MODIFIED MINING PLAN AND
PROGRESSIVE MINE CLOSURE PLAN

(UNDER RULE 17(1) OF MCR 2016 & 23 OF MCDR 2017)

VOLUME – I (TEXT& ANNEXURES)

IN RESPECT OF

SURDA LEASE

IBM Registration No: IBM/6381/2011

Mine Code: 14BHR27005

LEASE AREA: 388.68 HECTARES

FOREST AREA: 149.03 HECTARES

[Reserved Forest: 88.83 Hectares; Protected Forest: 60.20 Hectares]

NON FOREST AREA: 239.65 HECTARES

MINERAL: COPPER ORE

VILLAGE: SURDA-SOHADA, DISTRICT: SINGHBHUM (E)

TALUKA: GHATSILA, STATE: JHARKHAND

CATEGORY: "A" (FULLY MECHANISED)

Period of Proposal: 01.04.2020 TO 31.3.2025

Validity of Lease up to 31.03.2020 (Applied for Extension up to 31.03.2040)

APPLICANT

HINDUSTAN COPPER LIMITED, INDIAN COPPER COMPLEX

SURDA U/g COPPER MINES, GHATSILA – 832303

SINGHBHUM (E) (JHARKHAND)

PREPARED BY

Amit Degvekar, Sr. Manager (Exploration) and Parvez Alam, Sr. Manager (Mines)

Hindustan Copper Limited, Indian Copper Complex,

P.O.- Ghatsila, Distt. Singhbhum (East) 832303, Jharkhand

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(Qualified Person)

Amit Degvekar
(Qualified Person)

INTRODUCTION

The Surda Mine is located between latitudeN22032'43.119"- N22o34'17.401"and longitude86025'31.849''- E86o26'45.097" in Ghatsila Sub-Division, East Singhbhum district of Jharkhand state occurring in the famous Singhbhum Copper Belt. It is situated 10 km away from Ghatsila Railway Station, S.E. Railway and 45 km from Tatanagar.

The mine was opened in 1930's at a modest scale with available information of ore reserves but production and exploration was suspended later on. After independence, the mine was re-opened in1956. In the year 2003, mine production was suspended again due to high production cost etc. Dewatering, equipment maintenance and other essential activities kept continuing. Production activities re-started again from 14.04.2007.

The mine has been developed over a strike length of 2.2 km and to a depth of 474m. i.e. 13thlevel. The present production capacity of the mine is **3, 17,238tonnes** (As per actual production in 1993-94). However, it has been proposed in this Mining plan to enhance the production quantity up to 538526tonnes (2024-25) . The lessee is in the process to obtain the environment clearance for the enhanced quantity (0.9Mtpa) . TOR in this regard has been obtained from the Ministry of Environment, Forests& Climate Change (**Annexure -11A**). The proposal was listed for presentation at the 8th meeting of the Expert Appraisal Committee at Agenda No. 3.1 on 22.07.2016 and committee has recommended the proposal for Environmental Clearance vide minutes of the 8th meeting of EAC subject to forest (copy of EC recommendation by EAC committee is enclosed as **Annexure- 11B**)

Govt. of Jharkhand vide letter No. Kha. Ni. (Garhwa) 01/2012 dated 18.03.2015 under section 8A(8) of MMDR Amendment Ordinance 2015 have extended the lease period up to 31.03.2020 (copy enclosed in **Annexure-8**). The Supplementary Lease Deed executed in support of the extended lease period has been enclosed as **Annexure-9A**. Company has applied for extension of validity of surda mining lease as per clause 3 of **Mineral (Mining by Government Company) Rule, 2015** and its subsequent amendment (copy of application submitted to the Secretary , Department of Mines and Geology Govt. of Jharkhand is enclosed as **Annexure -9B**)

Surda Mines a part of Mosaboni Mining Lease has been accorded Stage-II Forestry Clearance by the MoEF&CC (Forest Conservation Division) vide letter no Letter No.F.No.8-64/93-FC dated 15.05.1998 co-terminus with lease (copy enclosed as **Annexure-12A**).Company has Deposited total NPV amounting Rs. 95247845/- (Nine Core Fifty-two Lack Forty-seven Thousand Eight Hundred Forty-five only) in CAMPA fund as per demand Note of NPV received vide letter no. 2956/Jamshdpur dated 12.09.2019.Letter No.2995dated 18.09.2019 issue by DFO, Jamshedpur confirming payment of NPV is attached as **Annexure 12B**.

Last Mining Plan of Surda Lease for a period of 2019-2020 over an area of 388.68 Ha. has been approved by IBM vide letter no.RAN/ESB/Cu/MP-21/2018-19 dated 16.04.2019. Copy of the approval letter is enclosed in **Annexure-10**

The present submission is of Modified Mining Plan for its approval under rule 17(1) of MCR 2016 for the extended mining lease period upto 31.3.2040.

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(Qualified Person)

1.0 GENERAL

a) Name of applicant/ lessee/ Rule 45 registration No.	**Shri S.K.Bhattacharya** **Director (Mining) & Nominated Owner** **Hindustan Copper Limited** **1, Ashutosh Chowdhury Avenue, Kolkata- 19** A list of board of directors of HCL is given in **Annexure-1**.A copy of the board resolution appointing Shri. S.K.Bhattacharya as the nominated owner of the mine is given in **Annexure-2**. The photocopy of the id proof & address proof (Both permanent & temporary) of the nominated owner of the mine is enclosed in **Annexure-3**. The list of leases held by the applicant has been enclosed in **Annexure-4**.
Registration No. of HCL. under Rule 45	IBM/6381/2011(Copy enclosed as **Annexure 5**)
Address	**SurdaUnderground Copper Mine** P.O: Ghatsila,
District	East Singhbhum,
State	Jharkhand
Pin Code	832303
Phone& Mobil No	033 – 22817138 , Mob No. 9433005094
Fax	033 - 22902978
e-mail	bhattacharya_sk@hindustancopper.com
b) Status of the applicant	
Private individual	No
Cooperative Association	No
Private Company	No
Public Company	No
Public Sector Undertaking	Yes
Joint Sector Undertaking	No
c) Mineral(s) which is / are include in the prospecting license (From fresh grant)	Not Applicable
d) Mineral(s) which is/ are include in the lease deed	Copper and associated minerals
e)Mineral(s)whichthe applicant/lessee intends to mine	Copper and associated minerals

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f) Name of Qualified Person (QP) under rule 15(1) of MCR,2016 or a Person employedunder clause (c) of Sub rule (1) of rule 42 of MCDR, 1988(Applicable for Scheme ofMining only)preparing Mining Plan:	
Name of the QP who prepared the mining plan and his qualification and Experience	Amit Degvekar - Manager (Exploration), HCL Ltd. ParvezAlam - Sr. Manager (Mines) Copy of the proof of qualification & experience of QP are enclosed in **Annexure-6**.
Address	Hindustan Copper Limited Indian Copper Complex Ghatsila– 832303
Phone	06585 256495
Mobil number	8210071178 8084227920
e-mail	amit_nd@hindustancopper.com parvez_a@hindustancopper.com
Telex	-
Registration No.	NA
Date of grant/ renewal	NA
Valid upto	NA

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2.0 LOCATION AND ACCESSIBILITY OF MINES

a) Lease Details (Existing Mine)

Name of Mine	SurdaCopper Ore Mines (Lease Area : 388.68 Ha)
Latitude &Longitude of boundary point	Surda underground copper mine falls on Survey of India Toposheet- 73 J/6, Lat. / Long. of the boundary pillar co-ordinates are given below:- **Longitude** / **Latitude** 86°25'31.849"E / 22°34'18.848"N 86°25'58.633"E / 22°32'43.119"N 86°26'45.097"E / 22°32'56.241"N 86°26'22.197"E / 22°34'17.401"N
Period / expiry Date	Up to 31.03.2020 (applied for extension of validity of mining lease for 20 year i.e. upto 31.03.2040 as per clause 3 of **Mineral (Mining by Government Company) Rule, 2015** and its subsequent amendment.
Name of lease holder	Hindustan Copper Limited
Address	Tamra Bhavan, 1, Ashutosh Chowdhury Avenue, Kolkata -700019
Tel.	033-22817138
Fax	033-22902978
e-mail	Bhattacharya_sk@hindustancopper.com
Mobile	09433005094

b) Details of applied / lease area with location map (fresh area/mine)

Forest (Specify)	Area, (Ha)	Non Forest (Specify)	Area, (Ha)
Reserved Forest	88.83	Govt. Waste Land Community waste land	107.94 6.40
		Grazing Land	
Protected Forest	60.20	Agriculture Land	121.78
		Others (Specify) District Board Land Education board Land	 3.53
Total	**149.03Ha**	**Total**	**239.65**

Total Lease area /Applied area	388.68 Ha/ Khata wise / plot wise land schedule of mining lease area of 388.68 Hectares under the mouza Benashole (100), Sohada (101), Surda (102) Pathargora (160) and Forest Block (1098) showing ownership is enclosed as **Annexure-16.**

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District & State	District : East Singhbhum State : Jharkhand
Taluka	Ghatsila
Villages	Benashole (100), Sohada (101), Surda (102) Pathargora (160) and Forest Block (1098)
Whether the area falls under Coastal Regulation Zone (CRZ)? If yes, details thereof	No
Nearest distance from any boundary pillar to the nearby National Park/WildLife sanctuary/Protected Area (to be given if located within 10km from the radius of applied/lease area)	Not applicable
Existence of public road/railway line, if any nearby and approximate distance-	Surda Copper mine can be approached from Ghatshila Railway station by 10 kmmotorable road
Approach route fromDistrict Head Quarters to area/ mine site	The mine can also be approached from TatanagarRailway Station by 40 km all weather road.

Toposheet No. with Latitude & Longitude of all corner boundary point /Pillar

Surda underground copper mine falls on Survey of India Toposheet- 73 J/6 and is located at Ghatsila subdivision of Ease Singhbhum district of Jharkhand state in the Singhbhum copper belt it is at distance of about 10kmn from Ghatsila Rly, Stn. And around 240 km from Kolkata and 50km from Tatanagar . The same has been show in the key plan enclosed as Drg. No. **HCL/ICC/SRD/2019-20/01** Lat. /Log. Of the boundary pillar co-ordinates are given below:-

Longitude	Latitude
86°25'31.849"E	22°34'18.848"N
86°25'58.633"E	22°32'43.119"N
86°26'45.097"E	22°32'56.241"N
86°26'22.197"E	22°34'17.401"N

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

The same has been shown in the key plan as Drg. No. **HCL/ICC/SRD/2019-20/01**

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

3.1 Date and reference of earlier approved MP/ SOM:

Last Mining Plan of Surda Lease for a period of 2019-2020 over an area of 388.68Ha. has been approved by IBM vide letter no. RAN/ESB/Cu/MP-21/2018-19 dated 16.06.2019. Copy of the approval letter is enclosed in **Annexure-10**.

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

Not applicable

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

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Review of proposals made in the last approved mining scheme and actual achievement for the SurdaMines is given below.

i. Exploration

Exploration in the form of detailed definition drilling at the development headings were proposed in the last approved mine plan. Review of the same is as follows:

Exploration (Surface Boreholes)

Year	Planned Exploration	Actual Exploration
2019-20	3200m (4 Nos. of Coring/angular BHs)	2430 m(4 Nos. of angular BHs)
Total	**3200m (4 BHs)**	2430 m(4Nos of angular BHs)

Reason for deviation : In the year 2012-13 to 2014-15 M/s MECL have completed total 08 Nos. of borehole totaling 7483.60m intersecting load corresponding to the 17th& 20th level, this have confirmed and substantiated the down the dip ore load continuity and indicates the ore bode is still open in depth. Final Geological report submitted by MECL in 2018. The 2nd phase drilling started during the year 2018-19 and completed 02 BHs with 1576m and balance drilling completed in 2019-20.

Exploration - underground Boreholes:

Year	Planned Exploration	Actual Exploration
2019-20	750m (25Nos)	0 (Till 31.12.2019)
Total	**750m (25Nos)**	**0**

Contract could not be materialized.

ii) Mine Development and Exploitation

The achievement position as against the target in respect of ore, sub grade & waste are given in the table below:

Year	Ore, t		Sub grade, t	
	Planned	Actual	Planned	Actual
2019-20	443110	188393 (till 31.12.2019)	0	0
Total	**443110**	**188393 (till 31.12.2019)**	**0**	**0**

Reasons of Deviation: Mine work with old capacity i.e. 0.317 Million due to non-availability of expansion EC.

iii) Afforestation

The achievement position as against the target in respect of afforestation is given below:

Year	Afforestation, Nos.	
	Planned	Actual, Nos.
2019-20	500 Nos.	500 Nos.
Total	**500 Nos.**	**500 Nos.**

iv) Land Reclamation and Rehabilitation:

In the mining plan period it was not proposed to reclaim& rehabilitation any mined out area of land. Obviously there is no deviation in this part

v) Waste dump management:

In the mining plan period it was not proposed to handle OB & reject . Obviously there is no deviation in this part

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vi) Control of dust, Noise, air and ground vibration:

It was proposed to carry out sampling of air, water and noise periodically and take mitigation measures to limit the pollution level of these parameters. Monitoring of the air quality, noise quality, water quality etc. have been regularly carried out as per the norms and details of the same are enclosed in **Annexure-20**

3.4 Give status of compliance of violations pointed out by IBM

Details status of the violation enclosed at **Annexure-29**.

3.5 Indicate and give details of any suspension /closure/ prohibitory order issued by any Government agency under any rule or Court of law:

No any suspension /closure/prohibitory order issued by any government agency under any rule or court of low.

3.6 In case the MP/SOM is submitted under rules 9 and 10 of the MCDR'88 or under rule 17 of the MCR'2016 for approval of modification, specify reason and justification for modification under these rules:

The Company has applied for extension of validity of surda mining lease for 20 year (up to 31.03.2040) as per clause 3 of **Mineral (Mining by Government Company) Rule, 2015** and its subsequent amendment. The present submission is a Modified Mining Plan for its approval under rule 17(1) of MCR 2016 for the extended ML period upto 31.3.2040.

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PART – A

1.0 GEOLOGY AND EXPLORATION

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

i. PHYSIOGRAGHY-

The deposit crops out as a NNW-SSE trending ridge parallel to the strike of the rock formations. The immediate hanging wall side of the ore body is a rolling cultivated country side upto the Subarnarekha River. All the tributary nallahs are seasonal and the Subarnarekha is the perennial source of water in the area. There is no big village in the area. Forest land is only along the hill ridge and hill slope. The base area covers 35% of forest land, 55% of agriculture land and 10% of waste land, Vegetation is thick. The Surda town ship is about 3 km south east and other HCL colony has come up in the SE of the deposit

ii. DRANAGE PATTERN

The study area is part of the Subarnarekha Basin. The Subarnarekha River is a major perennial river which drains a large part of south-eastern Jharkhand, western part of West Midnapur District of West Bengal and north-eastern parts of Odisha adjoining West Bengal before flowing into the Bay of Bengal. In the study area, the Subarnarekha flows from northwest towards the south-east through a wide valley about 2 – 3 km east of Surda Mine Lease

Surda Mine Lease is drained by mainly by two streams. The northern and centralparts are drained by seasonal drainage channels originating from springs in ML which form the Gharaduba Nala. The southern part of the ML is drained by the Surda Nala. These perennial streams flow towards the south-east / east to meet each other about 2 km east of the ease's south-eastern corner before draining into the Subarnarekha River ~0.5 km further east. Another perennial stream, the Kankuram Nala , flows from the south-west towards the north-east just beyond the lease's northern boundary to join the Subarnarekha River about 2.5 km north-north-east of Surda Mine Lease. A small area in the north-western corner of the lease drains into the Kankuramnala. Major part of the area has dendritic drainage pattern. The drainage of the area is controlled through a network of small seasonal and perennial streams which drain into the Subarnarekha river. The ubarnarekha river flows from the north east towards the south-east about 2.5 km east of the lease area. The general groundwater table of the lease hold area is located 12 – 16 m below the ground level.

iii. Vegetation

Forest types occurring in the district are Tropical Dry Deciduous Forest and Tropical Moist Deciduous Forest. The Surda ML area has forest land of about 35%, 55% of agriculture land and 10% of waste land, most of the forest has been reduced to the status of coppice forest. For over a major part even coppice forests have been degraded almost to shrub forest. The patches of virgin natural forest shows the forest type.

iv. Climate

The overall climate of Singhbhum district is characterized by intensely hot summer and moderately cold winter with hot westerly wind prevailing over the area, the following are the seasons of the east Singhbhum district.

1. Winter(dry) Nov.-Feb
2. Summer (hot) March- June
3 Monsoon (wet) July-Oct

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The average annual rainfall for the district is around 1300 mm since the annual rain fall lies between 1200mm to 1400mm. The monsoon season usually starts from May and continues till September. June to September is the wettest period claiming 81% of total annual rainfall.

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

The stretch of Precambrian rocks in Singhbhum (Jharkhand), extending over a length of nearly 200 km. between Kesharpur (Orissa) in South-West, has an array of economic mineral deposits of importance. Copper, Uranium, Kyanite and apatite deposits are well known and are confined to the "Shear/Thrust zone" popularly known as "Singhbhum Copper Belt".

ICC Group of mines is a part of the Singhbhum Shear/Thrust zone and it is associated with Dhanjori and Chaibasa rocks of Singhbhum Super Group of Archaean age. The rock formations within the area are regionally metamorphosed sediments and meta-volcanics of Precambrian age. The rocks to the north of the shear zone are garnetiferous-mica-schists, quartzites and quartz-kyaniteschists belonging to Dhanjori Group and found all along the hills and valleys to the south of shear zone. The regional strike of rock formations in N 10 to 40 degrees W and dip is 30 degree due NE. The rocks within the shear zone are highly sheared and mylonitised equivalents of siliceous rocks - granites and quartzites. Because of the presence of soda rich feldspars in granite in Mosaboni area, the rock is called soda granite. Quartzite and more siliceous rocks are found in Surda area and further north-westwards.

Chalcopyrite is the most pre-dominant sulphide mineral followed, in order of abundance, by pyrite and pyrrhotite. Important amongst oxide minerals are apatite, magnetite etc. Gold and silver occurs in minor quantities. The sulphides occur commonly as massive, veins, stringers along foliation and fracture planes, as disseminations and as minor replacement patches and veins

GENERALISED CHRONOLOGICAL STRATIGRAPHIC SUCCESSION OF THE PRE-CAMBRIANFORMATIONS IN SINGHBHUM-KEONJHAR-MAYURBHANJ AREAS

(After Sarkar and Saha, 1977,1983; Basu, Ray, Saha& Sarkar,1981; Saha Ray and Sarkar,1988)

South of the shear zone	North of the shear zone
End of SinghbhumOrogenic Cycle	
Newer Dolerite(c.1600-950Ma)	(c.2220-1650Ma) Soda Granite Granophyre
Chakradharpur Granite-Gneiss Mayurbhanj Granite Kuilapal Granite (c.2100 Ma)	
----------Unconformity----------	
Jagnnathpur-Dhanjori-Simlipal lavas Dhanjori Group (>2200 Ma)	Dalma lavas with inter- trappean reworked lava, conglomerates
Quartzite, Conglomerate	
----------Unconformity----------	
Singhbhum Group Chaibasa Formation	Dhalbhum Formation Chaibasa Formation

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----------Unconformity----------
Singhbhum Granite (Ph.III c.2300 Ma)
Iron Ore Orogeny
Iron Ore Group(<3300 Ma)
----------Unconformity----------
Singhbhum Granite (Ph. I & II c. 3300 Ma)
Older Metamorphic Gniess
(Metamorphic agc> c.3300 Ma)
OMG tonolite (c.3800 Ma)
O.M.Orogeny
Older Metamorphic Group (>c.3800 Ma)

c) Detailed description of geology of the lease area such as shape and size of the mineral/ore deposit, disposition various litho-units indicating structural features if any etc. (Applicable for Mining Plan for grant & renewal and not for Scheme of Mining/Modifications in the approved mining plan/scheme of Mining).

Copper mineralization

Lithology

On the basis of Geological Mapping done by Geological Survey of India, the following sequence of rock from S.W. to N.E. is reconstructed for the Surda area The details are given below:-

North-East:-

11. Epidiorite and basic rocks (Dalma Trap)
10. Sericite-Quartz-Schist
9. Quartzite (Chaibasa Stage)
8. Sericite-Kyanite-Quartz-Schist
7. Feldspathic-Schist with Tourmaline and Magnetite rock (not continuous along strike)
6. Quartz-Conglomerate(not continuous along the strike and well developed in the mines-Shear Zone rocks)
5. Granular-Quartz-Chlorite rock with tourmaline and magnetite and vein Quartz conglomerate
4. Biotite-Schist
3. Quartzite (Dhanjori Quartzite)
2. Biotite-Schist
1. Talc-Chlorite-Schist and ultrabasic Dhanjori Traps rocks

Southwest:-

The rock of the Chaibasa Stage (Sericite-Kyanite-Quartz-Schist and quartzite) are thrust over the younger rocks of Dhanjori group

Structure:

The general strike of the rocks in the area is NW-SE with dip varying from 300 to 50o towards NE. The thrust zone maintains a NW-SE trend in this part of the belt. The rock formations have been affected by tectonic movements giving rise to a series of major plunging folds and axes trending approximately ESE-WNW and developed within the shear zone. On the limbs of these folds, S-shaped cross folds have been observed. The Quartzite rocks shows well developed joint pattern. There are three mutually perpendicular tension fractures and two diagonal shear fractures are observed in the host rocks. The linear structure in the area is

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represented by (i) Pebble elongation (ii) Slicken-Slide (iii) Parallel alignment of mineral grains and (iv) axes of Micro fold, the lineation normally pitching 450 to 500 towards N 500 E.

Mineralization:

The surface indication of mineralisation in the form of gossan bands is traceable along the strike of the formations. Gossan zone consists of iron oxides formed insitu and are yellowish brown, brick red to black in colour. In some cases triangular and other box works are noticed. On an average, the depth of oxidation does not exceed 30 m. and the main minerals of oxidation are azurite, malachite and iron oxide which are found to stain the outcrops.

Control:

Mineralisation is largely confined to granular-chlorite-biotite-schist and quartzite-chlorite-schist, especially where there are a number of sheared quartzite reefs. These rocks show evidences of crushing, silicification and hydrothermal alteration.Mineralisation occurs as disseminations along foliation, fracture and breccias fillings and also minor replacement patches

Mineralization & Lode disposition

The copper mineralisation is exposed right on the surface of the hill slope in the form of oxidised outcrop and feeble gossans zones exhibiting limonitisation in shades of brown, red and purple colours.

Copper sulphide ores are medium to coarse crystalline with a typical golden-yellow colour. Next to chalcopyrite in order of abundance is pyrite followed by pyrrhotite and pentlandite. Within the shear zone, the intensity of mineralisation is variable and narrow zones of rich mineralisation following shears are known as “Lodes”.

In the southern part of Surda Mine, there are three lodes, which are termed as Hanging wall. Inter and Foot wall lodes. In the Central and Bottom sections, number of shoots with intervening lean zones have formed a lode up to 20m wide, at places.

Lode description

In Surda mine three lodes are identified and the details are as under:-

Hanging Wall Lode:

This is the richest among all the lodes of the mine block, occur between 450ms to 600m N near No. 3 shaft and between 900m S to 1300ms around No.4 shaft area. This lode shows an en-echelon pattern along strike, folded in places and the thickness (1m. to 6.5m) increases or decreases along strike and dip directions, however, the grade is consistent and mined by Room and Pillar and Cut and Fill / PP methods.

Inter Lode:

It occurs between 1300 m S to 950 m S around NO. 4 shaft and 500 m S to 150mS around No. 3 shaft. The width varies between 1.65m to 16m, variation in strike and dip directions also. The host rock varies from hard granular-quart-chlorite to Quartz-schist, chlorite-schist. Both Room & Pillar and HCF/PP methods of stoping are suitable here.

Footwall Lode:

This lode occurs around central part of the mining area between 400 m S to 900mS. Width varies 1.5m to 7.0m approx. This lode is suitable for HCF method of stoping.

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d) (i) Name of prospecting /exploration agency:

1. Hindustan Copper Ltd.
2. Mineral Exploration Corporation Ltd.

(ii) Address

1. Tamrabhavan1, Ashutosh Chowdhury Avenue, Kolkata – 700019
2. Dr. Babasaheb Ambedkar Bhawan, Seminary Hills, Nagpur-440 006, Maharashtra.

(iii& iv) E mail address and phone no.

1. Tel.-033 -2283, 2226, 2529, 2952, 2871, 2032
   FAX-033 -2283, 2478, 2640
   e-mail: hcl_ho@hindustancopper.com
2. Tel:0712-2510310, 2511833
   Fax- 712-2510548
   E-mail: headbd@mecl.gov.in

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.

The area was explored by Cape copper company in early 1930's by opening adit but the exploration was suspended. Indian Copper Corporation started a systematic prospecting in the area from the year 1955. Since then, total 97 nos. Surface Boreholes totaling 33399.96 m and 3058 nos. underground boreholes totaling 50,953 meters have been drilled till 31.12.2019. The deepest surface borehole in this area is MSM 08 drilled up to 1035meters with an inclination of 52^0 to horizontal.

Surda Block was explored by equally spaced series of surface Boreholes to intersect ore bodies at 3rd, 5th and 8th levels of the mine. Later on one deep underground borehole from the 10th level and two deep surface boreholes were undertaken to prove depth continuity of ore body below 14th level of mine. MECL has taken up a drilling programme of 17 nos. boreholes totaling 9063.7m in 1992-94. Depth continuity of lode by drilling deep surface boreholes has been started by M/s MECL during 2012-13 to 2014-15. Total 08 bhrehole has been completed totaling 7483.60m intersecting lode corresponding to the 17^{th}& 20^{th}level.This has confirmed and substantiated the down the dip ore lode continuity. This indicates that the ore body is still open in depth. In 2^{nd} phase of depth exploration total 06 Nos. of boreholes has been completed totaling 4006.00m. Hence the lease area has been explored by means of detailed exploration through 97 numbers of surface boreholes with a total drilling of 33399.96m of drilling till 31.12.2019. The average distance between consecutive boreholes is less than 100m along the strike. All the surface boreholes have been shown in the geological plan (**Drg.No. HCL/ICC/SRD/2019-20/03**). Hence in the Geological axis the reserves fall under Detailed Exploration (G1) category. The details of surface boreholes (Borehole logs) are given in **Annexure 17**.

Underground definition drilling at an average interval of 30 m has been carried out upto 10 Level. A total of 3058 nos. of underground boreholes totalling 50,953 meters have been drilled till date for estimation of recoverable reserves with sufficient level of confidence. The underground boreholes have been shown in the lode plans (Drg.No. HCL/ICC/SRD/2018/06A to HCL/ICC/SRD/2018/06H). The Details of underground exploration (Borehole logs) is given in **Annexure-17**.

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Estimated average Block-width -2.6 m
Block Cut-off grade (% of Copper) is 0.80 %
Blocks falling below this grade are not considered for computation.

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.

The lease area has been explored by means of detailed exploration through 97 numbers of surface boreholes with a total drilling of 33399.96m of drilling till 31.12.2019. The average distance between consecutive boreholes is less than 100m along the strike. All the surface boreholes have been shown in the geological plan (Drg.No. HCL/ICC/SRD/2019-20/03). Hence in the Geological axis the reserves fall under Detailed Exploration (G1) category. The details of surface boreholes (Borehole logs) are given in Annexure 17.

Underground definition drilling at an average interval of 30 m has been carried out upto 10 Level. A total of 3058 nos. of underground boreholes totalling 50,953 meters have been drilled till date for estimation of recoverable reserves with sufficient level of confidence. The underground boreholes have been shown in the lode plans (Drg. No. HCL/ICC/SRD/2019-20/06A to HCL/ICCSRD/2019-20/06H). The Details of underground exploration (Borehole logs) is given in **Annexure17**.

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 radicals may be undertaken for selected samples from a NABL accredited Laboratory or Government laboratory or equivalent. Entire mineralized area may be analyzed meter wise with 10% of check samples. (At least for 10% of total samples may be analyzed in accordance to BIS and reports from NABL accredited/other government laboratory).

Samples for analysis were prepared in the usual manner of splitting the desired length of the core longitudinally into two equal halves. One half of the split core was preserved and the other half was powdered to (-) 100 mesh size. Out of this powder, about 200 gms of materials were separated out by progressive coning and quartering. This 200 gms of material was then ground to (-) 200 mesh size. Half of this material was kept as duplicate and from remaining half about 30gms was separated by coning and quartering and sent for chemical analysis for trace element. Sample lengths varied depending upon the strength/grade of mineralisation subject to the maximum 1.0m. In few boreholes, the non-mineralized cores were also sampled and analysed to see if any, minor and trace elements of significance are present in them. After then, it was established that the non-mineralised zone do not contain any element of significance, the sampling was confined to the sulphide bearing horizon only.

Composite sample

Composite samples from the ore zone were prepared by taking equal weight per unit length of core irrespective of the size.

iv) Expenditure incurred in various prospecting operations.

The total expenditure incurred in various exploration activities for the last plan period is Rs. 5,77,37,444/-.

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 28(1)(a) of MCDR 1988.

The surface plan of the leasehold area is enclosed as Drg. No**. HCL/ICC/SRD/2019-20/02**

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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 proposed exploration, various lithounits 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 28 (1)(b) of MCDR 1988.

The geological plan of the leasehold area showing all the above features is enclosed as Drg. No.HCL/ICC/SRD/2019-20/03

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

Detailed geological sections of Surda lease in the scale of 1: 4000. The same is shown in Plate No. HCL/ICC/SRD/2019-20/04A – 04C**.**

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

It has been planned to drill 07 number of Surface borehole totaling about 4900 meter of drilling in the year 2019-20. Apart from this exploration with the help of underground drilling and sampling shall be continued. The tentative year wise surface exploration programme is given below :

Year wise proposed exploration program (From Surface)

Year	No of Bore Hole	Meters to be drill in M	Average depth of hole in M	Bore hole ID
2020-21	7 Nos.	4900 m	700	PBH-01 to PBH 07
2021-22	-	-	-	-
2022-23	-	-	-	-
2023-24	-	-	-	-
2024-25	-	-	-	-
Total	7 Nos.	4900m	700	PBH-01 to PBH 07

For estimation of recoverable reserve with sufficient level of confidence underground definition drilling at an average interval of 30 m will be carried out.

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 ofthe deposit as specified under the UNFC field guidelines may be incorporated.

Reserves assessed in the previous approved document

The details of the reserves/ resources established at 0.5% Cu cut off for surda lease as on 1.12.2018 is given in the following.

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Category of reserves/ resources	Qty. in million tons	Grade in % Cu
Proved reserves (111)	1.40	1.08
Probable reserves (122)	1.53	1.03
Feasibility Mineral Resources (211)	7.02	1.02
Pre-feasibility Mineral Resources (222)	1.44	1.17
Remaining Measured Resources (331)	3.81	1.26
Remaining Indicated Resources (332)	6.76	0.99
Remaining Inferred Resources (333)	6.77	0.95

a) Reassessment of resources for the present scheme period:

M/s MECL has competed total 08 borehole totaling 7483.60m during 2012-13 to 2014-15 intersection lode corresponding to the 17th and 20th level, this has confirmed and substantiated the down the dip ore load continuity . The final GR submitted by MECL hence reassessment of resources has been done.

Basis of estimation of previous Resources:

The following points have been considered for UNFC classification of ore reserves of Surda lease:-

i. Reserves which have been estimated on the basis of surface boreholes are categorized as 331/332/333 categories.(Figure 6.1)
ii. Actual mine development and definition drilling from underground developments at an interval of about 30 metres to establish the lode configuration with sufficient level of confidence. (Figure 6.2)
iii. In areas where consecutive two payable borehole intersections are available which are at a distance of 300 m along dip and 150 m to 200 m along strike, the reserves in theses are categorized under 331 categories.
iv. Drill reserves lying up to 50m along dip and 60m along strike from the extents of 331 categories are categorized in 332 categories.
v. Reserves which have been estimated on the basis of single borehole intersection or where the consecutive borehole intersections are more than 300m apart along dip and 150 to 200m along strike are categorized in 332 categories.
vi. Drill reserves lying up to 25 m along dip and 30 m along strike from the extents of 332 categories are categorized in 333 categories.
vii. Grade has been estimated considering dilution factor.
viii. The reserves of oxide zone (to the quantity of 9.9 lakh tones above 3rd level) have not been taken in to account while computing the reserves / resources

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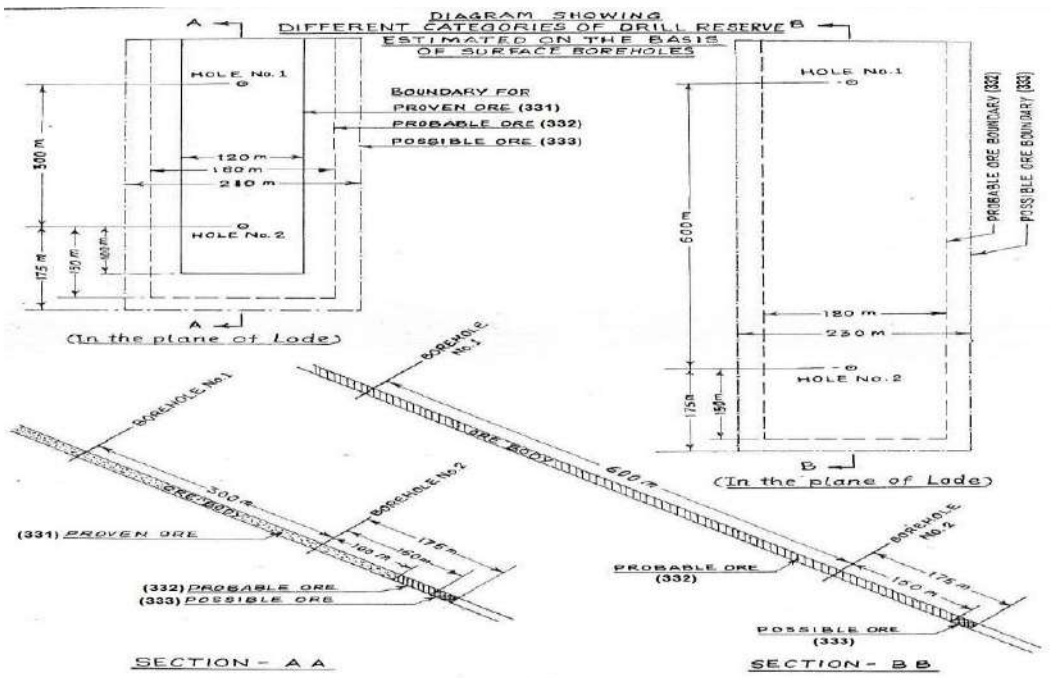
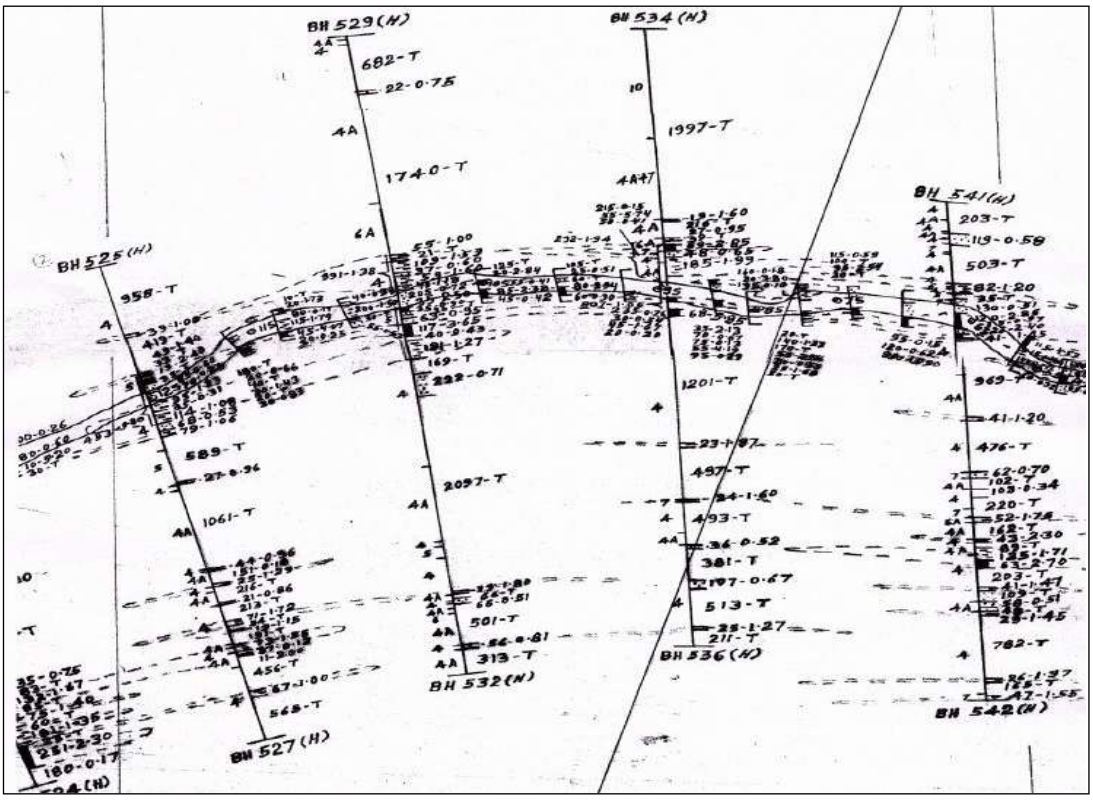


(Figure: Different categories of drilled reserves)



(Figure : Underground boreholes and lodes demarcated on the basis of definition drilling)

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Parameters for resource estimation

The details of the resources established in million tonnes at 0.5% Cu cut off for Surda lease as on 01.04.2019 is given in the table below. The detailed calculation of the reserves/ resources established at 0.5% Cu cut off for Surda lease as on 01.04.2019 is given in **Annexure-13**.

Level of Exploration	Resources in Million Tons	Grade (% Cu)
G1- detailed Exploration	14.71	1.06
G2- General Exploration	7.57	1.02
G3- Prospecting	9.94	0.95
G4- Reconnaissance	Nil	Nil

Block	Inferred Mineral resource (333)	Indicated Mineral resource (332)	Measured Mineral Resources (331)	Total
Surda Lease	9.94	7.57	14.71	32.23

Feasibility study has been thereafter carried out for converting the measured resource into reserves of different category. A copy of the feasibility report is enclosed at **Annexure-19**. Out of the above mentioned figures, a portion of the same are blocked in the remnant sill, crown & rib pillars. The mine already has forestry clearance both for surface & underground workings and no reserves as on date are likely to be blocked under the same. The details of the reserves blocked are given in the table below:-

Block	Locked-in in-situ pillars/ lean grade ore
SurdaLease	8.12 Mt

The details of the measured resource, proved reserves & remaining measured resources as on 1.04.2019, established for the Surda lease is shown in the table below:-

Qty. in Million tonnes

Category of resource	Block	Qty. in million tonnes	Grade in % Cu	Blocked resource in million tonnes	Qty. of proved reserves in million tonnes	Grade of proved reserves in % Cu	Remaining qty. of Measured resource	Grade of remaining qty. of measured resource in % Cu
A	B	C	D	E	F	G	H=C-E-F	H
Measured	Surda	14.71	1.06	6.68	2.38	1.15	5.65	1.07

The details of the indicated resource, probable reserves & remaining indicated resources as on 01.04.2019, established for the Surdalease is shown in the table below:-

Category of resource	Block	Qty. in million tonnes	Grade in % Cu	Blocked resource in million tonnes	Qty. of probable reserves in million tonnes	Grade of probable reserves in % Cu	Remaining qty. of Indicated resource	Grade of remaining qty. of indicated resource in % Cu

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A	B	C	D	E	F	G	H=C-E-F	H
Indicated	Surda	7.57	1.08	1.44	2.88	1.17	3.25	1.00

The details of the inferred resource, possible reserves & remaining inferred resources as on 01.04.2019 , established for the Surda lease is shown in the table below:-

Category of resource	Block	Qty. in million tonnes	Grade in % Cu	Blocked resource in million tonnes	Qty. of possible reserves in million tonnes	Grade of possible reserves in % Cu	Remaining qty. of Inferred resource	Grade of remaining qty. of inferred resource in % Cu
A	B	C	D	E	F	G	H=C-E-F	H
Inferred	Surda	9.94	0.9	-	-	-	9.94	0.90

k) Furnish detailed calculation of reserves/resources section wise (When the mine is 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, reserve/resources may be estimated by level plan method, as applicable, as per the proposed mining parameters.

The detailed calculation of the level wise resources established at 0.5% Cu cut off for Surda lease as on 01.04.2019 is given in **Annexure-13**.

l) 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)

The details of the reserves established for Surda lease under UNFC category as on 01.04.2019 is given in the table below:-

Category of reserves/ resources	Qty. in million tons	Grade in % Cu
Proved reserves (111)	2.38	1.15
Probable reserves (122)	2.88	1.17
Feasibility Mineral Resources (211)	6.68	1.01
Pre-feasibility Mineral Resources (222)	1.44	1.17
Remaining Measured Resources (331)	5.65	1.07
Remaining Indicated Resources (332)	3.25	1.00
Remaining Inferred Resources (333)	9.94	0.90

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2.0 MINING

A. OPEN CAST MINING:

Not applicable.

B. UNDERGROUND MINING

i. Mode of entry (adit, incline, shaft, ramp/ decline)

(Briefly describe the reason for choosing the mode of entry and its location with justification. Describe development &stoping method.)

The access to the underground mine is through

1) No. 3 vertical shaft from northern end sunk up to 5th level (i.e. about 176 m below from the surface) at central part of the mine .
2) No. 4 incline shaft from southern side approx. 1200m south of No.3 shaft at 400 inclination to the horizontal is sunk up to 10th level i.e. 360 m below surface.

At the close proximity of the vertical shaft No. 3 there is sub incline shaft from 5th level to 13th level (i.e.474 m below surface). The sub-incline is at an angle of 31o – 35o to horizontal. The ore reserve has been developed to a strike length of mainly 2.2 km with a maximum of 3.5 km at one level and a maximum depth of about 500m from surface. The proposed vertical shaft of 6 m diameter shall be an additional mine entry after commissioning. Shaft will be sunk up to 18th level (i.e. 600m below surface).

Mining method followed are:

Room & pillar methods for ore body width – 1.5 m to 4 m.
Cut &fill method for ore body width – 4 m to 6 m.
Post pillar methods for ore body width - 6 m and above.

Detail description on the method of stoping is given in as follows:.

Permission for stoping by DGMS has been obtained (copy enclosed as **Annexure-14**). Description of method of stoping is given in the subsequent paragraphs.

A. **Room and Pillar Stoping Method:** This method is used where the ore body width is between 1.5 and 4.0m. A raise is put along the H/W contact from lower level to upper level. A chute is installed at the lower level, together with an electric scraper engine. A sill pillar of 5m above the lower level and a crown pillar of 5m below the upper level are left as support (Shown in Figure A).

In this method both faces of a central raise are advanced to a span of 10-15m, with systematic bolting of the roof at a spacing of 1.2m x 1.2 m, 1.5m long 20m dia tor-steel grouted rock bolts are used as conventional support in place of timbers. 1.8m log bolts are also occasionally used for roof support in geologically disturbed area. A rib pillar of 3 to 4m wide is left between two consecutive stopes. Floor stripping is undertaken where width of ore body exceeds 1.6m. Once the mining is completed to the extremities of the stope, back filling of the excavated area is done.

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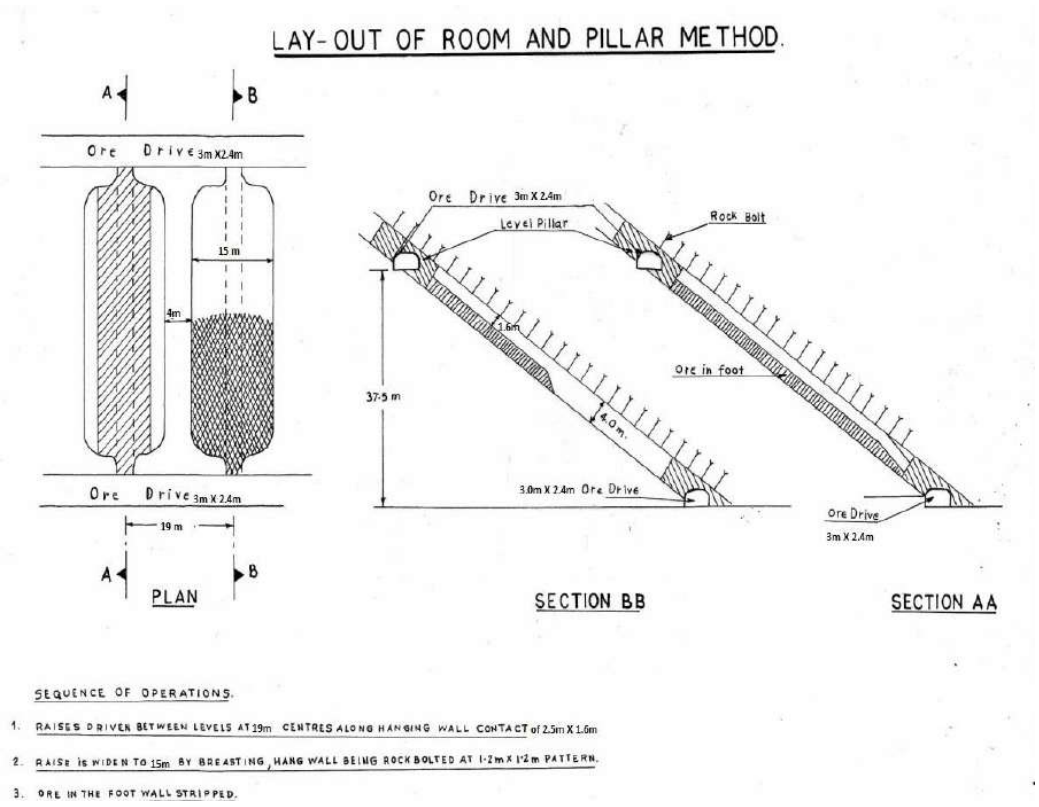

(Figure: A)

Room & Pillar method is suitable for narrow lodes having thickness of 1.5m to 4.0m which is the case in Kendadih mine. In case the width of the ore body is more other methods may be adopted, which are described as below:

B. Horizontal Cut & Fill Stoping method:

Where the width of ore body is 4-6m **Horizontal Cut and Fill** Method (HCF) is used. The stoping is started by driving a sill level about 5m above the ore drive and full width of the ore body is exposed for a maximum vertical height of 4.8m. The hanging wall is supported by rock bolts systematically at 1.5mx 1.5m pattern. A F/W haulage is driven on the F/W side of ore body and ore passes are excavated at 50 degree inclination either in waste or ore the stope at intervals of 60m along strike. 1.5m dia ore pass rings made out of 10mm thick steel plates are welded inside the stope to serve as man way and ore pass through the backfill. Cavo 310 or 0.76 cum electric LHDs are used to load and haul broken ore into the operations. Two panels are generally prepared one for production and other being available for filling and consolidation. Back stripping is carried out in panels with 2.4m vertical cut at a time (Shown in Figure B).

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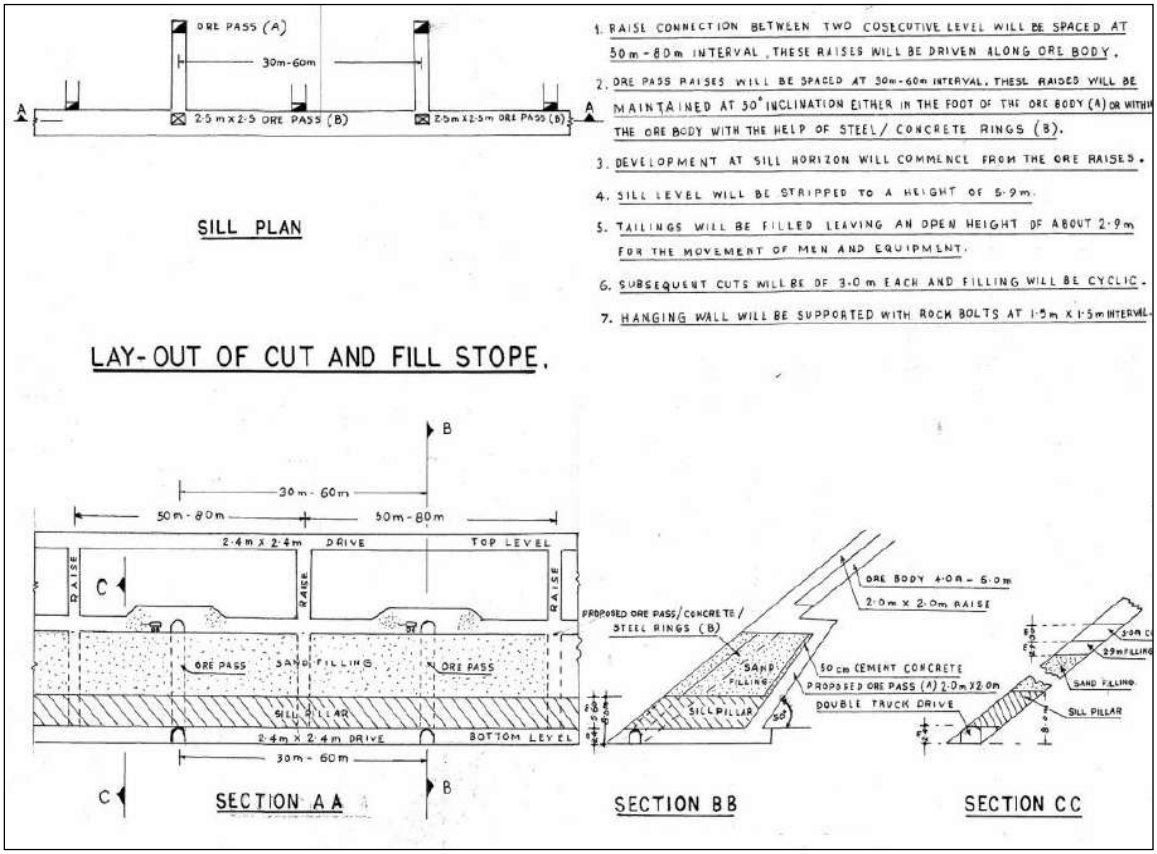

(Figure: B)

C. Post Pillar Stoping Method :

This method is generally adopted in ore bodies exceeding 6m wide and a minimum strike length of 80m. Basically, it is identical to HCF mining except for the formation of 4m x 4m in situ vertical posts to give additional stability to the roof by breaking long spans excavated. In addition to rock bolting of the roof, the back of each cut in ore is also rock bolted using 1.5m long grouted type rock bolts on 1.5m x 1.5m pattern. The post pillars are spaced at an interval of 13m along strike and 9m across it. Generally, 2.4m high cuts are taken by drilling 2.4 m long by using stope air legs jack hammer. Maximum height of the excavation is limited to 4.8m above the backfill. 0.76/1.5 cum electric LHDs transfer the broken ore into the ore passes from where it is hauled in larger mine cars by locomotive on to the grizzly. (**Shown in Figure C**).

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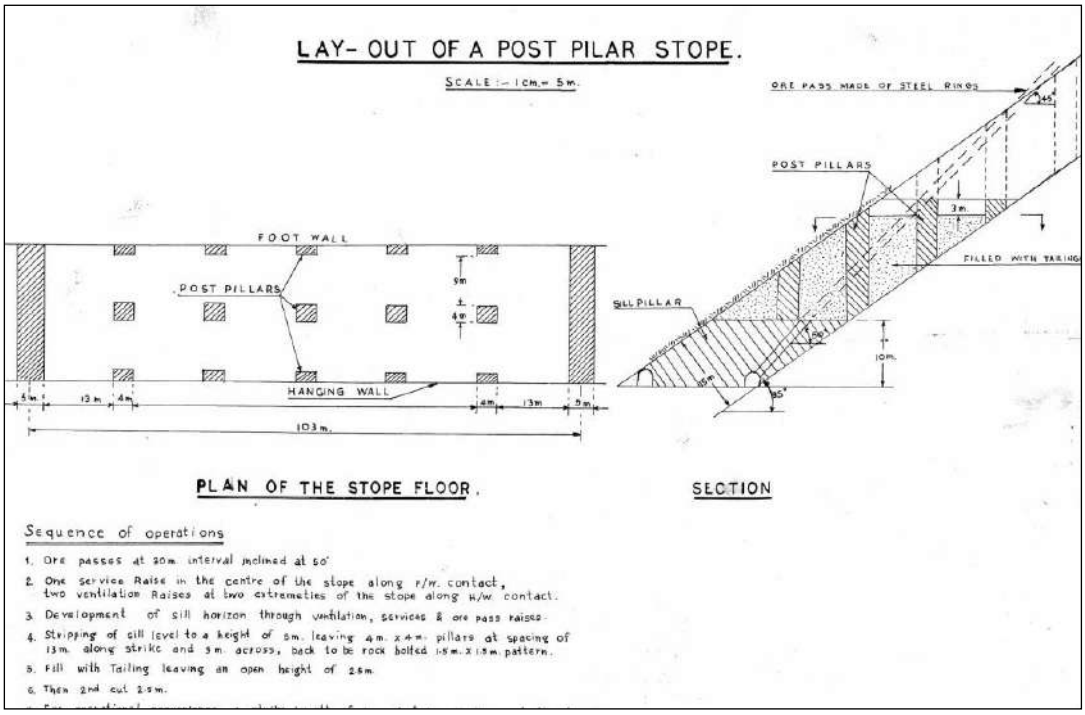

(Figure: C)

Sequence of Method:

- Raise driven between levels along hangwall contact of ore body
- Development of sill drive of 3 m x 3m size, 5.0 m vertically above the lower level
- Arrangement of scraper fitting both north and south side of the raise at sill drive.
- Driving of cross cut (02 Nos) from lower level to ore pass of the stope as per the section given
- Raise is widen by breasting 6.5 mts each side from the center line of the raise
- Leaving of the solid pillar of 4 m x 4 m along the 9 m dip at both side

The salient design of the existing stope parameters are given in the table below:-

StopeParmeters	**Details**
No. of working stopes	6
Size of the panel	80m to 150 m
Level interval	37.5m
Thickness of crown pillar	5m
Thickness of sill pillar	5m
Thickness of rib pillar	4m
Size & interval of stope pillar	Not applicable for R&P stope
Size/ shape of man way	1.6mdia
Size/ shape of ore pass	1.5mdia
Method of stowing/ backfilling	Hydraulic stowing
Method of drainage of stowed water	Through perforated pipes via manway to lower and collected in sumps. Pumps are located in these sumps to pump the collected water

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ii. Underground layout

(Attach a note briefly describing the u/g layout using longitudinal sections/ longitudinal vertical projection and level plans where necessary indicate size & intervals of levels & raises/ winzes with proper reasoning and proposal for year wise / level wise extent of development for 5 years along with the support system)

The existing layout of the underground mine along with the plans indicating development the proposed stopes to be excavated in the proposed plan period is given in Drawing No. **HCL/ICC/SRD/2019-20/08**. The longitudinal vertical projection for the same has been shown in Drg No. **HCL/ICC/SRD/2019-20/14A**.

Year wise/Level wise extent of development for the proposed plan period:

The development schedule of Surda mine for the proposed plan period is as follows:

The proposed drives for development of the Surda mine is given below:-

Development Heading	Sectional reference grid	2020-21	2021-22	2022-23	2023-24	2024-25
6 L, DN 385 N , H/W	319N	100	110	-	-	-
7 L, DN 400 N , H/W	320N	-	-	100	100	-
8 L, DN 410 N , H/W	313N	-	-	100	100	-
9 L, DN 445 N , H/W	328N	-	-	0	100	100
9 L, DN 800S , F/W	570S	185	185	-	-	-
9 L, X-cut W, 420 S	570S	-	-	50	-	-
10 L, DN 485 N , H/W	353N	-	-	100	80	-
10 L, DS 970 S , H/W	1165S	-	-	0	-	-
10 L, DN 970 S , H/W	1165S	-	-	0	-	-
10 L, DS 420 S , Int	600S	90	110	110	-	-
10 L, X-cut W, 400 S	570S	60	-	-	-	-
11 L, DN 480 N, H/W	345N	-	125	125	-	-
11 L, DS 935 S, H/W	1135S	-	-	-	-	100
11 L, DN 935 S, H/W	1135S	-	-	-	-	265
11 L, X-cut W, 850 S	1050S	-	-	200	200	145
12 L,DN 70 N , H/W	110S	100	200	-	-	-
12 L,DS 210m N , H/W	205S	-	-	100	150	140
12 L, DS 390 S, F/W	575S	50	50	-	50	100
12 L, DS 900 S, H/W+X-cut	1140S	-	-	-	-	100
12 L, DN 900 S,H/W	1140S	-	-	-	-	265
12 L , X-cut W,820 S	1050S	-	-	-	-	150
13 L,DN 130 N , H/W	120S	-	-	-	-	150
13 L,DS 15 S , H/W	205S	-	-	-	-	100
SUB TOTAL		**585**	**780**	**885**	**780**	**1615**

Drive in ORE in m		525	780	635	580	1470
Drive in Waste in m		60	0	250	200	145

Production from drive dev. (@ 20.74 tons/ m (3.0 x 2.4 x 2.88)

Ore Generation, MT		**10886**	**16174**	**13167**	**12027**	**30482**
Waste generation,MT		**1244**	**0**	**5184**	**4147**	**3007**
Total		**12130**	**16174**	**18351**	**16174**	**33489**

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The development pertaining to raises in ore is given below:-

Raises (inclined)	2020-21	2021-22	2022-23	2023-24	2024-25
5L, 300 N	65	-	-	-	-
5L, 390 N	65	-	-	-	-
6L , 340 N	65	-	-	-	-
6L , 360 N	65	-	-	-	-
6L , North Ventilation R 555 N	-	55	-	-	-
7L, 450 N	-	-	65	-	-
7L , North Ventilation R 570N	-	-	-	65	-
8L , 460 N	-	-	-	65	-
8L , 585 N	-	-	-	-	65
9L , 580 N		65	-	-	-
9L , 455 S	65	65	-	-	-
9L , 735 S	65	-	-	-	-
9l , 840 S	35	-	-	-	-
10L , 535 S	-	65	-	-	-
10L , 605 S	65	65	-	-	-
10L , 965 S	-	65	-	-	-
10L , 1105 S	-	65	-	-	-
11L , 375 N	65	-	-	-	-
11L , 460 N	65	-	-	-	-
11L ,500 N	65	-	-	-	-
11L ,600 S	-	65	-	-	-
12L , 05 S	-	65	-	-	-
12L , 215 S	-	65	-	-	-
12L , 320 S	65	0	-	-	-
12L , 425 S	-	65	-	-	-
12L , 610 N, H/W	-	-	-	65	-
12L , 460 N, H/W	-	-	-	65	-
12L , 370 N, H/W	0	0	65	-	-
12L , 270 N, H/W	0	65	0	-	-
12L , 110 N, H/W	65	-		65	-
12L, 425 S	-	-	65		-
12L, 600 S	-	-	-	65	-
12L, 820 S	-	-	-	65	-
13L , 10 S	-	-	-	-	65
13L , 95 S	-	-	-	-	65
13L , 210 S	-	-	65	-	-
13L , 125 N, H/W	-	-	-	-	65
13L , 285 N, H/W	-	-	-	-	65
13L, 500 N	-	-	-	65	-
13L, 360 S	-	-	-	65	-
13L, 550 S	-	-	-	-	65
SUB TOTAL	815	770	260	585	390

Raise in ORE	815	715	260	520	390
Raise in Waste	-	55	-	65	-
Total m	815	770	260	585	390

Production from Raise dev. (@10.37 tons/ m (2x1.8x2.88))

Ore Generation, MT	8450	7413	2696	5391	4044
Waste generation, MT	-	570	-	674	-
Total	8450	7983	2696	6065	4044

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Therefore, the total development in ore is given in the following table:-

Parameters	2020-21	2021-22	2022-23	2023-24	2024-25
Drives , t	10886	16174	13167	12027	30482
Raises, t	8450	7413	2696	5391	4044
Total, t	19336	23587	15863	17418	34526

The development sequence has been planned in such a manner that development of the area is completed prior to its soping.

Other waste developments are given in the table below:-

Development Details	2020-21	2021-22	2022-23	2023-24	2024-25
Deepening of 4 Shaft below 10L in Mts	-	100	120	50	-
Drop Raising in waste rock Mts	-	-	-	-	118
Sub Total A	-	100	120	50	118
Stripping in Cum (Ore transfer from 10thL to 13th L ore bin & Construction of Ore bin)	562	860	860	640	600
Deepening of Sub Incline	2020-21	2021-22	2022-23	2023-24	2024-25
13L-14L winzing	-	45	-	-	-
14L SI plate X-cut	-	30	-	-	-
Sub Total	-	75	-	-	-
25 S Winze in Ore Mts	70				
Sub Total B	70	150	-	-	-
New Vertical shaft & x-cuts	2020-21	2021-22	2022-23	2023-24	2024-25
Vertical Shaft	184	56	0	0	0
Sub Total C	184	56	0	0	0
X-cut between SI & VS	2020-21	2021-22	2022-23	2023-24	2024-25
11 L	188		-	-	-
12 L	15	153.5	-	-	-
13 L	15	76.5	-	-	-
14 L	15	-	51	-	-
15 L	15	-	-	-	-
16 L	15	-	-	-	-
17 L	15	-	-	-	-
18 L	15	-	-	-	-
SUB TOTAL D	293	230	51	0	0
Stripping in Cum (Ore bin 13th L SI , Ore transfer & Spillage bin)	562	860	860	640	600
GRAND TOTAL IN METERS (A+B+C+D)	547	536	171	50	118

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The year-wise production plan is given in the table below:-

Work Place	Mine Grid	Sect. Ref. Grid	Block No	2020-21	2021-22	2022-23	2023-24	2024-25	Reserve - As on 01.01.2020
Permitted Stopes									
6 L, 700 S	820 S-675 S	910S-740S	13	25000	-	-	-	-	39858
8 L, 300 S	375 S – 235 S	495S-350S	42	15000	-	-	-	-	29000
8 L, 700 S	745 S – 590 S	855S-705S	29	60000	60000	60000	60000	60000	501448
8 L, 1000 S	1130 S – 930 S	1310S-1045S	28	60000	72000	72000	72000	72000	587784
11 L, 200 N	65 N – 225 N	100S-65N	43/43A	36000	36000	36000	36000	36000	230859
11 l, 400N	230 N - 430N	75 N- 280 N	58						
11 L, 200 S H/W, Int	240 S – 20 S	415 S - 210 S	45	50000	50000	20000	-	-	115393
Development will be complete before onset of the scheme and permission to be acquired from IBM									
7 L, 330 S, H/W	395 S – 260 S	505S-365S	20	60000	72000	72000	72000	72000	607564
From New stopes proposed to be developed during the ensuing period									
5 L, 250 N, H/W	225 N - 390 N	190 N-350 N	59	7000	7000	24000	34000	34000	367418
6 L, 250 N,	260 N - 390 N	200 N-330 N	60	0	7000	10000	34000	34000	336454
9 L, 700 S	715 S-410 S	490 S - 855 S	61	0	0	7000	20000	20000	694237
10 L, 700 S	700 S - 450 S	900 S - 740 S	62	0	0	7000	20000	20000	501448
10 L, 1000S	1115 S - 860 S	1050 S - 1315 S	63	0	0	7000	20000	24000	581533
11L, 300 S	350 S - 240 S	420 S - 550 S	64	7000	14000	24000	25000	25000	690989
11 L, 440 N	375 N-500 N	220 N - 350 N	65	0	7000	24000	35000	35000	526694
12L, 100 S	220 S - 05 S	200 S-410 S	66	0	12600	45000	72000	72000	623033
TOTAL				320000	337600	408000	500000	504000	

The summary table indicating the production of ROM, Sub-grade, saleable grade from development & Stoping is given in the table below

year	ROM Production in tonnes					
	From Dev.	Grade	Prod.	Grade	Dev+ Prod	Grade
2020-21	**19336**	**0.8**	**320000**	**0.85**	**339336**	**0.85**
2021-22	**23587**	**0.8**	**337600**	**0.85**	**361187**	**0.85**
2022-23	**15863**	**0.8**	**408000**	**0.85**	**423863**	**0.85**
2023-24	**17418**	**0.8**	**500000**	**0.85**	**517418**	**0.85**
2024-25	**34526**	**0.8**	**504000**	**0.85**	**538526**	**0.85**
Total	**110730**	**0.8**	**2069600**	**0.85**	**2180330**	**0.85**

Rock bolt system shall be practiced as a primary means of support to the rock. The spacing of the rock bolts are determined by systematic support rule approved by Directorate General of Mines Safety and on case to case basis based on the experience acquired on the rock strength during the operation of the mine. A copy of Systematic Support Rule (SSR) has been enclosed as **Annexure 15**.

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iii. System of drilling & blasting

Parameters	Details
Drilling pattern in ore	Burn cut and Wedge cut for development faces
Drilling pattern in rock	Burn cut and Wedge cut for development faces
Drilling pattern in stopes	For narrow lodes, 3 holes are drilled in a row having 0.66m burden and spacing 0.85m, Drilling angle 45^0 with respect to face, hole depth 2.0m
Max. number of holes blasted in a round	In development: 48 holes/ round In stoping: Maximum no. of holes per blast is 60-80
Charge per round (kg)	In development: 40 kgs/ round. In stoping: 70 kgs / round.
Charge per hole (kg)	In development: 0.75 kgs/ hole. In stoping: 0.9 Kg/hole
Type of explosive	Emulsion Explosive
Powder factor (Norms) development- Stoping-	The powder factor achieved in stopes is around 0.40-0.60 kg/ tonne& in the development faces will be around 0.55-0.70 kg/ tonne.

iv. Method & sequence of stoping

(Briefly describe the method of stoping to be adopted, illustrated by plan, cross-section & longitudinal sections indicating broad parameters in the table below. In case it is open stoping attach a geo technical report from a national reputed agency on stability of open stopes. In case of filled stopes the detail of filling method to be described with supporting plans & sections. Broader thumb rule in respect of development be considered)

Mining method followed at Surda mines are

Room & pillar methods for ore body width – 1.5 m to 4 m.
Cut &fill method for ore body width – 4 m to 6 m.
Post pillar methods for ore body width - 6 m and above

Detail description on the method of stoping is given in as follows:

A. Room and Pillar Stoping Method: This method is used where the ore body width is between 1.5 and 4.0m. A raise is put along the H/W contact from lower level to upper level. A chute is installed at the lower level, together with an electric scraper engine. A sill pillar of 5m above the lower level and a crown pillar of 5m below the upper level are left as support (Shown in Figure A).

In this method both faces of a central raise are advanced to a span of 10-15m, with systematic bolting of the roof at a spacing of 1.2m x 1.2 m, 1.5m long 20m dia tor-steel grouted rock bolts are used as conventional support in place of timbers. 1.8m log bolts are also occasionally used for roof support in geologically disturbed area. A rib pillar of 3 to 4m wide is left between two consecutive stopes. Floor stripping is undertaken where width of ore body exceeds 1.6m. Once the mining is completed to the extremities of the stope, back filling of the excavated area is done.

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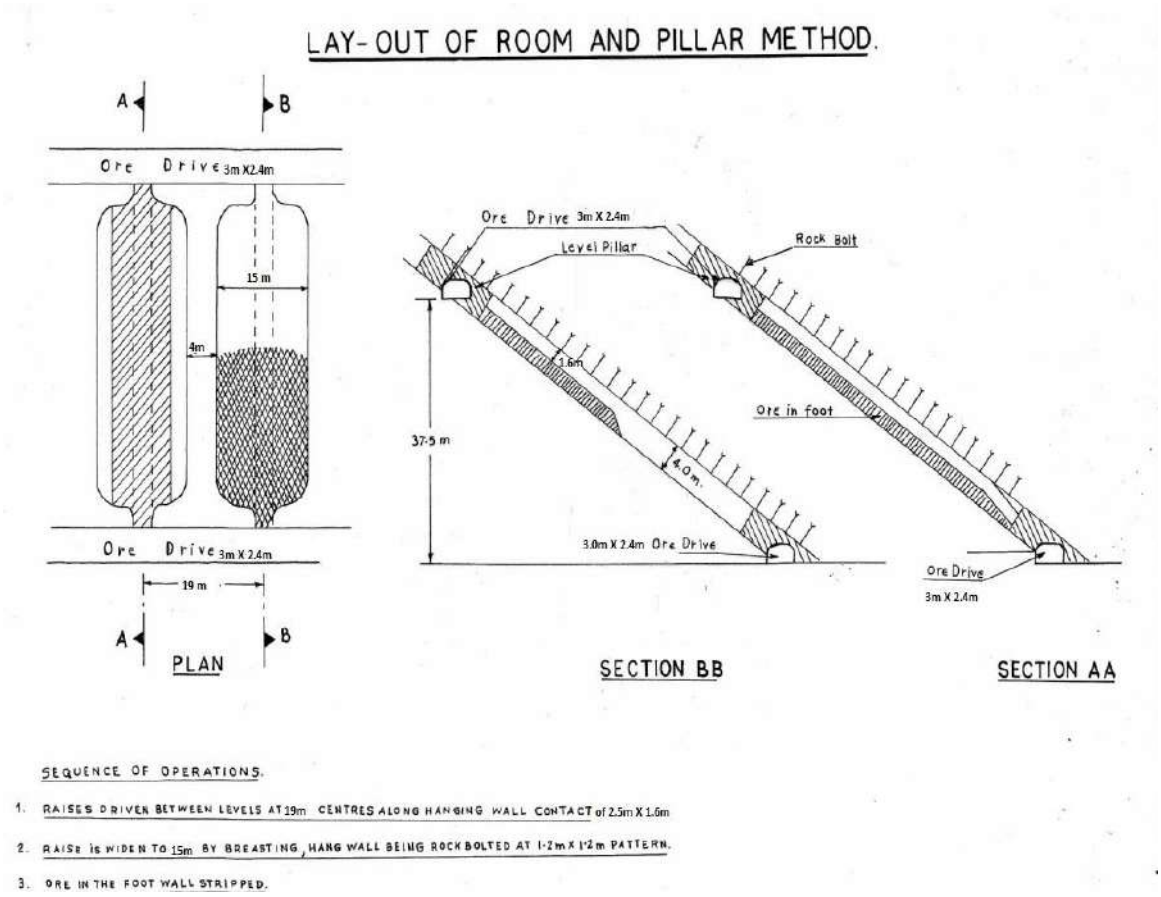
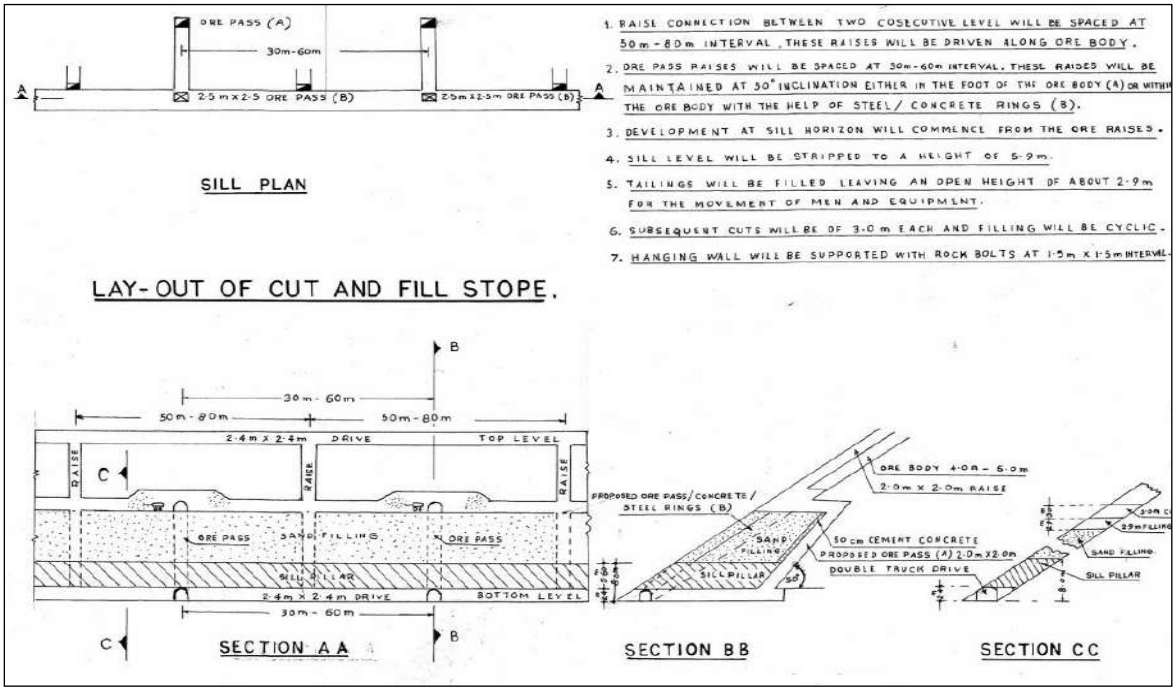


Fig – A

Room & Pillar method is suitable for narrow lodes having thickness of 1.5m to 4.0m which is the case in Kendadih mine. In case the width of the ore body is more other methods may be adopted, which are described as below:

B. **Horizontal Cut & Fill Stoping method:**

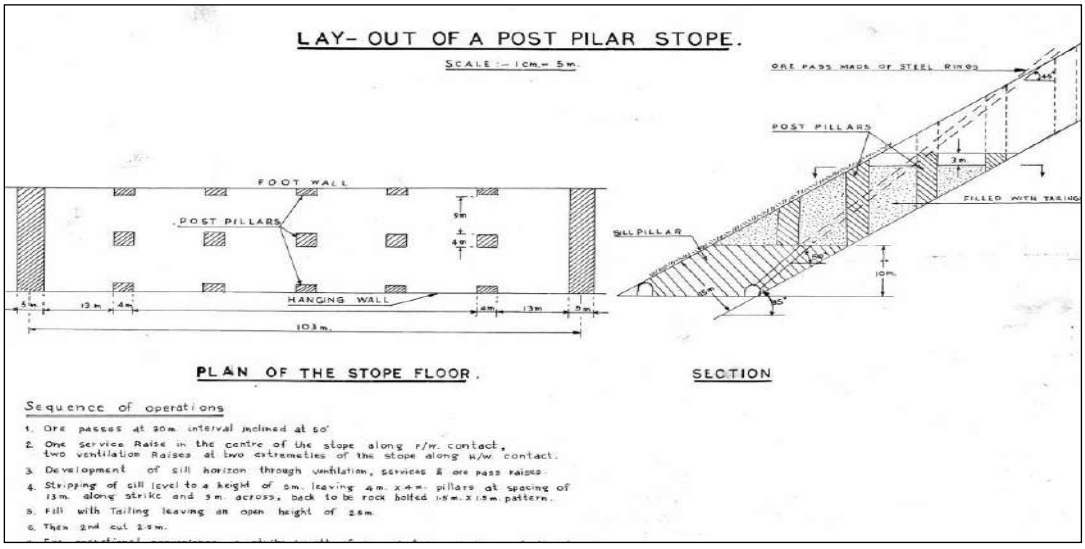
Where the width of ore body is 4-6m **Horizontal Cut and Fill** Method (HCF) is used. The stoping is started by driving a sill level about 5m above the ore drive and full width of the ore body is exposed for a maximum vertical height of 4.8m. The hanging wall is supported by rock bolts systematically at 1.5mx 1.5m pattern. A F/W haulage is driven on the F/W side of ore body and ore passes are excavated at 50 degree inclination either in waste or ore the stope at intervals of 60m along strike. 1.5m dia ore pass rings made out of 10mm thick steel plates are welded inside the stope to serve as man way and ore pass through the backfill. Cavo 310 or 0.76 cum electric LHDs are used to load and haul broken ore into the operations. Two panels are generally prepared one for production and other being available for filling and consolidation. Back stripping is carried out in panels with 2.4m vertical cut at a time (Shown in Figure B).



(Figure: B)

c. Post Pillar StopingMethod:

This method is generally adopted in ore bodies exceeding 6m wide and a minimum strike length of 80m. Basically, it is identical to HCF mining except for the formation of 4m x 4m in situ vertical posts to give additional stability to the roof by breaking long spans excavated. In addition to rock bolting of the roof, the back of each cut in ore is also rock bolted using 1.5m long grouted type rock bolts on 1.5m x 1.5m pattern. The post pillars are spaced at an interval of 13m along strike and 9m across it. Generally, 2.4m high cuts are taken by drilling 2.4 m long by using stope air legs jack hammer. Maximum height of the excavation is limited to 4.8m above the backfill. 0.76/1.5 cum electric LHDs transfer the broken ore into the ore passes from where it is hauled in larger mine cars by locomotive on to the grizzly. (Shown in Figure C).



(Figure: C)

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Sequence of Method:

- The ore drive, approximately 3.0 m x 2.4 m will be developed along the hanging wall contact from one end of the proposed block to the other end along the strike;
- The raises 2.0m x 1.8 m shall be driven at a distance not exceeding 80m along the strike of the ore body to connect the consecutive levels;
- Ore pass raises will be made at 30 – 60 m interval. These raises will be maintained at 50 degree inclination either in the foot of the ore body or within the ore body with the help of steel rings.
- Sill level drive of 3.0 m x 3.0m will be taken along the strike direction having 5.0m vertical pillar from lower level;
- Where the width exceeds 9.0m, post pillars of 4.0m x 4.0m size, as support to the back shall be left in situ and spaced not exceeding 13.0m along the strike and 9m in dip direction;
- The heightening of the sill level shall be taken up for 2.0m such that height of the stope from stope floor shall not exceed 5.0m at any place;
- The slice height in the ore shall be 2.5m vertically;
- The back of the stope (i.e. freshly exposed roof) shall be supported with rock bolts made of TOR steel of 20mm diameter. The spacing of the rows shall be 1.5m and distance in between the rows shall be 1.5m. The length of the rock bolts shall not be less than 1.5m;
- The freshly exposed back and hang wall shall be supported by rock bolting and unsupported span shall not exceed 5m from the face at any stage;
- The de-slimed mill tailings/ sand shall be filled in the stoped out area leaving open height not exceeding 2.5m;
- The extraction and filling shall be cyclic in manner.

Stope parameters:

The salient design of the existing stope parameters are given in the table below:-

Stope Parmeters	**Details**
No. of working stopes	6
Size of the panel	150 m
Level interval	37.5m
Thickness of crown pillar	5m
Thickness of sill pillar	5m
Thickness of rib pillar	4m
Size & interval of stope pillar	Not applicable for R&P stope
Size/ shape of man way	2.5 m x 1.6m
Size/ shape of ore pass	2.5 m x 1.6m
Method of stowing/ backfilling	Hydraulic stowing
Method of drainage of stowed water	Stowed water is transmitted through a system of drainage, and collected in sumps located at different levels. Pumps are located in these sumps to pump the collected water

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Production Schedule

The schedule of production from development as well stoping operation is as below (All figures in tones):

Production from Development	2020-21	2021-22	2022-23	2023-24	2024-25
Ore Generation, from Drive MT	10886	16174	13167	12027	30482
Ore Generation, from Raise MT	8450	7413	2696	5391	4044
Ore Generation from Development (A)	19336	23587	15863	17418	34526
Production from Stoping (B)	320000	337600	408000	500000	504000
Total Production (A+B)	339336	361187	423863	517418	538526

Year-wise development and production plan for the proposed plan period, are indicated in drawing nos. **HCL/ICC/SRD/2019-20/08**

v. System of underground transportation as per the table given below:

Parameters	Details
From face to pit bottom or loading point	Mucking of the ore produced from stopes/development faces shall done by scrapper/CAVO loaders/Pneumatic hopper loaders/LHD etc. From ore pass chute ore shall be loaded to tubs/mine cars of the Battery locomotives. Then it is transported by locomotives to the Grizzly over the ore pass Chute above the inclined shaft at that level.
From pit bottom to surface	The ore shall be hoisted to surface through: From Sub- Incline chute, the collected ore shall be hoisted to No. 5 Level through Sub-Incline shaft and from 5 Level, the hoisted ore shall be transport to surface via No. 3 shaft (Vertical).
From surface to end use plant	Ore hoisted by skip hoisting system to surface and discharged into surface ore bin at headgear. The ore shall be then taken to the Mosabani concentrator plant by tippers.
Safety features provided on conveyor/ haulage track/ roadway	All the safety features as per the statutory requirements such emergency brake signaling system etc.

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Vi. System of winding/ hoisting:
(Attach a note briefly describing the system & linking with its adequacy for the desired rate of material and man handling)

The strike length of the mine is more than 2.2 km. Therefore more than one shaft were established in the past, to achieve full production target

Winder No. 1: installed in no. 4 shaft. It is 400 KW Double drum winder. Motor – 400 KW. Drum dia. X Drum width - 3.00m x 1.00 m.; Rope - 30 mm dia full locked coil rope.

Max. speed with ore - 6.0 m/sec.
Max. speed with Men - 3.5 m/sec.

Due to its location in south extremity, the ore production from south section including central section is trammed in upgrade to reach No. 4 shaft. In spite of hoisting capacity of around 30,000 tonnes / month, this shaft could not utilise its full capacity, and at the same time the pay load of the skip is only 3.65 tonnes instead of its scheduled capacity of 4.5 tonnes.

Winder No. 2: Installed in No. 3 shaft. It is 100 H.P., double drum winder. Rope diameter 26 mm Right hand Langslay rope.

Drum dia x Drum width - 2.5m x 0.83 m
Max speed with ore - 6m/sec
Max speed with men - 3.5 m/sec
Hoisting capacity (Scheduled) - 17,500 tonnes / month

It has been experienced, that even attending all other duties (i.e. man/material hoisting etc.) 15000 tonnes / month can be achieved

Winder No. 3 Installed in Sub Incline. It is 175 H.P., double drum winder. Rope diameter 22 mm Right hand Langs lay rope.

Drum dia x Drum width – 2.28 m x 0.91 m
Max speed with ore - 5m/sec
Max speed with men - 3 m/sec
Hoisting capacity (Scheduled) - 15000 tonnes / month

vii. Subsidence management may be described as indicated below:

Surface subsidence is not expected because hydraulic stowing is practiced inconjunction with Cut and Fill method and also due to high is-situ rock strength(as indicated in IIT Kharagpur study report) and sufficient depth cover. Additionally,depending on situation ore pillar is left, if required, between hanging wall and footwall. IIT Kharagpur has been entrusted with the work of subsidence prevention. No surface subsidence has been observed as yet due to working since 1956. In their preliminary report IIT Kharagpur has indicated that no surface subsidence is expected in the expansion or post expansion phase.
Central Institute of Mining and Fuel Research had carried out a study on the measurement of deformation in post pillar at Surda Mine. It was observed that after filling the pillar remained stable.
The subsidence study report by IIT KGP has been attached as **Annexure- 18**.

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Conceptual mine planning taking into consideration the present available reserves & resources describing the ROM excavation, disposal of waste, stowing/ backfilling, surface subsidence, reclamation & rehabilitation showing on a plan with few relevant sections.

As per last approved Mining Plan, the maximum capacity of the mine will be 9 lakh tonnes per annum. The mining will be carried out in three lodes.

Hanging Wall Lode

Between 450m S to 480m N and between 900 m S to 1300m S, thickness of lode varies from 1m to 6.5m.

Here, Room & Pillar and Cut & Fill/ PP methods of stoping are suitable.

Inter lode

Between 1300mS and 950mS and 500mS to 150mS, width varies from 1.5m to 16.0 m. Here, Room & Pillar and Cut & Fill (HCF)/PP stoping methods are suitable

Foot Wall lode

Between 400mS and 900mS width varies from 1.5m to 7.0m, it is suitable for Cut & Fill / PP stoping. In some parts, hangwall& inter lodes have been merged together to form a wider ore body. On the basis of lode geometry, stopes are designed in the underground

Sequence of mining operation

Surda block extends 4.5 km in strike in Phase – II and existing phase – I operation is developed over a strike length of 2.2 km. The average width of the ore body is 5.5 meter, dipping at 30^0 to 35^0. Presently, the mine has been developed upto 13 level (each level interval around 37.5m), but stoping operation is restricted upto 11th level. Ore are extracted from the underground by room & pillar, horizontal cut & fill and post pillar method of mining. The waste generated in development is utilized for filling the stoped out area. After establishing the ore reserve below 10th level, mining operations shall be taken up to 18th level in future. A vertical new shaft of 6.0 m finished dia. is proposed up to 18th level for future operations.

Mine entry

Main access to the Surda Mine is through a vertical shaft (No. 3 shaft) sunk up to 5th level (i.e. about 176 m below from the surface) at Central part of the mine and another inclined shaft (No. 4 shaft) at 40^0 inclination to the horizontal located at approx. 1200m South of No.3 shaft is sunk upto 10th level i.e. 360 m below surface. Deeper levels below 5th level to 13th levels (i.e. 474 m below surface) are developed by an inclined shaft at an angle of 31^0 to 35^0 to horizontal. The ore reserve has been developed to a strike length of mainly 2.2 km with a maximum of 3.5 km at one level and a maximum depth of about 500m from surface. The proposed vertical shaft shall be an additional mine entry after commissioning.

Strategies to increase shaft capacity

No. 4 shaft capacity is to serve up to 10th level for hoisting ore from 9th level bin. This shaft will be extended up to 14th Level with a provision of bin of approx. 500 MT capacity and loading facility at 13th level This winder has a higher capacity, calculated as 30,000 tonnes per month. However, its location being at one extremity of the mine, ore from Centre section shall be trammed upgrade direction.

The present capacity of the skip is 3.65 tonnes. The winder is designed to hoist a pay load of 4.5 tonnes. With winder up gradation and re-fixation of the track line and hoisting on all seven days of the week, shaft will have a capacity of 27,000 tonnes per month at 90% performance.

No. 3 shaft capacity is 20,000 tonnes per month. Thus the total capacity of Shaft-system becomes 27,000 + 20,000 = 47,000 tpm.

Thus, the total combined capacity of the both the shafts may reach up to 47000 tonnes per month. Therefore, to increase production, to utilise the full shaft capacity, keeping some

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reservation, it is proposed that mine production will be 1700 tonnes per day initially and finally mine production shall be increased to 9,00,000 tonnes per year to match the Shaft capacity. A loco-haulage system at 8th level will be established to transfer ore from Centre Section to No. 4 shaft.

Present plan is to increase mine production to 3000 tonnes per day and 9, 00,000tonnes per year. A new vertical shaft and ore hoisting systems upto 18th level is planned and initial work has been started. The proposed expansion plan of Surda mines by the way of sinking a new vertical shaft and ore hoisting system has been described in the following paragraphs.

Expansion plan

The major activities of Surda expansion are enumerated below:

Sinking of Vertical shaft of 6 m diameter from surface to 18th level for a depth of 600 m. Vertical shaft will have two compartments. One for ore hoisting with combination of two number of skip and another for men & material. The shaft will be located at the centerof of the ore body, i.e. 13th level. Accordingly, level connection at 11th level to 18th level will be equidistance.

Deepening of existing sub incline shaft from 13th level to 18th level.

Inter connection cross cut between Vertical shaft and sub incline shaft from 13th level to 18th level.

Deepening of existing 1200 S winze from 12th level to 16th level.

Level connection from 9th level to 16th level between 1200 S winze to sub incline shaft.

Level and stope development from 9th to 16th level and below.

Development of haulage drive.

Installation of Ore handling system, i.e. crusher, feeder, surge Bin, measuring hopper, spillage handling system etc. below 16th level.

The existing method of mining will be carried out throughout the life of the mine and the conceptual mine lay out is shown in drawing No **HCL/ICC/SRD/2018/10A**. There is no evidence of the copper ore mineralization diminishing at depth and it can be anticipated that substantial additional ore reserve will be established in future by deep drilling to extend the life of the mine. Action has been initiated already for down depth exploration and to exploit the ore reserve below 10th level through a new vertical shaft and ore hoisting system.

However the proposed expansion and exploration programme (both surface drilling and underground exploration) will enhance the reserve base of the mines by converting the existing resources into reserves category. Therefore the life of the mine shall be increased accordingly.

To achieve these production levels, procurement of equipment and efficient manpower is necessary for both development and production. It is expected that the LHDs, Locos, and compressors, will have a lead time of 2 to 3 years. Thus, the target of production 3000 tonnes per day will be achieved during fourth year. Therefore, purchase of equipment, materials and induction of manpower is very vital in this proposal. Our next consideration is mine ventilation.

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Environmental Control Measure

a. Construction phase:

As the surface infrastructure is already existing and township and colony are well established. No new surface construction is planned. Primarily the waste rocks generated from waste development will be used for filling voids in underground excavations and road repair the excess rocks (if any) will be dumped on surface dump where a green belt will be developed by plantation

b. During production phase

Both top –soil preservation and land reclamation are not applicable in Surda mine because neither new surface construction nor land profile disturbance have occurred (except some office, buildings etc) due to mining (as the mining operations mostly done by underground methods). Dust suppression measures – For Movement of Truck / Dumper for ore and tailings transportation – Water spray arrangement in the discharge chute will be re-innovated. Both crushing plant, ball mill etc are located at Mosaboni concentrator plant. Similarly, the tailing pond is also located at Mosaboni. Mosaboni plant being all established outside lease area, the dust suppression measure in mine site will not be burdened. For Noise and vibration from stationary equipment like Diesel generator set or ventilation fan, compressor, the workers will be provided ear –muffs and their duty will be suitably rotated. Discharge of mine water is already regularly analysed by R & D department of Moubhandar and the report is sent to state pollution control board. In the conceptual period a new technology i.e. Paste filling technology is planned to be used for effective management of tailings in Surda mines area.

viii. Mine ventilation:

(Enclose a note outlining the steps to be taken to ensure adequate supply of air in all parts of the mine and prevention of noxious gases produced & excessive rise in temperature or humidity so as to ensure adequate ventilation. Also indicate no. & type of main mechanical ventilators, total air requirement as per statute, total intake/ return (cu.m/ sec) etc.

Ventilation requirement for Surdamine has been assessed considering the production rate and number of persons employed belowground in the largest shift. The method of ventilation will be ascensional.

Intake-system-
Intake system- No. 3 shaft
Intake system- No 4 shaft

Exhaust system-

North return air-way ,located at northern side of the mine

South return air ways—located at the southern side of the mine

The volume through exhaust fans is constant and the balance of flow is maintained by regulators.

Details of Fan capacities installed at the return airways:

North fan:

Aeroto axial flow fan 165 HP, wg 60m, 4300m3 /min capacity installed at 600m north of No. 3 shaft at north Ventilation return airway. This is acting as the up cast for bottom and Northern portion of the mine.

South fan:

VH 2500 165 HP,74mm wg , 6000m3/min capacity installed at No. 1 Adit i.e. South ventilation return airway located at 660m south of NO. 3 shaft. This is acting as the up cast for the centre and south portion of the mine.

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Ventillation network

No. 3 shaft , No.5 adit& sub-incline serve as intake for north portion of the mine. North portion is ventilated from split of Sub- incline up to 11th level and 50m N winze to 7th level. From 11th level it is returning through 25 m S winze and 180 m S raise to 10th level and to 8th level via 75m S raise and 4L drive north to north fan. The intake air from No. 2 shaft and No.4 shaft ventilates the south portion of the mine. The 3L/660 S and 3L/540 S stope of the mine is ventilated by a split from 5L/4 shaft via 5L/725 S winze (old). 7th level and 9th level is ventilated from split of No. 4 shaft. The return air from 9L is up casted to 5L by 1065m S and 600m S winze and from there the return air is coursing to south fan. After expansion, new vertical shaft will act as intake airway along with No.3 shaft and sub-incline. For return airway for southern portion will be 1200 S winze & No.4 shaft, while ventilation raises will be excavated at the northern side of each level, which will finally meet the ventilation return airway at 600 m N of No. 3 Shaft. A separate ventilation raise has to be established from crusher chamber to eight level then to surface by no.4 shaft. The ventilation line diagram of Surda Mine is enclosed in the list of drawings. The existing ventilation arrangement of the mine is quite adequate for the present production rate of about 3000 tonnes / day. The discharged quantity of air by both the two fans is 10300 m3/min.

Stope Ventilation

By maintaining a minimum velocity of 0.5 metres per second through the Room and Pillar and Horizontal Cut and Fill stopes, the volumes required have been estimated at 6.0 cubic metres per second and 18.0 cubic metres per second respectively and the volume required has been estimated at 24.0 cubic metres per second in stopes. Broadly, the fresh air will enter via auxiliary fan at top of stope, the working places at the stope bottom, rise through the workings and exhaust out on the level above and then be directed to the nearest return airway.

These two fans are sufficient to cater the ventilation requirement of the mine.

The ventilation plan is shown in Drawing **No. HCL/ICC/SRD/2019-20/15**

ix. Extent of Mechanisation

(Briefly describe with calculation for adequacy and type of machinery & equipment proposed to be used in different activities of drilling, material handling in development & stope, hauling, hoisting to surface, surface transportation & any other operation)

A list of equipment/ machineries proposed to be deployed with its justification is given in the table below:-

Drills		
a) Output of PP stopes per day Output per m/c shift Total nos. of m/s required per stope	- 	250 t 45 tonnes 5 nos. in production 1 no. for Rock botling.
b) Output of HCF stope per day Output per m/c shift No. of m/c required per stope	- 	200 t 45 tonnes 4 m/c for stoping 1 m/c for rock bolting

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c) Output of R&P stopes per day Output per m/c shift No. of m/c required per stope	-	80 t 45 t 2 m/c for stoping per day and 1 m/c for rock-bolting
Total drilling m/c required for the existing stopes		
Post pillar = 4 stopes x 5 m/c day (stoping) & 4 x 1 m/c (bolting) Total production per day: 1000t (PP stopes)	-	20 m/c production 4 m/c rock bolting Total: 24 m/c
HCF = 2 stopes x 4 m/c/day (stoping) & 2 x 1 m/c (bolting) Total production per day: 400 t (HCF stopes)	=	8 m/c Production 2 m/c rock bolting Total: 10 m/c
Total machines required for development		8 Nos. (6 Nos. in ore & 2 Nos. in waste)
No. of m/c required per face for development	=	16 nos.
Total m/c required Stoping Rock bolting Dev m/c Total	=	 34 m/c 6 m/c 16 m/c 56 m/c plus 10% extra 62 m/c
Loading:		
LHD (Electric) – 0.57 m3 and 1.2 m3 Output of LHD/day	=	250 – 300 MT/day
Production from PP stopes (4 Nos. @250tpd)	=	1000 t
Production from HCF stopes (2 Nos. @200tpd)	=	400 t
Total production	=	1400 t
No. of LHD required	=	5.6 ~ 6 Nos.
Production from Cavo used for development of stopes& also in stoping (HCF)	=	100 – 120 T/day
Total production envisaged from cavo loader	=	600t
No. of cavo loaders required	=	6 nos.
Total rocker shovels required @ 1 per development heading and a total of 8 Nos. of such headings	=	8 Nos.

Winding:

a. Double drum winder, 100 HP, Tub capacity- 1.4 tonnes (No. 3 Shaft)
   Capacity per day : 700 tonnes
   Actual output per day : 600 tonnes

b. Double drum winder, 175 HP, skip capacity- 2.75 tonnes (Sub Incline)
   Capacity per day : 500 tonnes
   Actual output per day : 500 tonnes

c. Double drum winder, 4000 KW, skip capacity- 3.75 tonnes (No. 4 Shaft)
   Capacity per day : 1000 tonnes
   Actual output per day : 600 tonnes

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Transport:

For evacuating the ore from stope a combination of Battery Locomotives and side tipping tubs are used and for hoisting through cage, square tubs are used. No. of locomotives depends upon the no of stope in operations. One Locomotive can be used for the pulling 06-08 Nos of side tipping tubs. Therefore, the no. of locomotives required will be 7 Nos. (6 for stoping& 1 for vertical hoisting)

Pumps:

Three stage pumping system (From 13th Level to 10th Level, From 10th Level to 5th level & 5th Level to Surface) is being maintained at present. Centrifugal pumps (electric driven) are used. Seepage water from 13th level is collected at 10th level pump sump with the help of 40/30 HP pumps. Similarly seepage water of No.4 shaft area is also collected at 10th level pump sump. In No. 4 shaft area 02 Nos of 40/30 HP pumps are used to keep the water level below chute of 10th level in 1200 mSwinze. Total dewatering required per day: 1300 Kl/day (average of rainy & dry spells).

Total de-watering required from 10th Level to 5th Level: 1000 Kl/day

Capacity of de-watering pump at 10th Level: 90 Kl / hr (03 Nos 100 HP pump)
Working hour per day : 15 hr
Total dewatering capacity : 1350 Kl/day

a) Total de-watering required from 5th Level to Surface : 1300 Kl/day
Capacity of de-watering pump at 5th Level : (85 + 60) Kl / hr
(01 No 220 HP pump & 02 Nos 100 HP pump)
Working hour per day : 15 hr
Grand total dewatering capacity : 2175 Kl/day

Therefore the pumps deployed as on date are 01 No. 220 HP, 05 Nos 100 HPand 03 Nos 40/30 HP pump. Total Pump available are 02 Nos. 220 HP, 07 Nos 100 HP, 04 Nos 40/30 HP pumps and 02 Nos of 10 HP pumps used to assist pumping from level to level

Equipment for production level of 0.9 MT or 3000 tpd

1. Drilling Machine:

No. of PP stope to be worked :6 Nos (6 m/c per stope)
No. of HCF stope to be worked : 5 Nos (5 m/c per stope)
No. of R& P stope worked per year- : 6 Nos (2 m/c per stope)
Development Heading : 8 Nos (2 m/c per face)
Total drill required : 89 Nos. ~ 98 Nos.

(Keeping into considerations provision for stand by). Additionally, 2 Nos of drill jumbo with 824 loader combination will also be deployed for better development.

2. Loading:

a. For Stoping operations;

Total LHD required :11 Nos (for 11 Nos. of PP & HCF stopes)
Total Cavo required : 10 Nos.
(for 1 No. per heading and 8 headings with provision for stand by)

b. For development;

824 loader will be deployed in development faces (for 3000 m/year of development)
Dev. rate of one 824 loader=300 m/year (When deployed with jack hammer)
No of 824 loader required in operation - 10 Nos , Stand by - 02 Nos
Total required - 12 Nos

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3.Winder: The method of mining which is in practice now will continue in Surda mine after expansion of the mine. The productivity of the mine after expansion will be 3000 Tons per day (TPD). The existing hoisting capacity of the shafts is 1700 TPD which will be replaced with the 1700 KW friction winder having skip capacity of 10 tonnes. Also a double drum winder of 530 KW will be installed for man winding as well as materials hoisting.

4. Transport: Battery Locomotives at least 17 Nos for the stopes (1 per stope for 11 stopes) and 04 Nos for the development heading will be required (1 per 2 headings) with stand by provisions. To meet the production target 60 Nos of gran by car to be required @ 4 Nos. per PP & HCF stope (11 Nos.) & 2 Nos. per RP stope (6 Nos.) with stand by provisions.
Therefore summary of fleet required for 0.9 Mt/yr. production from Surda mines is as follows:-

Equipment	Capacity/Specification	Total unit
Drilling machines,	32mm diameter	98 Nos.
Drill jumbo	57mm diameter:	2 Nos.
LHD	1.2 cu.m	11 Nos.
Cavo loaders	1 cu.m	10 Nos
824 loaders	1 cu.m	12 Nos.
Winder	1700KW	1 No.
Winder	530 KW	1 No.
Locomotives	8-10t	17 Nos
Granby cars	3-5t	60 Nos.
	220hp	6 Nos. (2 Nos. per stage for 3 stages)
	100hp	9 Nos. (3 Nos. per stage for 3 stages)
Pumps	40hp	6 Nos. (standby)

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3.0 MINE DRAINAGE

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

Generally the water table is considered to be around 15 m to 30 m below the surface.

b. Indicate maximum and minimum depth of Workings.

The present maximum depth of the underground workings is around 475m from surface (i.e. 13thLevel). During the proposed plan period the maximum depth will remains the same.

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

Surda mine has two pumping stations located at 5th level and 10th level respectively. The pumping capacity is 1800 lit./min from underground 5th level to surface. All the mine water of 5th level and above is collected at sump located at 5th level near No 3 shaft through drains. Water is pumped out directly from this sump to surface. The mine water below 5th level is collected at sump located at 10th level through drains. From this sump, water is pumped out to 5th level sump and then to surface. The mine water below 10th level is collected at 13th level sump and water is pumped out from 13th level to 10th level sump and subsequently to surface via 5th level. For Surda phase II, the mine water below 13th level will be collected at 16th level sump, from where water will be pumped out at 13th level sump and from 13th level to surface via 10th level and 5th level. The expanded mine will have the capacity to handle 4300 m3/d of water (including contingencies).

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.

The study area falls in the middle reach of the Subarnarekha River basin. The river Subarnarekha flows from NW to SE and covers the entire eastern part of the ML area. The mining lease and its adjacent area have undulating land surface. The mining lease area is to the east of a small hill range with approximately 300m elevation above the sea datum. The ground level has slope toward east from west. The natural drainage system is distinct due to hilly topography and well defined gradients in parts of the study area. During rainy season, many rain fed canal carries water from hill top to the river Subarnarekha. The northern part of the ML area is drained by Netranala, which flow towards northern half of the ML area and joins the Subarnarekha river. The southern part of the ML area is drained by Kankuramnala, which flow towards southern half of the ML area and joins the Subarnarekha river. Major part of the area has dendritic drainage pattern. The hill ranges are drained by seasonal streams, which form part of the Subarnarekha River system.

The average annual rainfall for the district is around 1300 mm since the annual rain fall lies between 1200mm to 1400mm. The monsoon season usually starts from May and continues till September. June to September is the wettest period claiming 81% of total annual rainfall. IMD study conducted in the entire East Singhbhum district has revealed that annual rainfall has lowered from 2052.4 mm in 2005 to 577.5 mm in 2010, showing a downward trend.

A number of tanks have been constructed in the study area to retain rain water during monsoon season, by constructing earthen bunds. The stored water is utilized mainly for local village needs in the study area. There are a few small tanks, which have been constructed to retain rainwater. Check dams have been constructed in the Kankuramnala and Netranala trapping the overland flow of water during monsoon season and also seepage water from

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hills. These bunds store water utilized mainly for local village needs in the study area. Number of Pucca drains has been constructed from hills to agricultural fields to divert the stream water to agriculture land during monsoon season. It is also observed that an irrigation canal has been constructed along the Subarnarekha River, which is originating near the confluence of GaraNala and Subarnarekha River, under Subarnarekha Multipurpose River Project. However, irrigation facilities are not available in the study area, as dam construction is not completed.

4.0 STACKING OF MINERAL REJECT /SUB GRADE MATERIAL AND DISPOSAL OF WASTE

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

No usage of surface land has been envisaged for disposal of any mine waste produced underground. All the wastes, so generated will be backfilled.

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.

Not applicable, as the wastes generated will be completely backfilled in the underground mined out stopes

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

Not applicable

5. USE OF MINERAL AND MINERAL REJECT

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

The ore mined will be supplied to the Mosaboni concentrator plant belonging to HCL only.

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

No intermediate industry involved for up-gradation of mineral.

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

The chemical characteristics of the feed to concentrator plant belong to HCL only is copper content – 1.16%, Fe_2O_3 – 3.5% & Molybedunum-0.01%. The concentrate produced is having a copper content of 25%. Thereafter the concentrate is send for smelting & refining.

d) Indicate precise physical and chemical specification stipulated by buyers

The chemical characteristics of the feed to concentrator plant belong to HCL only is copper content – 1.16%, Fe2O3 – 3.5% & Molybedunum-0.01%. The feed size is below 16mm to the concentrator plant after carrying out primary crushing underground and the fine crushing at surface.

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

The lean grade ores are blended with the high grade ore at the stope itself prior to raising the same to surface.

f) The useable mineral recovered from ROM may not be directly used in any industry and may need intermediate process to suit the user industry in terms of physical and chemical compositions.

The lean grade ores are blended with the high grade ore at the stope itself prior to raising the same to surface.

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6. 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.

The ore produced from Surda Mine will be processed at the Mosaboni Concentrator plant, located at Mosaboni at a distance of about 5 km. from Surda. Original capacity of Mosaboni beneficiation/Concentrator plant is 8,91,000 tonnes per year or 2700 tonnes per day.
Working days – 330 days; Recovery – 94%
Concentrate grade – 23% to 25%

Method of beneficiation:

The flowsheet for the plant incorporates :
1. Crushing,
2. Grinding,
3. Copper flotation,

1. Crushing

Primary Crushing is carried out underground with the crusher located below 6 level adjacent to the main hoisting shaft. The primary crusher is a 60 x 48 double-toggle jaw Crusher with a closed circuit setting of 120mm. Feed to the crusher is delivers over a sloping grizzly with 150mm opening. Hoisted ore is discharged to the coarse ore stockpile by means of a 1,600 mm belt conveyor. A 50tonne surge bin is located at the head frame, to provide a relatively steady feed to the conveyor belt. The stockpile is uncovered and discharges through a tunnel beneath the stockpile to the conveyor feeding the secondary crushers. The base of the stockpile is graded to carry water draining through the ore away from the loading tunnel. Ore discharges to the stockpile at a single point forming a conical heap, with a base diameter of approximately 50 metres. Total heap capacity is approximately 18,000 tonnes, of which 5,400 tonnes is live load, Overspill capacity for an additional 12,000 tonnes is also provided. During extended shaft maintenance, dead load will be reclaimed by bulldozer.

Fine Crushing:

Fine crashing takes place in two stages. The first stage is an open circuit standard cone crusher. The second stage is a closed circuit with three short head cone-crusher. The circuit is designed to reduce run of mine ore crushed to a maximum size of 150mm, in two stages, to final sizing of minus 16mm. Coarse ore from the stockpile is delivered to the fine crusher building through a 1,500 mm wide conveyor, at a rate of approx. 600 tonnes per hour maximum. The ore discharges to a 6,000 mm x 2,500 mm double deck vibrating screen with the lower deck screen scalping out material at the finished product size of minus 16 mm. The undersize material from the screen discharges to the fine ore belt, and is conveyed to the fine ore bin in the milling plant. The screen oversize is delivered by chute to the Symons standard cone crusher, 2,134 mm size. After crushing, the discharge from the crusher drops on to three belt conveyors in series to elevate the ore to the bin feeding the tertiary screens. These three screens of 6, 000 mm x 2,500mm size, are also double deck screen with the lower screens of 16 mm opening to remove material at final crushed size. The feed to the screens is split equally. The oversize from each screen falls to a separate Symons short head cone crusher of 2, 134 mm size. The crushers would be set to give a closed side setting of approximately 12mm. The crusher discharge falls to conveyor No.3 to be

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recycled through the tertiary screens. The undersize product from the tertiary screen falls to conveyor No.5 to be conveyed to the fine ore bin in the processing plant.

2. Grinding :

Fine ore of a maximum size of 16mm is transported from the crusher house to the fine ore bin 10,000 tonnes capacity located in the concentrator. Grinding is undertaken in a single closed circuit ball mill with cyclone classifier. The final group product is 75% passing 100 mesh. Four mills are operated in parallel with each mill circuit having a capacity of 1500 tones per day, based on an availability of 91.3 per cent . Actual feed rate is designed to be 68.5 tonnes per hour to each mill.

Description :

Feed for each mill would be drawn from one of two vibrating feeders discharging into a main feeder belt of 750mm width. A weightometer on the belt would control the feeder to a pre-set rate. The fine ore feed would discharge from the belt to a scoop feeder to the mill. Return cyclone underflow and water would also be fed to the scoop feeder box. Each ball mill size 5,000 mm length X 3,050 mm diameter would be driven by a 650 kw motor. The ball mill would discharge to the cyclone pump feed box through a standard trash screen discharge, with the pump feeding a manifold with two cyclones, one on standby. 600 mm cyclones are spiced for this service. Cyclone overflow would pass to the flotation circuit with the underflow returned to the mill feed box.

3. Copper Flotation

Rougher and scavenger flotation consists of four parallel banks of cells, each one normally operating in series with one of the grinding mills. The rougher concentrates from each bank are combined and subjected to two stages of cleaning to produce a final concentrate grading about 25-30% copper.

Description :

The cells proposed for flotation are with a capacity of 5.66 cubic metres each. Each bank consisting of 15 cells, has ten cells on roughing duty and five on scavening, with a total contact time of 25 minutes. Ahead of the flotation cells, a 14 cum, conditioner is installed giving 5 minutes retention time. Conditioned pulp feeds by overflow directly to the rougher cells. Tailings from the last scavenger cell are fed directly to the magnetic recovery circuit. The scavenger concentrate is combined with the cleaner cell tailings and pumped to a four-way distributor, to be returned to the rougher circuit feed. Copper rougher concentrate from the four banks of cells are combined and pumped by a Sala or similar vertical shaft pump to the cleaner and recleaner circuit. These each require ten of the 100 cu. ft. cells .Each bank gives between 20 and 25 minutes contact time. Recliner tails are returned to the head of the cleaner circuit and cleaner tails are turned, in turn, to the head of the rougher circuit, in each case using vertical shaft froth pumps. The final copper concentrate is pumped into the molybdenum recovery circuit.

Reagent feeding :

Reagent preparation and distribution is located on a floor above the floatation floor. This area is equipped with:-

a) Storage space for immediate requirements of dry reagents and drums of frother.
b) Reagent mixing tanks to prepare xanthate and other solutions (these would be standard tanks of about 1,000 litres capacity with propellar mixers).
c) A laboratory size ball mill and storage tank would be provided to make up lime slung for feeding to the flotation cleaner circuit.

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d) A platform scale for weighing dry reagents.
e) Standard cup and disc reagent feeders (these would be used for feeding xanthate, frother and conditioners for the moly float)
f) Reagent stock tanks of approximately 4000 litre capacity, adequate for 2-3 days usage in the plant.
g) A two tonnes capacity monorail hoist for lifting reagents etc to the reagent mixing floor.

Provision would be made on the mill feed belts for installation of a hopper and vibratory feeder for feeding dry lime.

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.

The detail of the process is indicated in chapter 6.a.

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

Backfill plant:

De-slimed tailings for back filling in the mines is produced by two stage cycloning of the final mill tailing. Back fill will be pumped directly to underground mines. The mine demand for back fill will be max 70% of the tailings. In addition, provision has to be made to supply cemented back fill.

Description:

Tailings from the magnetite recovery plant will be received in a feed tank with an overflow discharging directly to the final tailings pumps. Primarily, however, the tailing will be pumped into a battery of 400mm cyclones as a first stage of desliming. The overflow from the cyclone will be re pumped to a second cluster of 250mm cyclone for further de-sliming. The second stage cyclone overflow will be discharge to the tailings pump tank. Cyclone underflow from both sets of cyclone will discharge to a holding tank from which it can be pumped directly underground or to an outside storage area. Hydraulic fill can also be pumped to a second storage tank (cemented fill tank) in which it can be mixed with a cement slurry for pumping directly underground. The includes a cement storage bin and a small mixing tank for slurry the cement prior to its addition to the cemented fill in the back fill tank.

Operation:

The plant would be set up flexibly to permit operation with two stages of Cycloning to give the maximum tonnage of back fill, or single stage cycloning to give a lesser amount, or for the whole feed to be diverted directly to the tailing dam. Depending on the mine schedules, deslimed tailings would either capacity outside storage area. When this facility is full and no back fill is required underground at Chapri, the tailings would be diverted directly to the tailing dam. Cemented back fill would be prepared on a batch basis, immediately before it is required for emplacement.

Tailing Discharge:

Tailings are pumped as dilute slurry (about 15% solids) to the tailings disposal area. Rubber lined centrifugal pumps would be used for this service, with three lines available for carrying the slurry to the tailings dam. Water flushing facilities would be provided.

Annual tailing emplacement in the dam will be approximately 1 million tones of slimes annually.

Concentrate Handling:

Copper concentrate from the disc filter will discharge into a bay on the basement floor. Copper concentrate will be loaded out of the bay into contractor's trucks for delivery to the Moubhandar Smelter. Loading will be done by a front-end loader of 0.8 cubic metre bucket capacity. Magnetite concentrate will be handled in similar fashion, being loaded by front end loader into trucks for road delivery. Both copper and magnetite concentrates will be shipped in

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bulk. High value molybdenite concentrate will be dried and bagged in 50 kg heavy duty paper or plastic bags. The bagged concentrate will be stored prior to shipment, in a storage bay.

Expected Recovery and Grade:

The expected mill recovery is 94% (+) and the concentrate grade is 23-25% copper. Similar recovery and grade is achieved in the operations of the Kendadih Mill with, by and large, the same nature of ore.

Physical and Chemical Composition of tailing:

Tailing grade will be on an average 0.05% copper by chemical composition.

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.

Backfill plant:

De-slimed tailings for back filling in the mines is produced by two stage cycloning of the final mill tailing. Back fill will be pumped directly to underground mines. The mine demand for back fill will be max 70% of the tailings. In addition, provision has to be made to supply cemented back fill.

Description:

Tailings from the magnetite recovery plant will be received in a feed tank with an overflow discharging directly to the final tailings pumps. Primarily, however, the tailing will be pumped into a battery of 400mm cyclones as a first stage of desliming. The overflow from the cyclone will be re pumped to a second cluster of 250mm cyclone for further de-sliming. The second stage cyclone overflow will be discharge to the tailings pump tank. Cyclone underflow from both sets of cyclone will discharge to a holding tank from which it can be pumped directly underground or to an outside storage area. Hydraulic fill can also be pumped to a second storage tank (cemented fill tank) in which it can be mixed with a cement slurry for pumping directly underground. The includes a cement storage bin and a small mixing tank for slurry the cement prior to its addition to the cemented fill in the back fill tank.

Operation:

The plant would be set up flexibly to permit operation with two stages of Cycloning to give the maximum tonnage of back fill, or single stage cycloning to give a lesser amount, or for the whole feed to be diverted directly to the tailing dam. Depending on the mine schedules, deslimed tailings would either capacity outside storage area. When this facility is full and no back fill is required underground at Chapri, the tailings would be diverted directly to the tailing dam. Cemented back fill would be prepared on a batch basis, immediately before it is required for emplacement.

Tailing Discharge:

Tailings are pumped as dilute slurry (about 15% solids) to the tailings disposal area. Rubber lined centrifugal pumps would be used for this service, with three lines available for carrying the slurry to the tailings dam. Water flushing facilities would be provided.

Annual tailing emplacement in the dam will be approximately 1 million tones of slimes annually.

Concentrate Handling:

Copper concentrate from the disc filter will discharge into a bay on the basement floor. Copper concentrate will be loaded out of the bay into contractor's trucks for delivery to the Moubhandar Smelter. Loading will be done by a front-end loader of 0.8 cubic metre bucket capacity. Magnetite concentrate will be handled in similar fashion, being loaded by front end loader into trucks for road delivery. Both copper and magnetite concentrates will be shipped in bulk. High value molybdenite concentrate will be dried and bagged in 50 kg heavy duty

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paper or plastic bags. The bagged concentrate will be stored prior to shipment, in a storage bay.

Expected Recovery and Grade:

The expected mill recovery is 94% (+) and the concentrate grade is 23-25% copper. Similar recovery and grade is achieved in the operations of the Kendadih Mill with, by and large, the same nature of ore.

Physical and Chemical Composition of tailing:

Tailing grade will be on an average 0.05% copper by chemical composition.

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

Reagent preparation and distribution is located on a floor above the floatation floor. This area is equipped with:-

- Storage space for immediate requirements of dry reagents and drums of frother.
- Reagent mixing tanks to prepare xanthate and other solutions (these would be standard tanks of about 1,000 litres capacity with 47 propeller mixers).
- A laboratory size ball mill and storage tank would be provided to make up lime slung for feeding to the flotation cleaner circuit.
- A platform scale for weighing dry reagents.
- Standard cup and disc reagent feeders (these would be used for feeding xanthate, frother and conditioners for the moly float)
- Reagent stock tanks of approximately 4000 litre capacity, adequate for 2-3 days usage in the plant.

A two tonnes capacity monorail hoist for lifting reagents etc to the reagent mixing floor.

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

- Reagent mixing tanks to prepare xanthate and other solutions (these would be standard tanks of about 1,000 litres capacity with 47rganizat mixers).
- Reagent stock tanks of approximately 4000 litre capacity, adequate for 2-3 days usage in the plant.

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.

Peak water demand of the expanded project is expected to be 3000 m3/d. Of this 2030 m3/d of industrial water will be met by utilizing treated mine discharge water and other effluents generated in the project. Domestic water and drinking water will be sourced from water treatment plant.

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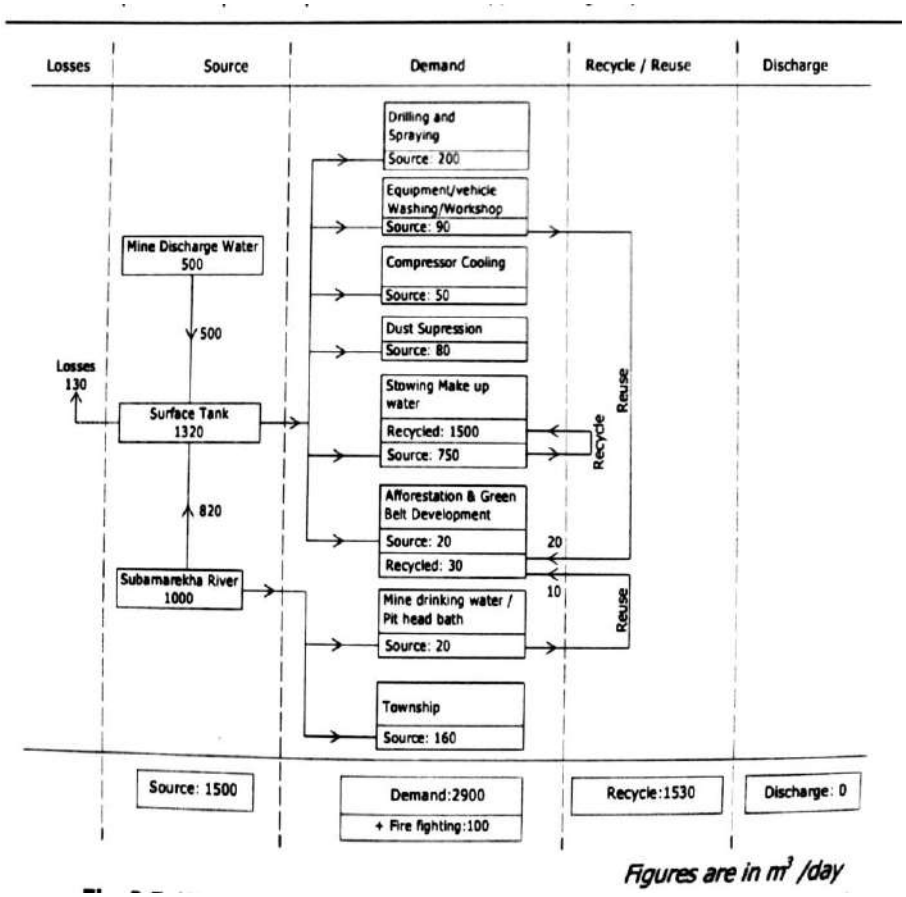

Water Balance of Surda Mining Lease

h) Brief description of the end use of copper concentrate & Maubhandar Smelter plant may be given.

Copper concentrate as obtained from Concentrator plant being get dried and then feed into flash furnace followed by Slag leaning furnace and Converter where the product obtained is copper anode , solid waste as obtained is copper granulated slag and off gas produced during the combustion in furnace being used by Sulfuric acid plant to produce sulfuric acid as by product.

Copper Anode so as produced from the Flash smelter is being send to Refinery for producing Pure Copper cathode as end product through electrolysis and Slime obtained as by product

7.0 OTHER

a) Site Services

The mine site area is relatively flat and close to the existing road leading to the nearby Surda Mine. Surface services and facilities for the mine are proposed to be located near the proposed vertical shaft

Surface services and facilities in this area are :

Administration Building :

This is a two storey building with the top floor comprising the office of General Manager, Project office & Office of Geologist, Surveyor etc. The bottom floor houses the offices of Contractors.

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Mine Office:
This is a one storey building with a floor area of aprox. 100 square meters.
Change House and Lamp Room:
At present, the change house and the lamp room are near both the No. 3 & 4 shafts
Canteen and First Aid Centre
The canteen is located near the No. 3 shaft where as the First Aid centre is located near both the No. 3 & 4 shafts.
Winder House
Winder house are located near both the No. 3 & 4 shafts and is also proposed to be located near the new proposed shaft.

Surface Magazines
There are two magazine of 0.45 t & 0.9 t respectively located within the Surda lease with the provision for storing class-2 slurry cartridge explosives along with safety fuse & delay detonators.
Power
The power demand of the expanded mine is estimated to be 7.2 MW. The power is supplied by Jharkhand State Electricity Board (JSEB). For the emergency power, 1 no. diesel generating set of 3.5 MW has been installed.

Water Supply
Peak water demand of the expanded project is expected to be 3000 m3/d. Of this 2000 m3/d of industrial water will be met by utilizing treated mine discharge water and other effluents generated in the project. Domestic water and drinking water will be sourced from water treatment plant.

Colony
A residential colony for workers is already existing within the mine lease. Additional housing is available at HCL's townships at Moubhandar and Ghatsila which have all amenities.

b) Employment Potential:

Mine Organisation :
The proposed organisation structure has been purposely designed to reduce the number of management levels for maximum effectiveness. Pre-production and production schedules were used to develop and expand the structure from which the total manpower requirements for the study were derived.
Workforce:
The manning for the total Surda Mine operation includes all the personnel required for the routine functioning and control of the mine-site & plant operations. The mine will be contractually operated by a contractor.
The details of the manpower requirements are given below:-

Mines :

Executives: 10 Nos.
Supervisors: 100 Nos.
Highly skilled workmen: 305 Nos.
Skilled workmen: 600 Nos.
Semi-skilled workmen: 501 Nos.
Un-skilled workmen: 32 Nos.
Total: 1548 Nos.

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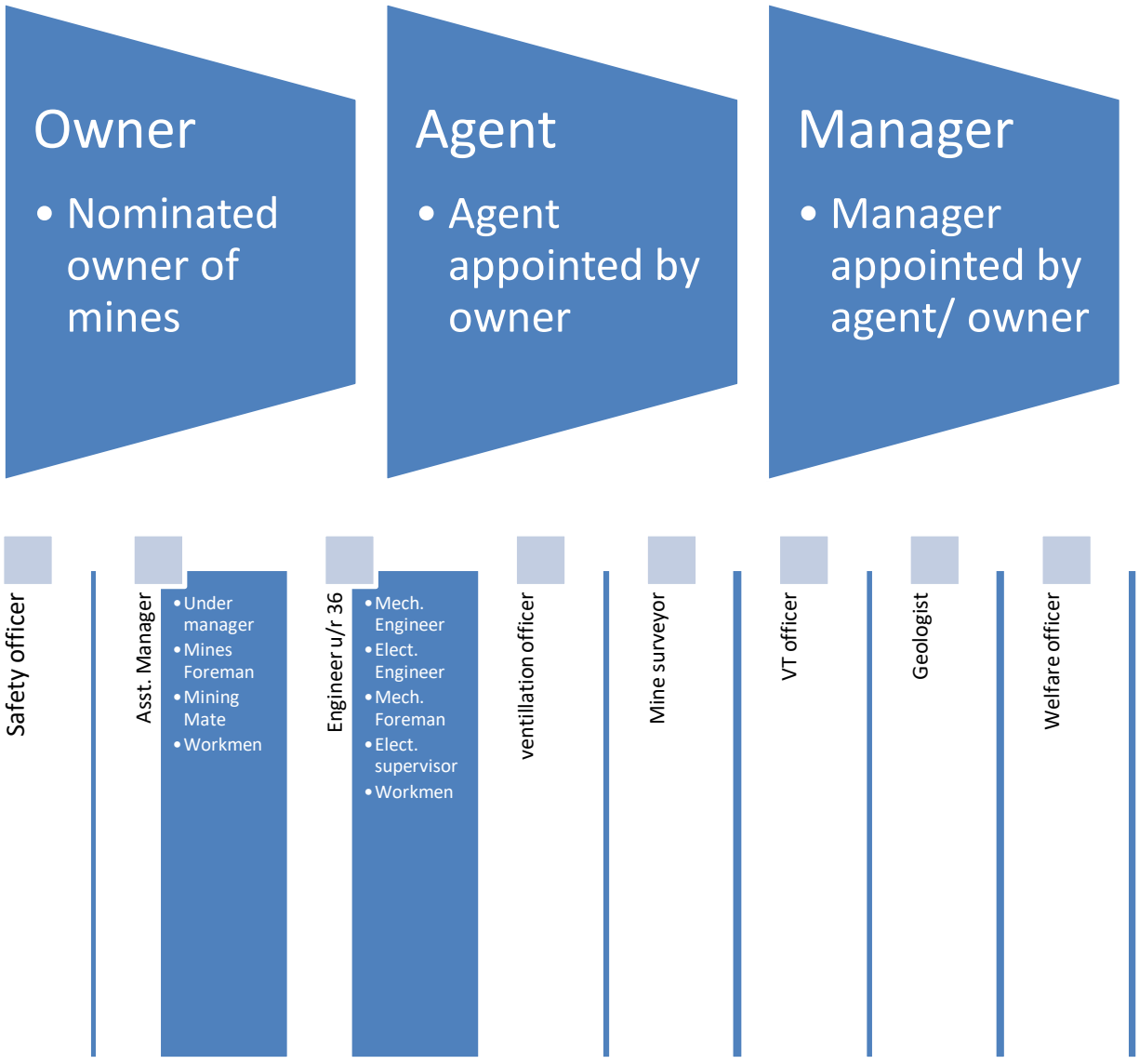
Concentrator plant:

Sr. Executives: 5 Nos.
Executives: 12 Nos.
Supervisors: 3 Nos.
Sr. workmen: 15 Nos.
Workmen: 77 Nos.
Skilled workmen: 31 Nos.
Unskilled workmen: 38 Nos.Total: 181 Nos.

Organization structure:



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Plan for the year 2020-21 to 2024-25 for the up-liftment of Scheduled Caste / Scheduled Tribe population

SN	Activities	Year and expenditure for the respective activities in Rs. In lakhs					Budget (Rs. In Lakhs)
		2020-21	2021-22	2022-23	2023-24	2024-25	
A	Drinking Water, Health & Sanitation						
1	Drinking water structure (Bore well with Motor fitting) including Soak Pit for Water Recharging in illages/schools	10.00	10.00	10.00	10.00	10.00	50.00
2	Construction of household toilets	15.00	7.50	7.50	0.00	0.00	30.00
3	Rural Medical camps	9.00	9.00	9.00	9.00	9.00	45.00
4	Eye Camps - Cataract operations	8.00	8.00	8.00	8.00	8.00	40.00
5	Installation of Sanitary Napkin Vending Machines and Incinerators with maintenance for a period of 03 years.	4.00	4.00	4.00	4.00	4.00	20.00
6	Project on Nutrition	0.66	0.67	0.67	0.67	0.67	3.34
	Sub Total	46.66	39.17	39.17	31.67	31.67	188.34
B.	Education, Vocational Skills and Livelihood						
7	Training & support to existing & new SHGs in Hand Glove/ Handloom/ Wooden Craft/ Muri (Puffed Rice)/ Dokra Art Unit/ Nursery	6.67	6.67	6.66	6.66	6.66	33.32
8	SRI with farmers on enhancement of rice/ wheat crop	10.00	10.00	10.00	10.00	10.00	50.00
9	Kaushal Vikas Yojana (Skill development training- RPL & Fresh Skilling)	10.00	10.00	10.00	10.00	10.00	50.00
10	Support to School Education (Lab Equipments, etc.)	30.00	30.00	30.00	30.00	30.00	150.00
	Sub Total	56.67	56.67	56.66	56.66	56.66	283.32
C.	Sports	Target (Units/nos)					Budget (Rs. In Lakhs)
11	Archery training	4.00	4.00	4.00	4.00	4.00	20.00
12	Football league	2.00	2.00	2.00	2.00	2.00	10.00
13	Mega cricket tournament	4.00	4.00	4.00	4.00	4.00	20.00
	Sub Total	10.00	10.00	10.00	10.00	10.00	50.00
D.	Environment						
14	Plantation (with 3 years maintenance period)	3.34	3.33	3.33	3.33	3.33	16.66
	Sub Total	3.34	3.33	3.33	3.33	3.33	16.66
E. Management Cost, Institutional Cost, Contingency							
21	Contigency/ Institutional & Management Cost	8.34	8.33	8.33	8.33	8.33	41.66
22	Miscellaneous (Promotion of Culture, etc.)						
	Sub total	8.34	8.33	8.33	8.33	8.33	41.66
	Grand Total	125.01	117.5	117.49	109.99	109.99	579.98

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8.0 PROGRESSIVE MINE CLOSURE PLAN

8.1 Environment Base line information:

Existing Land use Pattern

The existing land use pattern as on 31.12.2019 is shown in the table below:

Sl No.	Type of Land use	Present Area (Ha.)
1	Area for excavation, Mine entry	2.52
2	Storage of topsoil	2.94
3	Waste dump	5.49
4	Mineral storage & concentrator plant	4.85
5	Infrastructure (Administration building shaft portals, Manager office workshop and old township area etc.)	8.41
6	Roads	1.88
7	Green Belt	18.79
8	Township	10.69
9	New Production shaft site	10.76
	Total	66.33

b) Water regime

Sources of water in the study area villages include, shallow dug wells, river and ponds. The other system is tapping deep aquifers in some of the villages by deep tube wells and hand pumps. These wells have been an average depth of 20-30 meters. The water table in the dug wells ranges in between 4-10 m except in few cases when the water table is at deeper level .

Surdaarea forms part of the Precambrian, regionally metamorphosed tract of Singhbhum shear zone. Weathered residue of hard rocks as well as fractures, joints, fissures, faults and other zones of discontinuity are the principle repositories of groundwater in the area. Groundwater in the weathered and fracture zones of hard rocks occur under unconfined condition.

Quality of air, water and ambient noise level

The copy of environmental monitoring report is enclosed in **Annexure-16.**

Flora and Fauna

Flora

Characteristic forest types of the area, distributed along the topography are mainly Tropical. Moist Deciduous Forest and Tropical Dry Deciduous Forest. Types with their sub group in the study area were characterized as follows:

Distribution of forest is fragmented and restricted to the patches in the plains and along the banks of Subernrekha River in the northern and north-east portion of the study area. From the southern boundary of the study area a stretch of forest begins with thick boundary which gradually tapers while extending towards north-western portion. Within the forest boundary there exists large patches of open scrub with rural settlements. At several places this forest boundary is fragmented due to roads. The total Open mixed jungle/ Rocky area in the study area is about 33.44 % of the total area. Dense Trees occupies about 43.14 % in the study area.

The valley bottom and lower hilly slopes contains relatively deep soil due to washout from slopy crystalline rocks. These areas are characterized with the presence of moist peninsular valley sal forest and moderate shrub growth. Top canopy in these areas were dominated by

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Shorearobusta in association with Terminaliatomentosa, Adina cordifolia, Pterocarpousmarsupium, Madhucaindica etc. Main associates in the Second story tree are Syzygiumcumini and Ficus spp.

On the hilly tract in the area, with varying moisture retention capacities forest type changes into moist mixed deciduous forest and in the top canopy predominance of sal is replaced by Salmaliamalabarica and Adina cordifolia in association with Brideliaretusa, Dilleniapentagyna etc. Second story trees were represented by Kydiacalicina, Mallotusphilippensis and Polyalthiaceracoides. Bamboo community is represented by Dendrocalamusstrictus in patches in these areas. In the areas with heavy and wet soil along the valleys or along the water sides of Subernrekha River with clayey alluvial patches traces of Terminaliatomentosa forest were found. Top canopy of these forests were dominated by Terminaliatomentosa in association with T. ballerica, Salmaliamalabarica etc. Shoreaobusta is also present in rare frequency. Mallotusphilippensis is the main associate of second story tree

On some hilly slopes in the area where shallow soil is resting on hard impervious rock the characteristic forest type is changes into Northern tropical dry deciduous forest. Sal is the dominant tree of top canopy with regeneration. Associated trees of the same catogery and second story are Anogisuslatifolia, Boswelliaserrata, Buchananialanzana, Coclospermumreligiosum and Gardenia gummifera. Occasionally Madhucaindica and Emblicaofficinalis were also found associated. Woodfordiafruticosa is the most frequent shrub in this forest type along with Phoenix acaulis

Northern dry mixed deciduous is found on the low and eroded hills of the area. Fragmented top canopy and second story tree were predominantly represented by Anogeissuslatifolia infrequent association with Adina cordifolia, Mitragynaparvifolia, Aeglemarmelose, Embelicaofficinalis, lagerstroemia parviflora, Ficus spp. ButeaMonosperma, and occasionally associated Shorea, Boswellia, Madhuca, Bauhinia etc. Dendrocalamusstrictus is found with less abundance in this area.

Fauna

Primates are common faunal species of the forest surrounding the study area. Snakes and lizards are quite common. Wild species occasionally reported in the buffer zone are jungle cat, black napped hare, squirrel, jackals and porcupines etc. Different varieties of birds are also observed most frequently in the winter season. Amongst birds the bulbul, the white-breasted kingfisher, magpie robin, spotted dove, mayna, and jungle bubbler are prominent. Amongst reptiles, several poisonous snakes like cobra, viper, krait and nonpoisonous snakes (like boa, rat snakes, green whip, Bronze backed tree snake, etc) are abound in this area. The garden lizard and monitor lizard are also seen. Variety of butterflies (like common grass yellow/ common jezebel) and insects (such as beetles, spiders, red ants, and flies) are spotted in abundance in the study area.

Climatic conditions

The climate of this region is characterized by intensely hot summer (March to June) and moderately cold winter (November to February) with hot westerly wind prevailing in the area. The Monsoon season persists from July to October. The annual rainfall averages around 1,300 mm and 81% of annual rainfall occurs between June to September.

The overall climate of Singhbhum district is characterized by intensely hot summer and moderately cold winter with hot westerly wind prevailing over the area, the following are the seasons of the east Singhbhum district.

1. Winter(dry) Nov.-Feb
2. Summer (hot) March- June
3. Monsoon (wet) July

Human settlements

The list of villages in the buffer zone with their population is given below:-

Name of Village	Population, Nos.
Ghatsila	115130
Musaboni	104299
Sohada	1896
Chakuliya	1657
Terenga	1789
Tilabani	1299
Chapri	900
Uparbanda	912
Amianagar	860
Netra	173

Public buildings, places of worship and monuments

There are neither any places of commercial, historical or religious importance nor any place tourist interest within the buffer zone

Indicate any sanctuary is located in the vicinity of leasehold

There are no historical monuments or places of archeological interest within 10 km radius of the mine

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, dumping, roads, workshop, processing plant, tailing pond/dam, township etc.

Land use pattern at the end of conceptual period is given below.

Land use pattern at the end of conceptual period is given below.

Sl No.	Type of Land use	Present Area (Ha.)	Conc. Area (Ha.
1	Area for excavation, Mine entry	2.52	2.52
2	Storage of topsoil	2.94	2.94
3	Waste dump	5.49	5.49
4	Mineral storage & concentrator plant	4.85	4.85
5	Infrastructure (Administration building shaft portals, Manager office workshop and old township area etc.)	8.41	8.41
6	Roads	1.88	1.88
7	Green Belt	18.79	18.79
8	Township	10.69	10.69
9	New Production shaft site	10.76	10.76
	Total	66.33	66.33

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ii) Air quality

Operations of mining activities such as transportation, ore handling, crushing and mucking generate dust which usually gets air borne. The likely sources of air pollution with respect to the mining activities are as follows:

- Generation of dust from ore transportation
- Generation of dust during drilling, loading & unloading
- Air born emissions due to various operations
- Release of vehicular exhaust
- Dust is controlled by adopting the following practices:
- Effective water spraying at underground working places
- Effective water spraying at ore loading / unloading point at surface.
- Effective water spraying at all transfer points
- Water spraying arrangement along ore transport route within the mine premises.
- Plantation within the mine premises and also along the ore transport route
- Proper periodic maintenance of vehicles
- Trucks carrying ore shall be covered with sheet

Underground workings of the mine are ventilated by adequate ventilation arrangements. The requirements and standards specified by Director General of Mines Safety (DGMS) are adhered to about 12 Litres/ day of diesel will be consumed for diesel operated vehicle at underground and surface, which corresponds to a very less contribution of SO2 considering 0.25% mandatory limit of sulphur. There is no significant source of NOx generation at mine. The SO2 and NOx level remains below the prescribed limit. The existing noise level in the core zone varies from 36.00 to 72.3 dB (A). Work zone noise level is likely to increase due to the proposed expansion (lease renewal). Noise level increase due to mining activities such as drilling, blasting, handling and transportation of ore and operation of processing equipment. Air quality monitoring shall be carried out regularly. The details of the ambient air quality (AAQ) monitoring stations within the core & buffer zone are given in the table below. The monitoring is carried out once in every quarter for all the four quarters in a year.

Sl.No	Monitoring Station	Zone
1	Near Shaft No. 3	Core
2	Near Shaft No. 4	Core
3	Near Gate No. 1 (Concentrator plant)	Buffer
4	Near Gate No. 2 (Concentrator plant)	Buffer
5	Near Gate No. 3 (Concentrator plant)	Buffer

Noise level monitoring shall be carried out periodically during the proposed Mining Scheme period. The details of the noise quality (NQ) monitoring stations within the core & buffer one are given in the table below. The monitoring is carried out once in every quarter for all the four quarters in a year

Sl.No	Noise quality Monitoring Station	Zone
1	Concentrator plant	Buffer

iii) Water quality

The main source of wastewater generation from the mine is underground discharge. Total wastewater generation from mine is 1500 m3/day, which is pumped through closed conduits for treatment and reused in industrial operations. No wastewater is discharged to environment

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from mine. Total water required for mine is 3000 m3/day which is utilized in drinking & pit-head bath , dust suppression, stowing makeup, plantation and domestic consumption at mine colony. Water is supplied to the public outside the mine boundary. Sewage from mine and colony is treated in septic tank followed by soak pit.

iv) Noise Level

The existing noise level in the core zone varies from 36.00 to 72.3 dB (A). Work zone noise level is likely to increase due to the proposed expansion (lease renewal). Noise level increase due to mining activities such as excavation, drilling, blasting, handling and transportation of ore and overburden and operation of processing equipment

v) Vibration levels (due to blasting)

The impact due to blast vibration will be minimum as the blasting will be restricted to underground stopes& drives.

vi) Water regime

Sources of water in the study area villages include, shallow dug wells, river and ponds. The other system is tapping deep aquifers in some of the villages by deep tube wells and hand pumps. These wells have been an average depth of 20-30 meters. The water table in the dug wells ranges in between 4-10 m except in few cases when the water table is at deeper level.

vii) Acid mine drainage

Not applicable

viii) Surface subsidence

Subsidence is an important aspect of underground mining activity. As modified room and pillar method of mining is being practiced and rock mass is quite competent, no surface subsidence is anticipated. Operating mines of HCL has no record for subsidence. Risk associated with subsidence is insignificant.

ix) Socio-economics

The industrial activity together with inflow of capital, in-migration and employment of local inhabitants has shown positive impact on the overall social and economic condition of the people of the area. With the commencement of the project, a significant in-migration has taken place, a good number of which are the commuters from Surda, Sohada, Benasol, Uparbandha and adjoining villages. The project has provided a direct job opportunity to the local persons as both technical and non-technical workers. While substantial portions of them are villagers from the effective area, a part has also migrated in from far off areas. Establishments of well maintained residential colony for employees of all categories i.e. A,B,C,D have created substantial demands for commodities like food and consumable goods. Subsequently urbanization of surrounding area could be seen in recent time. Transportation link with District headquarters has been improved due to HCL's initiatives. Literacy has further increased because of better income and awareness amongst the people.

Copper mining and agriculture are the basic sector of employment for the local people in this area. The project has provided direct employment opportunity to local people. Indirect employment is being generated in trade and other ancillary services. Employment in these sectors is both permanent and temporary or contractual and involvement of unskilled labour. A major part of this labour force is mainly from local villagers who are expected to engage themselves both in agriculture and project activities. This enhances their income and lead to

overall economic growth of the area. The following socio-economic changes have taken place due to project activities:
The project is having a strong positive employment and income effect, both direct as well as indirect.

Improvement of infrastructure & transportation.
Improvement of health care and education facilities.
The project is having positive impact on consumption behavior by way of raising average consumption and income through multiplier effect.
The project has brought about changes in the pattern of demand from food to non-food items as sufficient income is being generated.
People located in the project area and in close vicinity, enjoying positive changes in life style and better quality of life.
People perceive that the project has helped in the development of various social infrastructures.

x) Historical monuments etc.
There are no historical monuments or places of archeological interest within 10 km radius of the mine.

8.3 Progressive Reclamation Plan :

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".
No fresh area is proposed to be degraded as the mine is an underground mine.

8.3.2 Topsoil Management:
No top soil will be disturbed during the course of underground mining operations.

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.
Not applicable

8.3.4 Acid mine drainage, if any and its mitigative measures.
Not applicable

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.

The maximum and minimum altitudes of 260 m AMSL and 104 m AMSL within the ML area occur in the western and eastern part of ML area respectively. There is an escarpment in the western part of the lease area.
The project is an underground mining project, where most of the activity is confined underground. Almost the entire waste rock generated during mining is used for towing underground and only a small proportion of waste rock may be brought to the surface for dumping.

The existing two main entries into the mine are at 154 m AMSL (Shaft 3) and 141 m AMSL (Shaft 4). At present the bottom level is the 13th Level, which is at -310 m AMSL. It is proposed to develop five more levels at intervals of 37.5 m. The bottom level (18th Level) will be at -498 m AMSL. Since the mining operations are confined underground no impact on surface topography is anticipated. There is no history of surface subsidence in Surda mine. Since mining is carried out in hard rock and stopes are stowed with mill tailings

8.3.6 A brief about surface features existing within a periphery of 60m from the lease boundary as per the Rule 5(b) of MCDR/2017

No noticeable surface feature available.

Summary of year-wise proposal for item no. 8.3 is given below:-

Items	Details	2020-21	2021-22	2022-23	2023-24	2024-25
Dump management	Area afforested (ha)	NIL	NIL	NIL	NIL	NIL
	No of saplings planted (Nos.)	NIL	NIL	NIL	NIL	NIL
	Cumulative no of plants (Nos.)	NIL	NIL	NIL	NIL	NIL
	Cost including watch and care during the year (INR)	NIL	NIL	NIL	NIL	NIL
Management of worked out benches	Area available for rehabilitation (ha)	NIL	NIL	NIL	NIL	NIL
	Afforestation done(ha)	NIL	NIL	NIL	NIL	NIL
	No of saplings planted in the year	NIL	NIL	NIL	NIL	NIL
	Cumulative no of plants	NIL	NIL	NIL	NIL	NIL
	Any other method of rehabilitation (specify)	NIL	NIL	NIL	NIL	NIL
	Cost including watch and care during the year	NIL	NIL	NIL	NIL	NIL
Reclamation and Rehabili-tation by backfilling	Void available for Backfilling (L x B x D) pit wise /stope wise	NIL	NIL	NIL	NIL	NIL
	Void filled by waste /tailings	NIL	NIL	NIL	NIL	NIL
	Afforestaion on the backfilled area	NIL	NIL	NIL	NIL	NIL
	Rehabilitation by making water reservoir	NIL	NIL	NIL	NIL	NIL
	Any other means (specify)	NIL	NIL	NIL	NIL	NIL
Rehabilitation of waste land within lease	Area available (ha)	18.79	18.79	18.79	18.79	18.79
	Plantation carried out (Nos.)	500	500	500	500	500
		Replacement of dead saplings in the green belt area of 18.79 Ha. with local species of ButeaMonosperma , Bambaxceiba , Shoriarobusta , Sygiumcumuni , etc.				
	Check dams (within retained/ surrendered area)	NIL	NIL	NIL	NIL	NIL
	Method of rehabilitation	NIL	NIL	NIL	NIL	NIL
Others (specify)	Total no of saplings planted outside lease area	NIL	NIL	NIL	NIL	NIL
	Total cost including watch and care	NIL	NIL	NIL	NIL	NIL
	Total cost for monitoring of Ambient Air Quality, water quality etc.	10,00,000	10,00,000	10,00,000	10,00,000	10,00,000

Copy of evaluation template for star rating submitted to IBM for the 2016-17, 2017-18 and 2018-19 is enclosed as **Annexure -27**

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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 objective of on-site disaster management plan for the mine is to in a state of perpetual readiness through training and development to immediately control and arrest any emergency situation so as to avert a full fledged disaster and the consequence of human and property damage and in the event of a disaster still occurring, to manage the same so that the risk of the damage to life and property in minimized.

HCL have a demand procedure for Emergency Preparedness and Responses. The emergency situations arising out of the situations as defined in the clause shall be addressed in the document.

The salient features are elaborated as below:

- Emergency Response Organization
- Communication System
- Action on the site
- Facilities available at site
- Medical treatment for injured personnel's
- Emergency Response Organization

Following officers of the mines will be responsible for co-ordination in case emergency situated in any sections of the mine.

Person	Responsibility
Head of Department / Mine Agent	Site Controller
Mines Manager / Shift in-charge	Accident Controller / Communication Officer
Employee who gives the first information about the incident / accident	Primary Controller
P & A Department (HOD)	Liaison Officer

Key Personnel and their responsibilities

Site Controller:

The head of the department / mine agent shall have an overall responsibility for controlling the incident / accident and directing the personnel.To prepare a full proof plan for control of accident like, landsides, subsidence flood and other natural calamities.

To inform statutory bodies of the State and Central Government.

To inform communication officer about the emergency, control centre and assembly point.

To provide all assistance and call for fire squad, security officer and other services required for removing / control of danger.

To ensure that all necessary personnel assemble at assembly point.

Make arrangement for medical treatment to the personnel injured seriously.

Accident Controller:

Mines manager shall act as accident controller/ communication officer.

Mock rehearsal of management plan prepared for accident.

To withdraw men / machine from the affected area with priority for safety of personnel, minimize damage to the machines, environment and loss of material.

To make a report based on the facts and figure and submit to the site controller.

To communicate to the site in charge and make arrangement for first aid and transportation of the injured personnel.

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Primary Controller:

To inform the Accident Controller / shift in-charge from the nearest means of communication about the location and the nature of accident.

- To assist in clearing any obstruction in relief of accident.
- To carry out all instructions of accident controller.
- To provide first aid treatment and communicate to the shift in-charge.

Capability of Lessee:

Following facilities are available at mine site:

- Public address system
- Telephone / Mobile handsets
- Runners / Messenger
- Emergency alarm
- Firefighting equipment and accessories with trained manpower
- Full fledge hospital at a distance of 4 km from the mine.
- Training centre
- Fire tender
- Ambulance van
- Jeeps

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.

When the mine is temporarily discontinued due to any unforeseen circumstances the following care and maintenance shall be carried out:

Notice to be served to all the concerned authority.

- Temporary fencing shall cover the mine entries.
- All access roads/openings to the pit / face shall be closed by parapet wall as per rule.
- Warming shall be displayed on the 'Notice Board' at appropriate places.
- Security personnel shall be posted at every danger point.
- No unauthorized person shall be allowed to enter into the mine without prior permission of the management.
- Garland drain shall be made all around the mine to prevent water flow towards mine for prevention of landslide/side fall and siltation etc.
- All men and machinery shall be withdrawn from the mine and shall be kept in a compound and safe place.
- All safety precautions shall be taken care of as per rule.

Parvez Alam
(Qualified Person)

Amit Degvekar
(Qualified Person)

8.6 FINANCIAL ASSURANCE:

The financial assurance is given in the table below.

S.No	Head	Area put to use at the start of scheme i.e. 01.04.20 (Ha.)	Additional area required during the scheme period (Upto 31.3.20) (Ha.)	Total (Ha.)	Area considered as fully reclaimed & rehabilitated (Ha.)	Net area considered for calculation of financial assurance (Ha.)
1	Area for excavation	2.52	-	2.52	-	2.52
2	Storage of topsoil	2.94	-	2.94	-	2.94
3	Waste dump	5.49	-	5.49	-	5.49
4	Mineral storage & concentrator plant	4.85	-	4.85	-	4.85
5	Infrastructure (Administration building shaft portals, Manager office workshop and old township area etc.)	8.41	-	8.41	-	8.41
6	Roads	1.88	-	1.88	-	1.88
7	Green Belt	18.79		18.79		18.79
8	Township	10.69		10.69		10.69
9	New Production shaft	10.76		10.76		10.76
	Total	66.33	-	66.33	-	66.33

The total financial assurance upto FY 2019-20 will be Rs.1,98,99,000/-@ Rs.3,00,000/- per hectare. A copy of the bank guarantee is enclosed as **Annexure -24A & 24B** .

Parvez Alam
(Qualified Person)

Amit Degvekar
(Qualified Person)

हिन्दुस्तान कॉपर लिमिटेड
HINDUSTAN COPPER LIMITED
www.hindustancopper.com
CIN : L27201WB1967GOI028825
भारत सरकार का उपक्रम
A GOVT. OF INDIA ENTERPRISE

CONSENT LETTER / UNDERTAKING / CERTIFICATE FROM THE LESSEE

01. The Mining Plan (2020-21 to 2024-25) in respect of Surda Mining Lease over an area of 388.68 hectares in villages Surda, Sohada, Forest Block, Pathorgora and Benashole, P.O-Ghatsila, Distt. Singhbhum (East), Jharkhand state under Rule 17 of MCR 2016 and Progressive Mine Closure plan under Rule 23 of Mineral Conservation and Development Rule 2017 has been prepared by following Qualified Persons (QPs) as per rule 15(1) of MCR 2016.

1. **Amit Degvekar, Sr. Manager (Exploration)**
2. **Parvez Alam, Sr. Manager (Mines)**

This is to request the Regional Controller of Mines, Indian Bureau of Mines, Ranchi to make any further correspondence regarding any correction of the Modifications in the Mining Plan with the said qualified persons at their address below:

1. Amit Degvekar, Sr. Manager (Exploration) Hindustan Copper Limited, Indian Copper Complex, P.O – Ghatsila , Distt. Singhbhum (East) - 832303, Jharkhand Mob: 8210071178 Email: amit_nd@hindustancopper.com	**2. Parvez Alam, Sr. Manager (Mines)** Hindustan Copper Limited, Indian Copper Complex, P.O – Ghatsila , Distt. Singhbhum (East) - 832303, Jharkhand Mob: 8084227920 Email: parvez_a@hindustancopper.com

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

02. It is certified that the CCOM's Circular No.-2/2010 has been implemented by Hindustan Copper Limited through an authorized agency approved by the State Government & report submitted to State Government for authentication.

03. It is certified that the Progressive Mine Closure plan 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 & records, all the measures proposed in this Progressive Mine Closure Plan will be implemented in a time bound manner as proposed.

04. The provisions of Mines Act, Rules and Regulations made there under have been observed in the **Mining Plan in respect of Surda lease over an area of 388.68 hectares** in Jharkhand State belonging to M/s Hindustan Copper Limited and where specific permissions are required, the Lessee will approach the DGMS. Further, standards prescribed by **DGMS** in respect of **miners' health** will be strictly implemented.

06. It is to undertake that the Mining Plan has been prepared for enhanced production beyond the existing EC limits but actual enhanced production from the lease area shall start only after the necessary clearances are obtained from MoEF&CC.

Place : Kolkata
Date :

Signature of the Applicant in Full:
Name in Full in Block Letters: SANJAY KUMAR BHATTACHARYA
Address: Director (Mining) & Nominated Owner,
Surda Mining Lease, Hindustan Copper Limited,
1, Ashutosh Chowhury Avenue, Kolkata - 700019.

पंजीकृत एवं प्रधान कार्यालय : ताम्रभवन,1,आशुतोष चौधरी एवेन्यू,पो.बो.स.10224,कोलकाता-700 019
Registered & Head Office : Tamra Bhavan, 1, Ashutosh Chowdhury Avenue, P.B. NO. 10224, Kolkata-700 019
दूरभाष Tel : 2283-2226 (Hunting), फैक्स Fax : (033) 2283-2478/2640, ई-मेल E-mail : hcl_ho@hindustancopper.com

Parvez Alam
(Qualified Person)

Amit Degvekar
(Qualified Person)

CERTIFICATE FROM QUALIFIED PERSONS

The provisions of the Mineral Conservation & Development Rules 2017 have been observed in the preparation of Modified of Mining Plan for Surda Mining Lease over an area of 388.68 Ha. of M/s Hindustan Copper Limited in Singhbhum (East) District of Jharkhand State and Whenever specific permissions are required, the applicant will approach the concerned authorities of Indian Bureau of Mines.

The information furnished in the mining plan is true & correct to the best of our knowledge.

Place: Surda **Name of the Qualified Person: Amit Degvekar, Sr. Manager (Exploration)**

Place: Surda **Name of the Qualified Person: Parvez Alam , Sr. Manager (Exploration)**

Parvez Alam
(Qualified Person)

Amit Degvekar
(Qualified Person)

LIST OF DRAWINGS (Enclosed as Volume II)

1	Key Plan	HCL/ICC/SRD/2019-20/01
2	Khasra map of Surda lease	HCL/ICC/SRD/2019-20/02
3	Geological Plan	HCL/ICC/SRD/2019-20/03
4	Geological cross-sections - Along Section Line F-F'	HCL/ICC/SRD/2019-20/04A
5	Geological cross-sections - Along Section Line K-K'	HCL/ICC/SRD/2019-20/04B
6	Geological cross-sections - Along Section Line M-M'	HCL/ICC/SRD/2019-20/04C
7	Ore reserves – Footwall Lode (Estimation resources by LVS)	HCL/ICC/SRD/2019-20/05A
8	Ore reserves – Hang wall Lode (Estimation resources by LVS)	HCL/ICC/SRD/2019-20/05B
9	Ore reserves – Intermediate -1 lode (Estimation resources by LVS)	HCL/ICC/SRD/2019-20/05C
10	Ore reserves – Intermediate-2 lode (Estimation resources by LVS)	HCL/ICC/SRD/2019-20/05D
11	Assay Plan Footwall Lode,	HCL/ICC/SRD/2019-20/06A
12	Assay Plan Hang wall Lode,	HCL/ICC/SRD/2019-20/06B
13	Lode Plan – 4th Level	HCL/ICC/SRD/2019-20/06C
14	Lode Plan – 5th Level	HCL/ICC/SRD/2019-20/06D
15	Lode Plan – 6th Level	HCL/ICC/SRD/2019-20/06E
16	Lode Plan – 7th Level	HCL/ICC/SRD/2019-20/06F
17	Lode Plan – 8th Level	HCL/ICC/SRD/2019-20/06G
18	Lode Plan – 9th Level	HCL/ICC/SRD/2019-20/06H
19	Lode Plan – 10th Level	HCL/ICC/SRD/2019-20/06I
20	Lode Plan – 11th Level	HCL/ICC/SRD/2019-20/06J
21	Lode Plan – 12th Level	HCL/ICC/SRD/2019-20/06K
22	Lode Plan – 13th Level	HCL/ICC/SRD/2019-20/06L
23	Lode Plan – 14th Level	HCL/ICC/SRD/2019-20/06M
24	Lode Plan – 15th Level	HCL/ICC/SRD/2019-20/06N
25	Lode Plan – 16th Level	HCL/ICC/SRD/2019-20/06O
26	Lode Plan – 17th Level	HCL/ICC/SRD/2019-20/06P
27	Lode Plan – 18th Level	HCL/ICC/SRD/2019-20/06Q
28	Lode Plan – 19th Level	HCL/ICC/SRD/2019-20/06R
29	Lode Plan – 20th Level	HCL/ICC/SRD/2019-20/06S
30	Surface Plan	HCL/ICC/SRD/2019-20/07
31	Year – wise Production & Development plan	HCL/ICC/SRD/2019-20/08
32	Section along the proposed shaft – Year – wise development plan	HCL/ICC/SRD/2019-20/09B
33	Conceptual Plan	HCL/ICC/SRD/2019-20/10A
34	Environment Plan	HCL/ICC/SRD/2019-20/11
35	Progressive Mine Closure Plan	HCL/ICC/SRD/2019-20/12
36	LV section showing Year wise Development & Production plan	HCL/ICC/SRD/2019-20/14A
37	Ventilation Diagram	HCL/ICC/SRD/2019-20/15
38	Conc. Plant flow sheet (In 4 sheets)	HCL/ICC/SRD/2019-20/16
39	Geo-Referenced Cadastral map	HCL/ICC/SRD/2019-20/17
40	DGPS coordinates superimposed on satellite imagery (CARTOSAT +LISS IV)	HCL/ICC/SRD/2019-20/18

Parvez Alam
(Qualified Person)

Amit Degvekar
(Qualified Person)

LIST OF ANNEXURES

Sl. No.	Description	Annex. No.
1	List of Board of Directors	1
2	Board resolution regarding appointment of Nominated Owner	2
3	Photo Id & address proof (Permanent & Temporary) of the nominated owner	3
4	List of leased held by the applicant in India	4
5	Copy of registration received under rule 45	5
6	Copy of qualification & experience of qualified person	6
7	Copy of Lease deed	7
8	Copy of letter from State Govt. for extension of lease period up to 31.03.2020	8
9	Copy of Supplementary Lease Deed	9A
10	Application to State Govt. for extension of Surda mining lease	9B
11	Copy of approval letter of last mining plan from IBM	10
12	Copy of TOR	11A
13	Copy of EC recommendation by EAC committee	11B
14	Copy of Forest Clearance letter (Annex-12A) & NPV payment details (Annex-12B)	12
15	Level wise resources established for the lease	13
16	Copy of all stoping permissions (IBM/DGMS)	14
17	Copy of the systematic support rules (SSR)	15
18	Land schedule of the lease area	16
19	Borehole logs	17
20	Copy of Report for Subsidence study of Surda mining area by IIT Kharagpur	18
21	Copy of feasibility report	19
22	Environment monitoring data	20
23	Copy Geo-referencing of boundary co-ordinates and DGPS Survey report submitted to state Govt.	21
24	Hydrogeological report	22
25	Copy of CTO	23
26	Bank guarantee	24A
27	Copy of Extended Bank Guarantee	24B
28	Magazine Licence	25
29	Photographs	26
30	Star rating evaluation template	27
31	NABL test report	28
32	IBM violation details	29
33	DGMS violation details	30

Parvez Alam
(Qualified Person)

Amit Degvekar
(Qualified Person)