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BHARAT COKING COAL LIMITED

**MINING PLAN
AND
MINE CLOSURE PLAN**

FOR

KUYA OC

(BASTACOLLA AREA)

MARCH - 2018

**CENTRAL MINE PLANNING & DESIGN INSTITUTE LTD.
REGIONAL INSTITUTE NO.-II
DHANBAD**

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LIST OF ANNEXURE

SL No.	Descriptions	Annexure No.
1	Ref No. BCCL/ GM (P&P) F-15/17/189 dated 27.12.2017	A1

List of Abbreviations used in the Report

BCCL	-	Bharat Coking Coal Limited
RF	-	Representative Factor
MECL	-	Mineral Exploration Corporation Limited
UVM	-	Unit Volatile Matter
UHV	-	Useful Heat Value
GCV	-	Gross Calorific Value
BH	-	Bore Hole
B&P	-	Bord and Pillar
SDL	-	Side Discharge Loader
DB	-	District Board
SOP	-	Standing on Pillar
OC	-	Open Cast
OB	-	Over Burden
HEMM	-	Heavy Earth Moving Machinery
CMR	-	Coal Mines Regulations
DGMS	-	Directorate General of Mines Safety
UG	-	Underground/Ungraded
GPM	-	Gallon Per Minute
HT/LT	-	High/Low Tension
HP	-	Horse Power
DVC	-	Damodar Valley Corporation
BOD	-	Biological Oxygen Demand
MCP	-	Mine Closure Plan
WM	-	Weathered Mantle

ANNEXURE-I

भारत कोकिंग कोल लिमिटेड
कोल इंडिया लिमिटेड की अनुषंगी इकाई
कोयला भवन, कोयला नगर धनबाद
धनबाद- 826005.

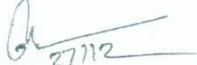
Ref : GM(P&P)/F-15/17/ 189

To, Date 27/12/17
The Regional Director,
RI-II, CMPDI , DHANBAD

Sub:1. Mining Plan with Mine closure Plan of Kuya OCP (Bastacolla Area)
2.Mining Plan with Mine closure Plan of Maheshpur Colliery (Govindpur Area)

Dear sir,

As discussed, preparation of mining plans with mine closure plans are required for the above said mines for placing before BCCL Board for approval . As such you are requested to place requirement of EDs for the subject jobs for getting approval of competent authority

Yours Faithfully

GM(P&P)

CC: D(T)PP for kind information
GM Bastacolla Area
GM Govindpur Area

GENERAL INFORMATION

1. Name of the Coal Block area (Acre/Hectare/Sq. Km.)
Kuya Colliery , 340.50 Ha as per the data supplied by the colliery authority.
2. Name of the Coalfield and its location i.e. District and State
Jharia Coalfield, Dhanbad distt. , Jharkhand
3. Name & Address of the Applicant : P.K.Dubey
General Manager,
Bastacolla Area, Bharat Coking Coal Limited,
Dhanbad.
4. Indication, if it is a Revised Mining Plan and if so, the Revision no. i.e. First Revision, Second Revision etc.

Not Applicable
5. Targetted capacity: 2.00 MTY + 30%
6. Date of preparation of Mining Plan- March 2018
7. Indication, if the Mining Plan is re-submitted after incorporation the suggestions of Standing Committee

Not Applicable

CHAPTER – I

INTRODUCTION

1.0 INTRODUCTION

Bharat Coking Coal Limited, a subsidiary of Coal India Limited, is a Central Public Sector undertaking, wholly owned by the Govt. of India, engaged for extraction of Coal in Jharkhand and West Bengal.

1.1 BACKGROUND OF MINING PLAN

Kuya colliery is under the administrative control of Bastacolla area. The mine is situated in Eastern part of Jharia Coal field. It is about 9 KM away from Dhanbad Railway Station and connected by Dhanbad Baliapur road.

Kuya colliery has been operating since early 1930s. Present Kuya group of mines are a result of amalgamation of a number of collieries operating at the time of nationalisation. Some of these collieries are Kuya and Khas Kuya, New Golakdih, North Golakdih, Goluckdih (J-150), Central Golukdih, East Kujama, Pure selected Golakdih and Pure Golakdih.

At present total leasehold boundary of Kuya Colliery is 340.50 Ha as per data supplied by colliery authority which includes 176 Ha of Kuya underground, 60 Ha of whole Golukdih colliery and 104.50 Ha land transferred from Ghanoodih.

Project Report for Goluckdih (Non Coking) Opencast (Recast) (1.20 Mty) was prepared by CMPDI in August 2003 and subsequently approved in 228th BCCL board meeting held on 28.08.2003. The area considered in the above project report comprises part of Goluckdih, Kuya and Ghanoodih collieries with a quarriable area of total 144 Ha.

Now BCCL vide letter no GM(P&P)/F-15/17/189 dated 27.12.2017 (Ref. Annexure-I) had requested CMPDI for preparation of Mining Plan with Mine Closure Plan of Kuya OC, Bastacolla Area. Accordingly Draft Mining Plan and Mine Closure Plan of Kuya OC was prepared by CMPDI on the basis of plans and data supplied by colliery authority at current scenario and circulated to BCCL

for comments. Comments regarding Draft Mining Plan and Mine closure Plan of Kuya OC has been received from BCCL. After compliance of the above comments this report has been finalized and is being submitted. Issues regarding planning of coal seams below III seam bottom and incorporation of remaining 11.17 Ha forest land in the mining plan were discussed with BCCL officials on 16.3.18. It has been decided that Opencast feasibility (both technical and economical) of the seams below III Bottom seam will be examined later and accordingly separate/revised mining plan will be prepared in future to extract these seams after getting requisite forest clearance permission/approval of remaining 11.17 Ha forest land from concerned ministry.

Present Mining Plan and Mine Closure Plan of Kuya OC is prepared within total leasehold boundary of 340.50 Ha with quarriable area of 182.88 Ha. The common quarriable area of Project Report for Goluckdih (Non Coking) Opencast (Recast) and Present Mining Plan and Mine Closure Plan of Kuya OC is around 117 Ha.

The Kuya Colliery had two working units (OC & UG) given as follows:

- ❖ Kuya UG was producing coal from I Seam by B&P method of mining by using SDL. As per decision of BCCL management the underground production has been stopped from 2016-17 and only pumping operation is going on presently.
- ❖ Kuya OCP, at present is producing coal from IV Top, IV Bot, III Top & III Bot seams by opencast method with III Bot. seam as base using shovel & dumper combination.

The coal production from 2012-13 to 2016-17 within the leasehold of Kuya Colliery is given below:

SI No.	Year	Coal Production (UG) in te.	Coal Production OCP in te.		Total Coal Production OCP in te.
			Departmental	Hired	
1	2012-13	52684	267904	1216668	1537256
2	2013-14	47914	279788	1465205	1792907
3	2014-15	32725	292720	2086580	2412025
4	2015-16	23741	289040	1826800	2139581
5	2016-17	4272	202060	1519400	1725732

Objective Of Mining Plan and Mine Closure Plan

This Mining Plan and Mine closure Plan of Kuya OC has been prepared for obtaining modification in environmental clearance due to enhanced production of Kuya Colliery which falls in Cluster VIII group of mines of BCCL.

Scope of the Mining Plan and Mine Closure Plan :

1. Exploitation of the seams by opencast method of mining is considered.
2. Seams from III Bottom Seam to IV top seam within the proposed quarry limit has been considered for exploitation.
3. The updated mine plan / data generated and supplied by colliery authorities have been considered for preparing this report. The surface plan of this report is mainly based on colliery plan and topo sheet of Survey of India.
4. An element of approximation exists in location and extent of mine workings when matched with borehole location plan. Surface features like quarries, Incline, roads etc. shown on the plan supplied by colliery do not well match with Survey of India Topo sheet available on 1:4000 RF.

1.2 SURFACE REORGANIZATION

1.2.1 LAND ACQUISITION:

Ownership wise distribution of land as furnished by Kuya Mine Authority is given below :

OWNERSHIP WISE DISTRIBUTION OF LAND

(Figures in Ha.)

PARTICULARS	AREA (in Hectare)
BCCL Land	141.65
Forest Land	117.19#
Govt. Land	35.06
Tenancy Land	46.60
Total Land	340.50

Out of the above forest land, forest Clearance in respect of remaining 11.17 Ha is under process. The land other than BCCL holding has to be transferred to BCCL / to be acquired by BCCL. De-coaled land of adjoining Colliery will also be required for accommodating external dump of around 37.52 M.Cum.of OB.

1.2.2 REHABILITATION / SHIFTING OF HOUSES

As per data furnished by colliery authority approximately 1374 Houses are required to be rehabilitated/shifted as these are situated over the land of proposed opencast area. In addition to above houses/structures etc. situated over proposed external dump area are also required to be rehabilitated/shifted.

1.2.3 OTHER SURFACE RE-ORGANIZATION

Diversion of Jore/Nallah:

A section of Tisra Jore flowing in the proposed quarry area, has to be diverted for operation of the proposed project. Diversion of the Tisra Jore has been proposed in the direction as given in the Sanctioned Project Report for Goluckdih (Non Coking) Opencast (Recast) (Aug. 2003).

Diversion of Road:

A part of Jharia Baliapur DB Road, passing through the proposed project area, will be affected due to the operation of the proposed opencast. The affected part of the said road has to be substituted by construction of alternative road. Diversion of the the above DB road has been proposed in the direction as given in the Sanctioned Project Report for Goluckdih (Non Coking) Opencast (Recast) (Aug. 2003).

CHAPTER-II

DETAILS OF EARLIER APPROVAL OF MINING PLAN

2.0 No approved mining plan exists for the mine.

Chapter- III

LOCATIONS, TOPOGRAPHY & COMMUNICATION

3.0 Introduction

The area under consideration falls within the Mukunda exploration block in the eastern part of Jharia coalfield, District: Dhanbad, Jharkhand. The Report is based on the data available in the "Geological Report on exploration for coal in Mukunda Open Cast Block" Jharia coalfield, Dhanbad (July, 1981, prepared by CMPDI, RI-2, Dhanbad).

3.1 General

The Jharia coalfield is located in the Dhanbad and Bokaro districts of Jharkhand. After nationalization and formation of Bharat Coking Coal Ltd. (BCCL), a feasibility report for reconstruction and development of the collieries (FR '78) of this coalfield was prepared in collaboration with the Polish consultants, wherein amalgamation of the erstwhile collieries including virgin area was envisaged. In this FR, 9 large opencast blocks and 21 large underground blocks were envisaged.

The present report is confined to the assessment of the part area (northern part) of original block of Mukunda OCP (GR, 1981), it includes Kuya Colliery and part area of Ghanoodih Colliery.

3.2 Location

The area under consideration is located in Northern part of Mukunda exploration block of Jharia coalfield and constitutes of leasehold boundary of Kuya Colliery, BCCL. The project area lies between Latitude 23°43'30" to 23°43'44" (N) and Longitude 86°25'30" to 86°27'00" (E).

North	:	Dobari Colliery
South	:	North Tisra
East	:	Barren Land
West	:	Ghanoodih Colliery

3.3 Area

The project area of the proposed quarry under consideration has a total surface area of about 3.405 Km² as per colliery record.

3.4 Accessibility

The proposed project area is about 5 Km west of Jharia town and can be approached easily by Dhanbad-Jharia-Sindri road. The location of the project site is shown in **Plate-I**.

3.5 Climate and Rainfall Data

The area under consideration falls in the sub-humid region of the state of Jharkhand. The maximum temperature rises as high as 48°C during summer (April to middle of June) and falls down to minimum of 6°C during winter (December to January). The area receives fair to moderate rainfall, the average annual precipitation being 140 cm, most of which is received between June to September.

3.6 Topography and Drainage

The area has a general undulating topography with a gentle southward slope. The mining activity which is going on in the area over 100 of years severely obliterated the general topography. Several small quarries, subsided goaf, OB dump, etc. have been shattered the original topography of the area. The highest elevation (214.65 m) has been observed near borehole no. NGK-28 in the northern part, whereas, the lowest ground elevation (184.54 m) has been observed in the southern corner of the block around borehole No NGK-2.

The drainage of the block is mainly controlled by a small nala, Tisra Jore is flowing from north to south.

3.7 Block Boundary

The project boundary is demarcated on surface and individual seam folio/floor contour plan.

3.8 Status of Exploration

A total of 14 boreholes have been drilled within the project area involving a total meterage of 1818.78 meters within the project area.

Table- 3.1
Status of Exploration

Serial No	Series	Drilling	No. of BH	Meterage drilled
1	NGK	CMPDI	14	1818.78

The density of boreholes comes to 4 BHs/Km² within the project area (within Kuya Colliery Boundary)

3.9 Scope and Limitations

1. The scope of the present assessment is to assess the potentiality of seams (seam IV TOP seam to seam III BOT seam) occurring within the project area for their extraction by opencast mining method.
2. Only the standard geological nomenclature of seams has been used in this report.
3. The report is based on the data available in the “Geological report on Exploration for coal in Mukunda Open Cast Block” Jharia coalfield, Dhanbad (July, 1981, prepared by CMPDI, RI-2, Dhanbad). In addition to that, there are some infilling bore holes (NGK Series) which were drilled after preparation of the above GR, have been incorporated in the present report.
4. The updated mine plan / data generated and supplied by colliery authorities have also been considered for preparing this report. The surface plan of this report is mainly based on colliery plan and topo sheet of Survey of India.
5. The coordinates of the boreholes have been converted into the Jharia grid as supplied by the colliery authority.

6. An element of approximation exists in location and extent of mine workings when matched with borehole location plan. Surface features like quarries, Incline, roads etc. shown on the plan supplied by colliery do not well match with Survey of India Topo sheet available on 1:4000 RF.
7. Areas having thickness less than 0.5 m have not been considered for geological reserve estimation.
8. In some bore holes (of NGK series) only band-by-band quality data are available, hence weighted average have been calculated for those data.
9. In seam descriptions, the special test data (CI, CT, SI etc.) and ultimate analysis data are taken from "Geological report on Exploration for coal in Mukunda Open Cast Block" Jharia coalfield, Dhanbad (July, 1981, prepared by CMPDI, RI-2, Dhanbad).
10. The project area is free from fire.

Chapter – IV

EXPLORATION, GEOLOGY, SEAM SEQUENCE, COAL QUALITY & RESERVES

4.1. Regional Geology of Jharia coalfield

The Jharia coalfield (453 Km²) is sickle shaped on plan and occurs in the form of syncline with its axis trending broadly in E-W direction and plunging towards west. The southern flank of this coalfield is truncated by boundary fault having maximum throw about 2.5 Km at Mohuda Basin. The non-coal bearing Talchir formation is mainly exposed along the northern and western portion of the coalfield. The Barakar formation covering an area of 218 Km² which is exposed in the northern, eastern and south-eastern part of the coalfield area contains over 40 coal horizons including local and persistent seams, some of which are exclusively store house of metallurgical coal in India. The Barakar formation is successively overlain by Barren Measure formation which is devoid of work able coal seams. This is mainly exposed in the central part of the coalfield. The Barren Measure is overlain by the coal bearing Raniganj formation (54 Km²). These are exposed within a sub elliptical basin the south-western part of the coalfield

4.2. Stratigraphy

The Regional stratigraphic succession of Jharia coalfield is given in table no. 4.1

Archeans: The Archeans, consisting of gneisses and mica schists are exposed all along the periphery of Jharia Coalfield. A tongue or protrusion of metamorphic, thrusting into the Gondwanas, is observed near Patherdih in the south-eastern part of the coalfield. Besides, a small inlier of metamorphic has been noticed near Khenudih in the north-western part of the coal field. Metamorphic high has been interpreted in the south-eastern part of the coalfield in Sitanala area, resulting the omission of older seams. The metamorphics are profusely intruded by quartz veins.

Talchir: In an Archean basement, the lower Gondwana sediments are deposited with a pronounced unconformity. The lowermost Gondwana sediments of Talchir formation are represented by variegated shale and greenish sandstones which at times show laths of unaltered feldspars. They are exposed all along the northern fringe of the coal field. They are, however not exposed along the southern fringe due to boundary fault. Near Lutipahar in the north-western part of the coal field, Talchir formation is comparatively well developed in a large area and boulder bed shows exposures of spheroidal weathering.

Barakar: In the eastern, northern and north-eastern parts of the block, the Barakar are extensively developed. All along the southern boundary they are extending under the thick over of Barren Measures. The Barakar formation comprises pebbly sandstones, conglomerate, grit, coarse to fine grained sandstones, shales, carbonaceous shales and coal seams. Verma *et. al.* (1989) have observed a gradual decrease in thickness of Barakar from east to west. A maximum thickness more than 1250 m has been observed in the south-eastern part of the coalfield in Tasra region, while minimum thickness of around 600m is noticed in Damuda area. Barakar is the most important geological formation as it contains more than 40 coal horizons having thickness more than 50 cm. In general seam X (Ten) and younger seams are better quality coal (prime coking) than older seams which changes with depth to non-coking coal.

Barren Measure: The Barren Measure formation lying conformably over the Barakar formation consists of massive multistoried sandstone alternating with carbonaceous shale, grey shale and sandstone/ shale intercalations with occasionally very thin impersistent, non-workable coal horizons in the lower part of the formation. The Barren Measures shows a widespread development extend ending from the central part of the coalfield up to the southern margin. The maximum thickness of the Barren Measure has been estimated to be around 625m in the central part of the basin. It gradually decrease westward and eastward and reduces to a minimum of 375m in the south-eastern part.

Raniganj: Raniganj formation is deposited in sub elliptical basin that is called Mohuda basin the south-western part of the coalfield. The formation represented by sandstone, shale, carbonaceous shale and coal seams. There are 24 coal seam have been reported from this formation. These seam comprise high volatile, high moisture, medium coking coal. The maximum thickness around 725m of Raniganj formation has been observed.

Igneous Intrusive: Mica peridotite and dolerite are the two most common Post Gondwana intrusives. The mica peridotite occur as dyke and sill throughout the entire coal field and has caused widespread devolatilisation of the coal seams. The dolerite dyke is mostly confined in the western part of the coal field and has limited effect on coal seams. A number of dykes and their offshoots have been established in the coalfield, but the most surprising phenomenon of a 250m zone characterized by pyrolitization and devolatilisation has been observed in the north-western part of the coalfield at Daumda Block where presence of any igneous intrusives has not been noticed. The mica periodotite sills have devolatilised the extensive reserve of good quality coal in the coalfield and have limited or practically no effect on inferior quality coal.

As mentioned earlier most of the area is covered by sandy soil and alluvium. The thickness of soil varies from 1.0 m to 10.0 meter.

Table-4.1
Geological Succession of Jharia coalfield

Stratigraphic Division	Age	Formation	Lithological characters
	Recent	Alluvium/Soil/Sand	
	Cretaceous to Jurassic	Mica Peridotite/Dolerite Dyke	
----- Unconformity -----			
Lower Gondwana	Upper Permian	Raniganj Formation	Mainly fine to medium grained grey current bedded sandstone with shale and coal seam
	Middle Permian	Barren Measures	Black carbonaceous micaceous shale with clay, ironstone and sandstone.
	Lower Permian	Barakar Formation	Coarse grained to conglomeratic white sandstone with shale and coal seams
	Lower Permian	Talchir Formation	Coarse grained sandstone, white or slightly variegated at Top, green shale with undecomposed feldspar, boulder bed etc.
----- Unconformity -----			
	Archeans		Granites, gneisses and schists.

4.3. Geology of Kuya Colliery

The area under consideration is located in the eastern flank of the Jharia coalfield, and it is primarily covered by the Barakar formation which is overlain by thin layers of sandy soil and clay. The thickness of soil is ranges between 1 m. (NGK-26) to 15.51 m. (NGK-25). The eastern limit of the coal bearing formation is delineated by metamorphic rock of Archean age. The rocks of Barakar formation consist of pebbly sandstone, grits, fine to coarse grained sandstone, intercalation of sandstone and shale, sandy shale, grey shale, carbonaceous shale, fire clays and number of coal seams. Coal seams IV TOP to III BOT occur within the project area and under the purview of this Geological Report (Plate No. G-III).

Good rock exposures are rather few excepts in old quarries and it has not been possible to precisely delineate the incrop position of the seams because

of the extensive goaf, and quarrying which have severely affected the original topography. The incrop position of the coal seams have been extrapolated on the basis of geological data viz. geological cross section, floor contour and quarry/incline positions and are interpretative. Geology and correlation of the seams have been established mainly on the basis of sub-surface data obtained from borehole and mine workings.

Igneous Intrusion:

The project are is free from any igneous intrusion.

4.4 Sequence of Coal Seams (within the proposed quarry Limit)

Table-4.2

Seam/Parting	True Seam Thickness (m)		Average Seam/Parting Thickness (meter)	No. of BH intersection	Depth Range (approx.) (m)
	Minimum	Maximum			
IV TOP	0.65 (NGK-25)	5.30 (NGK-2)	1.93	8	INCROP-100
P(IV TOP-IV BOT)	10 (NGK-18)	20 (NGK-2)	17		
IV BOT	2.50(NGK-15)	5.43(NGK-24)	4.37	10	INCROP-120
P(IV BOT-III TOP)	10 (NGK-21)	18 (NGK-18)	13		
P(IV BOT-III)	20 (NGK-22)	28 (NGK-24)	23		
III TOP	2.45 (NGK-16)	5.39 (NGK-14)	3.78	10	INCROP-140
P (III TOP-III BOT)	1 (NGK-2)	15 (NGK-30)	9		
III BOT	6.19(NGK-14)	13.41(NGK-2)	9.8	10	INCROP-160
III	14.38 (NGK-22)	17.36 (NGK-13)	15.70	4	INCROP-100
P (III-II TOP)	4 NGK-24)	9 (NGK-26)	6		
II TOP	0.2 (NGK-16)	1.68 (NGK-13)	0.95	7	INCROP-140
P(II TOP-II BOT)	5 (NGK-13)	27 NGK-16)	20		
P(III BOT-II BOT)	26 (NGK-28)	40 NGK-21)	30		
II BOT	0.34 (NGK-16)	2.73 (NGK-18)	1.40	12	INCROP-190
P (II BOT-I)	3 (NGK-25)	24 (NGK-14)	13		
I	2.81 (NGK-24)	7.49 (NGK-26)	4.90	12	INCROP-210

4.5 Nomenclature of coal seams Vis-À-Vis Colliery Nomenclature

Table – 4.3

Standard Nomenclature (Geological)	Colliery Nomenclature (Kuya Colliery)
IV TOP	IV
IV BOT	IV
III TOP	III
III BOT	II
II TOP	-
II BOT	I
I	0

4.6 Geological Structure of the Block

4.6.1 Strike & Dip

The geological structure of the area is relatively simple. The general strike of the strata is normally NNW-SSE swinging to N-S covering the major part of the area. The beds dip 4° to 12° due WSW, west and north respectively. The relevant details of strike and dip can be seen from the geological cross section and floor contour plans.

4.6.2. Faults

No major fault encountered within the project area.

4.7. Methodology for assessment of coal seams

4.7.1. Thickness & Spatial Variation of Seams

The description and the assessment of the quality of coal seam are primarily based on the seam folio plans which depict the iso-chores, iso-ash and iso-UVM lines besides the outer extent of the underground and opencast developments.

4.7.2. Iso- chores

Only the vertical thickness (In-band) of the coal seams, as encountered in the boreholes, has been considered for drawing iso-chores. Since 50 cm thickness has been considered as the minimum limit for reserve estimation, the iso-chores of 50 cm have been drawn followed by iso-chores of 0.9, 1.2, 2, 4, 6, 8, 10, 12, and 15 m.

4.7.3. Iso-ash

The ash content forms the basis for grading of coking coals as per notification by Gov. of India, Ministry of Energy, Dept. of Coal, dated 13.02.1981. Coal having ash > 50% (in case of coking coal) have not been assessed.

4.7.4. Floor contour plans

Floor contour plans of all persistent coal seams have been drawn. Spot levels of various seam workings have been considered during preparation floor contour plans. However in some cases, there are a little variation exists between the floor value and the spot level data of the respective seams. In this circumstance, we have confirmed the floor value with the FRL values of the respective seams available in various pit sections of different collieries. It may be noted that the spot levels are not necessarily on the floor of the respective seams as most of the seams are thick and UG development are present. Necessary corrections have been made while using the data.

4.7.5. Basis for thickness and quality determination

Analytical results of coal cores supplied by the C.F.R.I and private analytical agencies have been utilized to assess the thickness and quality of the coal seams.

While determining the quality of the seams following norms have been followed.

- i. Coal Sections containing ash upto 35.0%.
- ii. Shaly coal Section containing ash form 35.01% to 50.0%.
- iii. Dirt bands Sections with ash from 50.01% to 75%.

To arrive at the in-band thickness of the coal seams as per opencast norms, all dirt bands (combustible) up to 1.00 m thickness occurring within the seam have been included. Dirt bands having thickness more than 1.00 m occurring within the seam have been excluded.

If the non-combustible bands that are developed within the seam persistently in a considerable area, the seam have been considered as split and line of split or merger has been drawn in relevant floor contour and seam folio plans.

The analytical data / overall analysis of various coal cores for including bands (In-band) as well as excluding bands (Ex-bands) were provided by the analytical laboratories. The in-band ash of the seams, wherever not available, have been calculated on weighted average basis and in case where weight is not given it has been calculated on length average basis.

The volatile matter on unit coal basis (UVM) has been calculated by the following empirical formula –

$$\text{UVM}\% = 100 - (100 \times \text{FC}) / 100 - (1.1\text{A} + \text{M}) \dots \dots \dots (i)$$

Where:

FC = Fixed carbon

A = Ash%

M = Moisture %

Carbonate correction, wherever required have been carried out.

4.8. Seam-wise Description

Seam IV TOP

This seam occurs below V/VI/VII/VIII seam with a parting varies from 30.93 m (NGK-15) to 32.66m (NGK-25).The full coal thickness has been intersected into 8 boreholes within the project limit. The In-band thickness of seam varies from 0.65 m (NGK-25) to 5.30 m (NGK-2). The seam has been considered as Non coking coal within the project area. Detailed quality parameters and net geological resource is given below in table.

Quality Parameters

Proximate Analysis (On air-dried basis)

TH	ASH	UHV	Grade	GCV	GCV Grade
0.65-5.30	29.1-45.2	1158-4400	D-G	3762-5163	G8-G12

Net Geological Resource (Mt.)

IV TOP	A	B	C	D	E	F	G	TOTAL
PROJECT AREA				0.05	0.28	1.07	0.08	1.48
WITHIN EXTENT					0.15	0.66	0.05	0.86

Roof & Floor

Roof and floor both generally composed of carbonaceous shale.

Exploitation

The seam is extensively worked and quarried. In the incrop region the seam is extensively quarried out in the southern part (south eastern part of the Tisra Jore) and another quarry in the northern part is ongoing. A very small patch is quarried out in the northernmost part too.

The west-central part is heavily worked by underground development.

(Ref: GR, Mukunda OC Block, July, 1981).

Seam IV BOT

This seam occurs below IV TOP seam with a parting varies from 10.65 m (NGK-18) to 20.11m (NGK-2).The full coal thickness has been intersected into 10 boreholes within the project limit. The In-band thickness of seam varies from 2.50 m (NGK-15) to 5.43 m (NGK-24). The seam has been considered as

Non coking coal within the project area. Detailed quality parameters and net geological resource is given below in table.

Quality Parameters

Proximate Analysis (On air-dried basis)

TH	ASH	UHV	Grade	GCV	GCV Grade
2.50-5.43	36.7-46.8	2244-3770	E-G	4297-5151	G8-G11

Net Geological Resource (Mt.)

IV TOP	A	B	C	D	E	F	G	TOTAL
PROJECT AREA					0.47	6.16	0.52	7.15
WITHIN EXTENT					0.47	3.57	0.19	4.23

Roof & Floor

Roof and floor both generally composed of carbonaceous shale.

Exploitation

The seam is extensively worked and quarried. In the incrop region the seam is extensively quarried out in the southern part (south eastern part of the Tisra Jore) and another quarry in the northern part is ongoing.

(Ref: GR, Mukunda OC Block, July, 1981).

Seam III TOP

This seam occurs below IV BOT seam with a parting varies from 10.92 m (NGK-21) to 17.35m (NGK-18).The full coal thickness has been intersected into 10 boreholes within the project limit. The In-band thickness of seam varies from 2.45 m (NGK-25) to 5.39 m (NGK-2). The seam has been considered as

Non coking coal within the project area. Detailed quality parameters and net geological resource is given below in table.

Quality Parameters

Proximate Analysis (On air-dried basis)

TH	ASH	UHV	Grade	GCV	GCV Grade
2.45-5.39	27.01-46.3	1981-4697	D-G	4174-6067	G6-G11

Net Geological Resource (Mt.)

IV TOP	A	B	C	D	E	F	G	TOTAL
PROJECT AREA				0.82	2.61	2.43	0.29	6.15
WITHIN EXTENT				0.82	1.27	0.79	0.01	2.89

Roof & Floor

Roof and floor both generally composed of carbonaceous shale.

Exploitation

The seam is extensively worked and quarried. In the incrop region the seam is extensively quarried out in the southern part (south eastern part of the Tisra Jore) and another quarry in the northern part is ongoing.

The west-central part is heavily worked by underground development and in the northernmost part two small underground patch is also developed.

(Ref: GR, Mukunda OC Block, July, 1981).

Seam III BOT

This seam occurs below III TOP seam with a parting varies from 1.83 m (NGK-2) to 15m (NGK-30).The full coal thickness has been intersected into 10 boreholes within the project limit. The In-band thickness of seam varies from 6.19 m (NGK-14) to 13.41 m (NGK-2). The seam has been considered as Non

coking coal within the project area. Detailed quality parameters and net geological resource is given below in table.

Quality Parameters

Proximate Analysis (On air-dried basis)

TH	ASH	UHV	Grade	GCV	GCV Grade
6.19-13.41	33.38-44.9	2280-3970	E-G	4362-5399	G7-G10

Net Geological Resource (Mt.)

IV TOP	A	B	C	D	E	F	G	TOTAL
PROJECT AREA					4.11	12.15	0.98	17.24
WITHIN EXTENT					3.09	4.68	0.71	8.48

Roof & Floor

Roof and floor both generally composed of carbonaceous shale.

Exploitation

The seam is extensively worked and quarried. In the incrop region the seam is extensively quarried out in the southern part (south eastern part of the Tisra Jore) and another quarry in the northern part is ongoing.

The west-central part is heavily worked by underground development and a small underground patch is developed in south central part too.

(Ref: GR, Mukunda OC Block, July, 1981).

Seam III

III TOP and III BOT seam combined in the southernmost part of the project area as III seam. This seam occurs below IV BOT seam with a parting varies

from 20m (NGK-22) to 28m (NGK-24).The full coal thickness has been intersected into 4 boreholes within the project limit. The In-band thickness of seam varies from 14.38m (NGK-22) to 17.36m (NGK-13). The seam has been considered as Non coking coal within the project area. Detailed quality parameters and net geological resource is given below in table.

Quality Parameters

Proximate Analysis (On air-dried basis)

TH	ASH	UHV	Grade	GCV	GCV Grade
14.38-17.36	38.7-42.6	2760-3449	E-F	4495-4890	G9-G10

Net Geological Resource (Mt.)

IV TOP	A	B	C	D	E	F	G	TOTAL
PROJECT AREA					0.93	4.52		5.45
WITHIN EXTENT						2.28		2.28

Roof & Floor

Roof and floor both generally composed of carbonaceous shale.

Exploitation

The seam is part quarried and also developed by underground working. (Ref: GR, Mukunda OC Block, July, 1981).

4.9 Insitu Coal Quality

The quality of coal seams in this Revised Geological Report is based on "Geological Report, Mukunda Open Cast " Jharia coalfield, Dhanbad (July, 1981, prepared by CMPDI, RI-2, Dhanbad).The non-combustible bands like sandy shale, sand stone, siderite, grey shale (Ash > 75 %) etc. irrespective of

their thickness and carb shale (Ash > 50 %) of 1 meter and above in thickness occurring within the seam, have been excluded from the total thickness of the seam for computing the effective thickness (I100) of coal seams for the purpose of quality consideration. Rest of the dirt bands has been included as a part of the coal seams.

Faulted, partly faulted, worked seam/part worked seam thickness encountered in the boreholes have not been considered for the purpose of quality assessment.

4.10.1 Resource Estimation Criteria

- A. The seam wise status of developed, depillared and goaved areas in addition to virgin patches has been identified on the basis of seam working plan provided by the concerned area/colliery officials. These have been clearly marked on the seam folio plans and floor contour plans of all the seams proposed for quarrying in the area.
- B. **Goaf & Quarries:** These areas have been considered as devoid of coal, however in case of goaf the devoid zone is considered according to the height of the goaf.
- C. **Developed Areas:** In developed areas, where reserves are standing on pillars, seam wise dimension of extraction (height & width) have been decided on the basis of seam working plan made available by area/collieries authorities and after detailed discussion with them. And only after that percentage of extraction factor for each seam has been arrived which ranges from 30 % to 50 %. For standing on pillars an average of 30% and for stooks 90% extraction of coal has been considered and accordingly Net Geological Resource has been calculated. (**Annexure-II**)
- D. **Thickness:** Only the In-band (I100) thickness of the seam has been considered for reserve estimation. Areas having thickness less than 0.5 m have not been considered for reserve estimation.

4.10.2 Methodology of Reserves Calculation

The reserve has been estimated through “MINEX” software.

1. The resource has been calculated using “Detailed Resource Reporting” menu of **MINEX 6.5.3** software.
2. A deduction of 10% from the ‘gross resources’ of coal has been made to account for unidentified geological uncertainties like structural disturbances, washout zones etc. to arrive at the ‘net geological resources’.
3. The seam wise status of developed, depillared, stook, fire areas in addition to virgin patches has been identified on the basis of seam working plan supplied by the concerned area/colliery officials. These have been clearly marked on the seam folio plans and floor contour plans of all the seams.
4. **Heave Zone:** The areas falling within the heave zone of a fault has been excluded for the purpose of resource estimation.
5. Coal resource estimation of individual seam within the proposed quarry limit of Kuya Colliery has been assessed by taking the area of each seam extent marked in individual floor contour plan/seam folio plan

4.11 Band in Coal Seam

All the seams contain several number of bands. The thickness of the band varies from 2 centimeters to 2 meter. The bands generally composed of carbonaceous shale, dark shale, fine grained sandstone, MP etc.

4.12 Conclusion

The project area is free from any igneous intrusion, fire also devoid of major faults. The integrated geological assessment of the surface and subsurface data available from the earlier geological reports have clearly established 37.47 million tonnes of coal.

Net Geological Resource of Coal

Table No: 4.5

Seam wise/grade wise proved resource of Non coaking coal (Million Tonnes)
(within leasehold area)

Resource of Coal (in Million Tonne)								
Seam	A	B	C	D	E	F	G	Total
IV TOP				0.05	0.28	1.07	0.08	1.48
IV BOT					0.47	6.16	0.52	7.15
III					0.93	4.52		5.45
III TOP				0.82	2.61	2.43	0.29	6.15
III BOT					4.11	12.15	0.98	17.24
Total	0	0	0	0.87	8.4	26.33	1.87	37.47

Table No: 4.6

Seam wise/grade wise resource of Non coaking coal (Million Tonnes)
(within proposed quarry limit)

Resource of Coal (in Million Tonne) within Extent								
Seam	A	B	C	D	E	F	G	Total
IV TOP					0.15	0.66	0.05	0.86
IV BOT					0.47	3.57	0.19	4.23
III						2.28		2.28
III TOP				0.82	1.27	0.79	0.01	2.89
III BOT					3.09	4.68	0.71	8.48
Total				0.82	4.98	11.98	0.96	18.74

CHAPTER - V

MINING

5.0 PRESENT STATUS

Kuya colliery is under the administrative control of Bastacolla area. The mine is situated in Eastern part of Jharia Coal field. It is about 9 KM away from Dhanbad Railway Station and connected by Dhanbad Baliapur road.

Kuya colliery has been operating since early 1930s. Present Kuya group of mines are a result of amalgamation of a number of collieries operating at the time of nationalisation. Some of these collieries are Kuya and Khas Kuya, New Golakdih, North Golakdih, Goluckdih (J-150), Central Golukdih, East Kujama, Pure selected Golakdih and Pure Golakdih.

At present total leasehold boundary of Kuya Colliery is 340.50 Ha as per data supplied by colliery authority which includes 176 Ha of Kuya underground, 60 Ha of whole Golukdih colliery and 104.50 Ha land transferred from Ghanoodih. Leasehold area of the colliery is covered in in the “Geological Report on exploration for coal in Mukunda Open Cast Block” Jharia coalfield, Dhanbad (July, 1981, prepared by CMPDI, RI-2, Dhanbad).

The Kuya Colliery had two working units (OC & UG) given as follows:

- ❖ Kuya UG was producing coal from I Seam by B&P method of mining by using SDL. As per decision of BCCL management the underground production has been stopped from 2016-17 and only pumping operation is going on presently.
- ❖ Kuya OCP, at present is producing coal from IV Top, IV Bot, III Top & III Bot seams by opencast method with III Bot. seam as base using shovel & dumper combination.

Opencast:

As stated earlier only opencast mining is in operation in the leasehold of Kuya Colliery . In this mining plan and mine closure plan , it is proposed to extract IV Top, IV Bot, III Top & III Bot seams through opencast operation .The details of the quarry are given in relevant Para .

Nomenclature of coal seams Vis-À-Vis Colliery Nomenclature

Standard Nomenclature (Geological)	Colliery Nomenclature (Kuya Colliery)
IV TOP	IV
IV BOT	IV
III TOP	III
III BOT	II
II TOP	-
II BOT	I
I	0

Present Status of Seams:

Status of the seams are given below.

Seamwise status of Working

Sl. No.	Seam	Status
1	V/VI/VII Comb. and above seams	Exhausted in proposed quarry area and hence reserves not considered in proposed quarry.
2	IV Top	Partially developed by Bord and Pillar method. At present Opencast operation is going on.
3	IV Bottom	At present Opencast operation is going on.
4	III(Top)	About 75% area developed by Bord and Pillar method. At present Opencast operation is going on.
5	III(Bottom) & III(Comb.)	About 75% area developed by Bord and Pillar method. At present Opencast operation is going on.
6	II Top	No existence except in few boreholes. Not considered in proposed quarry.
7	II Bottom	Virgin. Not considered in proposed quarry.
8	I	About 75% area developed by Bord and Pillar method and Partially goaved out. Not considered in proposed quarry.

5.1 CHOICE OF MINING METHOD

Considering the dip of beds and mining of multiple seam separated by multi partings, presently the opencast is being operated with Shovel-Dumper System of mining and the same has been considered for future opencast operation.

5.1.1 JUSTIFICATION FOR OPTIMIZATION OF TARGETED CAPACITY

As per the mining parameters of the mine, the normative production of the mine is 2.0 MTY. The peak production from the mine will be 30% higher than the normal production (2.60 MTY) which can be achieved by better utilization of resources and favorable geo-mining conditions.

5.1.2 ASSUMPTIONS MADE, IF ANY

It is assumed opencast method with Shovel-Dumper System of mining will be used in the mine. It is also assumed that required excavation & transport capacity will be available for opencast mining operation.

5.2 RESERVES

5.2.1 GEOLOGICAL AND MINEABLE RESERVES

The reserves within leasehold boundary, outside extent, within the delineated quarry & parting wise OB within the delineated quarry area given in the following tables:

SEAMS	Net Geological Reserve (Mt.)			Mineable Reserve (Mt.) within delineated quarry
	Within leasehold boundary	Blocked Reserves in Barriar & Batter	Within delineated Quarry	
IV Top	1.48	0.62	0.86	0.77
IV Bottom	7.15	2.92	4.23	3.81
III(Top)	6.15	3.26	2.89	2.6
III(Bottom) & III(Comb.)	22.69	11.93	10.76	9.69
Total	37.47	18.73	18.74	16.87

PARTING WISE OB TO BE REMOVED WITHIN DELINEATED QUARRY

Partings	Volume in M.Cum
Rehandling of Loose OB	19.45
Top OB	40.78
Parting between IV Top and IV Bottom	12.61
Parting between III Top and IV Bottom	12.27
Parting between III Top and III Bottom	10.23
Total	95.34

5.4 GEO-MINING PARAMETERS

5.4.1 SEAMS TO BE WORKED

In this mining plan and mine closure plan, it is proposed to extract the IV Top, IV Bot, III Top & III Bot seams in the proposed quarry limit through opencast operation.

It has been decided in the meeting held with BCCL officials that Opencast feasibility (both technical and economical) of the seams below III Bottom seam will be examined later and accordingly separate/revised mining plan will be prepared in future to extract these seams after getting requisite forest clearance permission/approval of remaining 11.17 Ha forest land from concerned ministry.

5.5 MINING ELEMENTS

5.5.1 BRIEF DESCRIPTION OF OPENCAST OPERATIONS

Presently Kuya Colliery is producing coal from IV Top, IV Bot, III Top & III Bot seams through opencast operation and same operation has been proposed to continue in this mining plan and mine closure plan to extract coal. The base seam of the mine will be III Bottom seam floor. The mine boundary of the quarry is given below.

Mine Boundaries Delineation

The quarry limits of the Kuya Colliery on the surface is delineated within the leasehold boundary as under:

North : Minimum of about 15 m from the leasehold boundary / forest land for which clearance is under process. The mine may be extended to excavate this forest land in future after getting requisite forest clearance permission/approval from concerned ministry.

South : Minimum of about 20 m from the leasehold boundary leaving old quarries.

East : Outcrop/Incrop of III Bottom seam.

West : Minimum Distance of about 20 m from the leasehold boundary

Basic Dimensions of the Quarry

Basic dimensions of the quarry is tabulated below:

Sl. No.	Description	Unit	Value
1	Area of Excavation	Ha	182.88
2	AV. Strike Length	m	1900
3	Av. Dip rise width	m	900
4	Maximum depth	m	140
5	Base of quarry		III Bottom Seam

Opening of the Mine

Since Kuya Colliery is an existing opencast mine working as III bottom seam floor, the mine is already developed through access trench and box cut which is further fully developed into benches along the strike length above III Bottom seam floor. Surface Plan is shown in Plate no. II. The operation of the existing opencast mines will continue. It is suggested that the present operating mines, should work in such a fashion that the benches become straight and uniform, so that equipment deployment of the proposed opencast can be facilitated better in the later stage. While working, the existing OB dump over the area bearing coal of IV Top, IV Bot, III Top & III Bot seams within delineated quarry area required to be rehandled..

OC Operations

The Kuya Colliery (Opencast) has a life of about fifteen years considering the seams & area as stated above. The broad parameters Kuya Colliery (Opencast) are given here :

Mineable/Extractable Coal	:	16.87 M.Tes
Overburden including Loose OB	:	95.34 M. Cum
Av. Stripping Ratio	:	5.65 M ³ /Te

Around total 19.45 M. Cum. Of Loose OB including 14.94 M. Cum. Of Loose OB dumped earlier in the dip side (as per data and plan furnished by colliery authority) required to be re-handled.

Base of the Quarry

Floor of III Bottom seam is the base of the quarry .

Haul Road Layout

It is proposed to lay haul road in the south side batter of the proposed area to reach the maximum quarry depth, Haul road alignment is shown in Plate no. VIII (Final Stage Dump Plan).

Excavation

All the seams considered for exploitation will be mined in separate single bench where ever possible.

Variation in thickness of OB will make it difficult to maintain uniform bench height in OB horizons. However, it is proposed to have a ceiling on OB bench height from safety reasons. The height of the bench generally shall not exceed the boom height of shovel. The height of the bench is proposed as 10 m.

Out of total 95.34 M.Cum. of OB, 43.18 M.Cum. of OB will be dumped internally in the decoaled area of the quarry on quarry floor, 14.64 M.Cum. of OB will be dumped externally in the non-coal bearing area in eastern side within leasehold boundary and the rest around 37.52 M.Cum. will have to be dumped externally in decoaled area of adjoining colliery. The lead for internal OB dumping will be from 1.00 Km to 4.00Km and lead for external dump OB dumping in non coal bearing area will be from 3.00 Km to 6.00Km . Final Stage dump Plan is shown in Plate no. VIII. Since this is an existing mine, backfilling of OB in mined out area has already been started .

For convenience of operation it is proposed to keep a minimum working width of coal and OB bench as 10 to 20 m. The working benches of OB and coal will be kept at a slope angle of 70° and 80° respectively during operation.

The final pit slope of the quarry has been planned at 43° for the final depth of the quarry (140 m).

OB Dump Benches

Bench height for OB dumps will be 30 m and slope of individual dump benches will be 37°. Width of berm between two adjacent benches will be about 40 m. Dumping will be done by End-Tipping method.

Drilling and Blasting

O.B. will be excavated in benches after proper drilling & blasting. Drilling in OB benches will be done by 250mm/160mm drills. The blasted OB will be dozed, heaped and loaded on to dumpers for transportation to OB dumps.

Drilling in coal benches will be done by 100 mm/ 160mm drills and after proper drilling & blasting, the blasted coal will be loaded by Shovels on to dumpers for transportation up to the surface stock yard.

The standard practice involving the electric detonators for the initiation of detonating cord, detonating relays to achieve hole-to-hole delays, use of Heavy ANFO, slurry or emulsion explosives as the column charge will be used for blasting.

The pattern of drilling and blasting will be decided during actual operation of the quarry. However, specific consumption of explosives has been envisaged as 0.3 kg/cum for OB and 0.2 kg/cum for Coal.

Transportation

The ROM coal from the OC will be transported by the tipping trucks from the pithead stock up to Feeder Breaker. After crushing the coal to (-) 100 mm coal is transported to different sidings.

5.5.3 LIFE OF MINE

The life of mine for opencast project is 15 years at projected level of production.

5.5.4 SEQUENCE OF MINING

The mining shall be carried out in descending order.

5.6 MACHINERY TO BE DEPLOYED

Shovel Dumper System of Excavation with Drilling & Blasting will be supported with suitable population of Dozers, Motor Grader, Water Sprinkler and other Auxiliary / Support equipments. List of existing HEMM (Hired & Departmental) is given below.

Hired HEMM

SL.NO	MACHINE	MAKE	MODEL	CAPACITY	NO.
1.	Excavator Komatsu		300	1.9 (m3)	1
	Do	Volvo	460	Rock / Soil 2.45/3.2 (m3)	1
	Do	Do	480	2.45/3.2 (m3)	5
	Do	Tata Hitachi	210	1.2 (m3)	1
		FRONT END LOADER			
2.	Pay Loader	TATA	3036	3.0 (m3)	2
	TRUCKS / DUMPERS				
3.	Tipper Volvo		FM 400	18.6 (m3)	24
	Tipper	Tata	2523	16.0 (m3)	11
4.	ANY OTHER EQUIPMENTS				
	Dozer	Komatsu	D-65	165 HP	2
		Komatsu	D-155	460 HP	1
	Road Grader	Volvo	G-930	340 HP	1
	Drill	IR	LM-100 (Chain Mounted)	Dia 150 mm	1
	Drill		Tyre Mounted	Dia 160 mm	3

Departmental HEMM

SL.NO.	MACHINE	CAPACITY (MP)	TYPE	NO.
1	EKG (339 & 495)	5	Electric	02
2	BE-1000	5	Diesel	01
3	Dumper BH 50 M	60 Te.	Diesel	06
4	Dumper for Spraying	35	Diesel	01
5	Water Tanker	15 KL	Diesel	01
6	Dozer 11794 & 12870	3.9	Diesel	02 one each
7	ICM 260 & IDM 30	100 mm 160 mm	Diesel	02 one each
8	Crane RT 630C	30 T	Diesel	01
9	EMCO ELECON Drill Machine	160 mm	Diesel	01

5.7 PRODUCTION SCHEDULING

OPENCAST

The normative target production of the mine will be 2.00 MTY. However the peak production capacity of 2.60 MTY (2.00 MTY + 30%) which may be achieved by better utilization of resources & favorable geo mining condition.

The calendar programme of mining operation has been formulated based on the adopted sequence of mine development and optimum condition of mining operation for the entire life of opencast project.

The year wise production from the Kuya Colliery (Opencast) is given below:

Year	Coal Production (M.Tes)	O.B. Removal (M.Cum)
2017-18	1.84	8.28
2018-19	1.41	9.94
2019-20	1.15	9.11
2020-21	1.05	8.15
2021-22	2.00	14.12
2022-23	2.00	12.36
2023-24	1.50	6.76
2024-25	1.02	4.59
2025-26	0.80	3.6
2026-27	0.80	3.6
2027-28	0.70	3.15
2028-29	0.70	3.15
2029-30	0.70	3.15
2030-31	0.60	2.69
2031-32	0.60	2.69
TOTAL	16.87	95.34

5.8 SURFACE REORGANIZATION

LAND ACQUISITION:

Ownership wise distribution of land as furnished by Kuya Mine Authority is given below :

OWNERSHIP WISE DISTRIBUTION OF LAND

(Figures in Ha.)

PARTICULARS	AREA (in Hectare)
BCCL Land	141.65
Forest Land	117.19#
Govt. Land	35.06
Tenancy Land	46.60
Total Land	340.50

Out of the above forest land, forest Clearance in respect of remaining 11.17 Ha is under process. The land other than BCCL holding has to be transferred to BCCL / to be acquired by BCCL. De-coaled land of adjoining Colliery will also be required for accommodating external dump of around 37.52 M.Cum.of OB.

REHABILITATION / SHIFTING OF HOUSES

As per data furnished by colliery authority approximately 1374 Houses are required to be rehabilitated/shifted as these are situated over the land of proposed opencast area. In addition to above houses/structures situated over proposed external dump area are also required to be rehabilitated/shifted.

OTHER SURFACE RE-ORGANIZATION**Diversion of Jore/Nallah:**

A section of Tisra Jore flowing in the proposed quarry area, has to be diverted for operation of the proposed project. Diversion of the Tisra Jore has been proposed in the direction as given in the Sanctioned Project Report for Goluckdih (Non Coking) Opencast (Recast) (Aug. 2003).

Diversion of Road:

A part of Jharia Baliapur DB Road, passing through the proposed project area, will be affected due to the operation of the proposed opencast. The affected part of the said road has to be substituted by construction of alternative road. Diversion of the the above DB road has been proposed in the direction as given in the Sanctioned Project Report for Goluckdih (Non Coking) Opencast (Recast) (Aug. 2003).

CHAPTER - VI

MANPOWER, SAFETY AND SUPERVISION

6.0 MANPOWER

The existing departmental manpower at Kuya Colliery as on date is 848.

The breakup of manpower at present is given below:

CATEGORY	KOCP (Dept.)	Kuya (U/G)
Executive	12	06
MR	83	31
TR	286	430
Total	381	467

The total manpower engaged by outsourcing agency for its operation as on date is 176.

6.1 SAFETY

Safety of men and machine deployed in the mining area should be properly taken care of irrespective of whether the mining activities are performed by departmental or by outsourcing option.

All the regulations & schedules of Coal Mines Regulations 2017 relating to opencast mining and other circulars issued time to time have to be adhered to and implemented in order to maintain day to day safety precautions as per stature.

In addition to those relevant clauses as stipulated in Act & Regulation, all clauses and sub clauses as mentioned in the permission granted by DGMS, Min. of Labor and Employment, GOI for working of Kuya OCP shall be followed strictly.

SURFACE FEATURES :

- i) Before starting any quarrying operation all structures / dwellings if any located with 100 m distance from the proposed area shall be vacated and rendered uninhabitable and no blasting shall be done within 100 m of both sides of any High tension line and its trestle, passing through the proposed area, if any.
- ii) The management shall indemnify any person who may be affected and owner of any surface structure in case of damage or loss to any life or property arising out of aforesaid mining operation.
- iii) Water pool shall be constructed above entire fire affected area after filling it with mutti/inflammable material and shall be maintained effectively.
- iv) After completion of operations, excavated area shall be filled with incombustible material and restored to the original ground level within the period not exceeding three months voids formed due to excavation in the quarry shall be back-filled simultaneously with coal extraction.
- v) An embankment 3.0 m above the HFL and 3.0 m wide at top with sides sloping at an angle of 45 degree pitched with slope shall be built along the river and Jore at places where the R.L. of the ground containing the edges of the quarry 3.0 m less than the HFL at the River or Jore.

OPEN CAST WORKINGS :

- i) The height of the benches shall not be more than the height of the boom of the machine used for digging, excavation or removal.
- ii) The width of any bench shall not be less than:
 - (a) width of the widest Machine plying on the bench plus two meters, or
 - (b) if dumpers ply on the bench-three times of the width of the dumper or
 - (c) the height of the bench whichever is more.

- iii) The quarry shall be completely worked by deployment of Machineries no manual working shall be permitted within 10.0 m of the working face.
- iv) Adequate precautions shall be taken to ensure dressing of the side. Special care shall be taken, when any slip or other plane of weakness or other geological disturbance exists, so as to prevent danger to the work-persons.
- v) No person shall be engaged to work or allowed to travel close to high sides / benches from which he is likely to fall more than 1.8 m vertically down, unless he is provided with and uses a safety belt or rope.

FENCING AROUND OPENCAST WORKINGS :

- i) The top edge of the opencast working shall be kept fenced with wire rope strands or barbed wire, supported by posts of timber, iron or concrete (movable). The gap between the adjacent rope strand or wires shall not be more than 0.30 m and bottom most rope, strand or wire shall not be more than 0.25 m and the topmost rope, strand or wire shall not be less than 1.0 m from ground level.
- ii) At the finishing stage, opencast working shall be fenced with a masonry wall using lime mortar not less than 0.40 m thick and not less than 1.2 m high, with a parapet top.

SPOIL BANKS :

- (i) The slope of a spoil-bank face shall be determined by the natural angle of repose of the material being deposited, but shall in no case exceed $37\frac{1}{2}$ degree from the horizontal. The spoil-bank face shall not be retained by artificial means at an angle in excess of its natural angle of repose.

- (ii) Any spoil-bank exceeding 30.0 m in height shall be benched so that no bench exceeds 30.0 m in height and the general slope does not exceed vertical to 1.5 m horizontal.
- (iii) The toe of a spoil-bank face shall not be permitted to approach a railway or other public works, public road or building or other permanent structure not belonging to the Owner of the mine, closer than a distance equal to the vertical height of its face.
- (iv) No person shall, or shall be permitted to approach the toe of an active spoil-bank where he may be endangered from material rolling down the face.

HAUL ROADS :

- i) No road shall be of width less than three times the width of the largest vehicle plying on road plus 5.0 m.
- ii) All corners and bends in roads shall be made in such a way that the operators of the vehicle shall have a clear view for a distance of not less than 3.0 times the breaking distance of largest vehicle playing at speed of 40.0 Km/Hour.
- iii) Wherever it is not possible to ensure clear visibility of the operator for a distance as specified in Clause (b), there shall be provided two roads of width not less than 2 times the width of the largest vehicle plus 3.0 m with a strong road divider in between having adequate lighting and reflector along the divider.
- iv) Where any road is existing above the level of surrounding area, it shall be provided with strong parapet walls / embankment of the following dimensions:
 - (i) Width at top-not less then 1.0 m.

- (ii) Width at Bottom-not less than 2.5 m.
 - (iii) The height not less than the diameter of tyre of largest vehicle playing on road.
 - (iv) It may be noted that just dumping of mud or overburden shall not treated a strong parapet wall.
- v) No road shall have a gradient steeper than 1 in 16.
- vi) Ramps with 1 in 10 gradients shall not be more than 10.0 m at one stretch and in case of machine having largest turning radius, the length of the span at a stretch one the ramp shall be designed compatibly with a written permission from the Regional Inspector of Mines.

6.2 SAFETY ASPECTS FOR OF HEMM / EQUIPMENT

Special precaution should be taken while deploying workers in the mine. Before employing any labour to the mine proper vocational training should be imparted and recommendations of VIII Safety Conference should be strictly followed. Some of the major aspects are as follows:-

A) For persons:

- i) No persons shall be deployed unless he is trained at VTC. Records in Form-B Form-D shall be maintained.
- ii) Records of Vocational training Certificate and driving license of operators shall be kept by competent authority and shall be made readily available for inspection by management.
- iii) No person shall be employed unless person holds VTC. A record of it shall be maintained.
- iv) Adequate supervision shall be maintained by qualified competent persons only.

B) For Machineries as recommended by DGMS Cir. (Tech.) 1 of 1999:

- i) All the machineries to be deployed in mines should be checked before deployment by competent authority.
- ii) A proper record of repair and maintenance along with inspection done by competent authority and defect pointed out shall be maintained and signed by authorized person.
- iii) All the equipment shall be provided with audio-visual alarms, proper light for use at night and period.
- iv) When natural light is not sufficient an audio-visual alarms for reversing on trucks shall be provided.
- v) Machine manufacturers should be asked to give risk analysis details in respective machines deployed.
- vi) Suitable type of the fire extinguishers shall be provided in every machine.

C) General:

- i) No person/vehicle shall be deployed at any place other than authorized place.
- ii) All workers should obey lawful instruction of mine management.
- iii) Risk Management Plan of tipper/pay loader shall be made and implemented.
- iv) All drivers shall obey systematic traffics rules prepared by management.
- v) Before deploying workers they must be trained and briefed about safety aspects in opencast mine. However during course of execution of the work, if any accident occurs whether major or minor, the matter shall have to be immediately informed to mine management, i.e. Colliery Manager/Agent/GM of Area so that Notices of accidents in a accordance of (Reg.8 of CMR 2017) and Section 23 of The Mines Act 1952 may be given and other necessary steps may be taken in accordance with the Mines Act 1952.

- vii) Mine authority shall operate transport system in such a way so as to minimize pollution in the mine.

6.3 STABILITY OF BENCHES, QUARRY HIGHWALLS AND SPOIL DUMPS:

In opencast mines, slope failure takes place mainly due to:

- i) Shearing effect on rocks
- ii) Ground water pressure

Shearing effect occurs due to gravity loading, shock & seismic vibration. Shock & seismic vibration can be minimized by adopting control blasting techniques. Gravity loading can be minimized by controlling the kinetic load of dumpers by preventing over speeding while running on the benches.

Since the seams are developed, problem of ground water pressure is not likely to be faced in developed part of the project. Adequate pumping provision has been made which will reduce the ground water pressure.

Bench parameters shall be adopted as mentioned in the report. However, during actual mining operation, the condition of benches & dumps should be closely observed at regular intervals and the dimension is to be modified as and when required. Working benches and spoil dumps shall be kept under constant vigil to mark any development of crack.

During quarry operations, it is necessary to adopt required mining parameters for the stability of benches, high walls and spoil dumps. It is also mandatory to examine systematically the fencing of mine workings, landslides and cracks between benches. It is required to maintain well-graded and wide roads on benches keeping the width of working areas sufficient for spreading of blasted rock and movement of the mining and transport equipment.

During actual mining operation, systematic observations of the condition of benches, high wall slopes and spoil dumps should be carried out and the dimensions be modified if necessary to suit the local conditions.

6.4 PRECAUTIONS AGAINST DANGER OF INUNDATION FROM SURFACE WATER.

- 1) A careful assessment is to be made against the danger from surface water before the onset of rainy season. The necessary precautions should be clearly laid down and implemented. A garland drain needs to be provided to drain away the surface rainwater from coming into the mine.
- 2) Inspections for any accumulation of rainwater, obstruction in normal drainage and weakening in embankment.
- 3) Standing order for withdrawal of working persons in case of apprehended danger.
- 4) During heavy rain inspection of vulnerable points is essential. In case of any danger persons are to be withdrawn to safer places.
- 5) Nallah or water inlets may be diverted or isolated by embankments if so required.

6.5 PROTECTION OF EQUIPMENT DEPLOYED AT BOTTOM HORIZONS FROM FLOODING:

During the heavy monsoon period, the mining operation in the lower-most bench may have to be stopped. Therefore, it is proposed to drown the lower-most bench, which would work as a sump. The water will be pumped out and discharged into the nearby Chatkari jore.

For ensuring safety of the equipment while working out bottom horizons with no access to surface profile, the following measures should be taken:

- 1) Drivage of initial trenches if any and coal cutting on bottom benches should be done during the dry period of the year.
- 2) Ramps should be made for quick shifting of equipment from bottom horizons, liable to be flooded during monsoon period, to the top horizons.

6.6 PREVENTION OF ELECTRIC SHOCKS:

During mining operations, all the statutory provisions of the Indian Electricity Rules 1956, and Indian Standards for installation and maintenance of electrical equipment etc. should be observed.

- 1) For protection from electric shocks to persons, all electrical equipment with voltage up to 1000V should be provided with Earth Leakage Relay, which will automatically disconnect electrical circuits.
- 2) Closed mobile substations and switchgears should be mechanically interlocked which exclude the possibility of opening the door when oil switch and air circuit breakers are in operation.
- 3) All metal parts of electrical equipment should be properly earthed to avoid failure of insulation.
- 4) All H.T lines and cables located within the blasting zones should be disconnected during charging & blasting operations.

6.7 DUST SUPPRESSION & DILUTION OF EXHAUST FUMES :

The following measures should be adopted for dust suppression at all quarry working places, dumps, haul roads, CHP and near other auxiliary mining operations.

- 1) Spraying with water on all working faces & haul roads, by special spraying machines or water-sprinkler.

- 2) While drilling holes, it is necessary to use dust extraction devices.
- 3) Installation of local dust suppression and air conditioning devices in cabins of excavators and drilling rigs may be considered.
- 4) Leveling of spoil dump surface.
- 5) Separate dust suppression arrangement should be provided for CHP.

To prevent collection of harmful mixtures in the atmosphere, from the different sections of quarry workings, it is recommended:-

To spread out the sources of dust formation and omission of harmful gases throughout the working area of the quarry.

- 1) Drilling & blasting operations should be timed for periods of maximum wind activity during the day.
- 2) Dumpers may be provided with purifiers for exhaust gases.

6.8 MEASURES TO BE TAKEN WHILE DRILLING BLASTING:

PRECAUTIONS WHILE DRILLING :

1. The holes shall be drilled in the pattern proposed by the Manager on beginning of that day, in such a way that length of the face shall be more than three times the width of the face having three rows of holes, with spacing and burden as recommended for specific diameter of hole.
2.
 - i) No drilling shall be commenced in an area where shots have been fired, until the shot fire has made a thorough examination at all places, including remaining butts of old deep holes, for unexploded charges that the drill may strike.
 - (ii) The position of every deep hole to be drilled shall be distinctly marked by the blasting Overman so as to be readily seen by the drillers.

- (iii) No drill or bore rod or pick shall be inserted in butts of old deep holes even if an examination under Clause (i) has failed to reveal presence of explosives.
- 3.
- (i) Drilling operations shall not be carried out simultaneously on two benches at places directly one above the other.
 - (ii) Drilling and charging of deep holes shall not be carried out in the same area at the same time.

PRECAUTIONS WHILE TRANSPORT OF EXPLOSIVES :

- i) Where explosives are transported in bulk for deep hole blasting the precautions that will be laid down under Regulation 188 of CMR 2017 by general order from Chief Inspector of Mines, shall be strictly complied with.
- (ii) All conditions specified by the Chief Inspector of Mines in the documents, if any granting permission to carry a larger quantity of explosives in a single case or canister or for the use at one time in one place of more than one such case or canister, in relaxation of Regulation 163 of the Coal Mines Regulations, 2017, shall be strictly complied with.
- (iii) Notwithstanding anything contained in the Coal Mines Regulations, 2017, the transportation of explosives, preparation of charges and the charging and stemming of holes shall be carried out under the personal supervision of a competent person who shall himself fire the shots in deep holes.

PRECAUTIONS WHILE CHARGING OF HOLES :

- i) Where there is any doubt and particularly where there are cracks and crevices reported in the hole at the time of drilling the bottom 2.0 m length of the hole shall be filled with sand / water ampoule. In crushed / broken ground charging of the hole shall not be done.

- ii) Explosives shall be delivered first to the hole farthest from the 'Priming Station' so as to avoid persons walking among piles of explosives.
- iii) Not more than one hole shall be in the process of being charged at any one face at any one time.
- iv) All charging, stemming and connecting up shall be done while standing on the solid, that is to say, on the side of holes remote from the quarry face.
- v) The safe explosives charge for a limiting peak particle velocity shall not exceed the limits recommended at Para 7.2 of D.G.M.S. Circular No. 7 of 1997. The P.P.V. shall be measured once in every quarter and the records of the same shall be maintained in a bound paged book and a copy of the same shall be submitted to this Directorate.
- vi) The cartridges of explosive shall be lowered carefully to avoid sticking in the hole so as not to cause air / space. After inserting cartridges the length of the remaining hole shall be measured to ascertain that the cartridges are in close contact and there is no air space.

PRECAUTIONS WHILE FIRING OF THE SHOTS :

- i) A safe code of blasting practice shall be framed by the manager and shall be circulated to all concerned for its strict compliance.
- (ii) The Manager shall fix the blasting time and shall circulate it to all concerned and display it on the Notice Board.
- (iii) Clear and distinct warning shall be given before commencing charging of hole as well as before firing the shots. Subsequent to blast, after 15.0 minutes all clear signal shall be given. Presently hooters shall be installed for this purpose.
- (iv) Adequate number of guards shall be posted to prevent inadvertent entry of any persons in the danger zone during firing of the shots.

- (v) Shots shall not be fired except during the hours of day light or until adequate artificial light is provided. All holes charged on any one day shall be fired on the same day. Sleeping of holes shall not be permitted till the time specific permission in this regard is obtained.
- (vi) Shots if fired beyond day light hours should be muffled so that, flying fragments from blasting can not project beyond a distance of 10.0 m from the place of firing in this connection, attention is drawn to D.G.(Tech.) Circular No. 8 of 1976 for compliance.
- (vii) As far as practicable the shot firing shall be carried out either between shifts or during the rest interval or at the end of work for the day.
- (ix) Precautions with regards to taking shelter, etc., as laid down in Regulation 196 of the Coal Mines Regulations, 2017 shall be complied with.
- (x) Notwithstanding what is contained under Regulation 196 of the Coal Mines Regulations, 2017, no person other than blasting in-charge and his assistants, if any, shall be permitted to remain within a radius of 20.0m or within 60.0 m on the same bench where charging of holes with explosives is being carried out.
- (xi) A proper record of every blast showing the patter of shot-holes and particulars of charge and observation regarding fly rock and ground vibration shall be maintained by the blasting in-charge (First class Assistant Manager) and shall be countersigned by the Manager on every entry.
- (xii) All works relate to drilling, charging and firing of deep holes shall be carried out under supervision of Blasting – Officer / blasting in-charge, who shall having First Class Mine Manager’s Certificate of Competency. He shall be assisted by an Overman for all works.

Following measures should be taken while drilling and blasting operations in the quarry:

- 1) Drilling and Blasting in quarry should be done in accordance with the provisions of Mines Safety Act, rules and regulations. All the precaution laid down under Regulation 196 of Coal Mine Regulation 2017, should be strictly followed.
- 2) Adequate safety measures have to be taken during blasting operation in the quarry so that men/machine is not affected.

6.9 WORKING OVER DEVELOPED SEAMS

For deployment and movement of HEMM, minimum solid parting of 3m must be ensured over developed workings which should be mined by hydraulic backhoe.

Accurate survey plan of developed workings must be prepared for safe operation of the HEMM.

While working in fire affected zone, measures suggested for fire dealing should be adhered to, for maximizing the recovery of coal from fire zone.

Practice of selective mining of dirt bands should be adhered to by sub benching whenever bands of >1.0m is encountered.

Extractable local seams of >0.5m thickness, whenever encountered, must be exploited by sub benching.

6.10 CONSERVATION

For conservation of precious coal resource during mining operation, following measures are suggested :

- i) OB dump should be so planned so that no extractable coal is buried below OB dumps which may result in sterilisation of coal reserves.

- ii) No OB dumping should be done within the coal bearing area.
- iii) Adequate precaution should be taken to eliminate loss of coal while mining the developed coal seams.
- iv) Coal in "Coal+Jhama Zone" should be identified and mined selectively and separably from Jhama.
- vi) While working in zone affected by fire, measures as suggested in 'Fire Dealing Measures' should be adhered to religiously to maximise recovery of coal in fire zone.
- vii) Practice of selective mining of dirt bands must be adhered to by sub-benching whenever bench > 1.0 m thickness is encountered.
- viii) Extractable local seams (> 0.50 m thickness) whenever encountered must be exploited by sub-benching.

6.11 DISASTER MANAGEMENT PLAN

Mining is a hazardous industry. There is risk to life and property associated with various mining and allied activities of the project. The project report has been drawn in conformity with the prevailing statutory provisions as per Mines Act, 1952 & CMR 2017 applicable for safety in mines. A detailed study has been carried out covering identification and assessment of risk, and recommendation of measures to prevent damage to life and property against such risks.

Safety Audit is an integrated component of Risk Assessment and Safety Management, which is required to be undertaken on regular basis by System Study and Safety Audit (SYSSA). Such System Study and Safety Audit (SYSSA) should be conducted at least once in every year, after every major accident or disaster or dangerous occurrence, before implementation of any new technology

or use of any new system or machinery in the mine. Such Study may be subject wise as well as an integrated report of the mine incorporating all subjects such as mining, mechanical, electrical, personal, occupational Health & Hygiene, and any other subject applicable to the mine and the system prevailing or to be used therein.

Risk Reduction Programme (RRP) is an ongoing process to achieve Zero Harm Status of Safety in any mine and should be incorporated in the Disaster Management Programme.

6.12 Recommendations of 11th conference on Safety in Mines held on 4th & 5th July, 2013 at New Delhi regarding Contractor work vis-à-vis safety

6.12.1 Employer's responsibilities

- (a) Suitable clauses (in consistence with risk of the work allotted) shall be included in tender document (including NITs) stating how the risk arising to men and material from the mining operation/operations to be done by the contractors shall be managed.
- (b) Ensure that contractors are familiar with the relevant parts of the statutes, health and safety management system and are provided with copies of such documents prior to commencing work.
- (c) Ensure that contractor's arrangements for health and safety management are consistent with those for the mine owner. All the rules, regulations and bye-laws as applicable to the mine owner are also applicable to the contractor. Details of the contractor's workmen should be maintained in the owners Form-B register. Whereas as C, D & E registers for contractor men may be maintained independently by the owner and shall be kept in the mine office of the manager.

- (d) Ensure that contracts should preferably of longer period (3 years), so that there is adequate scope of management of safety by the contractor.
- (e) Ensure that contractors provide the machinery, operator and other staff with written safe work procedures for the work to be carried out, stating clearly the risk involved and how it is to be managed.
- (f) Monitor all activities of the contractors to ensure that contractors are complying with all the requirements of statute and the system related to safety. If found non-compliance of safety laws directing the contractors to take action to comply with the requirements and for non-compliance, the contractor may be suitably penalized. Clause to this affect may be a part of the agreement between the employer and the contractor.
- (g) Where a risk to health or safety of a person arises because of a noncompliance directing the contractor to cease work until the non-compliance is corrected.

6.12.2 Contractor's responsibilities:

- (a) Prepare written Safe Operating Procedure (SOP) for the work to be carried out, including an assessment of risk, wherever possible and safe methods to deal with it/them.
- (b) Provide copy of the SOP to the person designated by the mine owner who shall be supervising the contractor's work.
- (c) Keep an up to date SOP and provide a copy of changes to a person designated by the mine owner

- (d) Ensure that all work is carried out in accordance with the Statue and SOP and for the purpose he may deploy adequate qualified and competent personnel for the purpose of carrying out the job in a safe manner.
- (e) For work of a specify scope/nature, develop and provide to the mine owner a site specific Code of Practice (COP).
- (f) Ensure that all sub-contractors hired by him comply with the same requirement as the contractor himself and shall be liable for ensuring the compliance all safety laws by the sub or sub-sub contractors.
- (g) All persons deployed by the contractor for working in mine must undergo vocational training, initial medical examination, PME. They should be issued cards stating the name of the contractor and the work and its validity period, indicating status of VT & IME.
- (h) Every person deployed by the contractor in a mine must wear safety gadgets to be provided by the contractor. If contractor is unable to provide, owner, agent and manager of the mine shall provide the same.
- (i) The contractor shall submit to DGMS returns indicating -Name of his firm, Registration number, Name and address of person heading the firm, Nature of work, type of deployment of work persons, Number of work persons deployed, how many work persons hold VT Certificate, how many work persons undergone IME and type of medical coverage given to the work persons. The return shall be submitted quarterly (by 10th of April, July, October and January) for contracts of more than one year. However, for contracts of less than one year, returns shall be submitted monthly.

6.12.3 Employees Responsibilities

- (a) An employee must, while at work, take reasonable care for the health and safety of people who are at the employee's place of work and who may be affected by the employee's act or omissions at work.

- (b) An employee must, while at work, co-operate with his or her employer or other persons so far as is necessary to enable compliance with any requirement under the act or the regulations that is imposed in the interest of health, safety and welfare of the employee or any other person.

CHAPTER - VII

COAL HANDLING, WASHING & MODE OF DISPATCH

Coal production of the mine is linked to different power houses (Power plants of DVC and other companies) and washeries (Bhojudih washery & Dugda washery) through CK (West), BNR siding and Burragarh siding and rest quantity is transported through road to MPL, RTPS and E- Auction etc. The present lead for coal transportation from face to surface is 1 to 2 Km. C. K. West Siding is 3 to 4 KM and BNR Siding is about 10 KM from the coal dump. Feeder breaker exists in KOCP and 3 Nos. of feeder breaker in C. K. West Siding. The coal has been crushed in Feeder Breaker. The crushed coal is stored in hopper. The standing tipping trucks below the hopper receive the crushed coal and spread it on the wharf. The contractual pay loader loads the coal into the railway wagons for further transport.

During 2016-17 destination-wise despatch quantity is given below :

C.K. West Siding	:	0.736402 Million Te.
BNR Siding	:	0.580472 Million Te.
E- Auction by road	:	0.138626 Million Te.
Road MPL	:	0.037666 Million Te.
Boragarh Siding	:	0.012538 Million Te.
Road Linkage	:	0.00015 Million Te.
Total dispatch during 2016-17	:	1.505721 Million Te.

CHAPTER - VIII

INFRASTRUCTURE FACILITIES PROPOSED AND THEIR LOCATION

8.0 GENERAL

Kuya colliery is situated in Bastacolla area, Jharia Coalfield within Dhanbad District of Jharkhand. It is about 6 km away of Dhanbad Railway Station and well-connected by roads.

8.1 PRESENT LINKAGE OF COAL

Coal production of the mine is linked to different power houses (Power plants of DVC and other companies) and washeries (Bhojudih washery & Dugda washery) through CK (West), BNR siding and Burragarh siding and rest quantity is transported through road to MPL, RTPS and E- Auction etc. The length for coal transportation from face to surface is 1 to 2 Km. C. K. West Siding is 3 to 4 KM and BNR Siding is about 10 KM from the coal dump. Feeder breaker exists in KOCP and 3 Nos. of feeder breaker in C. K. West Siding. The coal has been crushed in Feeder Breaker. The crushed coal is stored in hopper. The standing tipping trucks below the hopper receive the crushed coal and spread it on the wharf. The contractual pay loader loads the coal into the railway wagons for further transport.

8.2 POWER SUPPLY ARRANGEMENT

Kuya opencast project is receiving power at 33 KV/ 11KV from Goluckdih Main Sub-Station. The existing transformers at KOCP are as under:-

- (i) Transformer : 11 KV/ 3.3 KV -1000KVA
- (ii) Lighting Transformer : 11 KV/ 440V - 100KVA

- (iii) Lighting Transformer : 11 KV/ 440V - 500KVA
- (iv) Lighting Transformer : 3.3 KV/ 220V - 10KVA
- (v) Lighting Transformer : 11 KV/ 440V - 100KVA
- (vi) Lighting Transformer : 11 KV/ 400V - 500KVA
- (vii) Lighting Transformer (2 Nos) : 500 KV/ 220V - 10KVA
- (viii) Lighting Transformer : 500 KV/ 440V - 20KVA
- (ix) Lighting Transformer : 11 KV/ 440V - 250KVA
- (x) Power Transformer : 11 KV/ 3.3V – 2.5KVA
- (xi) Power Transformer : 11 KV/ 550V - 750KVA
- (xii) Lighting Transformer : 500 KV/ 440V - 100KVA
- (xiii) Lighting Transformer : 500 KV/ 440V - 250KVA
- (xiv) Lighting Transformer : 500 KV/ 440V - 250KVA

Existing arrangement is sufficient to cater proposed mine operation.

8.3 WORKSHOP & STORE

- a) HEMM workshop at KOCP situated in South –West side in mine boundary.
- b) Central workshop at Area Level situated at Chandmari. Pumps and motors are repaired here.
- c) Regional Store at Area Level.

Existing arrangement is sufficient to cater proposed mine operation

8.4 MAGAZINE

There is no magazine at KOCP. The explosive and detonators for consumption of the mine is brought from Central Magazine located at Bera about 4 KM away from the mine. Licence No. E/HQ/JH/22/294(E43380) Used By :- Bera, Dobari and Kuya Colliery.

Existing arrangement is sufficient to cater proposed mine operation.

8.5 OTHER INFRASTRUCTURE FACILITIES AVAILABLE (ROAD, WATER SUPPLY ETC.) –

Company's Road: Network of colliery roads exist in the leasehold of the Mine and connected with Dhanbad to Baliapur road near Joyrampur More.

Water supply: Drinking water is supplied from MADA. For other miscellaneous domestic work Pit water is supplied.

CHAPTER – IX

LAND REQUIREMENT

9.0 LAND STATUS

Ownership wise distribution of land as furnished by Kuya Mine Authority is given below :

OWNERSHIP WISE DISTRIBUTION OF LAND

(Figures in Ha.)

PARTICULARS	AREA (in Hectare)
BCCL Land	141.65
Forest Land	117.19#
Govt. Land	35.06
Tenancy Land	46.60
Total Land	340.50

Out of the above forest land, forest Clearance in respect of remaining 11.17 Ha is under process. The land other than BCCL holding has to be transferred to BCCL / to be acquired by BCCL. De-coaled land of adjoining Colliery will also be required for accommodating external dump of around 37.52 M.Cum.of OB.

9.1 LAND USE**Type of Present land use (Ha)**

SI No.	Type of Land Use		Area (Ha)
1	Running Quarry	Backfilled	20.00
		Not Backfilled	99.63
2	Abandoned Quarries	Backfilled	0.00
		Not Backfilled	12.00
3	External O.B Dump		87.00
4	Service building/ Mine Infrastructure		4.50
5	Coal Dump		4.20
6	Rail and Road		3.00
7	Homestead Land	BCCL	10.00
		Private	5.00
8	Agricultural Land		4.86
9	Forest Land		11.17
10	Plantation		17.50
11	Water Body		1.50
12	Barren Land		60.14
TOTAL			340.50

CHAPTER - X

ENVIRONMENT MANAGEMENT

10.0 ENVIRONMENTAL IMPACT ASSESSMENT

10.1 INTRODUCTION

The impacts (both beneficial and adverse) of mining and its allied activities of the project have been assessed and presented in respect of biophysical & socio-economic environment.

Environmental Impact assessment has been carried out by studying the likely impacts on existing ambient air, water and noise conditions etc. of the area due to mining activities at the site under consideration. For this, the latest data generated from the mine / adjacent existing mine has been taken into consideration as this will give a practical status of the impact of existing mining activities in the area.

10.2 AIR POLLUTION IMPACT ASSESSMENT

The impact assessment has been carried out dealing with the following points:

- (a) Phase-wise inventory of air pollution emission sources
- (b) Impact assessment

a. Phase-wise inventory of air pollution emission sources

The pollution sources are obvious and to assess the impact, the project life is divided into following time frames:

Operation phase

Post-operational stage

The activities associated with these time frames and having impact on the ambient air quality along with the pollutants are enumerated in the following sections:

Operational phase

During this phase, activities necessary for mining of coal, its handling and transport are taken up. Such activities having impact on ambient air quality are detailed below:

- (i) Drilling & Blasting : Noise, Dust and Noxious gases
- (ii) Handling of coal : Noise, Dust and noxious gases
- (iii) Movement of vehicles : Noise, Dust and noxious gases

Post-operational stage

During this stage of the project, the activities related to the closure of mine are to be carried out. Preparation of final mine closure plan shall be carried out during the period four to five years before the closure of the mine. Some of the activities for the closure are:

- ❖ Modifications in physical and biological reclamation of subsided area, if any
- ❖ Salvaging and shifting operation of Machineries and other equipment
- ❖ Clearing of coal and other materials, restoration of infrastructure area & colony area to the extent possible and necessary if not useful for other projects
- ❖ Management of hydrology and hydrogeology.
- ❖ Redeployment of workforce, etc.

- ❖ Arrangement & implementation of post-operation monitoring mainly keeping watch, vigil, etc.

The activities having impact on the ambient air quality are enumerated below:

- (i) Movement of dozers for physical reclamation : Noise, Dust and obnoxious gases
- (ii) Movement of vehicles for shifting and salvaging operation of Machineries and other equipment : Noise, Dust and obnoxious gases
- (iii) Movement of vehicles for clearing of coal and other materials : Noise, Dust and obnoxious gases

b. Impact assessment

The mining and its related activities create ambient air pollution. The impact of mining on ambient air quality is highlighted in the following paragraphs:

The ambient air quality is influenced due to the presence of PM₁₀, PM_{2.5}, SO₂, NO_x, etc., which are generated due to various activities like drilling, blasting and coal & material handling related to the project. Further, the ambient air quality is affected to a varying degree due to the mining activities of other nearby opencast and underground coalmines of the same coalfield. The concentration of pollutants may vary depending upon the various micro-meteorological parameters and the seasons of a year.

In order to assess the ambient air quality in the area surrounding the site where mining activities are continuing since beginning of the 20th century vis a vis the present scenario monitoring has been carried out at different locations based on the wind pattern and topography. The results of the regular environmental monitoring by CMPDIL (Refer Chapter XI) shows that, in spite of continuous mining activity in the area environment has not been affected to any significant extent as the recorded data are all below the permissible limits.

The present assessment as validated through monitoring data as explained above, also proves that, mining activities in the area have not affected the ambient air quality to any significant extent which has become possible because of various Pollution Control Measures are continuously being taken and augmented whenever necessary.

Moreover, fortnightly monitoring of ambient air quality at all the operating mines helps in identifying any source generating the pollution for which appropriate control measures are then planned for implementation, which can be validated in the subsequent monitoring.

The Air Pollution control measures will be further strengthened to keep the air pollutants well within the permissible limit in the mine under consideration.

10.3 IMPACT ASSESSMENT ON WATER

I. Identification of the sources of water pollution

Likely sources of water pollution from this project along with the type of pollutants are as follows:

- (i) Sanitary (domestic) wastewater : Suspended solids and BOD.
- (ii) Water pumped out from mine : Suspended solids of coal, clay and oil.
- (iii) Surface run-off passing through coal stockpiles : Suspended solids.
- (iv) Storm water from leasehold area and built-up area : Suspended solids.
- (v) Waste Water from workshop : Suspended solids, Oil and grease

II. Assessment

Mining and its related activities may create water quality problems. The impact of mining at the project on both surface and ground water sources are given subsequently.

(a) Surface water sources

If the mine effluent is discharged without proper treatment it will lead to deterioration of water quality and pollution of water bodies. However as per environment monitoring data of Cluster- VIII provided in Chapter – XI, the environment quality of mine effluents is within permissible limits and subsequently will not affect the surface water sources. Mitigation measures would involve provision of the following depending on the site condition and actual requirement statutory or otherwise.

- (i) Garland drains for surface runoff.
- (ii) Sedimentation ponds/settling tank for reducing the pollution of surface water bodies.
- (iii) Workshop effluent treatment plant

However, due care will be taken to treat the mine water discharge by sedimentation if need arise for the mine under consideration.

III. Groundwater resource

In coal mines, the different aquifers overlying the working coal seam would be contributing groundwater to the mine by gravity drainage which need to be pumped out for safe operation of the mines.

Generally steep draw down cone would be formed in poor potential aquifers thereby influence the area to a small distance and reverse is established in respect of aquifers with high hydraulic conductivity. The Impact of mining activities is likely to be pronounced in the dip side which are estimated by utilising aquifer and mine parameters at final mine depth. It may be appropriate to mention here that the presence of prominent boundaries/water bodies, faults and also interfringing of sandstone and shale beds may restrict the propagation of draw down cone.

Further, the ground water level decline is more in the close vicinity of the pit. The effect will be pronounced in the down – dip side and milder in the up – dip side. But this effect will be temporary in nature and once the project is over, after 2-3 rains, the regime will regain its almost original status.

Any shortage of water in the affected villages during the temporary period will be supplemented through supply of treated water pumped out from the mine.

IV. Impact on noise level

In order to assess the existing ambient noise level in the surrounding of the mine site corresponding to existing scenario, ambient noise level data has been generated at different locations and it is seen that existing quality of ambient noise is quite satisfactory.

The noise level monitoring data are given in chapter - XI

The likely source of noise are given below

- Drilling and Blasting operations
- Operations of HEMM
- Operation of Equipment CHP, Workshop etc.

ACCEPTABLE INDUSTRIAL NOISE LEVEL

As per Env. (Protection) Amendment Rules, 2000 the ambient air quality standards in respect of noise in industrial, commercial, residential and silence zones area as follows:

Sl. No.	Category of area	Limits [dB (A)]	
		Day time (6.00 AM to 10.00 PM)	Night time (10.00 PM to 6.00 AM)
1.	Industrial	75	70
2.	Commercial	65	55
3.	Residential	55	45
4.	Silence zone	50	40

Assessment of the degree of noise, to which a workplace noise is harmful, is done by comparing the values measured at workplace to the permissible TLV adopted by statutory bodies like DGMS.

The Director General of Mines Safety vide their circular no. DG (Tech.)/18 of 1975 has prescribed the TLV for noise level as 90 dB (A), for the workers engaged in mining occupation likely to be exposed to in an 8 hour shift period with unprotected ear. Whereas, the following table shows the maximum permissible noise exposure levels, as per American Standards, for the industrial workers.

Exposure time (Hrs./day)	Noise level [dB (A)]
8	90
6	92
4	95
3	97
2	100

Exposure time (Hrs./day)	Noise level [dB (A)]
1.5	102
1	105
0.5	108
0.25 or less	115
EXPOSURE TO PULSE OR IMPACT NOISE SHOULD NOT EXCEED 140 dB (A)	

It is observed that noise level recorded in mine activity area (details given in Chapter XI) is well within the permissible limit for the mine under consideration.

The present assessment as validated through monitoring data as explained above, also proves that, mining activities in the area have not affected the ambient noise to any significant extent which has become possible because of various Pollution Control Measures are continuously being taken and augmented whenever necessary.

Moreover, fortnightly monitoring of ambient noise quality at all the operating mines helps in identifying any source generating the pollution for which appropriate control measures are then planned for implementation which can be validated in the subsequent monitoring.

The above paragraphs, clearly bring out the fact that, impact of mining activities on ambient noise is insignificant and the mine under consideration will be no exception.

V. Socio- economic Impact

There would be some obvious changes in various socio economic parameter due to mining activities eg. Increased economic activities & creation of new employment opportunities, infrastructural development, better educational and health care facilities etc.

The socio –economic impacts of the project is given below.

A) Population Growth and Migration

Mining activities in this coalfield is continuing since beginning of 20th century. The development of the area is totally indebted to coal mining as well as the entire economy of the area is sustaining due to coal mines. In addition to creating adequate direct employment in the coalmine large opportunities of indirect employment have also been created. Numbers of people from out side the state have migrated in this region, which has resulted in through mixing of different culture and customs as per the tradition of our country “Unity in diversity”.

B) Resettlement & Rehabilitation.

The village/ basti which are to be rehabilitated as per as per data provided by mine authority is given below.

Village/Site	BCCL	Pvt.	Enchr	Other	Total
Kuya New colony /10 No. / Durga Mandir Colony	195	105	105		405
KOCP Chandkuya/Ranisati / DB Road / Yag Shala Dhowa / Bandh Dhowra / Bangali Khoti	205	555	209		969

In addition to above, houses situated over proposed external dump area are also required to be rehabilitated/shifted.

C) Transport and Communication

The present network of metalled approach road to the place of work and other places of public interests like shopping, education, medical services etc. is going to improve with continuation of mining operation.

D) Health

The facilities created in the area are extended for neighbouring population also.

E) **Literacy**

With continuation of mining activities in the area, educational facilities developed in the area will continue to improve the literacy of the rural areas also.

F) **Economic Impacts**

With the continuation of mining activities the occupational structure of the area is going to improve further and many people are likely to be involved in the job of mining and allied activities. Hence, income level of these people is likely to improve to significant level.

Employment opportunities both direct & indirect in this project are likely to cause migration from outside. Amenities like medical educational, recreational etc. are available to local people and their quality of life has definitely improved.

VI. Land Use Pattern during Mining

Land in case of coal mining activity, gets degraded by way of actual excavation for coal winning operation and dumping of waste material on the surface especially in the open cast mining. Present land use is given in Chapter- IX.

Year wise backfilling quantity, backfilled area and area of reclamation of internal OB dump area is given below:

Year	Backfilled Quantity M.Cum.	in	Reclaimed Backfilled Area in Ha.
2017-18	3.20		
2018-19	3.22		
2019-20	3.60		
2020-21	3.21		
2021-22	5.64		

2022-23	4.80	
2023-24	1.80	
2024-25	1.80	
2025-26	1.80	8
2026-27	1.80	8
2027-28	1.89	8
2028-29	2.52	8
2029-30	2.52	8
2030-31	2.69	8
2031-32	2.69	8
2032-33		25.93
2033-34		25.93
2034-35		25.94
Total	43.18	133.80

VII. Impact on flora & fauna:

There is no endangered and endemic species in core and buffer zone.

By developing plantation of native species efforts are being made to improve the green cover in and around the immediate vicinity of the mine area.

BCCL in association with local people will make all efforts to conserve the flora & fauna in the immediate surroundings of the mine area.

10.2.1 ENVIRONMENTAL MANAGEMENT PLAN

I. Environmental Pollution Control Measures:

i) Air, Noise Pollution Control Measures:

- a) To reduce air pollution due to dust produced during various mining and allied activities, adequate water spraying is being done at strategic points so that dust do not get air-borne. Mobile water sprinklers are being used for dust suppression along haul road, coal transportation road etc. Fixed water sprinklers may be installed

along coal transportation road, coal stock yard and other dust prone areas. Additional Mobile Sprinklers may be required as per extent of mining. Suitable chemical re-agents to coagulate the dust particles would also be tried while water spraying.

- b) Proper blasting techniques by designing a suitable blasting pattern after actual field observation would be followed to minimize adverse effects of ground vibration and noise if required.
- c) Black topping of roads.
- d) Biological reclamation of subsided areas, development of green belt around infrastructure, colony, along roads and in vacant land against villages are being undertaken for arresting dust and noise propagation.
- e) Proper maintenance of all Machines etc. are being undertaken so as to reduce harmful exhaust and noise.
- f) Regular cleaning of transportation roads are being carried out.
- g) Coal are being transported using covered trucks. No overloading of trucks are being allowed.
- h) Personal protective gears are given to workmen exposed to dusty and noisy work environment.

PLANTATION / GREEN BELT AS A MITIGATIVE MEASURES AGAINST ENVIRONMENTAL POLLUTION:

Plantation is an important tool to combat air pollution, noise pollution and soil erosion. In addition to these it gives an aesthetic look to the area.

For plantation purpose following areas can be considered:

Area where ornamental trees viz. gulmohar, Eucalyptus and fruit trees like Mango, Guava, Jamun and medicinal plant like Neem etc. can be provided like colony area, schools, dispensary, community buildings, play-ground etc.

Areas where different rows of trees including tall and fast growing varieties along with ornamental shady trees shall be planted e.g. around colony, along roads, haul roads, and around industrial buildings, etc.

Plantation of these trees will also take off some pressure on the nearby forests as far as firewood is concerned. Grass carpeting may be done in batter region.

PLANTATION PROGRAMME / GREEN BELT:

The plantation would be taken up with the help of suitable agency. Thereafter, this process would continue concurrently with the mining activities.

WIDTH OF GREEN BELT:

- a) Along the roads 1000 saplings per road km; two rows on both sides of the road; width – 3 m.
- b) Around colony & infrastructure – 2500 saplings per ha; width – 5 m; 3 rows of plantation all around.
- c) Vacant land – 2500 saplings per ha.

Density of plantation will be as mentioned earlier.

Plantation activity will be carried out throughout the life of the mine in and around the quarry, OB dump and in safety zone. Phase wise Plantation activities to be carried out are as mentioned under:

Proposed Plantation Programme of Kuya Colliery (OC)										
	Year		OB Dump (Internal & External)		Batter		Safety Zone		Total Plantation	Total Area Under Additional Plantation (Ha)
			Area (ha)	Trees/ saplings	Area (ha)	Trees/ saplings	Area (ha)	Trees/ saplings		
During active mining	1	2017-18								
	2	2018-19					1.86	4650	4650	1.86
	3	2019-20					1.86	4650	4650	1.86
	4	2020-21					1.86	4650	4650	1.86
	5	2021-22					1.86	4650	4650	1.86
	6	2022-23					1.86	4650	4650	1.86
	7	2023-24					1.87	4675	4675	1.87
	8	2024-25					1.87	4675	4675	1.87
	9	2025-26	12.85	32125					32125	12.85
	10	2026-27	12.85	32125					32125	12.85
	11	2027-28	12.85	32125					32125	12.85
	12	2028-29	12.85	32125					32125	12.85
	13	2029-30	12.85	32125					32125	12.85
	14	2030-31	12.85	32125					32125	12.85
	15	2031-32	12.9	32250					32250	12.9
Post mining	PC1	2032-33	25.93	64825	12.16	30400			95225	38.09
	PC2	2033-34	25.93	64825	12.16	30400			95225	38.09
	PC3	2034-35	25.94	64850	12.17	30425			95275	38.11
		Total	167.8	419500	36.49	91225	13.04	32600	543325	217.33

ii) Water Pollution Control Measures:

a) Domestic Effluent:

Residential quarters are provided with conventional soak pit system.

b) Mine Discharge:

Water collected in the workings are first allowed to settle in sumps. Sufficiently large sumpage has been provided to eliminate the discharge of un-dissolved suspended solids to the surface along with mine water. The quality of mine pumped out water as being monitored in all the operating mines also establishes the fact that, the untreated mine pumped out water does not contain any significant pollution load.

However, it is proposed to carry out the monitoring of quality of mine discharge and if any undesirable element is found in the sample it will be treated properly before it is re-used.

- c) The final treated discharge then be utilized for various purposes e.g. water spraying, watering of plants, etc. Balance quantity if any, will be supplied for irrigation, if required otherwise discharged in natural watercourses.

iii) Remedial measures to control ground water depletion

The following methodology and remedial measures will be taken to minimize the mine-induced impact on ground water levels and also adverse effects in the area.

- (a) The decoaled voids will be used for water harvesting structures.
- (b) The back filling will arrest the mine seepage resulting in restoration of ground water level in the immediate vicinity of the area.
- (c) The unlined garland drain and sedimentation pond will enhance the runoff recharge.
- (d) The water shortage in the villages, if any, in the influence area can be supplemented by supply of water from outside source or from the mine water after treatment.

Regular well water monitoring in nearby villages is being carried out quarterly as per MOEF's guidelines.

II. Disaster Management Plan

Details of Disaster Management Plan Given in Chapter VI

III. MONITORING & MANAGEMENT ORGANISATION

Close monitoring of the environment and implementation of various protective measures discussed in the report forms an important part of Environment Management Plan (EMP). In the earlier paragraphs the causes of various pollutions along with the preventive and mitigative measures have been discussed. In the subsequent paragraph, monitoring organization is being discussed.

MONITORING ORGANISATION

To have a close watch on the environmental condition and implementation of the various measures suggested, a multi-disciplinary approach is essential.

- a) BCCL (HQ) acts as an apex body, which monitors the activities relating to environment at project level through the General Manager.
- b) General Manager of the area co-ordinates the activities of various disciplines in the area to render all necessary assistance at the implementing level i.e. the Project. Nodal Officer (Environment) of the area monitors all aspects of environment on behalf of the General Manager. He also takes suitable steps for generation of environmental data for its analysis and interpretations. Plantation is being done on a large area. The horticulturist along with the Supervisor shall only monitor and guide the agency for selection of site, treatment of soil and selection of species.

- c) Project Officer is primarily responsible for reclamation of the mined out area. He shall also be responsible for biological reclamation with the assistance of GM's office.

ORGANISATION CHART

Sl. No.	Measures/Actions		Agency
1.	Environmental Pollution Control	1	General Manager, Bastacolla Area
		2	Nodal Officer, (Environment), Bastacolla Area
		3	Project Officer, Kuya Colliery
		4	Area Manager (Civil), Bastacolla Area
		5	Environmental Cell (BCCL H.Q.)
2.	Environmental Monitoring	1	General Manager, Bastacolla Area
		2	Area Manager (Civil), Bastacolla Area
		3	Nodal Officer, (Environment), Bastacolla Area
		4	Project Officer, Kuya Colliery
		5	Environment Cell of BCCL Headquarters
		6	Environmental Laboratory of CMPDI, RI-II, Dhanbad
3.	Reclamation	1	Project Officer, Kuya Colliery
		2	Nodal Officer (Environment), Bastacolla Area

CHAPTER - XI

ENVIRONMENTAL MONITORING REPORT

11.1 WATER QUALITY

The mine falls in Cluster VIII for the purpose of Environmental Monitoring Data Generation. The monitoring of water quality for Cluster-VIII is being conducted by CMPDI RI-II, Dhanbad by collecting water samples from ground water, surface water and mine water discharge / workshop discharge (if any). The monitoring stations have been decided by BCCL in consultation with Jharkhand State Pollution Control Board. The various purposes of the water environment monitoring are as follows:

- To assess the water quality characteristics for critical parameters;
- To evaluate the impacts on agricultural productivity, habitat conditions, creational resources and aesthetics in the vicinity ; and
- To facilitate predication of impact on water quality by project activities

Water samples were collected as per standard practice. The effluent samples were collected and analysed for four parameters on fortnightly basis. The drinking and Surface water samples were collected and analyzed for 25 and 17 parameters respectively, on quarterly basis. Thereafter the samples were preserved and analysed at the Environmental Laboratory at CMPDI (HQ), Ranchi.

To assess the quality of lotic system (surface water), water samples were collected from the following locations:

Table 11.1 : Sampling Location for Surface Water

Project Site: Cluster VIII, Period: April 2016 – June 2016

SI. No	Name of Sampling Locations	Frequency	Location Code
01.	Kashi jore River U/S	Once in a season	SW18
02.	Kashi Jore River D/S	Once in a season	SW19

Tabel:11.2 PHYSICO-CHEMICAL CHARACTERISTICS OF SURFACE WATER QUALITYName of the Company: **Bharat Coking Coal Limited** Year : **2016-17.**Name of the Cluster : **Cluster - VIII**Period: **Q. E. June, 2016.****Stations:****Date of Sampling:**

1. Upstream in Kashi Jore SW-18

10/03/2016

2. Downstream in Kashi Jore SW-19

10/03/2016

Sl. No	Parameter	Sampling Stations		BIS Standard & Method
		SW-18	SW-19	
1	Arsenic (as As), mg/l, Max	<0.002	<0.002	IS 3025/37:1988 R : 2003, AAS-VGA
2	BOD (3 days 27°C), mg/l, Max	2.4	2.6	IS 3025 /44: 1993, R : 2003 3 day incubation at 27°C
3	Colour (Hazen Unit)	colourless	colourless	Physical/Qualitative
4	Chlorides (as Cl), mg/l, Max	58	68	IS-3025/32:1988, R-2007, Argentometric
5	Copper (as Cu), mg/l, Max	<0.03	<0.03	IS 3025 /42 : 1992 R : 2009, AAS-Flame
6	Disolved Oxygen, min.	5.9	4.8	IS 3025/381989, R : 2003, Winkler Azide
7	Fluoride (as F) mg/l, Max	0.56	0.67	APHA, 22 nd Edition SPADNS
8	Hexavalent Chromium, mg/l, Max	<0.01	<0.01	APHA, 22 nd Edition, 1,5 - Diphenylcarbohydrazide
9	Iron (as Fe), mg/l, Max	<0.06	<0.06	IS 3025 /53 : 2003, R : 2009 , AAS-Flame
10	Lead (as Pb), mg/l, Max	<0.005	<0.005	APHA, 22 nd Edition AAS-GTA
11	Nitrate (as NO ₃), mg/l, Max	5.32	8.42	APHA, 22 nd Edition, UV-Spectrphotometric
12	pH value	7.70	7.40	IS-3025/11:1983, R-1996, Electrometric
13	Phenolic compounds (as C ₆ H ₅ OH), mg/l, Max	<0.002	<0.002	APHA, 22 nd Edition 4-Amino Antipyrine
14	Selenium (as Se), mg/l, Max	<0.002	<0.002	APHA, 22 nd Edition AAS-GTA
15	Sulphate (as SO ₄) mg/l, Max	210	320	APHA, 22 nd Edition Turbidity
16	Total Dissolved Solids, mg/l, Max	588	764	IS 3025 /16:1984 R : 2006, Gravimetric
17	Zinc (as Zn), mg/l, Max	0.05	0.04	IS 3025 /49 : 1994, R : 2009, AAS-Flame

The physico-chemical characteristics of the surface water samples collected from the two locations have shown great resemblance with respect to the characteristics like temperature, turbidity, pH, colour, odour, chloride, sulphate, total alkalinity, total hardness, TDS and heavy metals, etc.

Table 11.3 : Sampling Location for Industrial Effluent/Mine Water

Project Site: Cluster VIII, Period: April 2016 – June 2016

SI. No	Name of Sampling Locations	Frequency	Location Code
1	Mine Discharge of Dobari	Each Fortnight	MW ₈

The physico-chemical characteristics of Mine water samples collected from Dobari have been presented below.

Table 11.4 : PHYSICO-CHEMICAL CHARACTERISTICS OF MINE WATER QUALITY

Name of the Company: **Bharat Coking Coal Limited** Year : **2016-17.**

Name of the Cluster : **Cluster - VIII** Month : **April, 2016.**

Name of the Stations & Code :

1. MW8- Mine Discharge of Dobari

(a) First Fortnight

SI. No.	Parameters	MW8	As per MOEF General Standards for schedule VI
		(Mine Discharge) 08.04.2016	
1	Total Suspended Solids	40	100 (Max)
2	pH	7.98	5.5 - 9.0
3	Oil & Grease	<2.0	10 (Max)
4	COD	20	250 (Max)

(b) Second Fortnight

Sl. No.	Parameters	MW8 (Mine Discharge)	As per MOEF General Standards for schedule VI
		29.04.2016	
1	Total Suspended Solids	34	100 (Max)
2	pH	8.32	5.5 - 9.0
3	Oil & Grease	<2.0	10 (Max)
4	COD	24	250 (Max)

*All values are expressed in mg/lit unless specified.

Name of the Company: **Bharat Coking Coal Limited**

Year : **2016-17.**

Name of the Cluster: **Cluster - VIII**

Month: **May, 2016.**

Name of the Stations & Code :

1. MW8- Mine Discharge of Dobari

(a) First Fortnight

Sl. No.	Parameters	MW8 (Mine Discharge)	As per MOEF General Standards for schedule VI
		09.05.2016	
1	Total Suspended Solids	34	100 (Max)
2	pH	8.19	5.5 - 9.0
3	Oil & Grease	<2.0	10 (Max)
4	COD	24	250 (Max)

(b) Second Fortnight

Sl. No.	Parameters	MW8 (Mine Discharge)	As per MOEF General Standards for schedule VI
		21.05.2016	
1	Total Suspended Solids	48	100 (Max)
2	pH	7.98	5.5 - 9.0
3	Oil & Grease	<2.0	10 (Max)
4	COD	40	250 (Max)

*All values are expressed in mg/lit unless specified

Name of the Company: **Bharat Coking Coal Limited**Year : **2016-17.**Name of the Cluster: **Cluster - VIII**Month: **June, 2016.**

Name of the Stations & Code :

1. MW8- Mine Discharge of Dobari**(a) First Fortnight**

Sl. No.	Parameters	MW8 (Mine Discharge)	As per MOEF General Standards for schedule VI
		14.06.2016	
1	Total Suspended Solids	44	100 (Max)
2	pH	7.98	5.5 – 9.0
3	Oil & Grease	<2.0	10 (Max)
4	COD	32	250 (Max)

(b) Second Fortnight

Sl. No.	Parameters	MW8 (Mine Discharge)	As per MOEF General Standards for schedule VI
		21.06.2016	
1	Total Suspended Solids	46	100 (Max)
2	pH	7.3	5.5 – 9.0
3	Oil & Grease	<2.0	10 (Max)
4	COD	28	250 (Max)

*All values are expressed in mg/lit unless specified

All the monitored parameters are well within the permissible limit.

Table 11.5 : PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLESName of the Company: **Bharat Coking Coal Limited** Year : **2016-17.**Name of the Cluster: **Cluster - VIII**Period: **Q. E. June, 2016.**Area : **Dobari**Project: **Dobari**Stations: **Ground Water from Ghanudih OC GW-8**

Date of Sampling:

20/05/2016

(Wherever not specified, characteristics are expressed in mg/l)

Sl. No	Parameter	Sampling Stations	Standard / Test Method
		GW-8	
1	Boron (as B), mg/l, Max	<0.20	APHA, 22 nd Edition ,Carminc
2	Colour,in Hazen Units	5	APHA, 22 nd Edition ,Pt.-Co. Method
3	Calcium (as Ca), mg/l, Max	77	IS-3025/40:1991, EDTA
4	Chloride (as Cl), mg/l, Max	102	IS-3025/32:1988, R-2007, Argentometric
5	Copper (as Cu), mg/l, Max	<0.03	IS 3025/42 : 1992 R : 2009, AAS-Flame
6	Fluoride (as F) mg/l, Max	1.10	APHA, 22 nd Edition , SPADNS
7	Free Residual Chlorine, mg/l, Min	0.06	APHA, 22 nd Edition, DPD
8	Iron (as Fe), mg/l, Max	<0.06	IS 3025 /53 : 2003, R : 2009 , AAS-Flame
9	Lead (as Pb), mg/l, Max	<0.005	APHA, 22 nd Edition, AAS-GTA
10	Manganese (as Mn), mg/l, Max	<0.02	IS-3025/59:2006, AAS-Flame
11	Nitrate (as NO ₃), mg/l, Max	4	APHA, 22 nd Edition, UV-Spectrophotometric
12	Odour	Agreeable	IS 3025 /05:1983, R-2012, Qualitative
13	pH value	7.78	IS-3025/11:1983, R-1996, Electrometric
14	Phenolic compounds (as C ₆ H ₅ OH), mg/l, Max	<0.001	APHA, 22 nd Edition,4-Amino Autipyrine
15	Selenium (as Se), mg/l, Max	<0.002	APHA, 22 nd Edition, AAS-GTA
16	Sulphate (as SO ₄) mg/l, Max	172	APHA, 22 nd Edition. Turbidity
17	Taste	Acceptable	APHA, 22 nd Edition. Taste
18	Total Alkalinity (c _a CO ₃),, mg/l, Max	336	IS-3025/23:1986, Titration
19	Total Arsenic (as As), mg/l, Max	<0.002	IS 3025/ 37:1988 R : 2003, AAS-VGA
20	Total Chromium (as Cr), mg/l, Max	<0.04	IS-3025/52:2003, AAS-Flame
21	Total Dissolved Solids, mg/l, Max	1070	IS 3025 /16:1984 R : 2006, Gravimetric
22	Total Hardness (c _a CO ₃), mg/l, Max	600	IS-3025/21:1983, R-2002, EDTA
23	Turbidity, NTU, Max	17	IS-3025/10:1984 R-1996, Nephelometric
24	Zinc (as Zn), mg/l, Max	0.01	IS 3025/ 49 : 1994, R : 2009, AAS-Flame

The physico-chemical characteristics of the ground water samples showed great resemblance with respect to the characteristics like temperature, turbidity, pH, colour, odour, chloride, sulphate, total alkalinity, total hardness, TDS and heavy metals, etc.

Air Quality monitoring

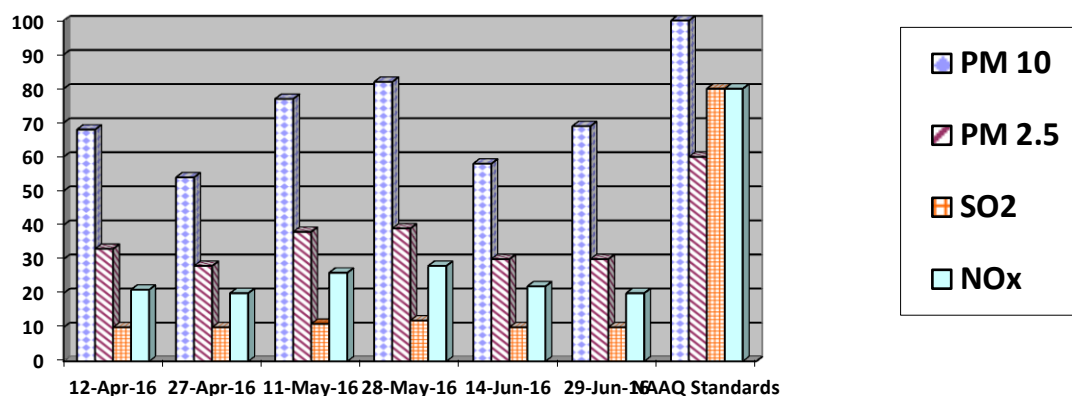
The monitoring of air quality under for Cluster VIII is being conducted by CMPDI RI-II, Dhanbad and test results of air samples are furnished subsequently. The monitoring stations have been decided by BCCL in consultation with Jharkhand State Pollution Control Board.

Table 11.6: Location of Air Sampling Stations

S. No.	Components	Locations (Station Code)	Frequency	Number of Parameters Covered
1	Air Quality	(Core Zone) Dobari (A11)	Each Fortnight	Four (PM10, PM2.5, SO _x , NO _x)
		(Buffer Zone) Jeenagora (A13) Hurriladih UGP (A28) Kusmatand Village (A12)	Each Fortnight	Four (PM10, PM2.5, SO _x , NO _x)

Table 11.6A: Ambient Air Quality in Cluster-VI Mine Area for Core and Buffer zone
(a). Station Code/Name: A11- Dobari Category: Industrial¹.

Sl. No.	Dates of sampling	PM 10	PM 2.5	SO ₂	NO _x
1	12 - Apr -16	68	33	<10.0	21
2	27 - Apr - 16	54	28	<10.0	20
3	11 - May -16	77	38	11	26
4	28 - May -16	82	39	12	28
5	14 - Jun - 16	58	30	<10.0	22
6	29 - Jun - 16	69	30	<10.0	20
NAAQ Standards		100	60	80	80

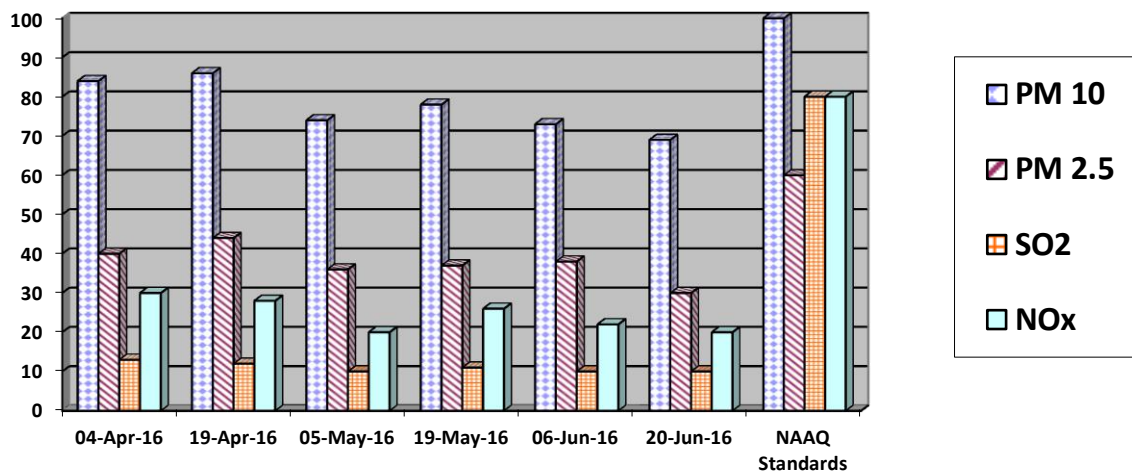


Note:

- All values are expressed in microgram per cubic meter.
- 24 hours duration

(b). Station Code/Name: A13 – Jeenagora, Category: Industrial².

Sl. No.	Dates of sampling	PM 10	PM 2.5	SO ₂	NO _x
1	04 - Apr -16	84	40	13	30
2	19 - Apr - 16	86	44	12	28
3	05 - May -16	74	36	<10.0	20
4	19 - May -16	78	37	11	26
5	06 - Jun - 16	73	38	<10.0	22
6	20 - Jun - 16	69	30	<10.0	20
NAAQ Standards		100	60	80	80



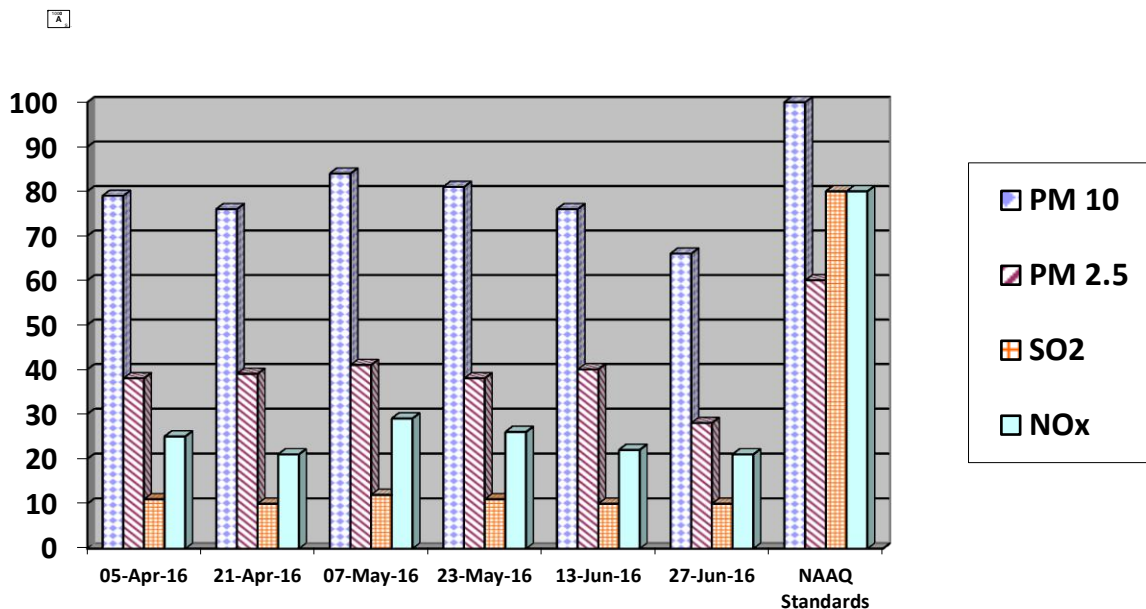
A

Note:

- All values are expressed in microgram per cubic meter.
- 24 hours duration

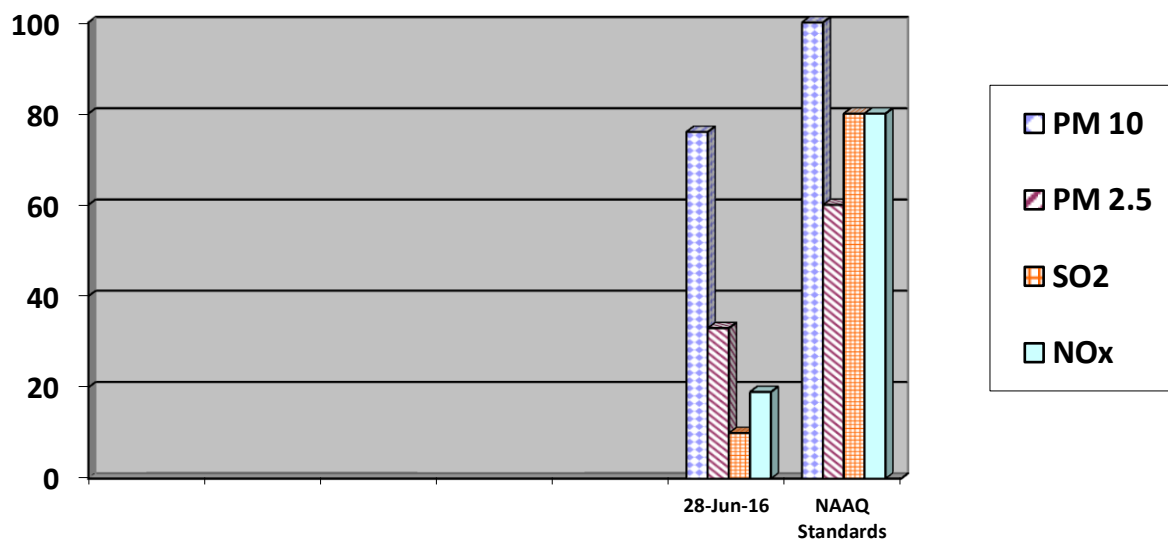
(c). Station Code/Name: A28 – Hurriladih UGP, Category: Industrial³.

Sl. No.	Dates of sampling	PM 10	PM 2.5	SO ₂	NO _x
1	05 - Apr -16	79	38	11	25
2	21 - Apr - 16	76	39	<10.0	21
3	07 - May -16	84	41	12	29
4	23 - May -16	81	38	11	26
5	13 - Jun - 16	76	40	<10.0	22
6	27 - Jun - 16	66	28	<10.0	21
	NAAQ Standards	100	60	80	80



(d). Station Code/Name: A12 – Kusumatand Village, Category: Industrial⁴.

Sl. No.	Dates of sampling	PM 10	PM 2.5	SO ₂	NO _x
1	28 - Jun - 16	76	33	<10.0	19
	NAAQ Standards	100	60	80	80



Results & Interpretations

The results of Ambient Air Quality are presented in tabular form along with Bar chart for each monitoring station.

Table 11.7 : National Ambient Air Quality Standards
(As per MoEF Notification on 16th November, 2009)

Sl. No.	Pollutant	Time weighted average	Concentration in Ambient Air		
			Industrial, Residential, rural and Other Area	Ecologically Sensitive Area (notified by Central Government)	Methods of Measurement
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO ₂), µg/m ³	Annual* 24 hours**	50 80	20 80	- Improved West and Gaeke - Ultraviolet fluorescence
2	Nitrogen Dioxide (NO ₂), µg/m ³	Annual* 24 hours**	40 80	30 80	-Modified Jacob & Hochheiser (Na-Arsenite) -Chemiluminescence
3	Particulate Matter (Size less than 10 µm) or PM ₁₀ µg/m ³	Annual* 24 hours**	60 100	60 100	-Gravimetric -TOEM - Beta attenuation
4	Particulate Matter (Size less than 2.5 µm) or PM ₂ µg/m ³	Annual* 24 hours**	40 60	40 60	-Gravimetric -TOEM - Beta attenuation
5	Ozone (O ₃) µg/m ³	8 hours* 1 hour**	100 180	100 180	-UV photometric -Chemiluminescence -Chemical Method
6	Lead (Pb) µg/m ³	Annual* 24 hours**	0.50 1.0	0.50 1.0	-AAS/ICP method after sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
7	Carbon Monoxide(CO) mg/m ³	8 hours* 1 hour**	02 04	02 04	-Non Dispersive Infra Red (NDIR)Spectroscopy)
8	Ammonia(NH ₃) µg/m ³	Annual* 24 hours**	100 400	100 400	- Chemiluminescence - Indophenol blue method
9	Benzene(C ₆ H ₆) µg/m ³	Annual*	05	05	- Gas chromatography based continuous analyzer - Adsorption and Desorption followed by GC analysis
10	Benzo(o) Pyrine (BaP)-Particulate phase only, ng/m ³	Annual*	01	01	-Solvent extraction followed by HPLC/GC analysis
11	Arsenic(As), ng/m ³	Annual*	06	06	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel(Ni), ng/m ³	Annual*	20	20	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be compiled with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Note – Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limit specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

NOISE LEVEL DATA

The monitoring of noise level data under for Cluster VIII mines is being conducted by CMPDI RI-II, Dhanbad and test results of noise level data are furnished subsequently. The monitoring stations have been decided by BCCL in consultation with Jharkhand State Pollution Control Board.

Location of Stations

- i). Dobarı (N11)
- ii). Jeenagora (N13)
- iii) Hurriladih UGP (N28)

Table 11.8: Ambient Noise Level Data Cluster-VIII Mine Area

Name of the Company: **Bharat Coking** Year : **2016-17.**

Coal Limited

Name of the Cluster: **Cluster -VIII** Month: **April, 2016.**

Name of the Stations & Code :
1. Dobarı (N11)
2. Jeenagora (N13)
3. Hurriladih UGP (N28)⁵

(a) First Fortnight

Sl. No.	Station Name/Code	Category of area	Date	Noise level dB(A)LEQ	*Permissible Limit of Noise level in dB(A)
1	Dobari (N11)	Industrial area	12.04.2016	61.4	75
2	Jeenagora (N13)	Industrial area	04.04.2016	67.8	75
3	Hurriladih UGP (N28)	Industrial area	05.04.2016	54.7	75

(b) Second Fortnight

Sl. No.	Station Name/Code	Category of area	Date	Noise level dB(A)LEQ	*Permissible Limit of Noise level in dB(A)
1	Dobari (N11)	Industrial area	27.04.2016	56.8	75
2	Jeenagora (N13)	Industrial area	19.04.2016	58.4	75
3	Hurriladih UGP (N28)	Industrial area	21.04.2016	56.8	75

Name of the Company: **Bharat Coking Coal Limited** Year : **2016-17.**

Name of the Project: **Cluster -VIII**

Month: **May, 2016.**

Name of the Stations & Code :

1. **Dobari (N11)**
2. **Jeenagora (N13)**
3. **Hurriladih UGP (N28)⁶**

a. First Fortnight

Sl. No.	Station Name/Code	Category of area	Date	Noise level dB(A)LEQ	*Permissible Limit of Noise level in dB(A)
1	Dobari (N11)	Industrial area	11.05.2016	58.7	75
2	Jeenagora (N13)	Industrial area	05.05.2016	56.7	75
3	Hurriladih UGP (N28)	Industrial area	07.05.2016	57.3	75

b. Second Fortnight

Sl. No.	Station Name/Code	Category of area	Date	Noise level dB(A)LEQ	*Permissible Limit of Noise level in dB(A)
1	Dobari (N11)	Industrial area	28.05.2016	61.2	75
2	Jeenagora (N13)	Industrial area	19.05.2016	61.6	75
3	Hurriladih UGP (N28)	Industrial area	23.05.2016	58.9	75

Name of the Company: **Bharat Coking Coal Limited** Year : **2016-17.**

Name of the Project: **Cluster -VIII**

Month: **June, 2016.**

Name of the Stations & Code :

1. **Dobari (N11)**
2. **Jeenagora (N13)**
3. **Hurriladih UGP (N28)**
4. **Kusmatand Village(N12)⁷**

a. First Fortnight data

Sl. No.	Station Name/Code	Category of area	Date	Noise level dB(A)LEQ	*Permissible Limit of Noise level in dB(A)
1	Dobari (N11)	Industrial area	14.06.2016	59.4	75
2	Jeenagora (N13)	Industrial area	06.06.2016	60.3	75
3	Hurriladih UGP (N28)	Industrial area	13.06.2016	61.3	75

b. Second Fortnight data

Sl. No.	Station Name/Code	Category of area	Date	Noise level dB(A)LEQ	*Permissible Limit of Noise level in dB(A)
1	Dobari (N11)	Industrial area	29.06.2016	61.3	75
2	Jeenagora (N13)	Industrial area	20.06.2016	57.8	75
3	Hurriladih UGP (N28)	Industrial area	27.06.2016	55.2	75
4	Kusmatand Village (N12)	Industrial Area	28.06.2016	59.4	75

****Permissible limits of Noise Level as per MOEF Gazette Notification No. GSR 742(E) dt. 25.09.2000 Standards for Coal Mines and Noise Pollution (Regulation and Control) Rules, 2000.***

*** Day Time: 6.00 AM to 10.00 PM, +Night Time: 10.00 PM to 6.00 AM.**

Results & Interpretations

Ambient noise levels were recorded during day time and the observed values were compared with standards prescribed by MoEFCC.

The observed values at all the monitoring locations are found to be within permissible limits.

CHAPTER - XII

PROGRESSIVE AND FINAL MINE CLOSURE PLAN

12.0 MINE CLOSURE PLANNING

12.1 OBJECTIVES OF CLOSURE PLANNING

Mine closure planning has to be carried out at the starting of the mine and needs periodic reviewing and revision during its life cycle to cope with the geo-technical constraints, safety and economic risks, social and environmental challenges. Various other objectives are as follows:

- ❖ To allow a productive and sustainable after-use of the site which is acceptable to the mine owner and the regulatory authority;
- ❖ To protect public health and safety;
- ❖ To alleviate or eliminate environmental damage and thereby encourage environmental sustainability;
- ❖ To minimize adverse socio-economic impacts.

12.2 DIFFERENT ASPECTS OF MINE CLOSURE PLANNING

The mine closure planning broadly involves the following aspects :

(a) Technical aspects;

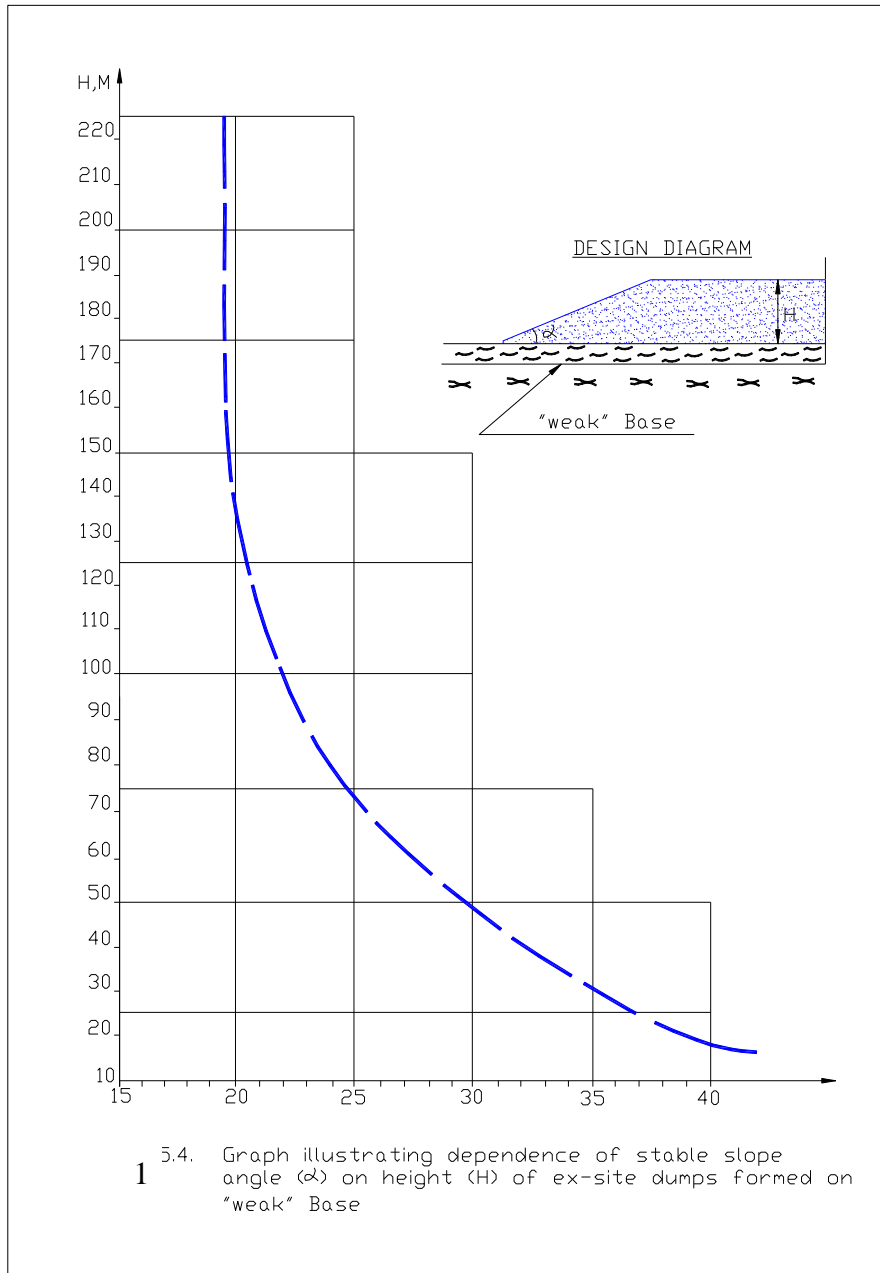
The following technical aspects would be reviewed in the final mine closure planning.

Safety hazards including management of fire and subsidence: In the mine closure plan, action will be taken to cover all the safety aspects including management of fire & subsidence and mine inundation.

Management of Pit Slopes: During operation of the mine, overall slope will be maintained at an angle not exceeding 22^o-28^o. Vegetation cover will also be provided along the slopes to arrest any failure.

As regards stability of back-filled dumps, the final level of reclaimed backfill will be matched with the levels of surrounding areas leaving a final residual void which will serve as a lagoon which may be utilised as water reservoir for the locality.

During operation, the external and internal OB dump will be developed with 40 m berm width and maximum height of 80m in case of external OB dump and the overall dump slope shall not exceed 22 to 28 degrees. The waste dumps will be provided with toe wall and garland drains. The dump will be technically reclaimed and vegetation will be grown after spreading the top soil. The above measures will prevent slope failure and improve the aesthetic value.



Backfilling has already started in the OCP and the final level of reclaimed backfill will be matched with the levels of surrounding areas leaving a final residual void which will also serve as a lagoon which may be utilised as water reservoir for the locality. Most of the back filled area shall be afforested by selecting proper plant species in consultation with State Forest Department. A part of the back filled area would also be developed for agricultural purpose with the help of the concerned State Authority.

- ❖ **Management of hydrology and hydro-geology:** The surface flow pattern of precipitation and mine water would be clearly developed and water channel suitably laid down so that it does not disturb the general hydrology of the area.

Mining operation may reduce the water table of the area. To recharge the water table, it is proposed that the mine water during operation will be discharged into surface water settling tank over flow of settled water from the tank will be used for water sprinkling, plantation, domestic purpose, etc. Therefore, the excess over flow water will be discharged into the nearby river. After closure of the mine vegetation will be grown on the entire vacant area..

- ❖ **Details of decommissioning of the infrastructures:** The decommissioning of the various infrastructures developed for the mine like office complex, roads, pipelines and transmission line etc. shall be planned in details so that the land occupied by these infrastructures are released. However, before such decommissioning, the possibility of re-use of these infrastructures for the neighboring mines shall be explored.

i) **Closure of entry to the open-cast mine :** After closure of the mining activities, all the entries to the mine will be effectively sealed off to avoid any accident and to prevent access to any unauthorized person. The area that is not reclaimed shall be properly fenced/ sealed to prevent any unauthorized

entry into the area. However, the guidelines / instructions from DGMS, if any, will be followed.

(b) Environmental aspects

This would include the following:

- ❖ **Management of final voids:** In the mine closure plan, voids due to mining are to be dealt and the final land use plan will include filling of the voids for land reclamation where possible and for hydro reclamation where feasible.
- ❖ **Reclamation of forests/vegetation:** It is to be ensured that in the final land use plan, all vacant land acquired for the project is afforested
- ❖ **Channelisation of available water:** If the mine is having sufficient water and if on closure, the mine water flows into the surface water courses, channelising this water for surrounding community for their irrigational/domestic uses may be taken up. This can be planned by providing structures involving one time costing
- ❖ **Management of Recharge Areas:** The pre-mining and post mining scenario on the hydrogeological recharge system would be included in the closure plan.
- ❖ **Acceptable Surface and Ground Water Flows:** In the final closure plan of the mine, wherever the mine water is likely to flow out to surface and meet the surface water sources; the quality of water from such mines would be assessed and flow pattern designed in the final plan.

(c) Social aspects;

The social aspects of land use planning relating to mine closure would include the following:

- ❖ **Re-deployment of Workforce:** The company employees will be gainfully engaged in the neighboring projects after cessation of mining activities.
- ❖ **Management of Community Facilities:** In view of the short life of the project no new community facility will be created. However, the existing facilities of adjoining areas will be strengthened.

(d) Financial aspects.

Mine Closure activities would be a constant exercise for the mine which would begin with the commencement of mining operations and continue till post closure. The mine closure activities would naturally entail certain expenditures, which will have to be borne by the mine operator. There are two types of Closure, namely, Progressive Mine Closure (Concurrent) and Final Mine Closure. This would cover the activities which are being executed along with normal mining operation and would continue to be executed in course of execution of the project.

The Final Mine closure cost has to deal with the following:

- Cost of closure activities.
- Cost towards organization for executing the closure activities.
- Cost of the post project monitoring.
- Creation of a corpus fund for the final mine closure.

12.3 MINE CLOSURE OBLIGATIONS

There is need to define the liabilities, responsibilities and authorities of the mine management, other regulatory bodies, Central and State Governments

after mine closure. Some obligations relating to the Mine Management Companies are as follows :

- (a) **Health & Safety:** Regulation Nos. 5, 66, 120, 128 of Coal Mines Regulations, 2017 and its related DGMS Circulars;
- (b) **Environment :** Water (Prevention & Control of Pollution) Act, 1974; Air (Prevention & Control of Pollution) Act, 1981; Environmental (Protection) Act, 1986 and Environmental Protection (Amendment) Rule, 2000; DGMS Directives on Noise & Ground Vibration;
- (c) **Forest :**
Forest (Conservation) Act, 1980.
- (d) **Rehabilitation :**
CIL's policy, however, applicable for land oustees only.
- (e) Decommissioning/asset disposal, etc.

12.4 IMPACT ASSESSMENT REMEDIAL MEASURES

Environmental Impact on Landscape, Water Source, air and noise pollution during mine life has been discussed earlier. It is imperative that the environmental monitoring may be continued for 3 years after closure of mines in order to assess corrective measures to be implemented to sustain pre-mining ecosystem and environment in the core and buffer zone (to the extent possible).

12.5 STAKEHOLDERS INVOLVEMENT

Various stakeholders effected due to mine closure need to be identified and they may be as follows :

The Company : Employees, Management & Stakeholders

The Community : Local business and service providers, landholders, neighbours and nearby residents, local Government and NGOs and Community Groups.

The State : The State Government. The Central Government and concerned Government Agencies.

There is need of regular consultations between the stakeholders to evolve the needs of the stakeholders and their involvement in the process.

12.6 CLOSURE ACTION PLAN

Closure planning is a whole-of-life exercise that begins at the start of a mine 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, and new technology and remain flexible enough to cope with unexpected events.

The following steps have to be undertaken in relation to Mine Closure Planning:

Prior to the surface demolition/restoration a surface audit should be undertaken on all surface structures, spoil heaps, lagoons, etc. to assess whether there are any hazardous materials that could cause problems; viz. explosives, chemicals, etc. A list of surface assets should be prepared and made available to potential purchasers, prospective purchasers could be invited and asked to submit sealed bids, this could ensure that the sale of assets give better financial gain.

In order to identify potential impact, necessary hydro-geological studies into post-mining ground water recharge have to be done.

Work force on roll of BCCL may be re-deployed for gainful utilization in the same or other mines of BCCL.

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 the mine. Once established, it may be updated annually.

12.7 PROTECTIVE MEASURES TO BE TAKEN

Protective measures must include the following :

- The protection of mine Entries , building and other structure on the project site against access by unauthorized persons;
- The maintenance of all mechanical, hydraulic and waste management system;
- The continuation of all monitoring programmes;
- The control of all contaminated effluents;
- The securing of all petroleum products, chemicals and waste;
- The rendering of all tailings, dams and piles of earth, rock and waste resulting from work done on the project site in a stable and safe condition.

12.8 CLOSURE COSTS

As per MOC guidelines, a corpus escrow account @ Rs 1.0 lakhs (August, 2009 Price Level) per Ha (for UG) and @ Rs 6.0 lakhs (for OC) of the project area shall be opened with the coal controller organization to meet the expenses of final mine closure. The current Guidelines read as:

“It has been estimated that typically closure cost for an opencast mine will come around Rs. 6.00 lakh per Hectare of the project area and it would be Rs. 1.00 lakh per Hectare for underground mine project area at current price levels (August, 2009) and these rates will stand modified based on Wholesale Price Index as notified by Government of India from time to time”.

It is difficult to conclusively predict the mining parameters on a long term basis owing to rapidly changing mining technology, developments in the field of clean coal technologies and R&D activities in development of alternative energy sources.

As per the latest Guidelines issued by the MoC, GoI (dt. 07.01.2013) the *“annual closure cost is to be computed considering the total project area at the above mentioned rates and dividing the same by the entire life of the mine in years for new projects and balance life of mine in years for operating/existing mines.”*

Jharia Coalfield is characterized by occurrence of a number of working coal horizons, giving a leverage of extended working life of the mines. Some more seams can come in the lap of workable horizons due to improvement in mining technology in times to come. The underground mines in leasehold of JCF are generally small capacity mines, giving a false impression of very long lives due to small level of current production level. There may be a strategy in future to amalgamate the mines for higher production level to attain the economics of scale. The existing OC Mines working at shallow depth may be worked at a

greater depth, In such a situation, the life of the mine arrived at with current level of production for the balance reserve may not be workable in the long run. In such a situation, it is envisaged that a Revised Mine Closure Plan should be prepared as per relevant guidelines and submitted for approval of the competent authority.

A Mine Closure Plan for Kuya Group of Mines was prepared earlier in October 2013 and subsequently approved by the BCCL Board. An escrow account bearing no 00150100008874 at Bank of Baroda was opened in this regard.

Now BCCL vide letter no BCCL/GM(P&P)/F-15/17/189 dated 27.12.2017 (enclosed as Annexure-I) has requested CMPDI, to prepare composite Mining Plan and Mine closure Plan of Kuya OCP.

Accordingly mine closure cost of Kuya OC is being updated on the basis of data/plans provided by mine authority at current scenario and balance life of the mine. Further, the same escrow account shall be continued for Kuya Colliery and the amount already accrued shall be adjusted against the new closure cost calculated.

In Kuya Opencast Project, the existing leasehold area is 340.50 Ha, out of which 34.0 Ha area is non-coal bearing area which will be used for external OB dump. Hence the whole leasehold area of 340.50 Ha is considered as project area for the calculation of closure cost of the area as per Open cast norms.

Based on the above consideration, the mine closure cost for Kuya colliery has been calculated.

The money deposited in the Escrow Account has to deal with the following:

- Cost of closure activities.
- Cost towards organization for executing the closure activities.
- Cost of the post project monitoring.
- Creation of a corpus fund for the final mine closure

As per Mine Closure guidelines, the total expenditure to be incurred at the notified rate of the year (August 2009) has been calculated in following manner:

Particulars	Value	Remarks
Area in Ha.	340.50	Area X Notified Rate
Notified Rate (Rs. Lakhs/Ha)	6	
Total Amount (in base year) (Rs. Lakhs)	2043.00	

As per the guidelines *“these rates will stand modified based on Whole Price Index as notified by Government of India from time to time”*.

Thus, an escalation factor has been calculated based on WPI of December 2017 is 180.6 (116.4 * 1.561) ** vis-à-vis WPI of August '09 (129.6) which comes out to be 1.393518519.

Particulars	Value	Remarks
Total Amount (in base year) (Rs. Lakhs)	2043.00	Total Amount (in base year) X Escalation Factor
Escalation Factor	1.393518519	
Escalated Amount(Rs. Lakhs)	2846.958	

** As per the directives from Office of the Economic adviser, WPI series has been revised. In the revised series, base year has been changed to 2011-12 from 2004 -05. To account for the aforesaid change WPI Linking Factor has been taken as 1.561.

As per the earlier approved Mine Closure Plan the total deposited amount in Escrow Account till 31.3.2017 was Rs. 711.318 Lakhs. As per the data furnished by BCCL, amount to be deposited in march 2018 for FY 2017-18 is 200.60 Lakh. Thus total amount deposited upto 31.03.2018 in escrow account comes to be

911.918 Lakh. The amount already accrued in the escrow account shall be adjusted against the new closure cost calculated.

To account for the deposited amount, the total amount is deducted from the escalated amount to arrive at the balance escalated amount.

Particulars	Value	Remarks
Escalated Amount (Rs. Lakhs)	2846.958	
Amount already deposited in escrow account (Rs. Lakhs)	911.918	
Balance Escalated Amount (Rs. Lakhs)	1935.040	

To arrive at the annual cost to be deposited in each year in an escrow account, the escalated amount shall be divided by the life of the section.

Particulars	Amount (in Rs. lakhs)	Remarks
Balance Amount	1935.040	
Balance Life excluding 2017-18	14	Balance Amount / Life
Amount in 2018-19	138.217	

As per the guidelines, the arrived annual cost has to be escalated by 5% every year for the remaining life of the mine. The amount to be deposited every year after 5% escalation is given below:

Year	Amount to be deposited per year in Rs. Lakhs
2018-19	138.217
2019-20	145.128
2020-21	152.384
2021-22	160.003
2022-23	168.004
2023-24	176.404
2024-25	185.224
2025-26	194.485
2026-27	204.209
2027-28	214.420
2028-29	225.141
2029-30	236.398
2030-31	248.218
2031-32	260.629
Total	2708.864

The amount calculated above shall be deposited every year by BCCL in the Escrow Account in the name of Kuya Colliery.

Thus, total amount that shall be further deposited for final mine closure activities of kuya opencast workings during the balance life of 14 years stands out to be Rs. 2733.147 lakhs as per the present status of the mine.

The amount already deposited in the escrow account will also be available for mine closure activities and should be included to arrive at the total funds available for Mine Closure Activities.

Particulars	Amount (in Rs. lakhs)
Amount Already Deposited in Escrow Account	911.918
Amount to be Deposited in the Escrow Account in the Future	2708.864
Total Amount available for Mine Closure Activities	3620.782

Based on the existing mine closure planning norms, the above calculated cost at Final WPI of December 2017 on mine closure may be tentatively grouped under different heads as given in following Table for opencast section as per guidelines of CMPDI (HQ).

Break up costs of Mine Closure Activities for Kuya Colliery (Opencast)

Sl. No.	Activity	Mine Closure Cost (Rs. in Lakhs)
A	Dismantling of Structures	
	Service Buildings	7.24
	Residential Buildings	96.67
	Industrial Structures like CHP, Workshop, field sub-station, etc.	10.86
B	Permanent Fencing of Mine Void and other dangerous area	
	Random Rubble masonry of height 1.2 metre including levelling up in cement concrete 1:6:12 in mud mortar	54.31
C	Grading of Highwall slopes	
	Levelling and grading of highwall slopes	64.09
D	*OB Dump Reclamation	
	Handling/Dozing of OB Dump into mine void	3210.19
	Bio-Reclamation including soil spreading, plantation and maintenance	14.48
E	LANDSCAPING	
	Landscaping of the cleared land for improving its esthetic	10.86
F	*Plantation	
	Plantation over area obtained after dismantling	18.10
	Plantation around fencing	7.24
	Plantation over the cleared OB Dump	0.72
G	Monitoring/Testing of parameters for three years	
	Air Quality	7.97
	Water Quality	7.24
H	*Enterpreneurship Development(Vocational/skill development training for sustainable income of affected people	
		9.41
I	*Miscellaneous and other mitigative measures	
		72.42
J	Manpower Cost for Supervision	
		28.97
	TOTAL	3620.782

Note: * : To be covered under Progressive Mine Closure activities also

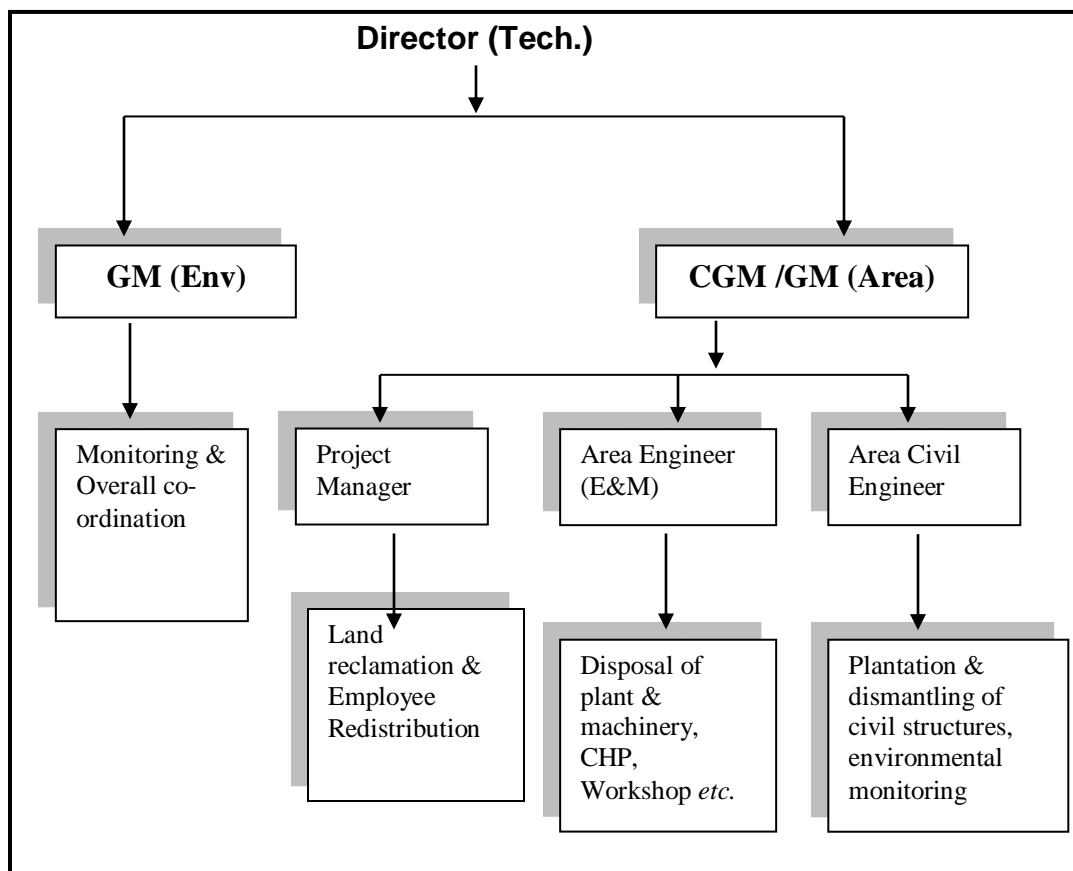
Mining is to be carried out in a phased manner initiating afforestation/reclamation work in the mined out area of the first phase while commencing the mining in the second phase i.e. continuation of mining activities from one phase to other indicating the sequence of operations depending on the geo-mining conditions of the mine. Up to 80% of the total deposited amount including interest accrued in the ESCROW account may be released after every five years in line with the periodic examination of the Closure Plan Guidelines. The amount released should be equal to expenditure incurred on the Progressive mine closure in past five years or 80% whichever is less. The balance amount shall be released to mine owner/leaseholder at the end of the final Mine Closure on compliance of all provisions of Closure Plan. This compliance report should be duly signed by the lessee and certify that said closure of mine complied all statutory rules, regulations, orders made by the Central or State Government, statutory organisations, court etc. and certified by the Coal Controller.

However, the additional amount beyond the escrow account, if any, estimated later on, will be provided by the mine operator after estimating the final mine closure cost as per the mine closure guideline.

12.9 IMPLEMENTATION PROTOCOL

As the mine closure activities would continue even after cessation of mining activities, an organization consisting of different discipline would be formed to undertake the implementation of mine closure activities as well as monitoring of the same. Such activity shall continue for a period of three years after the closure of mining activity in the mine. Once the closed mine becomes stabilized in respect of safety, environmental and social aspects, the monitoring team would be withdrawn.

For implementing the mine closure activities and monitoring thereof, the following organisational structure at corporate level has been proposed:



Environmental monitoring for three years after closure of mine will be carried out to evaluate the environmental quality of the area. If need be, proper mitigation measures will be taken up after evaluating the environmental quality. Before closure of the mine, Area GM will prepare survey and disposal report and the same will be submitted to DGMS for acceptance.

When the mine closure activities would take final shape and the entire area under influence is brought to an acceptable shape, BCCL would obtain a mine closure certificate from Coal Controller to the effect that the protective, reclamation and rehabilitation works in accordance with the approved mine closure plan/final mine closure plan have been carried out for surrendering the reclaimed land to the State Government concerned.