Tubed coal Mines Limited

Corporate Office: M-10(DS), Harmu Housing Colony,
BehindBJP Office, Ranchi (Jharkhand) Pin 834002
Phone: 0651-2247342 Fax: 0651-2247342

Revised Mining Plan

UNDER RULE 22 (4) OF MINERAL CONCESSION RULES, 1960
(Amendment – 2000)

For

TUBED OPEN CAST COAL MINE (6.0MTY)

(Auranga Coalfield, District-Latehar)
Jharkhand State.

(Extent 4.6 Sq.K.M)

Prepared by

V.K.SINGH
(Recognized Qualified Person)

June. 2009

Consultant

Geomin Consultants (Pvt.)Ltd.

Geomin Group

Head Office: 267, Kharvel Nagar, Bhubaneswar, Orissa
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A. ABBREVIATIONS

1.	Bhs	Boreholes
2.	C	Carbon
3.	CHP	Coal Handling Plant
4.	CMPDI	Central Mine Planning & Design Institute
5.	Cum/t	cubic metre per tonne
6.	Deg.	Degrees
7.	DGMS	Directorate General of Mines Safety
8.	DMMF	Dry mineral matter free
9.	DVC	Damodar Valley Corporation
10.	E	East
11.	Exl.	Excluding
12.	FBC	Fluidized bed combustion
13.	FT	Fusion Temperature
14.	Govt.	Government
15.	GSI	Geological Survey of India
16.	H	Hydrogen
17.	ha	Hectare
18.	HEMM	Heavy Earth Moving Machinery
19.	HP	Horse power
20.	I_{100}	excluding 1 m band thickness
21.	IDT	Initial Deformation Temperature
22.	Kg.	Kilogram
23.	Kl	Kilolitre
24.	Km	Kilometre
25.	KV	Kilovolt
26.	LAN	Local Area Network
27.	LMV	Light motor vehicle
28.	lps	Litre per second
29.	m	Metre
30.	M/s	Messer's
31.	MARC	Maintenance and Repair Contract
32.	Max.	Maximum
33.	Mcm	Million cubic metre
34.	MCR	Mineral Concession Rules 1960
35.	MECL	Mineral Exploration Corporation Limited
36.	Min.	Minimum
37.	ML	Mining lease
38.	mm	millimetre
39.	MOC	Ministry of Coal

40.	MOEF	Ministry of Environment & Forest
41.	Mtes	Million tonnes
42.	MTY	Million tonnes per Year
43.	N	North
44.	NH	National Highway
45.	OB	Overburden
46.	OCP	Opencast Project
47.	OEM	Original Equipment Manufacturer
48.	P.S	Police station
49.	PPV	Peak particle velocity
50.	RH	Relative Humidity
51.	ROM	Run-off Mine
52.	Sl	Sulphur
53.	S	South
54.	SMS	Site Mixed slurry
55.	Sp. Gr.	Specific Gravity
56.	t.	tonnes
57.	tph	tonnes per hour
58.	Ug	Ungraded
59.	VM	Volatile Matter
60.	WG	Washery grade
61.	W	West
62.	Yrs	Years

B. MAIN WRITE-UP

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C. SUMMARISED DATA

Sl. No.	Particulars	Details
1.	Location	Village-TUBED etc. Block- LateHar Distt- LATEHAR.JHARKHAND
2.	Proposed Lessee	Tubed Coal Mines Limited (TCML)
3.	**Proposed Leasehold** Area	**460 ha**
4.	Seams proposed to be worked	I T,II, III B, III M, III T, IV B, IV T, V B, V T, VII B, VII T,
5.	Gradient of seams	1 in 4 to 10
6.	Total no. of faults	Six (6)
7.	Geological Sectors	Four (4)
8.	Geological reserves	189.8228 Mtes
9.	Reserves mineable	170.838 Mtes
10.	Reserves sterilised (Barrier + Batter)	37.379 Mtes
11.	Mining Loss	4 Mtes
12.	Extractable Coal	130 Mtes (O.C. Mining) 9 Mtes (Highwall Mining)

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(Recd. Dated:)

13.	Quality of coal	D to G. 67% is F grade
14.	Parameters of proposed quarry 1. Area at surface 2. Average strike Length (i) Surface (ii) At floor 3. Max Depth.	 350 ha 1650 m 1250m 230 m
15.	Method of Mining	OPEN CAST – SHOVEL – DUMPER & Surface Miner
16.	Annual Coal Production	6.0 MTY
17.	Annual OB removal	15 MTY (Peak)
18.	Life of Mine in Yrs	2 (Const) + 25 (O.C)+2 Highwall
19.	Manpower requirement	400(Direct)+800(indirect)
20.	OMS	15Tes
21.	Average stripping ratio	2.15 m^3/te
22.	Total Volume of OB As External Dump As Internal Dump	**280 Mm^3** 80 Mm^3 200 Mm^3

D. LIST OF TABLES

E. LIST OF ANNEXURE

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VIII.	Photocopy of Recognition No. 34011/(17) 2004-CPAM dated 03/11/2004 of Shri V.K. Singh as RQP	XI to XI
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F. LIST OF PLATES

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RANA

EXECUTIVE SUMMARY

1.0 Ministry of Coal, Govt of India allocated Tubed Coal Block jointly to M/s HINDLCO Industries Ltd. And M/s TATA Power Company Ltd.

2.0 Location

The block is located in Latehar district of Jharkhand state with following co-ordinates.

Latitude (N) 230 48' 20" to 230 50' 09"

Longitude(E) 840 34' 09" to 840 35' 45"

3.0 Communication

The block is connected to NH 75 at Latehar by a black topped 12Km long road. Gomoh – Barwadih loop line of East Central Railway runs on Southern side about 10 Km away.

4.0 Proposed Leasehold Area 460 ha

5.0 Geological Exploration

Altogether 22 Boreholes were drilled (GSI – 2 BHs + MECL - 20 BHs) besides geological mapping, survey etc. A Geological Report was prepared in 2006 based on the field and above boreholes data. However, some indicated reserves in dip side are there and the same will be proved within a year of start of the mine.

6.0 Geological Formation & Coal Seams.

Archeans - Archean rocks form the basement of the sub basin.

6.1 Barakar Coal Seams – 13 Co-relatable coal seams/ sections have been found in Barakar formation. They are seam VII T, VII B, (VII Comb), VI, V T, V B, IV T, IV B, III T, III M, II B, II, I T, & I B. Seam VII Top and VII Bottom are combined in part of the block.

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Date... E - I

- Seam VI is unworkable in entire block.
- Seam VII T & VII B are found only in the central dip side area.
- Seam VII Comb is in very small area.
- Seam I T is workable in scattered patches.
- Seam I B is unworkable in major part of Block.

6.2 **Structure –**

(I) **Strike** – General strike of strata is almost N – S with minor swings. In extreme Southern part it swerves to NE – SW.

(II) **Dip** - The dip of the beds is generally 5^0 – 10^0 in the east (Sector II & I). In Sector – IV dip is around 7^0 – 15^0. In Central part (Sector – III) the dip is around 3^0.

6.3 **Faults –**

There are 6 faults.

Faults 1 & 2 are major boundary faults in east & west.

Other 4 faults divide the block in 4 sectors namely I, II, III & IV.

6.4 **Reserves –**

The coal reserve as per the geological repot is 189.8228 MT including 23 million tes of indicated reserves.

6.5 **Grade of Coal –**

Grade of coal varies from D to G, major is F.

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Dated E - II

7.0 Mining Method

Considering the geo mining features of reserve, it has been decided to mine coal by opencast method using surface miner and shovel dumper combination.

(I) Quarry Boundary –

The boundary of the quarry is given below.

Eastern boundary – Boundary fault F2, keeping a barrier of 50-60m against leasehold boundary of Tubed block for accommodating nala diversion and safe distance from diverted position.

Northern boundary – Incrop of seam II as the northern boundary which is natural boundary against non coal bearing area.

Western boundary – Boundary fault F1 & keeping a barrier of 70-80m against leasehold boundary of Tubed block for accommodating nala diversion and a safe distance from diverted position.

Southern boundary - Sufficient barrier left for including the diversion of nala, provision for a road along the boundary and place for peripheral road of the OCP.

(II) **Estimation of Extractable coal -**

Geological Reserves - 190 Mtes

(Including 23 Mtes of indicated reserves)

Mineable Reserves – 171 Mtes

Coal Losses

(Barrier – 13.456 MT)

(Quarry Batter – 23.923 MT)

(Mining Loss – 4 MT)

Expected Coal Exploration from OCP – 130 Mtes

At the end of opencast mine, a total of about 9 MT of coal is proposed to be mined from Highwalls.

(III) **Rated Capacity** – 6.00 MTY of coal.

(IV) **Life of Mine -** 30 Yrs

(Including Construction)

7.0 **Mining System –**

Keeping the geo-mining condition in view, it is proposed to follow horizontal slicing of bench formation both of coal and O.B. including Top O.B.

In coal seams and parting, bench height has been fixed as 10m, where as it will be raised to 15m in top overburden and others. Seam II has been considered as leased seam for main roadway development as seam I A is not consistent.

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7.1 Mine Opening & Development

An access trench road from surface (near BH MAT 10) to touch 380m FRL of seam II in sector III would be driven. Production face would be opened by expanding Box cut in Sector III.

(I) Approach to Sector II

Haul road in Sector III along Seam II would be extended towards eastern limit to touch FRL 380 m in Seam II. This is done as sector II has been thrown down and therefore Seam II is appearing in rise side than Sector III position.

(II) Approach to Sector I

A separate trench would be driven from sector II to reach sector I from a suitable bench of sector II. The reserve in sector I is very small.

(III) Approach to Sector IV

Approach to sector IV would be made from Sector III, again from suitable benches. Because sector IV has gone down, younger seams of sector IV would be reached from older seams of sector III.

(IV) Development Activities

For smooth progress of mining, the following activities are to be completed.

(i) Shifting of villages overlying mining area.

(ii) Diversion of part of Sukri River.

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E-V

7.2 **Working Method**

Shovel dumper combined shall be used for opening the mine and exposing different seams. However, for coal production in some seams e.g. seams II, V and VIII, when sufficient space gets created for coal benches, it is proposed to deploy surface miners.

7.3 **O.B. Benches –**

As soon as Top O.B. Benches reach more than 15m thickness, successive O.B. benches will be developed.

250mm dia RBH Drill be used for drilling Blasting holes in 15 metres thick O.B.

Blasted O.B. would be loaded into dumper by $10m^3$ Rope shovel/$8.3m^3$ hydraulic shovel for transport to Dump site.

Width of O.B Bench would be 35m for working Bench.

7.4 **Calendar Plan of Excavation –**

Given in table – 5.3 of Mining Plan (Pg. No. 52).

8.0 **Drilling & Blasting**

8.1 **Overburden/Partings –**

For overburden thickness of more than 10m, 250mm dia RBH Drill will be used. For O.B. & parting benches, 10 m & below, 160 mm dia RBH Drill would be used. Bulk explosive slurry/ emulsion will be used for blasting. Powder factor of $2.5m^3$/Kg of explosive has been assumed.

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E-VI

8.2 Coal – For coal winning surface miner will be used for medium thick seams like VII T, VT, VB and II containing 70% of coal reserves where as shovel – dumper shall be deployed for thinner seams. 160 mm RBH Drills will be used for drilling and blasting. Power factor of 6 tes/kg of explosive has been assumed.

The Bulk /SMS will be transported to site by explosive company. A set of 2 magazines having capacity of 6T will be provided for storage of detonators.

9.0 Mine Drainage –

The maximum accumulation of water from rainfall & seepage has been assessed as 577500 m^3/Day.

Required pumping rate has been assessed as 4812.5 m^3/hr.

9 nos of pumps of 540m^3/hr with 200m head have been provided.

10.0 Disposal of Waste –

10.1 Top Soil

A total of 0.5 Mm^3 of top soil would be removed & stored for reuse during land reclamation. Much of top soil, however can be concurrently used.

10.2 External Dump A

Dump A would accommodate 55.51 Mm^3. Top level of Dump would be 500mRL. It will have 3 tiers each of 30m.

10.3 External Dump D

It was envisaged in the mining plan that 50Mm^3 of overburden removed during last 4-5 years would be disposed off in Ext Dump D over 75 Ha of land outside the lease area. However, as per advice of the committee, during presentation, external dump D shall not be formed. The overburden shall be partly used to backfill the terminal void of the quarry and partly on top of backfilled area (internal dump C).

10.4 Internal Dump B & C

Internal Dump B would accommodate 75Mm^3 of O.B., its top level would be 500m,

Capacity of internal Dump C is 100Mm^3, which has now been, increased to accommodate some extra O.B. of last years

11.0 Surface Transport

11.1 Overburden Transport

O.B. would be transported by Rear Dumper to Ext Dump A.

11.2 Coal Transport

In initial years, coal will be transported to Latehar for dispatch to TATA Power thermal plant and Hindalco Power Plant by railway.The owner intends to put-up a railway siding near mine for transport of coal, directly from pit head to consumption points.

12.0 Environment Management

The environment management of project would cover :-

- Land Reclamation including reclamation of Ext & Internal Dumps.
- Waste water management.
- Air Quality Management.
- Resettlement & Rehabilitation of Project Affected Families.

13.0 Mine Closure Plan –

13.1 A progressive Mine closure plan has been developed for the mine, Activities under this component of mine closure plan would be carried out during operation of mine, including consistent reclamation of dumps.

13.2 Final Mine Closure Plan –

Final mine closure plan would be developed 3 Yrs ahead of scheduled date of closure of mining operation.

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CHARTER – 1

1.0 INTRODUCTION:

1.1 About the Coalfield

The Auranga coalfield (C.F) is the eastern most part of North Koel Valley of Gondwana basin. It is about 8km west of north Karanpura Coalfield, which is western most part of Damodar Valley of Gondwana Basin.

Auranga CF covers an area of 250 Sq. km and is located in Latehar district of Jharkhand State. The coalfield, trending east- west, is a narrow gondwana basin, wider in east and tapering in the west. Tubed Block is one of the identified non-CIL blocks and lies in the northern part of Auranga C.F.

1.2 About the Tubed Coal Block

The coal block has been jointly allotted to M/s HINDALCO Industries Ltd and M/s TATA Power Company Ltd, in ratio of about 60:40. These companies, as required by allotment letter, formed a J.V. company with title TUBED COAL MINES LTD (TCML). TCML is now proceeding to open an O.C. mine.

CMPDI awarded the job of Exploration & Preparation of Geological Report of Tubed Coal Block to Mineral Exploration Corporation Limited under priority Captive Mining Blocks.

MECL, commenced drilling in Tubed Block of Auranga CF in June 2004 & completed 3011.5m (20Bhs) till January 2005, in an area of 4.6 Sq. Km forming the Tubed Block.

The Mining Plan is based on the Geological Report of Tubed Block prepared on the basis of data generated in 22 Boreholes (2 GSI Bhs + 20 MECL Bhs), and published in March 2006 by MECL (Eastern zone ,Ranchi)

CHAPTER – 2

2.0 GENERAL INFORMATION

2.1	Name & address of the applicant	TUBED COAL MINES LIMITED. (A joint venture company of Hindalco Industries Ltd and The Tata power Company.) Corporate office :- M-10(DS), Harmu Housing Colony, Behind BJP office, RANCHI 834002.
2.2	Status of Applicant :	Tubed Coal Mine Limited (TCML), registered under company's Act 1956 has been allotted this block vide letter No. 38011/11/2006-CA-I, Government of India, Ministry of Coal, New Delhi dated the 1st August 2007 (Annex - I)
2.3	Mineral which Applicant intends to mine:	Coal
2.4	Annual Coal requirement of End Use Plants:	6 MTY.
2.5	Annual Coal Production Target:	6.0 MTY
2.6	Period for which the Mining Lease is required:	30 yrs. (To be renewed if required.)
2.7	Name & Certificate deatails of RPQ who prepared the Mining Plan:	Sri V.K. Singh Recognition No. 34011/(17) 2004 – CAPM Dated 3.11.2004
2.8	Name & Address of Prospecting Agencies:	Mineral Exploration Corporation Ltd. (A Govt of India Enterprises) Eastern zone, Ranchi.

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CHAPTER – 3

3.0 LOCATION, COMNUNICATION, BLOCK BOUNDARY, PHISIOGRAPHY, DRAINAGE & CLIMATE.

3.1 Location.

The Tubed Block covering an area of 4.6 Sq Km is situated in Latehar district of Jharkhand State. The block forms a part of survey of India Toposheet No.73 A/9 (1:50,000) between coordinates:

Latitude (N) 23^0 48' 20" to 23^0 50' 09"
Longitude (E) 84^0 34' 09" to 84^0 35' 45"

3.2 Communication.

The Tubed Block is well connected by a fair weather road to district HQ. Latehar. Latehar is at a distance of about 12km from the Coal block. National Highway 75 (Ranchi-Daltonganj) passes through Latehar. Latehar is at about 100 Km from Ranchi which is the Capital of Jharkhand State. A broad gauge railway line between Gomoh & Barwadih (loop line of East Central Railway) has Latehar as a railway Station.

3.3 Block Boundary

The boundaries of the Tubed Block is defined as follows and is shown in Plate No -2 & 4

North – An arbitrary line passing 640m & 820m NW of Bhs MAT 13 and MAT 14 respectively.

East – F_2 fault & arbitrary line extended towards north.

South- An arbitrary line passing 160m, 80m & 416m SE of Bhs MAT2, MAT1 & MAT18 respectively.

West- F_1 fault & arbitrary line towards north passing 280m & 584m west of Bhs MAT 10 & MAT 13 respectively.

There are 5 villages (partly) & 1 complete village lies within the leasehold of this coal block. These are Tubed (part) in the west side, Dihi(partly) in the north side, Ambajharan(partly) and Dhobiajharan in the central portion and Newari(partly) & Mangra(partly) in SE part of the block.

The block is free from mining activities. The nearest coal mine is Sikni Project of Jharkhand Mineral Development Corporation and the same is located at about 12km (aerial distance) south of Tubed Block.

3.4 Physiography, Drainage & Climate.

The block exhibits undulating topography. General slope is towards west. A prominent valley is located in SW part of the block along which Sukri River flows. The ground elevation (RL) varies from 386 m in the north-west (near the river) to 412 m in north east (high land area).

The drainage of the block is mainly controlled by Sukri River flowing in SW part of block. There are 3 East West flowing nalas which drain

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to Sukri River. Besides, there is also a nala located in the northern part of the block which also joins Sukri River near Bh MAT10.

As per annual temperature map of India (National Atlas), the block falls within the temperate zone having daily mean temperature of 22^0C-25^0C. The summers & winters are extreme. According to rain fall data, the area falls in the zone of 1200mm to 1400mm rainfall.

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CHAPTER – 4

4.0 GEOLOGY & EXPLORATION.

4.1 GENERAL GEOLOGY OF AURANGA COAL-FIELD.

4.1.1 Auranga CF is the eastern most basin of North Koel valley having Gondwana Coal deposits. It is located in the district of Latehar of Jharkhand State. (Plate-1)

Area of the Coalfield – 250sq km

Latitude 23^0 42' to 23^0 52' N

Longitude 84^0 18' to 84^0 42' E

The geological succession of Auranga C.F. is given below in

Table No- 4.1

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Age	Group	Formation	Thickness	Lithology
Late Triassic	Upper Gondwana	Mahadeva	180-210m	Highly Cross-bedded [illegible] Grained, ferriuginous s.s. pebble bed & red shale
			Unconformity	
Early Triassic	Lower Gondwana	Panchet	266 m+	Medium to coarse grained, felspathic, greenish to yellowish green, purple s.s. with brown to chocolate shale.
Late Permian		Raniganj	180-200 m	Fine to medium grained SS, Silt Stone, Sandy Shale, Carb Shale
		Barren Measure	80-160 m	Medium to coarse grained S.S., Carb Shale & ironstone bands.
Early Permian		Barakar Measure	400-600 m	Fine to coarse grained SS, pebble bed, conglonerates, carb shale, fire days & Coal seams.
		Karharbari	40-85 m	Grey, mottled, conglomeratic, Coarse grained SS & shale with dull Clean Coal
Early Permian to late Carboniferous		Talchir	30-50 m	Tillite, yellowish S.S, needle shale, rhythmite etc.
			Unconformity	
Pre Cambrain	Proterozoic	Chotanagpur Gneissic Complex.		Granite gneiss, quartzite, amphibolite and mica-schist.

4.1.2 Description of geological formations in Auranga C.F.

Metamorphics – The Pre- Cambrian rocks surround the Coalfield. The Lithologs of the rocks are given in Table No 4.1 at Page 7. A few patches of crystalline marble are also recorded towards north-east.

Talchir formation – Talchir formation is not found continuously and crops out over small area along the margin of the basin. Along the southern boundary of the basin, the Talchir bed does rest directly on the Precambrian basement.

Karharbari formation – The Karharbari formation has recently been recognized for the first time in jagaldagga area on the basis of sub surface and surface data and substantiated by paleontological studies.

Barakar formation - Barakar rocks occupy an elongated area trending east-west. The formation contains 7 nos of coal seams. These seams in ascending order are seam I, II, III, IV, V, VI & VII.

Based on vertical variation of Lithofacies the Barakar formation can be sub divided into 3 distinct members.

The upper member (80m) comprises medium to coarse grained thickly bedded sandstone, grey shale & alternations of thinly bedded shale & sandstone. It is devoid of coal seams.

Middle member is coal bearing. It contains fine to coarse grained, grayish white sandstone, siltstone, grey shale, carbonaceous shale and coal horizon. This has attained a maximum thickness of 300 m.

Basal member (80-100m) is dominantly arenaceous and shows characteristic development of profusely cross bedded, coarse to very coarse grained, multi storied sand stone, and conglomerates, fireclay bands and few thin coal seams.

Barren Measures - The explored thickness of Barren Measures is around 80-100 m. Earlier it was thought that Raniganj formation overlies Barakar formation. But recent survey has indicated that in the north eastern part around Kolherua, Lumribari a sequence of grey shale, have developed with inter bands of ironstone shale. This is similar to rocks of barren measures.

Raniganj formation - In the western part of coalfields the Raniganj formation crops out. It is also exposed in the bed of Auranga River near Deobar. Further east a narrow stretch of Raniganj beds occur near Jagaldagga. A wide out-crop of formation is seen along the eastern margin of the Sabanu hill. This strip continues from south of Ranchi upto Sukri river near Tubed in the crescent shaped outline. The thickness of the formation is about near 80-200 m.

Panchet formation - In the central part of the basin Panchet sediments cover a wide stretch along western, northern & southern slopes of Jagaldagga hill. A wide area between Auranga River and Mahadeva hills to the north is also covered by Panchet formation. In

the eastern part of the Sub-basin a good exposure of Panchet formation is noted near Aragundi, east of Sabanu hills.

Mahadeva formation – It is the youngest formation in this area. It invariably gives rise to isolated hillocks. In the western part, Mahadeva beds are exposed. Further east it crop out in Latehar hill and prominent hills to the north east of Jagaldagga.

4.2 Exploration in Tubed Coal Block.

MECL has conducted detailed exploration work in Tubed block including geological mapping, surveying, drilling, Lithogical logging & Coal sampling etc.

Different activities are being described briefly:-

4.2.1 Exploratory drilling – Exploratory drilling was commenced on 14/06/2004 and completed on 07/01/2005 in Tubed Block having an area of 4.6 Sq km. A total of 3011.15m in 20Bhs. (MAT 1to 20) has been drilled in Tubed Block. In addition to it, earlier, 2Bhs (AR 7& 11) had been drilled by GSI (315m). Thus a total drilling of 3326.15m was achieved in 22Bhs.

4.2.2 Surveying – The line joining bore holes AR-7 & 11 (drilled by GSI) has been considered as base line for surveying. The RL was carried out from these Bhs of GSI. Surface contours have been drawn at 2m interval and given in plate No-2

4.2.3 Geological mapping - The block is covered with soil & subsoil. A few scanty outcrops are observed and shown in Plate No.3. (Geological plan).

4.2.4 Lithological logging – The summary of lithologs of 22Bhs are given in Table No 4.3 at Page 13.

4.2.5 Sampling- The Coal cores of seams having thickness of 0.5m & above were sampled and sent to CFRI Ranchi for band by band analysis. The overall analyses (at 60% RH 400c) are available for 12-13 Boreholes.

4.2.6 The area lying in the southern side of the Fault F3 (Sector IV) contains 4 borehole namely, MAT -1, MAT – 2, MAT – 3 and MAT – 18. This area is having coverage of about **1.01 sq km.** It is proposed to drill 5 additional boreholes within one year of registration of the Mining Lease / Forest Clearance to clearly establish the reserves south of the fault F3.

If this proposed exploration in the Sector IV area shows any significant change in the structure of the deposit necessitating any change in mining sequence, we will submit a Modified Mining Plan for approval incorporating the required changes in the plan..

4.3 GEOLOGY OF TUBED BLOCK.

4.3.1 Tubed block is located in the northern part of Auranga CF. Major part of the block is covered by soil cover. Coal seams are exposed only in small quarries dug by local people.

4.3.2 Stratigraphic succession of Tubed block.

The geological succession as established in the block based on surface & sub-surface exploration data is given in table 4.2 on the next page.

Table No. 4.2

Period	Group	Formation (Thick)	Lithology
Recent & sub- recent		Alluvium (2.5-12 m)	Soil & Sub-soil
Unconformity			
Lower Permian	Lower Gondwana	Barakar (15.9-268m)	Sandstone, shale, carb shale & coal seams
Permo Carboniferous		Auranga	Absent
Unconformity			
Pre Cambrian		Archeans Metamorphics (.95-12m)	

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TABLE NO. 4.3

SEAM WISE/SECTOR WISE BORE HOLE LOG IN TUBED BLOCK

(Figure in meter)

Geological Sector	Sector 3																	Sector 2		Sector1	Sector 4	
Bore Hole Number	M10	M9	M13	M20	M15	M5	AR7	M8	M4	M17	M3	M7	AR11	M6	M16	M19	M2	M11	M12	M14	M-1	M18
Surface RL in m	6.49	393.04	389.53		395.95	392.26	391.39	398.36	394.5	397.51	392.4	397.2	399.88	404.28	404.0	405.7	405.85	398.46	405.05	403.24	401 26	398.2
Cover/Parting	5.1	8.73	5.0	14.35	14.87	24.46	11.55	27.94	33.17	48.57	77.65	63.14	62.8	96.59	101.79	161.4	167.34	30.13	91.08	21.04	144.65	73.63
Seam VII Top							7 75		7.42	10.04	10		10.6	11.97	8.8	10.06			11.9		10.42	9.56
Parting							3.9		2.79	2.29	3.05		2	1.68	1.91	1.67			1.06		3.37	3.69
Seam VII Bottom							1.6		65	1.08	.99		1 2	1.39	1.28	1.41			1.37		1 39	1 54
Seam VII Combined							-	9 08	-	-	-	10.14	-	-	-	-	-	9.11	-	-	-	-
Parting							16.45	19.87	17.94	16.25	-	19.53	19.8	23.24	15.62	22.55		13.98	12.9		22.2	30.96
Seam V Top					5.05	4.94	5.04	5.52	5.7	5.35	-	6.44	6.7	6.92	6.6	6.47	7.54	4.82	6.19		6.59	8.37
Parting					5.1	5.56	11.71	6.52	9.62	7.73	-	6.38	7.7	4.76	11.59	9.33	8.97	3.74	3.79		12.5	16.22
Seam V Bottom				5 77	6.11	7.12	5 8	6.82	6.15	7.61	-	7.51	6.95	7.92	6.48	9.7	8.41	6.8	8.51		7.94	11.22
Parting				5.39	3.15	3.83	10.2	3.44	4.47	2.42	21.23	1.45	4.65	2.31	3.26	3.57	3.15	2.62	3.14		4.84	4.7
Seam IV Top				.54	3.02	3.02	1 8	1 14	2.86	4.48	7.64	2.84	2.6	.69	3.02	1.56	1.54	1.37	1.46		4.2	6.78
Parting				3.09	1.02	1.4	2.9	.9	1.2	1.29	5.94	1.03	2.77	1.01	3.11	1.43	2.54	.76	1.18		.8	2.2
Seam Iv Bottom				5	.75	.77	1.05	.88	.8	.84	.75	.97	.73	1.46	.76	1.09	.89	.67	1.13		5.32	1 13
Parting				5.96	4.99	5.77	5.45	7.3	6.35	6.77	4.04	8.26	2.54	1.36	3.12	8.4	9.02	8.4	9.69		6.39	8.41
Seam III Top		2.03	2.39	1.81	2.34	2.78	.6	2.31	2.66	2.48	.76	2.61	.9	.58	6.3	2.29	2.99	2.8	3.7		1.73	7.42
Parting		1.847	1.59	3.95	3.35	3.95		3.77	3.82	4.27	3.64	4.03	3.0	6.97	4.66	2.47	3.63	4.07	6.18		1.23	3.98
Seam III Middle		.2	.44	.9	1.0	1.09		1.2	1.43	1.33	.53	1.29	1.9	1.3	1.31	.52	1.21	1.24	1.94		.47	1.73
Parting		2.01	2.08	5.02	2.95	2.9	4.3	2.95	3.36	3.0	3.33	3.83	9.7	1.57	3.49	7.5	3.87	3.17	4.12		2.51	5.71
Seam III Bottom		.85	.87	.55	.81	.84	.75	1.33	1.08	2.14	1.32	2.05	.9	1.51	2.35	.88	1.66	.56	1.07	1.92	1.89	4.05
Parting		8.97	9.37	6.82	5.94	7.38	4.8	5.19	6.38	3.66	3.33	2.38	5.33	2.87	5.28		7.92	6.02	8.26	7.61	7.28	5.94
Seam II	4.25	5.42	6.26	4.49	6.17	7.59	1.35	6.59	7.43	12.67	6.4	6.03	6.27	6.89	7.8		6.74	7.1	8.43	5.09	10.82	15.48
Parting	1.71	.22	1.6	5.94	2.93	1.79		1.37	3.52	3.23	2.86	3.35	8	1.47	1.34		1.28	1.52	2.44	1.69	1.26	2.88
Seam I Top	1.34		1.08	1.03	1.43	2.27		.86	1.04	1.0	.64	2.21	1.32	2.75	1.53		.97	2.12	2.38	1.0	3.09	4.73

Note-

Borehole drilled by MECL is denoted as MAT 10 (M10)

Borehole drilled by GSI is denoted as AR 7 (AR 7)

4.3.3 DESCRIPTION OF GEOLOGICAL FORMATIONS IN TUBED BLOCK.

Archeans- Archeans rocks form the basement of the sub-basin and have come in juxtaposition of Gondwanas due to major fault (F_2-F_2) in the eastern & northern part of the block. In NW part of block also metamorphics are present. In this part the contact between Metamorphics and Gondwanas are normal. The metamorphics are encountered in 18Bh. The rocks are mainly granite gneisses of Archeans.

Talchir – Talchir rocks are absent in the block

Barakar and Coal seams – Barakar formation is intersected in all the boreholes. The exploration has established presence of 14 co relatable coal horizons. These coal horizons in descending order are Seam VII Top, VII Bottom, VII Combined, VI, V Top Bottom, IV Top. IV Bottom, III Top, III Middle, III Bottom, II, I Top & I Bottom. Of these Coal layers, the following are depositional status;

i) Seams VII Top & VII Bottom is found only in the central & dip side area. VII COMB is in very small area.

ii) Seams VI are unworkable in entire block.

iii) Seams I Top is unworkable in 3 scattered patches.

iv) Seams I Bottom is unworkable in major part of the block.

The Sequence of Coal seams is given in Table No-4.4 page 16

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Soil & Weathered Zone – The block excepting exposure of rocks, is covered by soil (2.5m in MAT 13 to 12m in MAT 18). Weathered mantle varies in thickness from 3m in MAT 13 to 17.5m in MAT 16. The details of geological formations are given in table 4.5 at page 17

4.3.3 Structure of the Block.

The general strike of the strata is almost North-South with minor swing. In the extreme southern part (Sector -4) the strike swerves to NE-SW.

The dip of the beds is generally 5-10^0 towards east. In sector 4 the dip of the bed is around 7-15^0. In Central part (Sector 3) the dip is around 3^0.

Tubed block is structurally simple. It is intercepted by 6 faults. Fault No1&2 are major boundary faults on East & West sides. Other 4 faults F3, F4, F5 & F6 divide the block into 4 sectors e.g. sector I, II, III, & IV. Sector II & IV have gone deeper due to down-throw fault
The details of the fault are given in Table No.4.6 at Page 18

TABLE – 4.4

SEQUENCE OF COAL SEAMS IN DESCENDING ORDER

TUBED BLOCK

Sl. No	Sequence of seams/parting	Range of seam Thickness (m)		No. of Full Intersections
		Minimum	Maximum	
1.	VII-TOP	7.42(MAT-4)	11.97(MAT-6)	11
	Parting	1.06(MAT-12)	3.90(AR-7)	11
2.	VII-BOT	0.65 (MAT-4)	1.60 (AR-7)	12
	Parting with VI	3.15(MAT-16)	13.58(MAT-18)	10
3.	VII-COMB.	9.08(MAT-8)	10.14(MAT-7)	3
	Parting	7.36 (MAT-7)	9.38(MAT-11)	2
4.	VI	0.10(MAT-17)	0.64(MAT-6)	12
	Parting	4.47(MAT-11)	17.23(MAT-18)	11
5.	V-TOP	4.82(MAT-11)	8.37(MAT-18)	16
	Parting	3.74(MAT-11)	16.22(MAT-18)	13
6.	V-BOT	5.77(MAT-20)	11.22(MAT-3)	17
	Parting	1.45(MAT-7)	10.2(AR-7)	17
7.	IV-TOP	0.54(MAT-20)	7.64(MAT-3)	18
	Parting	0.76(MAT-11)	5.94(MAT-3)	18
8.	IV-BOT	0.50(MAT-20)	5.32 (MAT-1)	18
	Parting	1.36(MAT-6)	9.69(MAT-12)	18
9.	III-TOP	0.58 (MAT-6)	7.42(MAT-18)	20
	Parting	1.23(MAT-1)	6.97(MAT-6)	19
10.	III-MID	0.20(MAT-9)	1.94(MAT-12)	19
	Parting	1.57(MAT-6)	9.70(AR-11)	19
11.	III-BOT	0.55(MAT-20)	4.05(MAT-18)	21
	Parting	2.38(MAT-7)	8.97(MAT-9)	20
12.	II	4.49(MAT-20)	15.48(MAT-18)	21
	Parting	1.26(MAT-1)	8.00(AR-II)	20
13.	I -TOP	0.22(MAT-9)	4.73(MAT-18)	20
	Parting	2.01(MAT-1)	6.72(MAT-6)	14
14.	I-BOT	0.25(MAT-14)	3.42(MAT-16)	14

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TABLE NO. 4.5

STATEMENT SHOWING THICKNESS OF DIFFERENT GEOLOGICAL FORMATIONS, DEPTH OF SOIL AND WEATHERED ZONE ENCOUNTERED IN BOREHOLES TUBED BLOCK.AURANGA COALFIELD, DISTT. LATEHAR, JHARKHAND

BH.No.	RLs (m)	Soil Depth (m)	W. Zone* Depth (m)	Barakar Thick (m)	Metamorphic Thick. (m)	Total Depth (m)
B.Hs. DRILLED BY MECL.						
MAT-01	401.26	6.00	12.50	268.00	2.10	274.00
MAT-02	405.85	6.00	14.50	235.75		241.75
MAT-03	392.40	6.00	11.50	166.20	2.60	172.20
MAT-04	397.50	7.50	10.50	131.50		139.00
MAT-05	392.26	3.00	5.50	94.00		97.00
MAT-06	404.28	7.30	12.54	211.45	3.10	218.75
MAT-07	397.20	5.50	11.86	175.50	4.00	181.00
MAT-08	398.36	6.00	7.00	121.75	2.30	127.75
MAT-09	393.04	6.00	8.50	44.50	1.60	50.50
MAT-10	386.49	5.10	5.10	15.90	1.41	21.00
MAT-11	398.46	5.50	11.00	120.10	2.20	125.60
MAT-12	405.05	7.30	19.00	205.20	2.20	212.50
MAT-13	389.53	2.50	3.00	45.10	1.00	47.60
MAT-14	403.24	6.00	11.35	65.50	3.00	61.50
MAT-15	395.95	3.00	6.00	76.50	-	79.50
MAT-16	404.00	6.00	17.50	209.10	0.95	215.10
MAT-17	397.51	6.00	12.00	161.60	2.90	167.60
MAT-18	398.24	12.00	15.00	229.00	2.67	241.00
MAT-19	405.70	9.00	17.50	249.20	1.77	258.20
MAT-20	391.80	3.75	14.35	75.85	1.10	79.60
B.HS DRILLED BY G.S.I.						
AR-07	391.39	-	-	-	12.00	137.00
AR-11	399.88	-	-	-	2.85	178.00

* W.Zone – Weathered Zone

Note : This table has been reproduced from the GR supplied by CMPDI.

TABLE – 4.6

DESCRIPTION OF FAULTS EST ABLISHED IN TUBED BLOCK
Auranga Coalfield, Dist.: Latehar, Jharkhand

Sl. No.	Fault No.	Location	Nature of fault	Trend of fault	Throw Approx/ Direction	Intersection Details		Evidence	Remarks
						BH.No.	Depth Approx.		
1	$F_1 - F_1$	Located to the west of borehole MAT-18 & 20, forming the western boundary of the block in south-western part.	Oblique	NNW-SSE	Major fault dipping north easterly	-	-	Based on regional geological map	
2	F_2- F_2	Located in the northern part of the block and further towards east takes the sweve and forms eastern boundary		E-W to NW-SE	Major fault dipping southerly to south westerly	-	-	Exposed in nala cutting near Newari Village. Metamorphics and Gondwana have come in juxtaposition in the northern part.	
3	$F_3 - F_3$	Located in the southern half of the block passes to the north of borehole MAT- 18,3,1 &2	Oblique	ENE-WSW	40-50 m Southerly	MAT-3 MAT-2	110 m 160 m	Seam V (Bot) to V (Top) faulted. Seam VI to VII (Top) faulted	The throw of fault increase towards west.
4	$F_4 - F_4$	Located in the south-eastern part of the block passes to the north of borehole MAT-19	Oblique	NE-SW	0-20 m Southerly	MAT-19	255 m	Seam I (Bottom) to II faulted.	The fault dies out to east of bore hole AR11
5	$F_5 - F_5$	Located in the central part of the block passes to the north of borehole MAT- 13& 8.	Dip	ESE-WNW	30-60 m Northerly	-	-	Interpreted based on level difference of coal seam.	The throw of the fault decreases towards west
6	$F_6 - F_6$	Located in the northern part of the block passes just to the north of borehole MAT-14.	Dip	WNW-ESE to almost E-W	110 m Southerly	MAT-14	17 m	1) Interpreted based on level difference of coal seam. 2) Seam II (Middle to VII (Top) faulted.	Abuts with fault F_2 in the north- western of the block.

Note : This table has been reproduced from the GR supplied by CMPDI.

Formation of geological sectors in Tubed block – Because of interceptions of faults, the block has been divided in 4 sectors from geological reserve calculation point of view as well as working point of view.

Boundaries of proposed geological sectors are given below.

Sector I – Area surrounded by outcrop on north side, F_2 on east side F_6 on west side and meeting point of F_2 & F_6 on South side.

Sector II – Area surrounded by out crop on northern Side, F_6 on east side F_5 on west side and F_2 on south side.

Sector III– Area surrounded by out crop on NW side, F_5 & F_2 on east side, F_1 on west side & F_3 on south side.

Sector IV– Area surrounded by F_3 on northern side, F_1 on west side and Leasehold boundary on south side. East side of the sector is almost a point, the meeting point of F_2 and block boundary.

4.3.4 COAL RESERVES IN TUBED BLOCK.

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Basic assumption & norms.

In case of open cast Coal Reserves, the estimation has to be based on I-100 basis. i.e. combustible bands above 1m in thickness and 0.3m or more non combustible band, are excluded for coal reserve calculation.

Coal reserves have been estimated by isochoric method.

Following specific gravity of coal seams have been used for determination of coal reserves.

Grade	Sp. Gr.
C	1.47
D	1.52
E	1.58
F	1.67
G	1.75

Geological Coal reserves

A total of 189.8228 M.tes of Coal reserves have been estimated in Tubed Block out of which 166.9688M.tes fall in Proved Category and 22.854 M.tes in indicated category. However, for mining plan total reserves of 189.8228 has been considered as gross geological reserves.

The details of coal reserves seam wise, quality wise, sector wise are given in Table No. 4.7 to 4.9. on pages 21 & 22.

4.3.5 QUALITY OF COAL SEAMS IN TUBED BLOCK

The Coals of Tubed Block are high moisture, non- coking type, grading between C to G (predominantly F) Coal type and swelling index of coal seams are A & O. The Seam wise quality given in ultimate analysis has been given in Table No 4.10 on Page23 The result of Ash fusion temperature of Coal seams are given in Table No. 4.11. on Page 34

Table No. 4.7

Seam Wise Coal Reserves in Tubed Block

(In Mtes)

Sector	Sector 1	Sector 2	Sector 3	Sector 4	Total
Items	Total	Total	Total	Total	Total
VII T	-	5.2328	19.8101	10.9976	36.0405
VII B	-	.6069	2.1693	1.4958	4.272
VII C	-	.893	2.2552	-	3.1482
V T	.1957	3.0287	14.4882	6.9037	24.6163
V B	.3895	4.0379	20.8828	10.1759	35.4861
IV T	.0018	.7117	6.6797	5.5631	12.9563
IV B	.0983	.3486	.6815	1.6705	2.7989
III T	.335	1.8661	7.3788	3.7875	13.3624
III M	.2217	.7955	2.7892	.6235	4.4299
III B	.2262	.7204	3.2467	2.5566	6.7499
II	.6692	3.5572	25.7014	9.349	39.2758
IT	.0268	.6309	3.4523	2.5765	6.6865
Total	2.1642	22.4287	109.5302	55.6997	189.8228

TABLE – 4.8
SECTOR-WISE AND GRADE-WISE RESERVES
TUBED BLOCK, AURANGA COALFIELD, DIST, LATEHAR, JHARKHAND

(Figure in Million tes)

SECTOR	GRADE				TOTAL
	D	E	F	G	
I.	--	--	1.7104	0.4538	2.1642
II.	--	0.8226	15.0095	6.5966	22.4287
III.	0.0388	11.6489	72.2356	25.6069	109.5302
IV.	--	8.3775	37.8603	9.4619	55.6997
	0.0388	20.8490	126.8158	42.1192	189.8228

TABLE – 4.9
SEAM-WISE AND GRADE-WISE RESERVES
TUBED BLOCK, AURANGA COALFIELD, DIST, LATEHAR, JHARKHAND

(Figure in Million tes)

SEAM	GRADE				TOTAL
	D	E	F	G	
VII TOP	--	--	20.8425	15.1980	36.0405
VII BOT	--	2.7286	1.5434	--	4.2720
VII (COMB.)	--	--	3.1482	--	3.1482
V TOP	--	16.2625	8.3538	--	24.6163
V BOT	--	--	33.2181	2.2680	35.4861
IV TOP	--	--	2.7205	10.2358	12.9563
IV BOT	--	0.8489	0.9364	1.0136	2.7989
III TOP	--	0.2678	8.3919	4.7027	13.3624
III MID.	--	--	2.8483	1.5816	4.4299
III BOT	0.0388	0.5384	5.1121	1.0606	6.7499
II	--	0.1132	34.1988	4.9638	39.2758
I	--	0.0896	5.5018	1.0951	6.6865
TOTAL	**0.0388**	**20.8490**	**126.8158**	**42.1192**	189.8228

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TABLE – 4.10

STATEMENT SHOWING RESULTS OF ULTIMATE ANALYSIS OF COAL SEAMS ENCOUNTERED IN BOREHOLES TUBED BLOCK, AURANGA COALFIELD, DIST. LATEHAR, JHARKHAND

Sl. No	B.H No	Seam No.	Depth(m)		Thickness	Mode of Analysis	Ultimate Analysis				
			From (m)	To (m)			C %	H %	N %	S %	O% (By diff)
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12
1.	MAT-08	VII (Comb)	27.94	37.02	5.75	BCS	43.7 (77.0)	3.0 (5.3)	1.1 (1.9)	0.7 (0.9)	-- (14.9)
2.	-do-	V-TOP	56.89	62.41	4.84	BCS	44.0 (78.0)	2.9 (5.1)	1.0 (1.8)	0.6 (0.8)	- (14.5)
3.	-do-	V-BOT	68.83	75.65	4.87	BCS	46.8 (76.7)	3.1 (5.1)	1.2 (2.0)	1.1 (1.4)	- (15.1)
4.	-do-	IV TOP	79.09	80.23	1.04	BCS	39.8 (77.8)	2.6 (5.1)	1.1 (2.0)	0.7 (1.0)	14 (15.1)
5.	-do-	III TOP	89.31	91.62	1.90	BCS	44.5 (78.8)	2.9 (5.1)	1.2 (2.1)	0.7 (0.?)	- (13.3)
6.	-do-	III-MID	95.39	96.59	1.20	BCS	40.9 (79.2)	2.6 (5.0)	(1.2) (2.3)	0.7 (0.9)	- (12.6)
7.	-do-	III-BOT	99.54	100.87	1.09	BCS	41.0 (80.6)	2.5 (4.9)	1.2 (2.4)	0.8 (0.3)	- (11.3)
8.	-do-	II	106.06	112.65	5.64	BCS	43.8 (80.7)	2.7 (5.0)	1.0 (1.8)	0.5 (0.6)	- (11.9)

4.3.6 DESCRIPTION OF COAL SEAMS.

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Basic assumptions & norms adopted in G.R. :-

Seams correlation as adopted by GSI in Auranga CF has been considered also in Tubed block

13 correlatable coal layers are established in Tubed block. The sequence of coal seams is given in Table No- 4.4. Page16

Band by band analysis (on air dried basis) of all the MAT boreholes (20Bh) are available. According to this, the coal seams are high moisture, non coking coal with moderate to high ash content.

The seams have been delineated on the basis of band to band analysis. The lithology of bands based on Moisture+Ash content is given below:

i. Coal - Moisture + Ash upto 40%

ii. Shaly Coal - Moisture + Ash > 40 to ≤ 55%

iii. Carbonaceous shale (combustible dirt band) - Moisture +Ash > 55 to ≤ 75%

iv. Shale, its facie & sandstone etc (non combustible band) - Moisture + Ash > 75%

Note 1- If thickness of sandwitched coal layer between obvious bands/ non-combustible band is less than thickness of overlying & underlying bands, the coal layer is included as dirt band.

Note 2- While delineating the roof & floor of the seam, the dirt band/ obvious bands occurring near roof have been included in seam, if thickness of dirt band / obvious band is less than that of coal bands overlying & underlying it.

Note 3- While computing effective thickness of the seam, all the obvious bands irrespective of thickness and dirt bands of thickness >1m in opencast area, have been excluded.

Coal seams encountered in the block are described below :-

4.3.6.1 <u>Seam VII TOP</u>

Seam VIIT is youngest seam occurring in the block. It in-crops in western half of the block and can be traced to the west of Bh AR-7 & MAT 11 & east of Bh MAT 5&15. The in-crop of seam is displaced due to fault. The seam is encountered in 11 Bhs and omitted due to fault in Bhs MAT 2 & 14.

The parting between seam VIIT & underlying seam VIIB varies from 1.06m (MAT 12) to 3.9m (AR-7).

The thickness of seam VIIT varies from 7.42m (MAT4) to 11.97m (MAT 6). The thickness of the seam in general increases towards east.

The floor contour plan & isochore plan showing isograde line also have been drawn & shown in Plate No. 12

In 9 no.s of intersection out of 11 no.s of intersection, combustible bands with thickness less than 1m has been found. There are 6 to 10 numbers of such dirt bands whose cumulative thickness is varying from 1.11m to 2.3m; non-combustible bands 1 or 2 in numbers are found in 7 Bhs. Its cumulative thickness is varying from 0.05m (MAT16) to 0.45m (MAT-1). This thickness has been deducted to arrive at the effective thickness of the coal seam.

Quality wise, seam VIIT is inferior quality varying in grade from F to G.

A total of 36.0405Mtes have been estimated. Out of this 32.4523 Mtes are of proved category & balance 3.5882Mtes are of indicated category.

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The immediate roof of the seam is carb. shale while floor litholohy is represented by intercalcating shale & sand stone, carb. shale & shale.

Seam VII (BOTTOM)

The in crop of seam VII B runs parallel to that of seam VIIT. The in-crop of seam VIIB is faulted at 4 places. The seam has been encountered in 12BHs and is faulted in 2BHs (MAT 2&14). The seam is unworkable near BH MAT 3&4 in a patch.

The Seam VIIB underlies seam VII T by 1.06-3.9m and overlies seam VI by 3.15m (MAT16) to 13.58m (MAT18).

The thickness of seam VIIB is varying from 0.65m (MAT/4) to 1.6m (AR-7). It is unworkable near Bhs MAT 3&4.

Out of 10Bhs of intersection, combustible & non combustible dirt bands are present in only 2Bhs (MAT 6&12). Dirt bands upto 1m in thickness are varying in range of thickness from 0.13m (MAT12) to 0.16m (MAT 6).

Effective thickness of seam VIIB has been taken 1.37m.

Quality-wise, seam VIIB is varying from E to F

A total of 4.272 Mtes are estimated as coal reserves of which 2.6435 Mtes are of proved category and balance 1.6285 Mtes are of indicated category.

The immediate roof & floor of seam VIIB is represented by shale & carb. shale.

Seam VII (COMBINED)

Seam VII Top & VII Bottom are found as coalesced in central part of the block near Bhs MAT 11, 7 & 8. The quality of the seam is grade F. Reserves is estimated as 3.1482 Mtes

Seam VI

Seam VI underlies seam VIIB/ VIIC by 3.15 (MAT16) to 13.48 (Mat18) and overlies seam V TOP by 4.47m (MAT11) to 17.23m (MAT18). The seam VI is intersected in 12Bhs.

The actual thickness of seam VI is varying from 0.1m (MAT17) to 0.64m (MAT-6) Quality wise it is of grade F

As it is unworkable in entire block hence its reserves has not been considered and thus not calculated.

Seam V TOP

Seam V Top underlies seam VIIB/ VIIC by 12.9m (MAT12) to 25.2m (MAT1) and overlies seam V Bottom by 3.47m (MAT11) to 16.22m (MAT18). It is intersected in16Bhs and is omitted due to fault in 2Bhs (MAT 3 & 4).

The actual thickness of seam varies from 4.82m (MAT11) to 8.37m (MAT18). I-100 thickness varies from 4.43m (MAT11) to 8.12m (MAT18).

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Of 14 nos of intersections, dirt bands and non-combustible bands are present in all Bhs. Dirt bands varying in number from 1 to4 are noticed in 13Bhs. The cumulative thickness of these bands varies

from 0.07m (MAT-11) to 0.89m (MAT 6). Obvious bands varying in numbers from 1 to 2 are found in 12 Bhs with thickness ranges from 0.18m (MAT2) to 0.6m (MAT 19).

Quality wise coal seam V Top is varying from E to F. In major part it is grade E & deteriorates to F around Bhs AR 7 & MAT II, 12, 6 & 16.

The quality parameters are tabulated in table number 4.10. A total 24.6164 M.tes of coals are estimated. Its breakup is given in Table No. 4.7 to 4.9.

The immediate roof of seam V Top is carb shale and shale. The lithology of floor is represented by carb shale, shale and intercalcation of shale and sandstone.

Seam V BOTTOM

Seam VB underlies seam VT by 3.74m (MAT 11) to 16.22m (MAT18) and overlies seam IV TOP by 1.45m (MAT7) and 10.2m (AR7). It is intersected in 17Bhs and missing in 2Bhs MAT (3 &14).

The actual thickness of the seam varies from 5.77m (MAT20) to 11.22 (MAT 18). I-100 thickness varies from 5.63m (MAT20) to 10.62m (MAT10). On an average the seam VB ranges from 6 to 8m in thickness.

The shallowest depth & deepest depth for seam VB have been recorded as 20.12m (MAT20) and 222.59(MAT19) respectively. The FRL & Isochore plan of seam VB have been drawn.

Seam VB is graded as F to G. The quality parameter is tabulated in Table No- 4.10.

A total of 35.4861 M.tes of reserves has been estimated. Detailed break up of geological reserve is given in Table No- 4.7 to 4.9. The immediate roof of seam VB is represented by shale and carb shale while the immediate floor of the seam consists of carb. shale and occasionally intercalcation of shale and sand stone.

Seam IV TOP

Seam IVT underlies seam VB by 1.45m to 10.2m and overlies seam IV Bottom by 0.76m (MAT11) to 5.94m (MAT.3). The seam IVT is intersected in 18 BHs & omitted due to fault in 1Bh (MAT14). The seam is converted to carb shale around Bh (MAT15) located in south eastern part of block.

The shallowest & deepest floor depth has been recorded in Bhs MAT20 (26.05m) and MAT 19 (227.72m).

The FRL & isoclore plan for seam IVT have been prepared.

The thickness of seam IVT varies from 0.54m (MAT20) to 7.64m (MAT3), while I-100 thicknesses are from 0.54m (MAT20) to 7.44m (MAT3). Unworkable zone have been noted near Bh MAT 20 & 6.

Quality wise, coal seam IV T is grade G to F. In the major part of the block it is G which improves to grade F in 2 small pockets located near Bh (MAT 6 & 3). Other quality parameters are given in table No. 4.10. in page No23.

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A total of 12.9563 Mtes of geological reserve have been estimated The break up of coal reserve is given in Table No- 4.7 to 4.9.

The immediate roof of seam IVT is comprised of shale while immediate floor Lithology is shale and Carb. shale.

Seam IV BOTTOM

The seam IV B underlies seam IV T by 0.76m (MAT 11) to 5.94m (MAT 3) and overlies III Top by 1.36m (Mat-6) to 9.69m (MAT 12). Seam IVB is intersected in 18 Bhs. The seam is faulted in Bh(MAT 14)

The thickness of the seam IV B varies from .5m (Mat 20) to 5.32m (MAT-1). While 1-100 thickness from 5m (MAT 20) to 4.46m (MAT-1). The seam IV B is unworkable in 12Bhs. i.e. it is workable in eastern half and southern half of the block.

The Isochore of seam IVB has drawn showing workable area and non workable area of the block.

Out of 16 no.s of intersection, dirt bands are present in 8 Bhs. The cumulative thickness of 1 to 2 in number ranges from 0.12m (MAT 11) to 0.28m (MAT 12). Obvious bands of 2 in number are present in one Bh MAT-1 with Thickness of 0.86m.

Quality wise seam IVB is graded as G to C. In general it is E to G The quality parameters of seam IVB coal are tabulated in Table No. 4.10.

A total of 2.7989 M.tes are estimated as geological reserves. The detailed break up is given in Table No- 4.7 to 4.9.

The immediate roof of seam IVB is carb shale & shale while immediate floor is comprised of shale and arenaceous.

Seam – III TOP

Seam III T underlies seam IV B by 1.36m (MAT 6) to 9.69m (MAT 12) and overlies seam III middle by 1.23m (Mat 1) to 6.69m (MAT6).

Seam III T is intersected in 20 Bhs. It is faulted in Bh MAT 14. The minimum and maximum floor depths are 7.39m (MAT 13) and 240.93m (MAT 19).

The thickness of seam III T varies from 0.58m (MAT 6) to 7.42m (MAT 18) while I-100 thickness varies from 0.58m (MAT 6) to 6.5m (MAT 18). The seam is unworkable near MAT 6 and MAT 3, AR-7 & 11. In major area the thickness of seam ranges from 2 to 4m.

Floor Contour plan and Isochore plan have been drawn for Seam III T and given as Plate No 8

Quality wise seam III T Coal is graded as G to E. In major part of the block it is grade F. However it has deteriorated to G near Bh 18. Other parameter are given in Table No – 4.10

A total of 13.3624 Mtes has been estimated. Detailed break-up of geological coal reserve is given in Table No 4.7 to 4.9.

The immediate roof & floor of seam III T is shale and carb shale.

Seam III MIDDLE

The seam III M underlies seam III T by 1.23m (MAT-1) to 6.97m (MAT 6) and overlies from seam III Bottom by 1.57m (MAT 6) to 9.7m (AR-11)

The seam III M is intersected in 19 BHs and faulted in Bh (MAT14).

The minimum and maximum depth of cover above seam III.M is varying from 9.42m (MAT 13) to 243.92m (MAT 19).

Isochore plan of seam III M has been drawn.

The actual and I- 100 thickness of seam III M varies from 0.2m (MAT 9) to 1.94m (MAT 12). The seam is workable in central part of the block.

Quality wise seam III M varies from G to E. In workable zone the grade of seam in major part is F, which deteriorates to grade G in 3 small pockets near Bhs Mat 4,18 & AR 11. Quality parameters of the coal seam are given in Table No-4.10 & 4.11.

A total of 4.4299 Mtes of geological reserves has been estimated and its detailed break up is given in Table No- 4.7 to 4.9. The immediate roof & floor of seam III M is carb shale & shale.

Seam III BOTTOM

Seam III B underlies seam IIIM by 1.57m (MAT 6) to 9.7m (AR-11) and overlies seam II by 2.38m (MAT 7) to 8.97m (MAT 9) . Seam III B is encountered in 21 Bhs. It is unworkable in 9Bhs (MAT

5,9,11,13,15,19,20,AR 7 & 11) and minimum & maximum depth of seam are recorded as 12.37m (MAT 13) and 252.30m (MAT-19).

The isochore of seam III B has been drawn.

Quality wise, seam III B coal is graded as G to D. In major part the grade is F which deteriorates to grade G in the southern part of the block around Bh Mat- 1. The estimated reserves are 6.7499 Mtes

The immediate roof and floor of seam III B is represented by carb. Shale & shale.

Seam II

Seam II incrops in North western part of the block. The incrop of seam II runs from western boundary to fault F_2 in the eastern part of the block. In between, the in crop of seam II, is shifted due to fault at 2 places.

The seam II is intersected at 21 Bhs and it is faulted in Bh MAT 19. In Bh MAT 10, the seam is partially weathered.

The seam II underlies seam III B by 2.38 m (MAT 7) to 8.97 m (MAT 9) and overlies seam I T by 1.26 m (MAT 1) to 8 m (AR 11).
The Thickness of seam II varies from 4.49 m (MAT 20) to 15.48 m (MAT 18) while I -100 thickness from 4.44 m (MAT 14) to 14.88 m (MAT 18). In general ,thickness of seam varies from 6 to 8 m.

Inter section dirt bands and non combustible bands are present in all the Bhs. The seam contains 1 to 4 number of dirt-bands. The

thickness of these bands varies from 0.13 m (MAT 15) to 1.53 m (MAT 17) representing 2% to 14% of seam thickness. The obvious bands are noted in 13 nos of Bhs.

The shallowest depth of seam II is noted in Bh MAT 10 as 9.35 m and deepest is 259.54 m in Bh MAT – 1.

Quality wise the seam II coal is G to E grade. In major area it is graded F & G. In the eastern area its quality improves as grade E Quality parameter is shown in Table no 4.10 & 11.

A total of 39.2758 MTes of geological reserve are estimated. Out of this 35.0157 Mtes are proved reserves and balance 4.2601 Mtes are of indicated category coal reserves.

Seam I Top

It is intersected in 20 Bhs. In one Bh MAT19 it is faulted. The shallowest floor depth is found in Bh MAT10 (12.4m) and deepest floor depth is found in Bh MAT-1 (263.89m)

The parting between seam I TOP and overlying seam II varies from 1.26m (MAT-I) to 8 m (AR-11)

The immediate roof of seam I TOP is represented by shale and carb shale while the floor lithology consists of shale and carbonaceous shale.

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The Thickness of seam IT varies from 0.22 m (MAT 9) to 4.73 m (MAT 18) . The seam has unworkable thickness in 3 isolated patches. They are around Bhs MAT 14, 13, 9, 10 & 20, second around MAT 8, 4, 3 & 17 and third in south eastern part of block near BH MAT 2. In remaining area the seam is workable.

Out of 19 nos of intersection dirt bands and non combustible bands are present in 12 nos of Bhs.

Quality wise, the grade is varying from G to E, however in major part it is F.

A total of 6.6865 M.tes are estimated as geological reserves out of which 5.8242 Mtes is of proved category and 0.8623 Mtes is of indicated category.

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Chapter - 5

MINING

TABLE – 4.11

STATEMENT SHOWING ASH FUSION TEST OF COAL SEAMS ENCOUNTERED IN BOREHOLES

TUBED BLOCK, AURANGA COALFIELD, DIST. LATEHAR, JHARKHAND

Sl. No	B.H No	Seam No.	Depth(m)		Thickness (m)	Mode of Analysis	Ash Fusion Range		
			From (m)	To (m)			I.T	H.T	F.T
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	MAT-08	VII (Comb)	27.94	37.02	7.35	I-100	1190	>1400	>1400
2.	-do-	V-TOP	56.89	62.41	5.01	I-100	1280	>1400	>1400
3.	-do-	V-BOT	68.83	75.65	6.72	I-100	1290	>1400	>1400
4.	-do-	IV TOP	79.09	80.23	1.14	I-100	1225	>1400	>1400
5.	-do-	III TOP	89.31	91.62	2.31	I-100	1205	>1400	>1400
6.	-do-	III-MID	95.39	96.59	1.2	I-100	1140	>1400	>1400
7	-do-	III-BOT	99.54	100.87	1.33	I-100	1175	>1400	>1400
8.	-do-	II	106.06	112.65	6.47	I-100	1220	>1380	>1400

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CHAPTER – 5

5.0 MINING

5.1 PRESENT STATUS & SALIENT FEATURE OF THE MINING BLOCK

(I) The Geological Report (March- 2006) has been prepared by Mineral Exploration Corporation Ltd. (MECL) after exploration of Tubed Block. This Geological Report has been referred for preparation of Mining Plan for Tubed Coal Mine (6.0 MTY)

(II) Tubed mining block lies in the north-eastern part of the main basin of the Auranga Coalfield. It is a Non-CIL Block in which MECL drilled 20 boreholes with a total meterage of 3,011.5m, during June 2004 to Jan 2005, in addition to two borehole drilled by GSI for regional exploration. The block covers an area of about 4.6 sq. km. and is located in Latehar District of Jharkhand state. The location details of the project site are given in Chapter 2.

(III) Surface features

The area is having undulating, rugged topography. The general ground elevation of the block varies from 386m to 412 m above MSL. The east-west flowing small seasonal nalas join the Sukri River. The river flows south-north & is located in western part of the block. It drains out of this area in westerly direction.

(IV) As seen from Geological plan, based on MECL Boreholes, only Barakar measure rocks are exposed in the mining block. Regarding

Talchir formation, GR indicates that it is conspicuously absent in this block. Boreholes have directly, touched metamorphics in the block.

(V) **Barakar formation contains 7 coal seams (split into 13 sections)** in the block. In descending order, they are seams/sections VII T, VIIB, (VII Comb), VI, VT, VB, IVT, IVB, IIIT, IIIM, IIIB, II, IT & IB. Out of these seams, VI & IB have not achieved workable thickness hence they have not been considered for the mining plan.

(VI) The coal seams from VII Top to I Top (13 Sections) are very close to each other, because parting between them are quite low. Hence, they may be considered as a mining mass. The thickness of mining mass, which contains all these coal seams and their intervening partings, attains good thickness.

(VII) Quality-wise, the seams are graded as power grade coal (Grade F mainly)

(VIII) Structurally, the mining block is simple because of intervention of only 4 faults. Besides four faults, two major faults, F1 & F2 are boundary faults forming west & east boundaries of the block. Because of fault F3 to F6, 4 geological sectors have been envisaged for reserve calculation in the GR and from mining point of view these 4 sectors have been designated as sector I, sector II, sector III & sector IV.

(IX) As seen from, the geological plans and cross-section, entire block is amenable to opencast mining although sector IV which is on the down throw side of fault F3, is some what deeper.

5.2 Reasons and area considered for Opencast Mining.

(i) All the seams are incropped in the block and the incrops are found at shallow depth in northern part of the block.

(ii) Entire area of the mining block has been considered for open cast mining because of reasonable stripping ratio has been seen in totality.

(iii) As seen from Table No. 5.1 showing the thickness of coal seams; I Top is lowest horizon of coal seams in the block but it is workable only in a limited area hence seam II (5m to 12m in thickness), just above it, has been considered as basal seam for the proposed quarry . In addition to seam II, seam V B, V T & seam VII T also have good thickness which support open casting in the block.

(iv) The gradient of coal seam is about 1 in 4 to 9 (6-14^0). The quarry would reach a max. depth of 230m in sector III & IV.

(v) Percentage recovery is likely to be about 82% of Mineable reserves.

5.3 BOUNDARIES OF THE QUARRIABLE BLOCK

All the sectors e.g sector I, II, III & IV are considered for quarrying for all the workable coal horizons. As lowest coal horizon seam I Top is workable in limited area, hence a final stage working plan has been prepared with base seam II in the proposed 4 sectors as integrated Quarry. Accordingly, the boundaries of quarriable block are given below:-

Eastern boundary – Boundary fault F2, keeping a barrier of 50-60m against leasehold boundary of Tubed block for accommodating nala diversion and safe distance from diverted position.

Northern boundary – Incrop of seam II as the northern boundary which is natural boundary against non coal bearing area.

Western boundary – Boundary fault F1 & keeping a barrier of 70-80m against leasehold boundary of Tubed block for accommodating nala diversion and a safe distance from diverted position.

Southern boundary - Sufficient barrier left for including the diversion of nala provision for a road along the boundary and place for peripheral road of the OCP.

5.4 IMPORTANT ACTIVITES INVOLVED

i. In the quarriable block, 4 nallas are flowing from east to west and joins Sukri River flowing south to north, located in western side of the mining block. All these water courses are to be suitably diverted.

ii. A PWD Road is passing through the property. It is required to be rerouted for quarry operation.

iii. Part or full area of 6 villages namely, Tubed, Dihi,Ambajharan, DhobiaJharan,Mangra and Newari are located in the block. Out of this, Tubed village is required to be relocated before mining operation. Relocation of Tubed village is to be done together with diversion of Sukri river. Other villages falling in south side (Dip side) may be relocated before working reaches there.

iv. A suggested route of diverting nallah, road and river are given in final stage quarry plan, (Plate No 18). To accommodate these diversions, sufficient barrier width has been provided for these activities along the mine boundary on east south and north-west side.

5.5 GEOLOGICAL AND MINING CHARACTERISTES OF THE QUARRIABLE BLOCK.

Table No. 5.1

Geological & Mining Characteristics

S. No.	Particulars	Unit	GEOLOGICAL SECTORS			
A	Thickness of coal seams to be worked		SECTOR-1	SECTOR-II	SECTOR-III	SECTOR -4
	Seam I Top	m	1	1-2	1-2(>1 major)	1-4
	Seam II (base seam)	m	5 m	5-7.8	5-12.5	5-14
	Seam III Bottom	m	1-1.5	1-1.5(>1 in major area	1-2 (>1 in major area	1-4
	Seam III Middle	m	1	>1 to +1	1 to 3(>I in major)	1-2
	Seam III Top	m	2-3	2-3	1-5	1-6
	Seam IV Bottom	m	1.1	(>1 in major area	(>I-1.5 in major area)	1-4
	Seam IV top	m	>1 in major	1-1.4	1.1-3.18	2-7
	Seam V Bottom	m	6	6-7	6-9	8-10
	Seam V Top	m	4	4-6	4.5-7	6-8
	Seam VII Bottom	m	Not incropped	1- 1.37	1- 1.37	1-1.5
	Seam VII Top	m	Not incropped	9-12	7.3-10	9-10
B	Seam gradient	degree	1 in 5	1 in 7	I in 7-10	1 in 4
C	Overburden/parting					
	Parting bet IT & II	m	1.68	1.5-2.8	1.5-8	1.2-2.8
	II & III B	m	7.6	8.9	2.4-8.2	6.7-7.3
	III B & III M	m		4.12	1.57-3.8	4.2-5.7
	III M & IIIT	m		4-6.2	3.35-5	4
	III To & IV B	m		10	8.4	6.4-9.3
	IVB& IV T	m		1.2	1.4-2.9	1.6-2.2
	IV T & VB	m		2.6-3.14	2-10	5.4-5.8
	VB & VT	m		4.7-9.26	5.1-8.97	12.5-16.8
	VT & VII B	m		9.6-13.4	9.6-23.15	25-31
	VII B & VII T	m		1.0	1.6-3.9	3.4-3.7
	Top OB	m	5-50	5-150	5-150	70-150
D	Quarry parameter					
	Average strike length (Floor)	m	1250			
	Average strike length (surface)	m	1650			
	Average dip length (floor)	m	1800			
	Average dip length (Surface)	m	2000			
	Maximum depth of the quarry	m	230			
	Maximum lift of coal	m	220			
	Quarry area at surface	Ha	350 Ha			

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5.6 REFERENCE OF PLAN

i Mine Cross section in longitudinal section, showing bench formation for coal as well as overburden and mining system to be adopted has been shown in Plate No 5, under head geological plan

ii Stage plan of mining operation showing coal & overburden (OB) benches along with dump formation for 1st yr, 2nd yr, 3rd, 4th yr, 5th yr & end of mining operation are shown in plate no. 13 to 19 respectively. These plates show details of progress at each stage in 1st up to 5yrs.

5.7 ESTIMATION OF EXTRATABLE COAL

The geological coal reserve in the mining block (sector I, II, III & IV) has been given in Table No 4.7 Page No 21. The estimated mineable coal reserves in entire block comes to almost 171 Mtes and given in table No. 5.2. on Page – 44. Out of these, coal will be sterlised in barrier against the lease hold boundary and batter of high wall & site wall. It is estimated to be about 37 Mtes (About 13 Mtes in barrier and about 24Mtes in quarry batter). After deducting the sterlised coal (about 37Mtes) and mining loss during extraction (4Mtes) the extractable coal reserves is estimated as about 130Mtes.]

Of 24Mtes coal likely to be sterliesd in quarry batter, some coal can be extracted by high wall mining near the exhaustion period of mine (about 9Mtes).

Total extractable coal is estimated as

By opencast method	130Mtes
By highwall mining	9Mtes

However, it may be noted that at present technology of highwall mining has not been in practice, any where in India. It is likely to be available in future and when available, it will be separately planned for extraction from the batter to about 9 Mtes.

TABLE – 5.2

Statement showing estimated sterilized coal and likely quantity of extractable coal.

(Figures in Mtes)

Coal Reserves / Seams	Total Geological Reserves	Estimated likely in Mtes: Mineable Reserves	Sterilized coal in Barrier	Sterilized coal in Batter	Mining Loss	Extractable coal Reserves
1	2	3	4	5	6	7=(3-4-5-6)
Seam I T	6.70	6.03	0.52	1.05	0.08	4.38
Seam II	39.28	35.37	2.85	4.54	0.67	27.31
Seam III B	6.76	6.09	0.52	0.94	0.26	4.37
Seam III M	4.44	3.99	0.34	0.62	0.22	2.81
Seam III T	13.37	12.06	1.01	1.80	0.48	8.77
Seam IV B	2.82	2.54	0.29	0.54	0.08	1.63
Seam IV T	12.97	11.68	0.81	1.64	0.31	8.92
Seam V B	35.51	31.95	2.28	4.36	0.50	24.81
Seam V T	24.64	22.16	1.69	3.21	0.45	16.81
Seam VII C	3.17	2.84	0.00	0.18	0.20	2.46
Seam VII B	4.28	3.85	0.32	0.67	0.20	2.66
Seam VII T	36.06	32.44	2.37	4.45	0.55	25.07
Total	**190.00**	**171.00**	**13.00**	**24.00**	**4.00**	**130.00**

5.8 RATED CAPACITY OF OPENCAST PROJECT

In this mining plan for Tubed Coal mine, the production level has been estimated for a rated output of 6.0 MTY power grade coal. This is based on geological & mining characteristics of quarriable block.

The parameters of the Opencast Coal Mine make it feasible to produce 6.0 MTY coal along with corresponding OBR (peak 15 Mm^3) with normal technical indices viz location of HEMM, rate of annual advance, life of OCP etc.

5.9 DESIGN CRITERIA

The following design criteria have been adopted for the mining operation

Number of days of work annually	330
Number of shifts	2/3
Duration of each shift	12/8 hrs

5.10 LIFE OF THE PROJECT

For the rated output of 6.0 MTY of Run-of-Mine (ROM) coal per annum and with extractable reserve of 139.654 Mtes. and further considering the period of increase and decrease in output; the life of the Tubed Coal Mine is estimated as 30 Yrs including mine development period and working of coal by highwall mining.

5.11 MINING SYSTEM

Based on geological & mining characteristics of the quarriable block. i.e.

(i) Presence of 11 workable coal sector (cumulative thickness 35 40 m).

(ii) Variation of dips in different sectors, with gradients 1: 9 to 1:4

(iii) Variation of thickness of coal seams/parting

(iv) Difficult to construct haul road in sector II because of low strike length and longer dip length.

(v) Keeping above in view, it is prudent to follow horizontal slicing of bench formation both for coal and OB including top overburden. A tentative mining system has been shown in X-section plan in C-C' cross section. (Plate No 5)

Other Parameters

(i) The running slope of the mining system would be about 20^0 with horizontal where as closing slope would be 45^0.

(ii) In the coal seams and parting bench height have been kept 10m where as it is raised up to 15m in top overburden and other thick intermediate overburdens.

(iii) In this case a FRL of seam II has been considered for coal advance faces. Upper benches containing coal/parting would be advanced accordingly.

(iv) Seam 1T which is 2-3 m below the floor of seam II (base seam) would be worked by deepening parting bench wherever it achieved workable thickness of 1m and above.

(v) The mining system of horizontal slicing may be changed after gaining experience and if mining along strata slope could be found suitable.

5.12 MINE OPENING & DEVELOPMENT

In the northern boundary where seam II is in- cropped at shallow depth (near Bh MAT 10), an access trench road from surface to touch 380 m Floor Reduced Level (FRL) of seam II in sector III will be driven. Once the approach trench touches the floor of coal seam, production face would be opened by expanding Box-cut. In the formation of box-cut the OB production would be much more than production of coal.

This excavation is proposed by shovel-dumper combination. Overburden (OB) Bench & Coal Bench are further expanded by HEMM along the strike of the seam.

5.12.1 Approach to Sector II

Sector II is small sector and is on down throw side. Therefore separate entry in sector II is not suggested. hence for approaching sector II, the haul road driven in sector III along seam II would be extended on the same R.L of 380 towards its eastern limit. Then at R.L. of 380 m, a level road towards north in batter would be driven to touch FRL of 380 m in seam II, in sector II. This has been shown in Ist year stage plan. From this point of entry, a haul road would be constructed in Sector II, in seam II to touch the 350 FRL . This type of road connection from sector III to II would be repeated at intervals as shown in the final year stage plan. This arrangement to reach sector II from III is necessary because of short strike length and long dip of seams in sector II.

5.12.2 Approach to Sector I

The sector I would be approached separately because of its location. For this a separate trench would be driven as shown in 3rd year stage plan to touch seam II FRL 380 m from where haul road can be constructed. Upper seams can be approached from batter slope in dip side area.

5.12.3 Approach to Sector IV

Development in sector I & II are proposed such that it fits in to integrated main quarry of sector III. Sector IV is located on dip side of the property hence all the approach for winning sector IV would be made from sector III haul road, nearing the end of mine life.

5.12.4 Activities for Mine Development

Prior to any mining operation i.e. mine development activities are to be taken up. The following steps are imperative for this mine:

i. Shifting of village. Tubed to relocation site.

ii. Diversion of all nallas flowing over Tubed quarry able area. The proposed alignment to the diverted route is marked in the stage plans.

iii. Advance steps should be taken to divert Sukri river besides shifting of tubed village for winning entire extractable coal reserves estimated by opencasting i.e 130.128 Mtes.

In initial years, proposed quarry would be worked on the east side of Sukri River. As soon as Sukri river is diverted, the working would be extended to cover left out coal reserves falling in the west side of the block. Efforts will be made to divert the river within 7-10yrs for smooth mining operations.

A tentative alignment of diversion route of Sukri River is marked in Plate No. 18 & 19.

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5.13 HAUL ROAD & SUMP DEVELOPMENT –

Haul road would be constructed with the help of Motor Grader, compactor and Dozer, provided for the purpose, on the floor of seam

II at a gradient of 1 in 16. The width of haul road is kept as 25-30 m which is found suitable for plying medium sized dumpers dozer etc. More over the width of the haul road should be such that it should accommodate drainage pipeline and electrical HT line also.

Water would accumulate in the floor of seam II, especially during rainy season. Beside, strata water would also percolate in the mine and get collected towards the dip. Hence, a sump is to be made in the floor of seam II and it has to be kept two cut advance of haul road development. Pumping of the accumulated water in the sump has been covered in Pumping & Drainage chapter.

5.14 METHOD OF WORKING

First of all, the top soil would be removed with the help of small sized hydraulic shovel (2.8/1.9 m3) in conjunction with heavy duty trucks. Auxiliary HEMM like dozer with ripper may be used for stacking the Soil. This top soil will be stacked separately at top soil dump earmarked in the plan for its storage & reuse. After stripping top soil, benches will be formed in the OB/parting above coal seam II.

5.14.1 OB Bench

As soon as top OB bench reaches more than 15 metres in thickness, successive OB benches would be developed by deployment of 10m3 rope shovel / 8.3m^3 hyd shovel in conjunction with RD 85T for making OB bench of 15m in height.

The overburden benches would be drilled by RBH Drill 250mm.The blast hole will be loaded with explosives and blasted. The blasted material will be loaded by 10m3 rope shovel/8.3 m3 hydraulic shovel in case of top OB. Parting between seams VII B and V T is likely to be more than 10m. Here bigger capacity Shovel & 85 T Dumper can also be considered.

The dumpers will haul the blasted overburden initially to external dump site A (marked in the stage plan) and as soon as space is created by decoaling upto seam II and I B (wherever it develops the working height), the overburden would be dumped internally as internal dump B & C.

The width of the OB bench would be kept at 35m in the working bench. After deducting cut-width of 15m the balance will become 20m which will be a non working bench. This will become again working bench of 35m as soon as upper benches advanced by 15m. This operation will continue throughout the life of mine.

The benches in the mining mass (Between VIIT seam to IB Seam) would be kept in horizontal slice of 10m height so that 3.2m^3 to 3.8m^3 hydraulic shovel in conjunction with RD 50T would work with full efficiency.

The details of the strata including all workable coal horizon are given in Table No. 5.1 along with parting between the seams. As seen from the Table, only 4 coal seams (i.e. seams II available in 100% area), VB (available in 55% area) VT (in 45% area) & VIIT (in 30% area) are

medium thick, varying from 4.5 m to 12m which could be worked in separate bench.

Balance 7 coal horizons, i.e. seams IT, IIIB, IIIM, IIIT, IVB, IVT & VIIB are thin seams of varying thickness. In these cases parting between the coal seams are varying from 1m to 23m. Hence it would be very difficult to maintain coal bench as well as parting bench separately; hence a mixed bench of 10m height would be developed in horizontal slicing fashion.

The exact mining system would be developed at implementation stage after getting the working experience. However a tentative mining system has been developed and shown in Cross section plan in which coal/parting bench has been formed to cover coal seam as well as parting bench and maintenance of batter road at 30m level marked in side wall of the slope to work as approach road and facilitate dumping in regular fashion. This has been shown in stage plans.(Plates 13 to 19)

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5.15 CALENDAR PLAN OF EXCAVATION:

Year wise production plan of excavation along with coal production is given in Table No. 5.3. Accordingly, peak stripping ratio is estimated to be 2.5 m3/te for entire working life of the quarry. The life of opencast project is estimated as 30 years for the rated output of 6MTY Coal including mine construction period and high wall mining. The productive life of O.C. Mining comes to 25 Yrs.

Table No. 5.3
Calendar Plan of Excavation

YEAR	COAL (Mtes)		OB+T.S. (Mm^3)		S.R (m^3/te)	
	YRL	PROG	YRL	PROG	YRL	PROG
1st	1.0	1.0	4.87	4.87	4.87	4.87
2nd	2.15	3.15	8.6	13.47	4.0	4.27
3rd	4.0	7.15	12.04	25.51	3.01	3.56
4th	5.0	12.15	15.0	40.51	3.0	3.33
5th	**6.0**	**18.15**	**15**	**55.51**	**2.5**	**3.06**
6th	6.0	24.15	15	70.51	2.5	2.92
7th	6	30.15	15	85.51	2.5	2.84
8th	6	36.15	15	100.51	2.5	22.78
9th	6	4.2.15	13	113.51	2.17	2.69
10th	6	48.15	13	126.51	2.17	2.62
11th	6	54.15	13	139.51	2.17	2.57
12th	6	60.15	13	152.51	2.17	2.53
13th	6	66.15	12	164.51	2.0	2.48
14th	6	72.15	12	176.51	2.0	2.45
15th	6	78.15	12	188.51	2.0	2.41
16th	**6**	**84.15**	**12**	**200.51**	**2.0**	**2.38**
17th	6	90.15	12	212.51	2.0	2.36
18th	6	96.15	12	224.51	2.0	2.33
19th	6	102.15	12	136.51	2.0	2.31
20th	6	108.15	12	248.51	2.0	2.29
21st	6	114.15	12	260.51	2.0	2.28
22nd	6	120.15	9	269.51	1.5	2.24
23rd	5	125.15	6	275.51	1.2	2.20
24th	3	128.15	3	278.51	1.0	2.17
25th	2.1	130.25	2	280.51	1.0	2.15
TOTAL	130.25		280.51		2.15	

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Note:-

1. OB – Overburden
2. TS – Top Soil
3. SR – Stripping Ratio

5.16 PROPOSED HEAVY EARTH MOVING MACHINES

5.16.1 Productivity of HEMM combinations.

Annual productivities of shovel with matching dumper, adopted in this Mining Plan are given in the Table No. 5.4 & 5.5

Table No. 5.4

(Figure in Mm)

Sl. No.	Particular	Unit	Annual Productivity
1.	OBR		
	10 m3 rope shovel + RD 85T	Mm3	2.6
	8.3 m3 hyd. Shovel + RD85T	Mm3	2.57
	3.2-3.8 m3 hyd.shovel+RD 35T	Mm3	1.0
2.	Coal		
	8.3 m3 hyd. Shovel + RDCH 85T	Mm3	2.8
3.	3.2 m3 hyd. Shovel + RDCH 35T	Mm3	1.0

Productivity of RD 85 Te/50T / 35T in conjunction with 8.3 m3 hydraulic shovel/3.2 m3 FH/2.8m3 BH hydraulic shovel are given below:-

Table 5.5

(Figure in Mm3)

Combination	Lead in Km					
	1 km	1.5 km	2 km	2.5 km	3 km	3.5 km
10 m3 rope shovel + RD85T	0.3633	0.3055	0.27	0.248	0.2246	0.2067
8.3 m3 hyd. Shovel RD 85 T	0.4109	0.3463	0.3075	0.2818	0.2556	0.2353
3.2 – 3.8 m3 hyd.	0.1687	0.1417	0.1251	0.1149	0.1040	0.0950

Shovel + RD 35 T						
2.8 m3 hyd. Shovel + RD 35 T	0.1575	0.1339	0.1196	0.1100	0.1000	0.0900

5.16.2 OPTION FOR DIFFERENT COMBINATION OF HEMM

5.16.2.1 Over Burden Removal.

As seen from Table No. 4.5 the thickness of top soil is varying from 2.5m to 12m and found in entire block.

Top soil removal will be done with the help of dozer/dozer with ripper and F.E loader/backhoe-shovel+rear dumper/40 Te truck.

The top overburden bench, above the coal seam, (varying in thickness from 10 m to 140m), would be worked in horizontal slicing system with 10m height to 15m height benching. The width of working bench would be 35m. After cut width of 10-15m, the working bench would become 20-25m width as non-working bench. The recommended HEMM in this case, are 250 mm drill for blasting, 8.3m^3 hydraulic shovel/10m3 rope shovel along with RD 85T for transport of OBR to specified dump place.

In the mining mass (VIIT seam to IT seam) the parting between the coal seams is varying in thickness from 1 m to 23m. Such thin parting & coal seams would be worked by 10 meters thick horizontal slices. A separate bench of parting is only possible where parting thickness is >8 meters. Otherwise a mixed bench would be formed consisting of coal seam as well as parting and blasted as composite mass

Individual bench would be worked top downwards i.e. after removing layer of upper parting, coal seams is exposed and extracted.

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In this case the height of OB/coal mixed bench would be 10m and width would be 35 m for working bench and 25 m for non working bench i.e. the cut width is 10 m.

RBH drill of 160mm, medium size hydraulic shovel along with RD 35T/50 T is recommended for mining such OB/coal faces.

5.16.2.2 Coal winning

Deployment of surface miner for winning coal seams

The machine can cut & load coal onto dumpers through its own conveyor boom. No blasting is required. The machine requires a large area of exposed coal for efficient operation. Because of small web cutting, the output of coal is slack coal. Moreover, surface miner can be used for selective mine purposes also as surface miner can cut & load hard dirt bands separately since a thin layer of coal is taken at a time. Hence it may be used for maintaining quality improvement also.

Surface miners are in use in South Eastern Coalfields Ltd. (SECL) & Mahanadi Coalfields Ltd. (MCL) opencast mine of Coal India Ltd. (CIL) on contractual basis with slight modification of loading & transporting arrangement of coal. Instead of using raised boom of surface miner for loading coal on to dumpers, the surface miner cut the coal only for speedy removal of coal loading on to dumpers by pay loaders.

The loaded dumpers will ply in strike level as well as in haul road. and will lead to Pit Top where it will discharge coal at receiving pit.

In the case of medium thick coal seams (i.e seam II, V B, V T & VII T constitute 70% of coal reserves), surface miner can be deployed by making separate benches.

5.16.2.3 Deployment of Shovel-Dumper

But thinner seams, having thinner parting can be worked only by 10 metre mixed benches with horizontal slices. Thin seams such as IT, III B, III M, III T, IV B, IVT & VII B (20% of coal reserves) the coal bench would be merged with parting bench. Hence, the thin coal seams will be blasted along with the parting and segregated by coal dozer and loaded by small hydraulic excavator / FE loader on to dumpers

Therefore surface miner for seams VIIT, VT, VB & II and shovel - dumper for thinner seams shall be deployed.

5.16.3 SELECTION OF TYPE & SIZE OF HEMM

As shown in mining system and quantum of Overburden to be handled every year, conventional medium sized HEMM of indigenous make are suitable in this OCP (6.0 MTY) i.e. shovel + dumper combination for OBR.

They are 8.3 m3 hyd. Shovel with RD 85T for thick OB and inter burden bands along with matching auxiliary HEMM, like drills, dozer etc. for working in horizontal slicing.

However, after expiry of the rated life of 8.3 m3 hyd Shovel may be replaced by 10 m3 rope shovel if not found satisfactory (in case of top OB).

In case of parting and coal benches, 3.2/3.8 m3 hydraulic shovel is suggested as it is found to be more suitable because of :-

i. Benches are of mixed type having both Coal & O.B.
ii. Hydraulic shovels are lighter and have better maneuverability.
iii. Due to wrist action the hydraulic shovel can fully load the bucket in varying bench heights, resulting in better fill factor.
iv. Due to better fill factor, higher digging power & faster swing speed, the hydraulic shovels have higher productivity.

In case of coal seams, surface miner in combination of RD35 T is found to be more suitable as described in para 5.16.2.2, hence it is a selected variant for these seams e.g. VIIT, VT, VB & II.

For thin seams 3.2/3.8m^3 hydraulic shovel with RD 35T would be deployed.

The detailed list of HEMM is given in Table 5.6 on Pg58

5.16.4 LIST OF HEMM

Table No. 5.6

Sl. No.	Particulars	Size/ Capacity	Provision upto 5th yr	Phasing in Year					Ultimate Provision
				1st yr	2nd yr	3rd yr	4th yr	5th yr	
A	HEMM FOR COAL								
	Hyd Shovel (B.H) (Diesel Operated)	2.8 m^3	2	-	2	2	3	3	3
	Surface Miner	2500 mm	2	-	-	1	1	2	2
	Rear Dumpers	35 T	15	4	9	12	25	33	36
	Dozer with ripper	410 HP	2	1	1	2	2	2	2
	Wheel Dozer	300 HP	3	1	1	2	3	3	3
	F E Loader	5.74 m^3	3	1	1	2	3	3	3
	Wagon Drill	100 mm Φ	3	1	1	2	3	3	3
B.	HEMM for OB/PARTING								
1.	Hyd Shovel (Electric Operated)	8.3 m^3	5	1	2	3	4	5	5
		3.2-3.8m^3	6	3	5	5	6	6	6
2	Rope Shovel (Electric Operated)	10 m^3	-	-	-	-	-	-	
3	RBH Drill (Electric Operated)	250 mm Φ	5	1	2	3	4	5	8
		160 mm Φ	6	3	5	5	6	6	6
4	Dozer	410 HP	6	2	3	6	6	6	8
5	Rear Dumpers	85 T	36	6	13	19	25	36	44
		35 T	50	23	37	41	49	50	55
C.	HEMM FOR COMMON								
1	Motor Grador	280 HP	2	1	1	1	2	2	3
2	Wheel Dozer	410 HP	2	1	1	2	2	2	2
3.	Hyd. Shovel (BH) (Diesel Operated)	2.5 m^3	3	2	3	3	3	3	3
4.	FL loader (Diesel Operated)	3.5 m^3	6	2	3	4	5	6	6
5.	Heavy duty trucks	40 T	50	10	28	40	50	50	50
6	Water Sprinkler	28 KI	5	1	3	5	5	5	5
7	Diesel Bowser	30 KI	1	1	1	1	1	1	2
8	Diesel Hyd Crane	75 T	1	1	1	1	1	1	1
9.	Diesel (rough terrain Crane)	30 T	1	1	1	1	1	1	2
10	Diesel (rough terrain Crane)	12 T	1	-	1	1	1	1	2
11.	Diesel (Pick & Crane)	8 T	1	-	1	1	1	1	2
12	Tyre handler	-	1	1	1	1	1	1	2
13	Vibratory compactor for haul road	9.5 Km/hr.	1	1	1	1	1	1	1
D.	HEMM FOR Reclamation								
	Water sprinkler	28 kL	1	-	-	1	1	1	2
	Dozer	410 HP	1	-	-	-	1	1	2

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5.17 A BRIEF DESCRIPTION OF YEAR WISE STAGE PLAN OF MINING OPERATION

5.17.1 1ST year development Plan (Plate No13) of mining operation includes.

(i) Top Soil removal and disposal at the proposed site.

(ii) Construction of initial trench (No. 1) located near BH MAT 10 Where seam II is in cropped in sector III & further extended to sector II, the haul road is split in two routes separately in sector III as shown in Ist year stage plan. One split haul road route extended towards Bh MAT 13 within sector III to open box-cut in sector-III

(iii) The other split haul road for sector II is extended to FRL of 380m of seam II in sector III and haul road for mining coal & OBR upto 350 FRL of seam II is constructed. The development in sector II will be done simultaneously along with sector III.

(iv) A separate trench number 2 is also required to open box-cut in sector I in seam II (FRL 380 m) as shown in 3rd year Stage plan. As entire area (mining block) is quarriable hence there is shortage of external dumping place. Early excavation of sector I would, not only provide coal production but also create place for internal dumping.

(v) The lowest FRL in formation of box cut would be 370m is case of sector III, 350m in sector II. The base seam in both the sectors would be seam II.

(vi) Seam IT is found below seam II by 2 to 3m. Where ever it has achieved workable thickness a working bench would be formed to extract this coal.

(vii) Other coal seams falling above seam II would be worked along with bench formation. In case of necessity separate bench of thick coal seams would be formed.

(viii) As soon as initial trenches touch the floor of seam II (380m in FRL) a box cut is made in both sectors so that deployment of more HEMM can be accommodated. By further expanding the box-cut in 1st year stage plan, the number of OB benches (10m high x 25/35m width) would be 3 to 5 in number depending upon variation of surface contour in that area and depth of FRL from surface.

(ix) Accordingly, 4.87 Mm3 of Overburden (OB) would be removed and dumped in external Dump A and 1.0 Mte coal would be mined and dispatched. The break up of OBR & coal production is given in table No. 5.3 Calendar Plan Page No. 51.

5.17.2 2nd year stage Plan (Plate No. 14)

(i) In this case, the high wall side would be extended in dip side upto 360m FRL of seam II incase of sector III & 340m incase of sector II and thus 4 to 6 benches are formed i.e. addition of 1 more bench of Overburden (OB) compared with 1st year stage plan depending upon surface configuration.

(ii) In 2nd Year stage plan area, seam I Top has not been found to have developed upto a workable thickness both in sector III & sector II. Hence working in seam I Top has not been considered.

(iii) The exposed coal of seam II along with part of seam III B, III M & III T are added. This would enhance the coal production to 2.15 MTY. Coal production is also enhanced because of inclusion of more coal seams in batter above seam II.

(iv) OB volume of about 8.6 Mm3 from (OB)/parting bench would be removed and dumped in External dump A as shown in 2nd year stage plan.

(v) Upto 2nd year, the coal winning, is done by conventional method of working i.e. coal seam is drilled by 160mm drill, then blasted, and the blasted coal is loaded by 5.74 m^3 FE loader/2.8m3 hydraulic shovel on to 35 T dumpers. The coal is transported to pit top. The coal is crushed in the feeder breaker installed near Bh MAT 10 for its onward transmission of Rly. siding.

5.17.3 3rd year stage Plan (Plate No. 15)

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(i) Like 2nd year the highwall side is extended towards dip side upto FRL 340m in case of sector III & 320m in case of sector II in seam II.

(ii) The development of quarry is limited in west side wall because of Sukri river. Development of sector II would be done from sector III side in east high wall side as shown in stage Plan.

(iii) A small area is found for working seam I Top in sector III. The isochore thickness of seam IT is given in plate no. 6.

(iv) Other coal seams above seam II are opened up for producing more coals both in sector III and sector II.

(v) In this year surface miner in seam II would be deployed in sector III. Other coal seams would be worked with conventional HEMM because of mixed coal bench with parting.

(vi) Up till now the integrated opencast mine was covering sector III & sector II only. In the third year of Mine development, the top OB benches are extended further east beyond sector II to cover sector I. By this, seam II of sector I (FRL of 380m) is opened. Simultaneously, a separate haul road is also made as shown in this stage plan for coal evacuation from sector I.

(vii) Total number of bench would be 8 in number in case of sector II. The height of coal/parting bench would be 10mts.

(viii) By this excavation, 4 Mtes coal can be obtained from the mine.

(ix) During 3rd year, 12.04 Mm3 Overburden would be removed & dumped externally and internally as some decoaled

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area would get created, leaving access trench & haul road area, sufficiently clear from the internal dumps.

5.17.4 4th Year stage plan

(i) The high wall is advanced towards the FRL 325 m in case of sector III and 305m in case of sector II in seam II and 370m in case of sector I of seam II.

(ii) Western perimeters of the quarry are restricted due to presence of Sukri River. Sukri river diversion along with shifting of Tubed village is required to extend the western sidewall to cover entire strike length of the Mining Block.

(iii) In this stage a separate bench below the floor of seam I is opened to obtain coal of seam I Top in sector III and in sector II (50% area) as seam I T is developed to workable patch in this area.

(iv) Upper seams like V T & V B are included in this stage plan in sector III & II.

(v) Total number of mixed bench would be 8 in case of sector III & 10 in case of sector II and 4 benches in case of sector I. The size of bench would be such as explained earlier.

(vi) About 5 Mtes coal would be obtained with corresponding OBR of 15 Mm^3. The OBR would be dumped in external dump as well as in internal dump.

5.17.5 5th year stage plan (Plate No. 17)

(i) 5th year stage plan covers all the seams to be mined by opencast method as strike length is increased from the eastern bank of Sukri river in sector III to sector I. i.e. 1400m.

(ii) High wall side is further extended towards dip side upto FRL of 310 m of seam II in case of sector III, 290m in case of sector II & 345 m in case of sector I.

(iii) Seam I Top mining is restricted in patches because of non-availability of workable seam thickness continuously.

(iv) Total number of mixed bench of coal/parting would be 9 .

(v) 6Mtes coal is envisaged from all the coal seams in these years with corresponding OBR of 15 Mm^3.

(vi) The OBR would be dumped in external dump as well as internal dump.

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5.16.6 Final Year Stage Plan (Plate No.18)

(i) Final year covers all the sectors i.e. sector I, II, III, & IV. Sector IV is falling in dip side and separated by step down fault. Because of this entire mine area is step down 40-50m from sector III.

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(ii) The haul road reached in lowest FRL of seam II (sector III) would be extended to sector IV. As shown in final stage working plan (Plate no. 18).

(iii) It is envisaged that the Sukri River will be diverted and Tubed village will also be relocated. Hence after these steps quarry will operate in full strike. Thus about 18 Mtes of coal would be released for mining operation and can be worked with the haul road constructed with sector III.

(iv) While developing open cast project it must be kept in mind that some fixed horizons are maintained in high wall as well as side wall development since inception. This will help to approach to other sector to make an integrated open cast mine. Additionally this road will facilitate internal dumping and side wall of the coal mine can be merged with the internal dump.

(v) By seeing the plate No 18 the road level are 380 m, 350 m, 320 m, etc i.e. at the interval of 30 m. The bench height is 10 m in case of mixed coal/ parting bench in mining mass and 15 m bench in top OB would be multiple of this interval of level in highwall/ side wall that is 30 m.

CHAPTER- 6

6.0 DRILLING, BLASTING & GROUND VIBRATION

Drilling & blasting would be required both in the OB/parting & coal benches. Only in thin coal benches and thin OB benches, ripper dozer would be used for making it as loadable material. The top Soil & weathered rocks below it will also be needed drilling & blasting.

6.1 OB/Parting

Top OB benches above coal seams will be 10m to 15 m in height and 25m to 35 m in width, where 250 mm Φ RBH drill will be used for drilling blast holes. For partings of thickness 10 m and below, a bench width of 25-30 m will be worked with 160mm Φ RBH drills.

6.1.1 Blasting Pattern

Blasting pattern depends upon the nature and hardness of strata and varies from mine to mine. An appropriate blasting pattern would be finalized based on field trials.

However a suggested pattern, for initial period is given below:-

Peak Overburden Removal in a year	-	15Mm3
Weekly OB removal	-	0.29 Mm3
Type of explosive used	-	Bulk explosive
Powder factor assumed	-	2.5 m^3/Kg of explosive
Weekly Explosive requirement	-	116 Te
Blast hole Spacing	-	8-10 m
Blast hole Burden	-	7-8 m

Drilling & blasting will be programmed suitably to ensure an inventory of sufficiently blasted OBR.

6.2 Coal

Majority of Coal benches are less than 10m in height. These will have width of 25-30 m. 160 mm drills will be deployed. However, surface miners are also proposed for winning the coal seams. Therefore workload of drilling & blasting of coal would get reduced on deployment of surface miners. Field trials will be required for designing the suitable blasting pattern in coal /parting benches.

6.2.1 Blasting pattern

Suggested pattern is given below:-

1.	Type of explosives	-	Bulk Explosive slurry/emulsion
2.	Powder factor assumed	-	6 tes/Kg of explosive
3.	Explosives required for 3 days coal	-	3030 Kg
4.	Blast hole spacing	-	6 m
5.	Blast hold burden	-	5 m

6.3 Surface Miner

Surface miner is proposed for seams with suitable thickness e.g. seam II, seam V and VIIT. This will eliminate the drilling, blasting in these seams. After 2-3 yrs. sufficient exposure of the seam II would be there and the surface miner could be deployed. Prior to this, coal would be extracted by conventional drilling, blasting, shoveling and loading on to RD 35 T/ 50T.

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6.4 Ground vibration

The Ground vibrations due to blasting would be controlled by:

i. Reducing the explosive charge per delay.
ii. Reducing spacing & burden per blast.
iii. Reducing the amount of explosive charged per blast.
iv. Designing proper blast design geometry.

The blasting within 500 mts of habitation area will be done as "Controlled Blasting" with due permission of Directorate General of Mines safety and complying with all operational guidelines laid down by them for conduct of "Controlled Blasting".

6.5 Storage of Explosive

It is envisaged that blasting operation will be carried out with assistance from the explosive supplying agency. The Bulk/SMS (site mix slurry) will be transported to the mine site by the explosive agency and under competent supervision charging, stemming and blasting will be undertaken.

A set of 2 magazines having a capacity of (3T+3T= 6T) is provided for storing cartridge explosive, base charge, detonators, fuses etc and other explosive required for secondary blasting wherever necessary.

CHAPTER -7

7.0 MINE DRAINAGE AND PUMPING

7.1 The Topography

The topography of Tubed Block is undulating particularly in North eastern sector as well as in the southern side which are high. General slopes moves towards west side. The general elevation is about 400 m AMSL where as the RL of western bank of Sukri river is 386 m AMSL. Accordingly, all the nallahs from east side, north side and south side joins Sukri river. The river flows (within the mining block) near the western flank, from south to North and then takes a westerly direction, while going out of the coal block.

7.2 Nalla and River Diversion

The Nallas enter the block from northern and eastern direction and flowing westerly are to be diverted before start of mining operation. The ground profiles (Contours) are suitable to divert the Nallas along the block boundary. Similarly Sukri River will have to be diverted to allow mine to expand along strike for normal working. The proposed division is along block boundary. It runs for some distances along southern boundary and then it flows along western boundary. The proposed diversion alignments are shown in the stage plans.

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7.3 Water Accumulation in the Quarry

Water would get accumulated in the quarry from these likely sources.

i. Direct precipitation into the quarry.

ii. Surface run off from areas surrounding the quarry.

iii. Seepage into quarry from aquifers.

7.4 ASSESSMENT OF MAKE OF WATER TO BE PUMPED.

(a) The maximum excavation area on surface, in the quarry, at final stage working is estimated as 350 Ha. Considering the maximum rainfall in the area as 150 mm on a day, the maximum accumulation of water from rainfall is estimated as 350 Ha × 0.15 = 525000 m^3/day.

(b) Because of revision of drainage system in the mining block by constructing diversion drains all around the mining block, the surface run-off water will get minimized in its flows towards the excavated area.

(c) Estimated quantities of seepage from aquifers is estimated is as 52500 m^3/day (taking 10% of direct precipitation).

Thus maximum make of water of the OCP is estimated as 5, 77,500m3/day. Considering this accumulation of water to be pumped in 120 hrs, the pumping load per hours comes to about 4812.5 m^3/hrs therefore 9 no. of pumps of 540m^3/hrs with 200m head capacity are required to handle the peak monsoon precipitation.

During rainy season, the equipment from bottom most bench shall be shifted to higher benches. The water from OB dump, coal stock yard and office premises etc shall be diverted away from the mine entry by constructing proper drainage system.

Dewatering of mine has been planned in such a way that the working faces and haul roads will remain dry as far as possible. The layout of the quarry provides suitable gradient for water to flow

to the dip most sump area. About 10-15 m advance trench shall be kept continuously extended in heavy monsoon period. The best way is to advance haul road by 100-150m more in a year for making sump before the monsoon, which forms part of monsoon preparation. All garland drains & nalla diversion channels are also cleared before monsoon.

Water accumulated in the sump will be pumped out to the surface and finally discharged into /near by Sukri River.

CHAPTER - 8

8.0 DISPOSAL OF WASTE

8.1 Proposed quarry is planned in Barakar formation area which consist of Soil/weathered mantle and Barakar rocks like sandstone and shale. The thickness of soil varies from 2.5m to 12 m. including the weathered mantle. The balance OB is constituted by Barakar measures rocks.

Top soil dump

On average the soil is 2 m thick. It has been considered for separate removal and stacking, as it is required to be preserved. It is expected that part of soil generated during 1-4 Yrs would have to be accommodated near Mine Entry (earmarked in top soil dump). Partly it will be used to enrich green belt. After that, freshly generated soil would be spread over O.B Dumps for their reclamation. Fine clayey soil shall be segregated in stacks properly for its reuse in making embankment.

External dump A

The capacity of dump A, with three layers of 30m height is estimated as 55.51 Mm^3. This includes some parts of internal dumping in sector II. The total height of Dump A is projected to be + 110m over the R.L of 390 to 410 m, which is the original ground level. About 10 Mm^3 of O.B. would be used in strengthening of embankment to be constructed along the Sukri River.

Internal Dump B & C

Internal dump B would be formed as soon as decoaled area is sufficiently created on the east side of haul road. In this case it is 3rd year onwards. The total capacity is estimated in the final stage as 95 Mm^3 in different benches height as shown in final stage dump plan The top RL of Dump B would be 500 m, which is same as the RL of external O.B. dump A.

The internal dump C is located on west side of main haul road. The capacity is estimated as 120 Mm^3

Disposal Of O.B During Last Four Years of Mining Operations

During the last 4-5 years of the mine, mining would be in sector IV. The geo-mining condition is such that simultaneous mining of coal & backfilling the mine void with O.B. is not feasible in Sector IV. Hence the O.B. removed during this stage has to be accommodated over the internal dump C. Later on part of this O.B. would be pushed towards void to reduce depth of the void for keeping final depth of water body with 30-40 metrs.

Thus total O.B. of 280 Mm^3 is balanced as follows:

1.	In external dump – A -	55 Mm^3
2.	Along Embankment for strengthening	10 Mm^3
3.	In internal dump - B -	95 Mm^3
4.	In internal dump - C - & in the final void.	120 Mm^3
		280 Mm^3

CHAPTER – 9

9.0 USE OF MINERAL (COAL)

Coal of Tubed opencast project is power grade coal. Entire Coal production i.e. 6 MTY is fully linked to power projects of Hindalco Industries Limited & The Tata Power Company Limited, with share of the companies being 3.6 MTY & 2.4MTY respectively.

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CHAPTER - 10

10.0 SURFACE TRANSPORT.

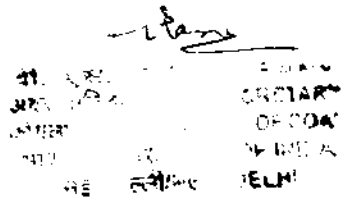
10.1 Transport of Overburden:

Initially the overburden would be transported to external dump 'A' by rear dumpers. After 3-4 years, the quarry void on the rise side will have sufficient space for internal dumping. The internal O.B dumping would start and then surface transport for O.B. would cease.

10.2 Transport of Coal

In the initial years, the coal from pit head will be transported to Latehar rly siding for despatches by rail from Latehar Rly Station to rly station nearby Sonahatu in Ranchi district where Hindalco's Captive power plant for their Aluminum smelter is proposed and also to the Rly station nearby Tata Power CPP, proposed to be in Jharkhand.

The end user company intends to lay Railway siding right up to the mine so that coal movement, to the maximum extent possible, is done through railway right from the pit top for the major portion of the mine life.



CHAPTER - 11

11.0 OTHER FACILITIES

11.1 Work-Shop

Work-Shop consists of 3 sections and described below

Field Work-Shop for carrying daily routine check up and Oiling/ greasing of HEMM like RD 35T/50T/85T, Dozer, Shovel etc.

Excavation Work-Shop- For Scheduled maintenance, including minor and major repairs of HEMM like RD 35T/50t/85T, Dozer and, Shovel, Surface minor etc.

Electrical & Mechanical Work-Shop – Daily Scheduled maintenance, minor & major repair of Feeder Breaker, pumps, Power distribution system etc

Repair & Maintenance of light vehicles – Scheduled major repair and capital overhauls, besides breakdown repairs will be undertaken.

11.2 Electric Power Supply. Electric Power Line of Jharkhand State Electricity board is available in Latehar district HQ. It is proposed to extended power line to Tubed Block Mine from which required power can be drawn for operating the mine.

113.3 Water Supply. In the initial years of mine life the water supply for industrial use as well as domestic water is proposed to be drawn from ground water sources. Afterwards, mine water, will be treated and used for all industrial & miscellaneous needs. For drinking water, ground water would be pumped, treated & used.

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CHAPTER - 12

12.0 EMPLOYMENT POTENTIAL.

12.1 Management of Activities

The Statutory, legal, supervisory and managerial jobs will be fully under the coal company. Operational jobs like O.B.R, coal removal, dispatches of coal shall be outsourced. Services like security, Town engineering, maintenance of ancillaries etc would also be outsourced. Most of the workshop facilities will be developed to be used by outsourced agencies.

12.2 Man Power Needs.

The statutory, supervisory and managerial manpower would be about 400 in number. Most of these are technical jobs to be undertaken by competent persons having statutory certificates/licenses.

12.3 The Skilled Operational and Maintenance.

Manpower for the Mine operation and workshop activities would be mostly outsourced. This is the area of major employment where jobs would be outsourced. Some other maintenance jobs would also be outsourced on contract basis.

12.4 The services sector comprising Town engineering, maintenance & security services where good no. of workforce are required would also be outsourced.

12.5 Secondary Employment

Besides the primary employment potential described above, there is scope of secondary employment because the area as a whole starts developing as and when construction work of mine starts. Large member of workers are engaged under contractors to complete the civil construction & Mine development jobs e.g. industrial & residential buildings, nalla diversion and other development jobs. Lot of works of supporting nature continues to be carried out during life of the mine thus generating secondary employment.

12.6 Tertiary Employment

Services sector in an industrial area like transport, Communication, artisans job, shops and establishments, education etc get a boom with increase in population of the workforce. They create situation for employment in these fields.

All above would create an economic well being of the people in the area.

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CHAPTER – 13

13.0 ENVIRONMENT MANAGEMENT PLAN

The environment of any area gets affected due to industrial activities. Mining has its own associated impact e.g land form changes, impacts on ground water and resettlement of displaced people. The following are major ingredients of environment needing attention:

(i) Land Environment including waste generation.

(ii) Water Environment.

(iii) Air Environment.

(iv) Loss of flora & displacement of fauna.

(v) Displacement of people.

13.1 Land Environment

13.1.1 Pre-Mining Land use of Proposed lease Area

The proposed leasehold area of the mine is 460Ha. The break up of the pre-mining land within leasehold is given below:

Forest land –	155.03Ha
House Hold	1.16 Ha
Agriculture land -	230.91 Ha
Waste Land-	41.59 Ha
Nala-	25.90 Ha
Road-	5.41 Ha
Total -	460.00 Ha

13.1.2 Proposed Mining Land Use.

Broad break-up of the land required for various purposes within the proposed lease hold area is given below:-

(I).Quarry - 350 ha

(II).Ext Dump - 63 ha

(III).Mine Infrastructure – 11.32ha

(IV).Nalla Diversion, peripheral road & safety distance - 35.68ha

Total - 460ha

13.1.3 Post Mining Land Use

The post mining land use envisaged for Tubed Coal Block is as follows:

(in hectares)

		Total area	To be afforested	Road	Nala Water body	Infrastructure
i)	Quarry area	350	339.00	7.00*	4.00 (water body)	---
ii)	External dump	63	63.00	---	---	---
iii)	Mine infrastructure and services	11.32	9.820	---	---	1.50*
iv)	Safety zone, barrier (Nala and road diversion)	35.68	19.180	2.50**	14.00 (nala)	---
	Total :	460	431	9.50	18.00	1.50

* For maintenance of afforested area

** For public transport.

13.1.4 Waste Generation & Disposal –

During mining operation, a total of 280Mm^3 of overburden is estimated to be generated. In first few years of mining operation, a total of 40 Mm^3 of O.B. will be stored in external dump located on North & East side of the quarry. During rest of the mine, O.B will be dumped into decoaled pit to facilitate reclamation. A total of 200Mm^3 of O.B. would be backfilled.

13.2 Water Environment:

13.2.1 Surface Water

The lease area is traversed by seasonal nallas, running from East to West. The Sukri river enters the block from South side, then runs from South in north direction in western part of the block. After traversing half of the block it turns westward & leaves the block.

All these water courses would be diverted along the boundary of the block. As water flow from upland beyond the lease area will all be diverted to Sukri river, diversion or river diversion would not affect any down stream users.

13.2.2 Ground Water

The ground water in the area will be affected by open pit mining. However, Jharkhand is a safe zone for ground water resource and Tubed coal mine will be an isolated mine, the effect would not be perceptible.

13.2.3 Waste water Generation & its Management -

(A) Mine Water –

In course of mining, waste water will be collected in the sump constructed in the dip most area. Source of mine water will be rain water and ground water seepage. The pumped out water will be led into a sedimentation Pond for proper treatment before it is used for industrial purposes or discharged into natural drains.

(B) Workshop Effluent -

Waste water will be generated in the workshop where the Dumper & other mining equipment will be washed regularly. It is proposed to provide an Effluent Treatment Plant for treatment of effluent from workshop. Treated water will be recycled for washing in the workshop. This will reduce fresh water requirement.

(C) Domestic Effluent –

Sewage & salvage water will be generated in township. A sewage Treatment plant will be provided for treatment of sewage water. Treated sewage will be recycled for horticultural use. This will also reduce fresh water requirement for the project.

13.3 Air Environment –

13.3.1 Source of Dust & Gases –

Mining & other allied activities will generate dust i.e. suspended Particulate Matter (SPM) & Respirable Particulate matters (RPM) as air pollutant. Beside dust, gases like SO_2 & NO_x are generated due to use of vehicles and blasting in the mines. The transportation of waste and coal along the roads cause the generation as well as transmission of dust in to atmosphere. All these would pollute the air environment.

13.3.2 Suggested Measures for dust Control

The follow remedial measures would be taken:

(I) Wet drilling in O.B & Coal would be practiced.

(ii) Arrangement of fixed sprinklers on permanent transportation & haul road.

(iii) Arrangement of mobile sprinklers on shifting & changing roads which are not permanent.

(iv) Enclosures, dust suppressing jets and covered conveyers in coal handling area.

(v) Maintenance of good surface haul roads.

(vi) Rows of trees will be planted as green barrier along transport roads, outside quarry area, infrastructural area etc.

(vii) Green belt & block plantation in the vacant areas & residential colony.

13.4 Bio- Environment –

The buffer zone and area around the mine have forests and green cover. Some forest area is being affected within the block boundary.

To minimize the adverse effects of forest cover loss, the total area covered by internal & external O.B. dumps will be densely vegetated with native species of flora. This will help to bring the fauna back to the area once the vegetation grow and sustain.

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13.5 Displacement of People –

As displacement of people is unavoidable due to mining operation, persons from villages falling inside the proposed leasehold area (about 200 families) are likely to be relocated. The proponent of the project has decided that all coal bearing area within the allocated block shall be opencasted and as such actions to relocate the affected families shall be taken up on priority. A suitable resettlement colony, as agreeable to the displaced persons shall be developed with all basic facilities. They shall also be given priority in the employment generated.

13.6 Resettlement & Rehabilitation Plan-

The project would acquire tenancy land which will lead to 157 families loosing land & 160 families loosing house. Thus a total of ~~all~~ 200 families would be affected requiring resettlement & rehabilitation .

The project would draw a R & R plan strictly in line with provisions of R & R policy framed & notified by Govt. of Jharkhand.

Salient features of the policy is given below:-

Salient Features of R & R Policy As Approved By Jharkhand State Govt.

1) All affected families owning house and whose house has been acquired or lost will be allotted free of cost a piece of land of the area to the extent of actual loss of area of the acquired house, but not more than 10 decimal of land for each nuclear family.

2) A pucca house having at least two bed rooms, one drawing room, one kitchen & one toilet of total carpet area equal to one hundred square meter will be given to each affected family. The affected family is entitled to get Rs 3 lakhs in lieu of a pucca house.

3) For all other families, a house of minimum 55 square meter area will be provided. or Rs 2 lakhs in lieu of that.

4) Each affected family who are to be displaced & are having own cattle, are entitled for an ad-hoc onetime grant of Rs 35,000 for construction of cattle shed.

5) Each affected family who are to be displaced are entitled to receive one time grant of Rs 15,000 for movement of house goods.

6) Each affected family who own a shop in the lease area & get displaced, is entitled to receive an amount of Rs 50,000 as one time grant.

7) Each affected family who lose their land, are entitled to get employment for one eligible person in the family.

8) The project proponent would arrange for technical training for members of project affected families to enable them in getting employment or for self employment.

9) The project proponent would give preference to affected persons or their Co-operative in award of petty contracts, shops & other economic opportunities arising out of the project.

10) The project proponent would give preference to landless persons or unemployed affected persons in semi- skilled or un-skilled jobs in the company.

11) The project proponent would, every year distribute 1% of their net profit to the project affected families as per guidelines given by the state Govt.

Based on above policy a detailed R & R action plan (RAP) would be prepared. The details cover shifting of all the houses from the lease area. It shall be ensured that coal extraction in the proposed quarry area is done by shifting all the habitants living in the quarry area.

(Recom...

CHAPTER - 14

14.0 MINE CLOSURE PLAN

14.1 INTRODUCTION

A conceptual mine closure planning needs to be done before the commencement of mine operation and requires periodic reviewing and modification during the mine's life cycle to ensure safety and to cope up with social & environmental challenges. Various objectives of the mine closure planning are as follows:

a) To allow such productive and sustainable after-use of the site that is acceptable to regulatory authorities besides the local community.
b) To protect public health and safety
c) To minimise adverse environmental impacts after completion of mining i.e. in Post project period.
d) To protect & rehabilitate the flora and fauna of the area

Various stake holders affected due to mine closure need to be identified and the suggested ones could be:

The Company	:	Employees, Management and owners.
The Community	:	Local business and service providers, landholders, neighbours and NGOs and community groups.
The State	:	The state Government, Central Government and other Government agencies.

वी. एस. राणा/V. S. RANA
अवर सचिव/UNDER SECRETARY
कोयला मंत्रालय/MINISTRY OF COAL
भारत सरकार/GOVT. OF INDIA
नई दिल्ली/NEW DELHI

There is need of regular consultation between these agencies to evolve the role of the agencies and their involvement in the process.

14.1.1 Following steps have to be undertaken in relation to Mine Closure Planning:

(a) A detailed study shall be taken up to assess the impact on Flora & Fauna due to mining activity.

(b) In order to identify potential impacts, necessary hydro geological studies during post-mining phase, groundwater recharge etc. shall be carried out.

(c) As a detailed component of the Closure Plan, a Decommissioning Plan is to be developed towards the final stages preferably 5 years prior to tentative closure of mine. Once established, it may be updated annually.

14.1.2 Reasons for Closure & Statutory Obligations

Closure

The mine is proposed to be closed on account of exhaustion of recoverable coal reserves in lease hold area. The mine may be closed on account of others unforeseen reasons i.e. Force Majeure or under receipt of directives from statutory organizations or court etc. In these cases, information and notice would have to be served to concerned Govt. authorities and departments as per law of the land

Statutory Obligations

There is need to define the liabilities, responsibilities and authorities of the different agencies like the mine management, other regulatory bodies, Central and State Governments for a post mine closure phase. Some obligations pertaining to the Mine owners.

1. Health & safety – Regulations of Coal Mines Regulations, 1957 and its related DGMS Circulars regarding actions on & after closure.

2. Environment (Protection) Act, 1986 and Environment protection Rules regarding mine closure plans.

3. Forest – Forest (Conservation) Act, 1980 – State & Central Govt.

4. Decommissioning/asset disposal, etc. - Environment (Protection) Act, 1986 including environmental clearance conditions.

14.1.3 Closure Plan Preparation

Progressive closure planning is a life-time mine exercise that begins with the commencement of mining operations and continues till post closure. The dynamic nature of closure planning requires regular and critical review to reflect changing circumstances as a result of any operational change, new regulation, new technology and must remain flexible enough, to cope with unexpected events. Mine Closure plan has been prepared accordingly.

वी. एस. राणा/V. S. RANA
अवर सचिव/UNDER SECRETARY
कोयला मंत्रालय/MINISTRY OF COAL
भारत सरकार/GOVT. OF INDIA
नई दिल्ली/NEW DELHI

(Recognised Quarry Manager)

14.2 CLOSURE PLAN

The plan has covered under following four disciplines:

1. Technical & Safety
2. Environmental
3. Social
4. Financial

14.2.1 Technical & Safety

(i) There shall be pucca boundary around the quarry to prevent inadvertent entry into the mine.

(ii) Single entry through a closed/controlled gate shall be ensured.

(iii) Approach road to water body and vegetated internal dump area to be developed for future use as reservoir and vegetated external dump areas. The control of access to these places shall be with the local gram sabha or gram panchayat or nagar panchayat after due transfer of rights by the owner.

(iv) Overall Batter and pit slopes shall be within studied safe angles to avert any slope failures.

(v) The internal dump areas sterilized, after exhaustion of mine, shall be fully vegetated, maintained for 3/4 years for its self sustenance.

(vi) The infrastructural set up e.g. workshop, sub-station, store, CHP, mine water treatment plant shall be gainfully deployed or if, to be abandoned, shall be completely decommissioned for reclaiming land areas covered by them.

(vii) All permanent buildings e.g office, canteen, dispensary, other service buildings shall be put to community uses to the extent possible. These shall be handed over to local civic or elected bodies.

(viii) All civic facilities e.g. lighting, community buildings, drinking water, school, dispensary etc. shall be handed over to local/state authorities for its maintenance & optimum uses.

14.2.2 **Environmental**

(i) Water harvesting system shall be made almost self sustaining for future uses.

(ii) Water reservoir in the mine, developed in decoaled area shall be kept under close monitoring for assessment of its water quality for its future uses. In the initial 3yrs the mine owners shall ensure this monitoring.

(iii) The vegetated land areas shall be handed over to village core group for managing its integrity and putting the same to sustainable uses

(iv) All land released from infrastructural decommissioning areas shall be reclaimed for most productive land uses.

(v) Total waste dumps shall be reclaimed within 3 years of mine closure. No top soil dumps will be left over.

(vi) The toe wall side of external dump shall be strengthened so as to contain any sediments from entering land areas/water courses.

14.2.3 **Social**

(i) Detailed socio-economic studies for affected land owners shall be done. Other dependent people shall also be included.

(ii) Compensation for land shall be mutually settled with land owners, in association with state officials, if association is required.

(iii) Community development programmes for neighborhood villages shall be taken up.

(iv) Boost to employment, education and communication shall be given.

(v) Self help groups shall be simulated to come up for general up lift of the area for future sustenance. Seed money shall be provided from the closure fund.

14.2.4 Financial

Abandonment cost will be estimated for various activities sited above under item 14.2.1, 14.2.2, & 14.2.3. The detailed estimation will be prepared 5 years prior to likely closure.

Financial Assurance

The rule 23 F(2) of Mineral Conservation & Development Rules (Amended-2003), provides for submission of financial assurance by the Project proponents to the competent authority before execution of a new mining lease. A financial provision of say Rs. 5.00 (Five) per tonne of coal produced is to be kept for managing the mine closure activities.

The financial provision may be increased after review in light of changing statutory provisions and/or changing circumstances in the mining area/system requirement.

वी. एस. राणा/V. S. RANA
अवर सचिव/UNDER SECRETARY
कोयला मंत्रालय/MINISTRY OF COAL
भारत सरकार/GOVT. OF INDIA
नई दिल्ली/NEW DELHI

CHAPTER – 15

15.0 CERTIFICATE BY RQP

15.1 Mining Plan of Tubed OCP Block has been prepared based on Geological Report on Tubed block, Auranga Coalfield, Dist.-Latehar (Jharkhand) prepared by MECL.

15.2 The provisions of Mineral Concession (amendment) Rules, 2002 and the provisions of Mines Act, Rules and Regulations there under, have been observed in the Mining Plan of Tubed OCP Block of Auranga Coalfields, Dist. Latehar, Jharkhand.

15.3 Wherever specific permissions are required, the applicant will approach the concerned authorities and MOC for granting permission.

15.4 The mining leasehold boundary does not infringe upon any adjacent coal block or coal bearing area.

15.5 The external OB dumps or any infrastructures/ancillary utilities are not sited on or within area of any other coal block.

15.6 Certified that the Plan is correct to the best of my knowledge and belief.

वी. एस. राना
अवर सचिव/UNDER SECRETARY
कोयला मंत्रालय/MINISTRY OF COAL
भारत सरकार/GOVT. OF INDIA
नई दिल्ली/NEW DELHI

(Recognition No.-34011/(17)2004-CPAM)

Shri V.K. Singh

Recognition No.-34011/(17)2004-CPAM

Dt:- 03.11.2004

CERTIFICATE

Certificate Regarding Block Boundary

This is to certify that the block boundary adopted in this mining plan is based on the Block Boundary delineated in the Geological Report as per para 1.06.01 page No -2 of G.R. This has been explained at item 3.3 on page 4-5 of this Mining Plan.

वी. एस. राणा/V. S. RANA
अवर सचिव/UNDER SECRETARY
कोयला मंत्रालय/MINISTRY OF COAL
भारत सरकार/GOVT. OF INDIA
नई दिल्ली/NEW DELHI

Shri V. K. Singh

Recognition No.-34011/(17)2004-CPAM

Dt:- 03.11.2004

TCML

Tubed Coal Mines Limited

(A Joint Venture of Hindalco Industries Limited & The Tata Power Company)

Regd. Office: Century Bhawan, 3rd Floor Worli, Mumbai - 400 025
Tel. 022-6662666, Fax. 022-24227586

A. CERTIFICATE

Certified that the mining plan of Tubed Coal Mine of M/s Tubed C... Mines Limited (TCML), Has been prepared under the guidance of S... V.K. Singh RQP No. 34011/(17)2004-CPAM dated 03-11-2004 in full knowledge and by consent of the Tubed Coal Mines Limited (TCML) of which I am the Vice President / CEO. All provisions made in the report are accepted by us.

To the best of our knowledge, provisions of the Coal Mines Act, Rules, Regulations & Circulars made there under Have been taken into consideration while making the mining plan.

P...   Signature

D...   Name with Designation: ... NARAYANA ...

Organization: Tubed Coal Mines Limited (TCML)

Address: 103, Commerce Tower,
Near Mahabir Tower, Main Road,
RANCHI -834001

वी. एस. राणा / V. S. RANA
अवर सचिव / UNDER SECRETARY
कोयला मंत्रालय / MINISTRY OF COAL
भारत सरकार / GOVT. OF INDIA
नई दिल्ली/NEW DELHI

... Off... 103, Commerce Tower, Near Mahabir Tower, Main Road, Ranchi (Jharkhand) Pin 834001
Phone: 0651-2330944/45 Fax: 0651-2330782

No. 38011/11/2006 CA I
Government of India
Ministry of Coal

Annexure – I

New Delhi, dated the 13th August, 2007

To

1. M/s. HINDALCO Industries Ltd.,
UCO Bank Building,
4th Floor, Parliament Street,
New Delhi – 110 001.

2. M/s. TATA Power Company Ltd.,
Jeevan Bharati, 10th Floor,
Tower No.1,
124, Connaught Circus,
New Delhi – 11 001.

Subject : Allocation of Tubed coal block in the State of Jharkhand for captive mining of coal by a joint venture company of M/s. HINDALCO Industries Ltd. and M/s. TATA Power Company Ltd. as per Option-I.

Sir

I am directed to refer to your request for allocation of coal blocks in the State of Jharkhand and to state that the request of the companies have been considered by the Central Government and it has been decided to allot Tubed coal block in CCL command area for working through a joint venture company for meeting their proportionate share of requirement of coal i.e. 72.21 MT for 750 MW in District Latehar, Jharkhand to be set up by HINDALCO and 47.79 MT for 500 MW in District West Singhbhum, Jharkhand to be set up by TATA Power. This allocation is in pursuance of the provisions contained in Section 3(3)(a)(iii) of the Coal Mines (Nationalization) Act, 1973 and subject to the following conditions :-

i) A joint venture company be formed between M/s HINDALCO Industries Ltd. and M/s TATA Power Company Ltd. The equity holding in the joint venture company will be in proportion to the assessed coal requirement of the companies.

ii) The joint venture company shall be formed and registered by the allocatees within 60 days from the date of allocation of this letter.

iii) The mining lease shall be obtained in the name of the Joint Venture Company and coal extracted from the mine shall be distributed among the allocatees in the proportion of their assessed requirement.

S. RAMA
अवर सचिव / UNDER SECRETARY
कोयला मंत्रालय / MINISTRY OF COAL
भारत सरकार / GOVT. OF INDIA
नई दिल्ली / NEW DELHI

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(v) The block is meant for captive use in their own specified end use projects i.e. 750 MW in District Latehar, Jharkhand to be set up by HINDALCO and 500 MW in District West Singhbhum, Jharkhand to be set up by TATA Power. The coal produced from the block shall not replace any coal linkages given to you by the Coal India Ltd. / its subsidiary and/or by the Singareni Collieries Company Ltd., without prior permission of this Ministry.

(vi) Middlings generated in the process of washing the coal shall be used for power generation in their own power plant i.e., the useable middlings/rejects generated during beneficiation shall be used captively by the allocatee. The modalities of disposal of surplus coal/middlings/rejects, if any, would be as per the prevailing policy/instruction of the government at the relevant point in time and could also include handing over such surplus coal/middling/rejects to the local CIL subsidiary or to any person designated by it at a transfer price to be determined by the Government.

(vii) Coal production from the captive block shall commence within 36 months (42 months in case the area is in forest land) in case of open cast mine and in 48 months (54 months in case the area falls under forest land) in case of underground mine from the date of this letter. The end-use project schedule and the coal mine development schedule should be modified accordingly and submitted to the Ministry within 3 months from the date of this letter. A copy of the indicative milestone chart is enclosed.

(viii) The joint venture company shall buy geological report from CMPDIL within six weeks from the date of this letter.

(ix) The joint venture company shall submit a bank guarantee for Rs. 28.4 crore (equal to one year's royalty amount based on mine capacity of 4 mtpa assessed by CMPDIL, grades of coal from E to G grade and the average royalty @ Rs. 71 per tonne) within three months from the date of this letter. Subsequently, upon approval of the mining plan, the Bank Guarantee amount will be modified based on the final peak/ rated capacity of the mine.

(x) The joint venture company shall submit a mining plan for approval by the competent authority under the Central Government within six months from the date of this letter.

(xi) The progress of the mine will be monitored annually with respect to the approved mining plan, which will mention the zero date. In case of any lag in the production of coal, a percentage of the bank guarantee amount will be deducted for the year. This percentage will be equal to the percentage of deficit in production for the year with respect to the rated/peak capacity of the mine, e.g., if rated/peak capacity is 100, production as per the approved mining plan for the relevant year is 50 and actual production is 35, then (50-35)/100x100 = 15% will lead to deduction of 15% of the original bank guarantee amount for that year. Upon exhaustion of the Bank Guarantee amount the block shall be liable for de-allocation/cancellation of mining lease. The Joint Venture Company shall ensure that the Bank Guarantee remains valid at all times till the mine reaches its rated capacity or till the Bank Guarantee is exhausted.

भारत सरकार / GOVT. OF INDIA
नई दिल्ली/NEW DELHI

xi) No coal shall be sold, delivered, transferred or disposed of except for the stated captive mining purposes, and except with the previous approval of the Central Government.

xii) Mining of coal from the allocated captive coal block shall be carried out in accordance with the applicable Statutes/Rules/Orders/Directions governing the mining of coal in the country.

xiii) Those of the above conditions relevant at the time of grant of mining lease shall be included as additional conditions in the mining lease in addition to any further conditions imposed by or agreed to by the Central Government.

xiv) The State Government at the time of seeking previous approval for the grant of mining lease shall submit a draft of the mining lease containing the above relevant conditions for vetting by the Central Government. The final mining lease shall be as vetted/modified by the Central Government. Any deviation from the vetted/modified draft shall render the mining lease deed *ab-initio* null and void and without effect

2. Allocation / mining lease of the coal block may be cancelled, inter-alia, on the following grounds :-

a. Unsatisfactory progress of implementation of their end use power plant.
b. Unsatisfactory progress in the development of coal mining project.
c. For breach of any of the conditions of allocation mentioned above.

The de-allocation/cancellation of mining lease shall be without any liability to the Government or its agencies, whatsoever. Any expenses incurred by the allocatee or any right or liability arising on the allocattee out of the measures taken by him shall solely be to his account and in no way be transferred to or borne by the Government or its agencies.

3. The Joint Venture Company may approach CMPDIL for the geological report and contact the State Government authorities concerned for the necessary permissions/clearances etc. for attaining mining rights and related matters. The arrangement of transport of coal will have to be worked out by the company in consultation with the Ministry of Railways / the Ministry of Surface Transport depending on the mode of transport.

Yours faithfully,

(K C Sarma)
Deputy Secretary

Encls. As above.

वी. एस. राणा/V. S. RANA
अवर सचिव/UNDER SECRETARY
कोयला मंत्रालय/MINISTRY OF COAL
भारत सरकार/GOVT. OF INDIA
नई दिल्ली/NEW DELHI

No.38011/11/2006-CA-I
Government of India
Ministry of Coal

Annexure – II

New Delhi, the 26th September, 2007

To

1. M/s HINDALCO Industries ltd.,
UCO Bank Building,
4th Floor, Parliament Street,
New Delhi 110 001

2. M/s TATA Power Company Ltd.,
Jeevan Bharati, 10th Floor,
Tower, No.1,
124, Connaught Circus,
New Delhi 110 001.

Subject: Allocation of Tubed coal block in the State of Jharkhand for captive mining of coal by a joint venture company of M/s HINDALCO Industries Ltd. and M/s TATA Power Company Ltd as per Option - 1.

Sir,

I am directed to refer to this Ministry's letter of even number dated 1st August, 2007 on the above subject vide which Tubed coal blocks has been allocated jointly to M/s HINDALCO Industries Ltd. and M/s TATA Power Company Ltd. and to say that keeping in view the pending a case in the High Court of Kolkatta filed by M/s Bengal Sponge Manufacturer Mining Pvt Ltd, you are requested to hold up all further activities till such time a direction is received from the Hon'ble Court.

Yours faithfully,

(V.S. Rana)
Under Secretary to the Government of India

A - IV

Annexure – III

[illegible] [illegible] NEW DELHI [illegible]

No. 38011/1/2006-CA-I
Government of India
Ministry of Coal

New Delhi, dated the [illegible] September, 2008

To

1. M/s. Hindalco Industries Ltd.,
UCO Bank Building,
4th Floor, Parliament Street,
New Delhi-1.

2. M/s. TATA Power Company Ltd.,
Jeevan Bharati 10th Floor,
Tower NO.1,
124, Connaught Circus,
New Delhi-1

Sub: Allocation of Tubed coal block in the State of Jharkhand to M/s. Hindalco Industries Ltd. and M/s. TATA Power Company Ltd. as per option [illegible]

Sir,

I am directed to refer to this Ministry allocation letter of even number dated 1st August, 2007 and subsequent letter of even number of this Ministry dated 26th September/1st October, 2007 on the above subject and to say that consequent upon the High Court of Calcutta order dated 22nd August, 2008 passed in [illegible] 169 of 2006 filed by M/S Bengal Sponge Manufacturers Mining Private Limited [illegible] & ors. the contempt petition has since been disposed of without any costs.

In view of above the joint allocattees of Tubed coal block may proceed [illegible] on development of coal block. The achievement of the milestones for developing the coal block would not be calculated for the period [illegible] due to the court [illegible] from 1st October, 2007 [illegible] September [illegible].

[illegible]
[illegible] Secretary to the Govt. of India

A - [illegible]

Annexure – IV

प्रारुप 1

पंजीकरण प्रमाण-पत्र

[illegible] U10100MH2007PLC174466 2007 - 2008

[illegible]

TUBED COAL MINES LIMITED

[illegible] 1956 (1956 [illegible]

[illegible]

Form 1

Certificate of Incorporation

Corporate Identity Number : U10100MH2007PLC174466 2007 - 2008

I hereby certify that TUBED COAL MINES LIMITED is this day incorporated under the Companies Act, 1956 (No. 1 of 1956) and that the company is limited.

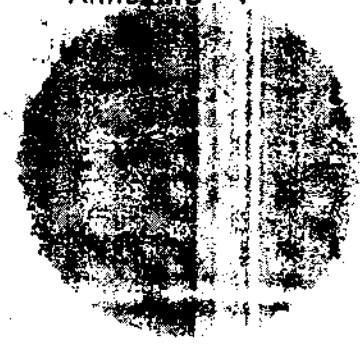
Given under my hand at Mumbai this Twenty Fifth day of September Two Thousand [illegible]

[illegible]

[illegible]

A - VI

Annexure – V



₹ 100

वी. एस. राणा/V. S. RANA
अवर सचिव/UNDER SECRETARY
कोयला मंत्रालय/MINISTRY OF COAL
भारत सरकार/GOVT. OF INDIA
नई दिल्ली/NEW DELHI

7. To make [illegible] ments on behalf of the Company of any costs, charges or [illegible] [illegible] rson or authorities

8. [illegible] communications with all governmental authorities in [illegible] with the above

9. To enter [illegible] or upon the land of Mines or any structures related to the Mines [illegible] th the view to inspect into its defects and take necessary actions [illegible] red to eradicate the defects

10. To commence and defend the Company before any person or authority [illegible] administrative, judicial, executive police or other authority, and to [illegible] de such applications, petition, undertakings, declaration, [illegible] [illegible] tters and other documents of whatever natures for or in connectio[illegible] with or pursuant to the said Mines / Company

11. To comm[illegible] and defend the Company in any suit, action or other proceedin[illegible] in any court or justice and before the public officer of the [illegible] the recovery or the enforcement of any debt or any sum of money [illegible] is due to the Company

IN WITNE[illegible] [illegible]EREOF the Common Seal of the Company has been affixed this [illegible] day of [illegible] 2008

TUBED COAL MINES LIMITED

RENGAIYENGAR RAM **RAHUL SHAH**

ACCEPTED BY

LAKSHMI NARAYANA

वी. एस. राणा/V. S. RANA
अवर सचिव/UNDER SECRETARY
कोयला मंत्रालय MINISTRY OF COAL
भारत सरकार GOVT. OF INDIA
नई दिल्ली NEW DELHI

BEFORE ME

D. R. SAWANT
M.COM.LLB
ADVOCATE HIGH COURT
NOTARY GOVT. OF INDIA
27 OCT 2008

A -VIII

सीएमपीडीआई
आईएसओ 9001 कम्पनी
CMPDI
ISO 9001 Company

सेन्ट्रल माइन प्लानिंग एण्ड डिजाइन इन्स्टीच्यूट लिमिटेड
Central Mine Planning & Design Institute Limited

No. DG/693(A)/ 2043

Dt. 16-10-2007

To
Sri R.K.Kasliwal
Tubed Coal Mines Ltd.
Century Bhavan
3rd. Floor
Worli
Mumbai-400025

Annexure – VI

Sub : **Geological Report of Tubed Coal Block**
Ref.: 1. Your letter no. nil dt. 10-10-2007
2. Your letter no. nil dt. 15-10-2007

Dear sir,

One original copy of Geological Report of Tubed Captive Coal Block consisting of Text, Annexure & Plates is being handed over to your authorized representative for your exclusive use. Kindly note that this report should neither be reproduced in any form nor it should be given to any body for use.

The money receipt against interim cost of exploration of Rs 1,48,8[illegible] deposited by you by DD / Cheque no 180151, dt 10-10-2007 (IDBI Bank) may be collected from this office later on, as it has been deposited to-day only.

Thanking you,

Yours faithfully,

Encl As Above

[illegible]

[illegible]

A - IX

PDI

Company

Central Mine Planning & Design Institute Limited
Gondwana Place Kanke Road Ranchi 834008(Jharkhand)

No: RDC/033 4: 5 6 9?

Annexure – VII

Date 15.12.2008

To

Shri Lakshmi Narayana

Coal Mines Ltd
Commerce Tower
Mahabir Tower
Road
Ranchi 834 001

Sub: **For authentication of Map showing Tubed Coal Block Boundary.**

Dear

...y refer to your letter No TCML/letter/08/14 dated 12.12.2008 on the above

...Tubed Block duly authenticating the Block boundary is enclosed for ...at your end.

...already communicated vide our letter No CMPDI/OC/033 ... /833 841 dated ... you are required to deposit an amount of Rs 3,25,205.00 against balance ... by Demand Draft on CMPDI Ltd payable at Ranchi.

Yours faithfully,

(A.K. Wahi)
CHIEF GENERAL MANAGER

Date ... (Authorised Person)

वी. एस. राणा/V. S. RANA
अवर सचिव/UNDER SECRETARY
कोयला मंत्रालय/MINISTRY OF COAL
भारत सरकार/GOVT. OF INDIA
नई दिल्ली/NEW DELHI

A - X

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Annexure – VIII

By Registered Post

Government of India
Ministry of Coal & Mines
Department of Coal

To

New Delhi, the 1st November, 2004.

Shri V. K. ...

Subject : Grant of recognition to Shri V. K. Singh as competent person to prepare Mining Plan.

Sir,

... mentioned subject and to convey approval of the Central Govt. to grant of recognition under Rule 22 of Mineral Concession Rule, 1960 to Shri V. K. Singh as competent person to prepare Mining Plan for coal and lignite for any coal block up to 10 years from the date of issue of this letter.

Yours faithfully,

बी. एस. राणा / B. S. RANA
अवर सचिव
भारत सरकार
नई दिल्ली

A - M

No.34011/(28)/2009-CPAM
Government of India
Ministry of Coal

New Delhi, the 4th June, 2009

Annexure – IX

To

...ri Lakshmi Narayana
...& CEO,
...s Tubed Coal Mines Limited.
...entury Bhawan, 3rd Floor Worli,
...mbai-400 025. (FAX NO.022 24227586)

...ubject : Presentation of Mining Plan (February 2009) for Tubed Coal Block, Auranga Coalfield, Jharkhand submitted by M/s Tubed Coal Mines Limited.

Sir,

...m directed to inform that the Mining Plan presentation to the Technical Mem... of the Standing Committee constituted under MMDR Act, 1957 of the abo... ...ntioned project was held on 26-05-2009 at Ministry of Coal, Shastri Bha... New Delhi

...he following suggestions were made:

i. ...sons for delay in submission of mining plan should be furnished.

ii. ...ummarized data of the project and an executive summary should be ...ished.

iii. ...company has been allotted 122.21 MT coal, whereas the available ...erves are more than this. The decision regarding additional coal needs to ...btained from the competent authority

iv. ...od of delineation of block boundary should be explained. RQP should ...ose a certificate that the block boundary adopted in the mining plan is in ...ormity with that provided by the CMPDIL

v. ...Jc as per 3.5 should be enclosed

vi. ...e low density of bore-holes the RQP explained that out of the 4.6 sq km ...block area only 3.5 sq km is coal bearing and the drilling has been ...entrated there. However area on southern side (beyond a fault) ...s further exploration. It was suggested that this exploration should be ...pleted within one year and the exploration programme for this area ...be incorporated in the mining plan together with a commitment that if ...nal drilling shows a change in the structure of the deposit compared to ...as been taken as the basis for preparation of the Mining Plan, the will ...sed & resubmitted

vii. ...er in which the geological and extractable reserves have been worked ...ould be detailed out

A - XII

viii. RQP stated that the figures of geological reserves as shown in the mining plan are the same as the gross geological reserves mentioned in the geological report. It was suggested that a certification to this effect by the RQP should be furnished.

ix. Besides considering mining losses of 3.2 MT, additional about 19 MT have been deducted from the geological reserves to arrive at mineable reserves. This is not in line with the standard practice and needs clarification.

x. Different figures (130.25 MT and 139.65 MT) have been indicated for extractable reserves. The RQP explained that about 9.5 MT is being proposed to be extracted by highwall mining. It was suggested that the figures should be reconciled to indicate the total extractable reserves by all methods.

xi. External OB dumping has been proposed to be carried out even towards the end of quarry life. This needs to be avoided.

xii. It was observed that the negative proving has not been done on the proposed site for external dumping. It was suggested that the same should be carried out an dump/infrastructure should be planned only after the negative roving of the site.

xiii. R & R issues needs to be adequately covered in the mining plan

xiv. Post mining land use plan needs to be furnished

It is requested that Mining Plan incorporating above suggestions should be submitted to this Ministry in quadruplicate duly signed by RQP.

Yours faithfully

[illegible]

Section Officer (CPAM)
Tele: 011 23386[illegible]
Fax: 011 23387[illegible]

A-XIII

Tubed Coal Mines Limited

(A Joint Venture of Hindalco Industries Limited & The Tata Power Company Limited)

Regd. Office. Century Bhawan, 3rd Floor Worli, Mumbai - 400 025
Tel 022-6662666, Fax: 022-24227586

Dt. 22.06.09

To,
The ... n Officer (CPAM)
Mi... of Coal,
Go... ndia,
Ne... i.

Annexure – X

Sub: Reference your letter no.34011/(28)/2009-CPAM dt.4th June,2009.

De...

...losed please find herewith our submissions to the various observations made by the ... Committee members vide the aforesaid subjected letter. We are also submitting in ... cate duly signed by the RQP, the mining plan incorporating the changes in the light of ... aid observations. Hope you will find it in order.

वी. एस. राणा/V. S. RANA
अवर सचिव/UNDER SECRETARY
कोयला मंत्रालय/MINISTRY OF COAL
भारत सरकार/GOVT. OF INDIA
नई दिल्ली/NEW DELHI

Fai...

(La... Narayana)

...d Mines Limited.

...servation wise submissions
...ning Plan in quadruplicate

A - XIV

Corporate ... Bypass Road ... 0651-224-342