m}^2$  x lateral distance  $228.0\text{ m} \times 3.1\text{BD} = 9598.34$  tonne

C5' ore body, Twelfth bench Floor RL 280m: Cross sectional area  $13.58\text{m}^2$  x lateral distance  $228.0\text{ m} \times 3.1\text{BD} = 9598.34$  tonne

C5' ore body, Thirteenth bench Floor RL 274m: Cross sectional area  $13.58\text{m}^2$  x lateral distance  $228.0\text{ m} \times 3.1\text{BD} = 9598.34$  tonne

C5' ore body, Fourteenth bench Floor RL 271m: Cross sectional area  $6.8\text{m}^2$  x lateral distance  $228.0\text{ m} \times 3.1\text{BD} = 4806.24$  tonne

Total production from cross section C5 C5'  
 $=9598.34+9598.34+9598.34+9598.34+9598.34+9598.34+9598.34+9598.34+9598.34+9598.34+9598.34+4806.24 = 118387.88$  tonnes

Cross section: C4 C4'

'C4' ore body, Seventh bench Floor RL 319m: Cross sectional area  $26.32\text{m}^2$  x lateral distance  $139.9\text{ m} \times 3.1\text{BD} = 11414.72$  tonne

'C4' ore body, Eight bench Floor RL 313m: Cross sectional area  $26.32\text{m}^2$  x lateral distance  $139.9\text{ m} \times 3.1\text{BD} = 11414.72$  tonne

'C4' ore body, Ninth bench Floor RL 307m: Cross sectional area  $26.32\text{m}^2$  x lateral distance  $139.9\text{ m} \times 3.1\text{BD} = 11414.72$  tonne

'C4' ore body, Tenth bench Floor RL 301m: Cross sectional area  $26.32\text{m}^2$  x lateral distance  $139.9\text{ m} \times 3.1\text{BD} = 11414.72$  tonne

'C4' ore body, Eleventh bench Floor RL 295m: Cross sectional area  $26.32\text{m}^2$  x lateral distance  $139.9\text{ m} \times 3.1\text{BD} = 11414.72$  tonne

'C4' ore body, Twelfth bench Floor RL 292m: Cross sectional area  $13.18\text{m}^2$  x lateral distance  $139.9\text{ m} \times 3.1\text{BD} = 5707.96$  tonne

'B2' ore body, Second bench Floor RL 319m: Cross sectional area  $14.27\text{m}^2$  x lateral distance  $106.74\text{m} \times 3.1\text{BD} = 4721.86$  tonne

'B2' ore body, Third bench Floor RL 313m: Cross sectional area  $14.27\text{m}^2$  x lateral distance  $106.74\text{m} \times 3.1\text{BD} = 4721.86$  tonne

'B2' ore body, Fourth bench Floor RL 307m: Cross sectional area  $14.27\text{m}^2$  x lateral distance  $106.74\text{m} \times 3.1\text{BD} = 4721.86$  tonne

'B2' ore body, Fifth bench Floor RL 301m: Cross sectional area  $14.27\text{m}^2$  x lateral distance  $106.74\text{m} \times 3.1\text{BD} = 4721.86$  tonne

'B2' ore body, Sixth bench Floor RL 295m: Cross sectional area  $14.27\text{m}^2$  x lateral distance  $106.74\text{m} \times 3.1\text{BD} = 4721.86$  tonne

'B2' ore body, Seventh bench Floor RL 289m: Cross sectional area  $7.13\text{m}^2$  x lateral distance  $106.74\text{m} \times 3.1\text{BD} = 2359.27$  tonne

Total production from cross section C4 C4'  
 $=11414.72+11414.72+11414.72+11414.72+11414.72+5707.36+4721.88+4721.88$   
 $+4721.88+4721.88+4721.88+2359.27 = 86749.63$  tonnes

**Cross section: C1 C1'**

'B1' ore body, Second bench Floor RL 325m: Cross sectional area  $14.80\text{m}^2$  x lateral distance  $231.22\text{m} \times 3.1\text{BD} = 10608.37$  tonne

'B1' ore body, Third bench Floor RL 319m: Cross sectional area  $14.80\text{m}^2$  x lateral distance  $231.22\text{m} \times 3.1\text{BD} = 10608.37$  tonne

'B1' ore body, Fourth bench Floor RL 313m: Cross sectional area  $14.80\text{m}^2$  x lateral distance  $231.22\text{m} \times 3.1\text{BD} = 10608.37$  tonne

'B1' ore body, Fifth bench Floor RL 307m: Cross sectional area  $14.80\text{m}^2$  x lateral distance  $231.22\text{m} \times 3.1\text{BD} = 10608.37$  tonne

'B1' ore body, Sixth bench Floor RL 301m: Cross sectional area  $14.80\text{m}^2$  x lateral distance  $231.22\text{m} \times 3.1\text{BD} = 10608.37$  tonne

'A1' ore body, Second bench Floor RL 325m: Cross sectional area  $30.21\text{m}^2$  x lateral distance  $33.43\text{m} \times 3.1\text{BD} = 3130.75$  tonne

'A1' ore body, Third bench Floor RL 319m: Cross sectional area  $30.21\text{m}^2$  x lateral distance  $33.43\text{m} \times 3.1\text{BD} = 3130.75$  tonne

'A1' ore body, Fourth bench Floor RL 313m: Cross sectional area  $30.21\text{m}^2$  x lateral distance  $33.43\text{m} \times 3.1\text{BD} = 3130.75$  tonne

'A1' ore body, Fifth bench Floor RL 307m: Cross sectional area  $30.21\text{m}^2$  x lateral distance  $33.43\text{m} \times 3.1\text{BD} = 3130.75$  tonne

'A1' ore body, Sixth bench Floor RL 301m: Cross sectional area  $30.21\text{m}^2$  x lateral distance  $33.43\text{m} \times 3.1\text{BD} = 3130.75$  tonne

'B1' ore body, Seventh bench Floor RL 295m: Cross sectional area  $14.80\text{m}^2$  x lateral distance  $231.0\text{m} \times 3.1\text{BD} = 10598.28$  tonne

'B1' ore body, Elght bench Floor RL 289m: Cross sectional area  $7.40\text{m}^2$  x lateral distance  $2310\text{m} \times 3.1\text{BD} = 5299.14$  tonne

'A1' ore body, Seventh bench Floor RL 295m: Cross sectional area  $30.21\text{m}^2$  x lateral distance  $33.43\text{m} \times 3.1\text{BD} = 3130.75$  tonne

'A1' ore body, Eight bench Floor RL 289m: Cross sectional area  $15.11\text{m}^2$  x lateral distance  $33.43\text{m} \times 3.1\text{BD} = 1565.89$  tonne

Total production from cross section C1 C1'  
 $=10608.37+10608.37+10608.37+10608.37+10608.37+3130.75+3130.75+3130.75+3130.75+10598.28+5299.14+3130.75+1565.89=$   
**89289.88tonnes**

**Cross section: C2 C2'**

'C1' ore body, Tenth bench Floor RL 325m: Cross sectional area  $11.51\text{m}^2$  x lateral distance  $33.87\text{m} \times 3.1\text{BD} = 1208.52$  tonne

'C1' ore body, Eleventh bench Floor RL 319m: Cross sectional area  $11.51\text{m}^2$  x lateral distance  $33.87\text{m} \times 3.1\text{BD} = 1208.52$  tonne

'C1' ore body, Twelfth bench Floor RL 313m: Cross sectional area  $11.51\text{m}^2$  x lateral distance  $33.87\text{m} \times 3.1\text{BD} = 1208.52$  tonne

'C1' ore body, Thirteenth bench Floor RL 307m: Cross sectional area  $11.51\text{m}^2$  x lateral distance  $33.87\text{m} \times 3.1\text{BD} = 1208.52$  tonne

'C1' ore body, Fourteenth bench Floor RL 301m: Cross sectional area  $11.51\text{m}^2$  x lateral distance  $33.87\text{m} \times 3.1\text{BD} = 1208.52$  tonne

'C2' ore body, Tenth bench Floor RL 325m: Cross sectional area  $15.29\text{m}^2$  x lateral distance  $45.0\text{m} \times 3.1\text{BD} = 2132.96$  tonne

'C2' ore body, Eleventh bench Floor RL 319m: Cross sectional area  $15.29\text{m}^2$  x lateral distance  $45.0\text{m} \times 3.1\text{BD} = 2132.96$  tonne

'C2' ore body, Twelfth bench Floor RL 313m: Cross sectional area  $15.29\text{m}^2$  x lateral distance  $45.0\text{m} \times 3.1\text{BD} = 2132.96$  tonne

'C2' ore body, Thirteenth bench Floor RL 307m: Cross sectional area  $15.29\text{m}^2$  x lateral distance  $45.0\text{m} \times 3.1\text{BD} = 2132.96$  tonne

'C2' ore body, Fourteenth bench Floor RL 301m: Cross sectional area  $15.29\text{m}^2$  x lateral distance  $45.0\text{m} \times 3.1\text{BD} = 2132.96$  tonne

Total production from cross section C2 C2'  
 $=1208.52+1208.52+1208.52+1208.52+1208.52+2132.96+2132.96+2132.96+2132.96+2132.96=$   
**16707.40 tonnes**

**Cross section: C3 C3'**

'A4' ore body, First bench Floor RL 331m: Cross sectional area  $6.93\text{m}^2 \times$   
lateral distance  $5.78\text{m} \times 3.1\text{BD} = 124.17 \text{ tonne}$

'A4' ore body, Second bench Floor RL 325m: Cross sectional area  $9.0\text{m}^2 \times$   
lateral distance  $5.78\text{m} \times 3.1\text{BD} = 161.26 \text{ tonne}$

'A4' ore body, Third bench Floor RL 319m: Cross sectional area  $9.0\text{m}^2 \times$   
lateral distance  $5.78\text{m} \times 3.1\text{BD} = 161.26 \text{ tonne}$

'A4' ore body, Fourth bench Floor RL 313m: Cross sectional area  $9.0\text{m}^2 \times$   
lateral distance  $5.78\text{m} \times 3.1\text{BD} = 161.26 \text{ tonne}$

'A4' ore body, Fifth bench Floor RL 307m: Cross sectional area  $9.0\text{m}^2 \times$   
lateral distance  $5.78\text{m} \times 3.1\text{BD} = 161.26 \text{ tonne}$

'A4' ore body, Sixth bench Floor RL 301m: Cross sectional area  $9.0\text{m}^2 \times$   
lateral distance  $5.78\text{m} \times 3.1\text{BD} = 161.26 \text{ tonne}$

Total production from cross section C3 C3'  
 $= 124.17 + 161.26 + 161.26 + 161.26 + 161.26 + 161.26 = 830.47 \text{ tonnes}$

Total production during the Fifth year  $= 110367.98 + 86749.53 +$   
 $89289.66 + 16707.40 + 830.47 = 308065.04 \text{ or } 308065.0 \text{ tonnes}$

**B) DEVELOPMENT FOR MANGANESE ORE**

**FIRST YEAR**

**Cross section: C2 C2'**

'C1' ore body Soil: H.W. Cross sectional area  $86.23\text{m}^2 \times$  lateral distance  $33.87 \text{ m}$   
 $= 2901.39\text{m}^3$

'C1' ore body OB: H.W. OB Cross sectional area  $828.87\text{m}^2 \times$  lateral distance  
 $33.87 \text{ m} = 91480.82\text{m}^3$

C1' ore body Soil: F.W. Cross sectional area  $81.55\text{m}^2 \times$  lateral distance  $33.87 \text{ m}$   
 $= 2762.09\text{m}^3$

'C1' ore body OB : F.W. OB Cross sectional area  $700.15\text{m}^2 \times$  lateral distance  
 $33.87 \text{ m} = 23714.06\text{m}^3$

'C1' ore body Soil: I. B. Cross sectional area  $4.82\text{m}^2$  x lateral distance 33.87 m =  $163.25\text{m}^3$

'C1' ore body : I. B, OB Cross sectional area  $85.59\text{m}^2$  x lateral distance 33.87 m =  $2896.93\text{m}^3$

'C2' ore body: H.W. OB Cross sectional area  $1017.10\text{m}^2$  x lateral distance 10.3 m =  $10476.13\text{m}^3$

'C2' ore body : F.W. OB Cross sectional area  $781.70\text{m}^2$  x lateral distance 10.3 m =  $8051.51\text{m}^3$

'C2' ore body : I.B. OB Cross sectional area  $90.40\text{m}^2$  x lateral distance 10.3 m =  $931.12\text{m}^3$

Total Soil removal during First year:  $2691.39 + 2762.09 + 163.25 = 5916.73$  or  $5917.0\text{m}^3$

Total OB removal during First year:  
 $31450.82+23714.08+2896.93+10476.13+8051.51+931.12 = 77532.59$  or  $77533.0\text{m}^3$

## SECOND YEAR

Cross section: C2 C2'

'C1' ore body : H.W. OB = Nil

'C1' ore body Soil: F.W. Cross sectional area  $6.75\text{m}^2$  x lateral distance 33.87 m =  $228.62\text{m}^3$

'C1' ore body : F.W. OB Cross sectional area  $202.69\text{m}^2$  x lateral distance 33.87 m =  $6865.11\text{m}^3$

'C1' ore body : I.B. OB Cross sectional area  $11.81\text{m}^2$  x lateral distance 33.87 m =  $399.23\text{m}^3$

'C2' ore body: H.W. OB Cross sectional area  $9.33\text{m}^2$  x lateral distance 45 m =  $419.85\text{m}^3$

'C2' ore body : F.W. OB Cross sectional area  $6.95\text{m}^2$  x lateral distance 45 m =  $218.25\text{m}^3$

'C2' ore body : I.B., OB Cross sectional area  $58.75\text{m}^2$  x lateral distance 45 m =  $2643.75\text{m}^3$

'B1' ore body : H.W. OB Cross sectional area  $9.33\text{m}^2$  x lateral distance 231.22 m =  $2157.28\text{m}^3$

'B1' ore body : F.W. OB Cross sectional area  $6.95\text{m}^2$  x lateral distance 231.22 m  
=  $1606.95\text{m}^3$

'B1' ore body : I.B. Nil

Cross section: C1 C1'

'B1' ore body : H.W. Nil

'B1' ore body : F.W. OB Cross sectional area  $1.87\text{m}^2$  x lateral distance 231.22 m  
=  $432.36\text{m}^3$

'B1' ore body : I.B. OB Cross sectional area  $27.8\text{m}^2$  x lateral distance 231.22 m  
=  $6427.91\text{m}^3$

'A1' ore body : H.W. OB Cross sectional area  $1.87\text{m}^2$  x lateral distance 24.31 m  
=  $45.45\text{m}^3$

'A1' ore body : F.W. Nil

'A1' ore body : I.B. Nil

Cross section: C3 C3'

'B1' ore body : H.W. OB Cross sectional area  $11.0\text{m}^2$  x lateral distance 231.22 m  
=  $2543.42\text{m}^3$

'B1' ore body : F.W. OB Cross sectional area  $6.42\text{m}^2$  x lateral distance 231.22 m  
=  $1484.43\text{m}^3$

'B1' ore body : I.B. Nil

Cross section: C4 C4'

'C4' ore body Soil: H.W. Cross sectional area  $7.15\text{m}^2$  x lateral distance 139.9 m  
=  $1000.26\text{m}^3$

'C4' ore body : H.W. OB Cross sectional area  $7.00\text{m}^2$  x lateral distance 139.9 m  
=  $979.3\text{m}^3$

'C4' ore body Soil: F.W. Cross sectional area  $1.23\text{m}^2$  x lateral distance 139.8 m  
=  $172.07\text{m}^3$

'C4' ore body : F.W. OB Cross sectional area  $15.31\text{m}^2$  x lateral distance 139.9 m  
=  $2141.86\text{m}^3$

'C4' ore body : I.B. Nil

Total Soil removal during Second year :  $228.62 + 1000.28 + 172.07 = 1400.97$  or  $1401.0\text{m}^3$

Total OB removal during Second year:  
 $8885.11 + 398.23 + 419.85 + 312.75 + 2843.75 + 2157.28 + 1606.98 + 432.38 + 6427.91 + 45.45 + 2543.42 + 1484.43 + 979.30 + 2141.86 = 28453.70$  or  $28454.0\text{m}^3$

### THIRD YEAR

Cross section: C4 C4'

'C4' ore body Soil: H.W. Cross sectional area  $56.97\text{m}^2$  x lateral distance 139.9 m =  $7970.10\text{m}^3$

'C4' ore body : H.W. OB Cross sectional area  $304.32\text{m}^2$  x lateral distance 139.9 m =  $42574.36\text{m}^3$

'C4' ore body Soil: F.W. Cross sectional area  $1.23\text{m}^2$  x lateral distance 139.9 m =  $172.07\text{m}^3$

'C4' ore body : F.W. OB Cross sectional area  $149.25\text{m}^2$  x lateral distance 139.9 m =  $20880.07\text{m}^3$

Total Soil removal during Third year:  $7970.10 + 172.07 = 8142.17$  or  $8142.0\text{m}^3$

Total OB removal during Third year:  $42574.36 + 20880.07 = 63454.43$  or  $63454.0\text{m}^3$

### FOURTH YEAR

Cross section: C4 C4'

'C4' ore body : H.W. OB Cross sectional area  $302.30\text{m}^2$  x lateral distance 139.9 m =  $42291.77\text{m}^3$

'C4' ore body Soil: F.W. Cross sectional area  $21.03\text{m}^2$  x lateral distance 139.9 m =  $2942.09\text{m}^3$

'C4' ore body : F.W. OB Cross sectional area  $175.625\text{m}^2$  x lateral distance 139.9 m =  $24555.25\text{m}^3$

'B2' ore body : H.W. OB Cross sectional area  $75.94\text{m}^2$  x lateral distance 106.74 m =  $8105.83\text{m}^3$

'B2' ore body : F.W. OB Cross sectional area  $38.30\text{m}^2$  x lateral distance 106.74 m =  $4088.14\text{m}^3$



**Cross section: C5 C5'**

'C5' ore body : H.W. OB Cross sectional area  $12.77\text{m}^2 \times$  lateral distance 228 m =  $2911.56\text{m}^3$

'C5' ore body : F.W. OB Cross sectional area  $10.0\text{m}^2 \times$  lateral distance 228 m =  $2280.0\text{m}^3$

Total Soil removal during Fourth year : 2942.09 or  $2942.0\text{m}^3$

Total OB removal during Fourth year:

$42291.77+24555.25+8105.83+4088.14+2911.56+2280.0 = 84232.55$  or

$84233.0\text{m}^3$

#### **FIFTH YEAR**

**Cross section: C1 C1'**

'B1' ore body : H.W. Nil

'B1' ore body : F.W. OB Cross sectional area  $2223.78\text{m}^2 \times$  lateral distance 231.22m =  $514182.41\text{m}^3$

'B1' ore body : I.B. OB Cross sectional area  $235.17\text{m}^2 \times$  lateral distance 231.22m =  $54376.01\text{m}^3$

'A1' ore body Soil: H.W. Cross sectional area  $136.13\text{m}^2 \times$  lateral distance 33.43m =  $4617.68\text{m}^3$

'A1' ore body : H.W. OB Cross sectional area  $1701.68\text{m}^2 \times$  lateral distance 33.43m =  $56887.16\text{m}^3$

'A1' ore body : F.W. Nil

Sub Total Soil :  $4617.68 \text{ m}^3$

Sub Total OB :  $514182.41+54376.01+56887.16= 625445.58 \text{ m}^3$

**Cross section: C2 C2'**

'C1' ore body : H.W. Nil

'C1' ore body Soil: F.W. Cross sectional area  $50.18\text{m}^2 \times$  lateral distance 33.67m =  $1699.59\text{m}^3$

'C1' ore body: F.W. OB Cross sectional area  $3204.37\text{m}^2 \times$  lateral distance 33.67m =  $108532.01\text{m}^3$

'C1' ore body : I.B. OB Cross sectional area  $58.0\text{m}^2$  x lateral distance  $33.87\text{m}$  =  $1964.46\text{m}^3$

'C2' ore body : H.W. OB Cross sectional area  $1160.78\text{m}^2$  x lateral distance  $45\text{m}$  =  $52235.10\text{m}^3$

'C2' ore body : F.W. Nil

'B1' ore body : H.W. OB Cross sectional area  $594.60\text{m}^2$  x lateral distance  $231.22\text{m}$  =  $137483.41\text{m}^3$

'B1' ore body : F.W. Nil

Sub Total Soil :  $1699.59\text{m}^3$

Sub Total OB:  $106532.01+1964.46+52235.10+137483.41 = 300214.98\text{m}^3$

Cross section: C3 C3'

'B1' ore body : H.W. OB Cross sectional area  $805.72\text{m}^2$  x lateral distance  $231.22\text{m}$  =  $186298.58\text{m}^3$

'B1' ore body : F.W. OB Cross sectional area  $1454.23\text{m}^2$  x lateral distance  $231.22\text{m}$  =  $336247.10\text{m}^3$

'A4' ore body : H.W. OB Cross sectional area  $1361.62\text{m}^2$  x lateral distance  $5.78\text{m}$  =  $7965.18\text{m}^3$

'A4' ore body : F.W. OB Cross sectional area  $569.44\text{m}^2$  x lateral distance  $5.78\text{m}$  =  $3291.36\text{m}^3$

Sub Total :  $186298.58+336247.10+7965.18+3291.36 = 533822.22\text{m}^3$

Cross section: C4 C4'

'C4' ore body Soil : H.W. Cross sectional area  $44.76\text{m}^2$  x lateral distance  $139.90\text{m}$  =  $6261.92\text{m}^3$

'C4' ore body : H.W. OB Cross sectional area  $929.19\text{m}^2$  x lateral distance  $139.90\text{m}$  =  $129993.68\text{m}^3$

'C4' ore body : F.W. OB Cross sectional area  $1020.38\text{m}^2$  x lateral distance  $139.90\text{m}$  =  $142746.40\text{m}^3$

'B2' ore body : H.W. OB Cross sectional area  $1959.0\text{m}^2$  x lateral distance  $106.74\text{m}$  =  $209103.68\text{m}^3$

'B2' ore body : F.W. Nil

Sub Total Soil :  $6261.92\text{m}^3$

**Sub Total OB :  $129993.68 + 142748.40 + 209103.66 = 481845.74 \text{ m}^3$**

**Cross section: C5 C5'**

**'C5' ore body Soil : H.W. Cross sectional area  $83.72\text{m}^2$  x lateral distance  $226.0\text{m}$  =  $19068.16\text{m}^3$**

**'C5' ore body : H.W. OB Cross sectional area  $3529.54\text{m}^2$  x lateral distance  $226.0\text{m}$  =  $804735.12\text{m}^3$**

**'C5' ore body Soil : F.W. Cross sectional area  $233.55\text{m}^2$  x lateral distance  $226.0\text{m}$  =  $53272.2\text{m}^3$**

**'C5' ore body : F.W. OB Cross sectional area  $4203.67\text{m}^2$  x lateral distance  $226.0\text{m}$  =  $958436.76\text{m}^3$**

**Sub Total Soil:  $19068.16 + 53272.2 = 72360.36\text{m}^3$**

**Sub Total OB:  $804735.12 + 958436.76 = 1763171.88\text{m}^3$**

**Total Soil removal during Fifth year:  $4617.68 + 1699.59 + 6261.92 + 72631.38 = 85210.55$  or  $85211.0\text{m}^3$**

**Total OB removal during Fifth year:  $825445.58 + 300214.88 + 533822.22 + 481845.74 + 1763171.88 = 3704500.40$  or  $3704500.9 \text{ m}^3$**

#### **SUMMARY OF PRODUCTION & DEVELOPMENT**

| Year         | Production<br>(Tonnes) | Development<br>( $\text{m}^3$ ) |                  |
|--------------|------------------------|---------------------------------|------------------|
|              |                        | Soil                            | OB               |
| I            | 25,966.0               | 5917.0                          | 77533.0          |
| II           | 28,909.0               | 1401.0                          | 28454.0          |
| III          | 34,244.0               | 6142.0                          | 89464.0          |
| IV           | 43,494.0               | 2942.0                          | 84293.0          |
| V            | 3,06,065.0             | 86211.0                         | 3704500.0        |
| <b>Total</b> | <b>4,38,678.0</b>      | <b>103613.0</b>                 | <b>3868174.0</b> |

## CONCEPTUAL PERIOD

As per DGM' estimate, there is a resource of 4, 40,185 tonnes, out of which the lessee will mine 4,88,678 tonnes during the ensuing mining plan period. The balance left out resource for conceptual period would be 1507 tonnes. Hence, no conceptual mining is being planned due to meagre balance resource. However, proposed exploration if establishes additional reserve, the conceptual plan will be modified accordingly.

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खनन योजना तैयार करने के लिए अर्हता प्राप्त व्यक्ति के रूप में मान्यता प्रमाण-पत्र  
CERTIFICATE OF RECOGNITION AS QUALIFIED PERSON TO PREPARE  
MINING PLANS

(अर्हता नियम विधिवले, 1960 के नियम 22 के अंतर्गत)  
(Under Rule 22 of Mineral Concession Rules, 1960)

श्री श्रीराम वाघभरे-का पुत्र श्री एम.एस.वाघभरे

Sri M.S. Waghmare A/o Shriram Waghmare

असम/26/11, एम.एस.जी. रोड, गेजेट, कोलकाता - 700 095

M/S 26/B, Main Row House, National Layout, Bangalore - 560 090

की अर्हता योग्यताओं तथा अनुभवों के संतोषजनक प्रमाण देने के बादने में पर्याप्त रूप से

having given satisfactory evidence of his qualifications and experience in

विषयक नियमवली, 1960 के नियम 22 के अंतर्गत अर्हता योग्यता प्रमाण देने के लिए

granted recognition under Rule 22 of the Mineral Concession Rules, 1960 as a

अर्हता प्राप्त व्यक्ति के रूप में मान्यता दी जाती है।

qualified person to prepare Mining Plans

संख्या मंत्रीराम अर्हता

His Registration No. 11

आवेदन/निर्देश/2255/2011/ए-एन/एन/255/2011/ए

यह मान्यता इस व्यक्ति के लिए दी जा रही है कि वह 02/12/2011 तक मान्यता योग्य है।

This recognition is valid for a period of ten years ending 02/12/2021

REGIONAL CONTROLLER OF MINES  
कोलकाता

स्थान / Place : कोलकाता/Bangalore  
दिनांक / Date : 05/12/2011



अभियांत्रिकी स्नातक  
(Bachelor of Engineering)



*This is to certify that*  
Shri Manohar Shriram Waghmare  
 obtained the degree of अभियांत्रिकी स्नातक (Bachelor  
 of Engineering) in this University in the  
 Examination held in March-April, 1987  
 and was placed in the First Division,  
 in Mining branch.  
Engineering

**GUOULDOH- MINERALIZED AREA**





**PHOTOGRAPHS SHOWING BOUNDARY POINTS OF THE LEASE**

